A birelational analysis of the Russian imperfective

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Abstract

This paper provides two puzzles for a theory of aspect. The first concerns the quirky behavior of the Russian imperfective with regard to its culmination properties: it seems to function like the perfect aspect in certain cases, but like the progressive in others. The other puzzle concerns how the Russian imperfective constrains the temporal location of a described event: it relates distinct event parts to a given temporal parameter. Which part is at play depends on how this parameter is specified. If it is specified by an adverbial, then an event is located in time. If it is specified by the discourse context, then a consequent state is located in time. I solve the former puzzle by appealing to the structure of atomic vs. non-atomic events and solve the latter by appealing to two temporal inputs required by an aspectual marker. These inputs reveal that aspectual meaning involves both temporal information and information about discourse connectivity.

1 Introduction

Moens & Steedman 1988 proposed that events have the tripartite structure shown below in Fig.1. The culmination point of an event is its inherent telos—i.e. a point at which an event ceases to take place. An achievement solely consists of a culmination point—i.e. it is over as soon as it is instantiated. An accomplishment (or culminated process), on the other hand, consists not only of a culmination point, but also a preparatory process, which in turn consists of a series of preparations leading to a culmination and in certain cases, the consequence of this culmination or an event’s consequent state (cf. the term ‘result state’ in Dowty 1979). For example, an event of Dudkin walking to my house constitutes a series of preparations—e.g. Dudkin putting on his shoes, walking through the park, taking a short break, etc.—that lead him to the final step after which he is in front of my house. Finally, activities (or processes) solely of a preparatory process.

<table>
<thead>
<tr>
<th>Preparatory process</th>
<th>Culmination point</th>
<th>Consequent state</th>
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Figure 1: Moens and Steedman’s (1988) tripartite event structure
Aspectual markers provide evidence for a particular event structure. Moens and Steedman proposed that the English progressive combines with a VP and makes reference to the preparatory process of the VP-event, thereby implying ‘non-culmination’ or ‘ongoingness’. The English perfect, on the other hand, makes reference to the consequent state of a VP-event and thereby implies a ‘consequence’ arising from an event’s culmination. For this reason we understand the letter writing event to be ongoing in (1), but in (2), the consequence of the letter writing event is what’s at issue.

(1) Abelard is now writing a letter to Heloise’s uncle, the Canon.  
(2) Abelard has now written a letter to Heloise’s uncle, the Canon.

This paper presents two puzzles for a theory of aspect that arise from the Russian imperfective. One puzzle concerns the observation that this aspect leads to an entailment that a described event culminated only in certain cases. In particular, it seems to function like the perfect aspect in certain cases, viz. (3), but like the progressive in others, viz. (4).

(3) Nedelju nazad k nam priežža-l otoc.  
‘Father had come to see us a week ago.’

(4) Nedelju nazad Marija čita-l-a ‘Vojnu i sir’.  
‘A week ago, Maria was reading War and Peace.’

Traditionally, this seeming ‘optionality’ has been dealt with by treating the imperfective as an unmarked member of an opposition with the perfective (Jakobson 1932)—the imperfective is thought to “posses no positive semantic mark which it would express constantly” (Bondarko 1971, cited from Rassudova 1984, pp. 14). Some have even claimed that “there is no such thing as the meaning of the imperfective; this ‘aspect’ is really a non-aspect” (Paslawska and von Stechow 2003, pp. 336). In search for a ‘positive meaning’ of this aspect, one often encounters analyses that treat it as being ambiguous, disjunctive or so grossly underspecified that they are ‘nearly meaningless’ (see Grønn 2003 for an overview). In this paper I propose to relate the culmination entailment properties of the Russian imperfective to atomicity. Extending analyses offered by Filip 2000 and Kagan 2007, I propose that the Russian imperfective is a partitive operator that encodes a generalized version of Landman’s (1992) continuation branch—a function that allows one to trace how an event that is instantiated in the world of evaluation develops in some possible world. The idea is that the imperfective encodes a continuation branch function with the following restriction: an event is on the continuation branch for another event only if the latter is a part of the former. Assuming this part need not be proper, we allow for the possibility that an event ‘develops’ into itself in the world of evaluation and explain why an imperfective sentence can make reference to an atomic event, which in turn leads to a culmination entailment.

The other puzzle concerns how aspect constrains the temporal location of a VP-event part. The standard view (henceforth: unirelational) is to say that aspect constrains the temporal location of an eventuality relative to a single parameter: a time (cf. Reichenbach’s
1947 reference point and Klein’s 1994 topic time). This time can be specified by a grammatical expression like an adverb. For example, the progressive in (1) locates the preparatory process of the letter writing event at the time denoted by now, while the perfect in (2) locates the consequent state of the letter writing event at this time.

The temporal parameter can also be specified by the discourse context. For example, the dinner making event described below, in (5b), is understood to follow some time after the coming home event described in (5a); (5) does not entail that the dinner making event occurred at the time denoted by at 6.

   b. Abelard made her dinner.

To account for discourses like (5), Hans Kamp and colleagues (Kamp 1979, Kamp and Rohrer 1983, et seq.) proposed that aspect could locate a described eventuality relative to a contextually provided event. Assuming that eventualities can be mapped onto their run times, the view that aspect relates an eventuality to a time is maintained. A potential drawback of Kamp’s proposal, however, is that events are related to times specified by an adverb differently from the way they are related to times provided by the discourse context—e.g. in (5a) the coming home is located at a time specified by an adverbial (i.e. 6 o’clock), but in (5b) the letter writing event is located after a time specified by the discourse context (i.e. run time of the coming home event). For this reason Kamp & Reyle (1993) distinguish the location time—i.e. the time specified by an adverbial—from the reference time—i.e. the time provided by the discourse context and thereby diverge from Reichenbach’s (1947) unified notion of a reference point.1

Partee (1984) proposes to refine Kamp’s analysis by saying that aspect can locate an eventuality relative to a salient time that is “just after” a previously mentioned discourse event. Webber (1988) recasts this idea in terms of the event structure in Fig. 1: aspect can locate an eventuality relative to the duration of a salient consequent state of a previously mentioned discourse event. On such an analysis, the letter writing event in (5b) is located within the duration of the consequent state of the coming home event (rather than after the coming home event). Such a proposal is elegant because it (i) makes use of an independently motivated event structure and (ii) relates events to times specified by an adverbial in the same way it relates events to times provided by the discourse context, thereby preserving Reichenbach’s (1947) original insight.

Despite its elegance, I argue in the next section that the Partee-Webber approach cannot account for the dual nature of the Russian imperfective. This aspect is remarkable because it relates distinct event parts to a temporal parameter. Which part is at play depends on how this parameter is specified. If it is specified by an adverbial, then an event is located in time. If, on the other hand, it is specified by the discourse context, then a consequent state of an event is located in time. Based on these observations, I propose in the spirit of Kamp & Reyle (1993) that the Russian imperfective aspect is birelational: it requires two inputs—a grammatically constrained time and a salient discourse state—relative to which a described eventuality is located. The proposed analysis is presented in §3, where I also show how it generalizes to the English progressive.

1 Based on before and after clauses, as well as temporal anaphora involving multiple event antecedents, Nelken and Francez (1997) provide independent evidence for positing two time parameters.
The main contributions of this paper can be summarized as follows. It provides two puzzles for a theory of aspect. The first concerns the quirky behavior of the Russian imperfective with regard to its culmination properties. The other concerns the dual nature of this aspect with regard to they way it constrains the temporal location of VP-event parts. I solve the former puzzle by appealing to the structure of atomic vs. non-atomic events and solve the latter by appealing to two temporal inputs required by an aspectual marker. These inputs reveal that aspectual meaning involves both temporal information and information about discourse connectivity.

### 2 A puzzle for a unirelational theory of aspect

Consider the flashback discourse in (6), which consists of a series of perfective sentences. The initial two sentences in this discourse entail that the flower giving event precedes the kissing event. However, without the location adverbial in (6b), the understood event ordering is reversed: the flower giving is understood to follow the kissing. Moreover, the perfective clauses in (6b,c) form a narrative progression—i.e. the theater-inviting event is understood to follow the flower giving.

(6) a. *Nedelju nazad Marija po-celova-l-a Dudkina.*
   ‘A week ago, Maria kissed Dudkin.’

b. *Za nedelju do togo on po-dari-l ej cvety*
   ‘A week before that he had given her flowers

   and PFV give-PST.3s her flowers

c. *i priglasi-l ee v teatr.*
   ‘and PFV invite-PST.3s her to theater
   and (then) had invited her to the theater.’

These observations are expected on a unirelational analysis of aspect, in which the temporal location of an eventuality is fixed relative to a single temporal parameter. For example, according to Webber’s (1988) analysis sketched out in the previous section, the

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2 To the best of my knowledge Chvany (1985, 1992) was the first to discuss Russian aspect in flashback discourses. See also Kamp & Rohrer 1983 for a discussion of flashback discourses in French, and Kamp & Reyle 1993 and Parsons 2002 for English.
flower giving event described in (6b) is located within a time that precedes the kissing event by a week (see Fig. 2 below); when the adverbial is not present, this event is located within the duration of the consequent state of the kissing event (see Fig. 3 below). Similarly, the theater inviting event described in (6c) is contained within the duration of the consequent state of the flower giving event described in (6b).³

Figure 3: Temporal ordering of events without the adverbial in (6b)

Let us now consider the flashback discourse in (7), which is like (6), except that (7b) and (7c) are imperfective sentences.

   ‘A week ago, Maria kissed Dudkin.’

b. *Za nedelju do togo on dari-l evy cvety*.
   ‘A week before that he had given her flowers’

c. *i priglaša-l ee v teatr.*
   ‘And then had invited her to the theater.’

Although there is no order that the events described in (7b) and (7c) are understood to have occurred in, both are understood to precede the kissing event in (7a). Interestingly, if the location adverbial in (7b) were not present, the understood event ordering in (7a,b) would remain unaltered.

A reasonable hypothesis that arises given these generalizations is that the Russian imperfective is similar to the English perfect (cf. Paducheva 1996):

(8) Hypothesized analysis of the Russian imperfective

The Russian imperfective encodes the temporal relation *topical time is contained within the duration of the consequent state of described event* (cf. Moens & Steedman 1988) and the consequent state of the described event does not serve as an antecedent.

³ Since an explicit theory of anaphora resolution is beyond the scope of this paper, I follow Kamp & Reyle 1993 and assume that we can identify the ‘salient’ antecedent in a given sentence based on our intuitions about the temporal ordering of eventualities—e.g. we know that the consequent state of the flower giving event serves as the antecedent in (6c) since we understand the theater inviting event to follow the flower giving event.

Relating (8) to the discourse in (7), we would say that the topical time in (7b)—i.e. the duration of the consequent state of the kissing event—is contained within the duration of the consequent state of the event described in (7b)—i.e. the consequent state of the flower giving. This would explain why flower giving event is understood to precede the kissing event when there is no adverb in (7b). Moreover, assuming that the consequent state of the flower giving event does not serve as an antecedent for subsequent discourse, we would explain why there is no order that the events described in (7b) and (7c) are understood to have occurred in.

Despite its success, (8) cannot be maintained along with a unirelational analysis of aspect. To see why not, consider the following observation about (7b):

(9) Observation
(7b) entails that the described event culminated within the time denoted by the adverbial—i.e. (7b) is false if Maria did not successfully receive flowers from Dudkin a week before the kissing event.

Recall that according to a unirelational analysis, events are related to times specified by an adverbial in the same way they are related to times provided by the discourse context. Therefore, if (8) were right, then we would have to explain (9) in the following way: the imperfective in (7b) requires that the time denoted by the adverbial be contained within the duration of the consequent state of the giving event. As illustrated below in Fig. 4, this wrongly predicts that the consequent state of the flower giving event—rather than the flower giving event itself—took place a week before the kissing event:

To make account for (9), we have to say that the flower giving event is contained within the time denoted by the adverbial. However, if that were right, and we wanted to maintain a unirelational analysis of aspect, then we would make the wrong prediction about the inferred discourse order in (7a,b) in cases where an adverbial is not present. In such cases, we crucially need an analysis along the lines of (8). Put differently, the Russian imperfective raises the following puzzle:

(10) Discourse connectivity puzzle
a. If the temporal parameter is specified by an adverbial, then the Russian imperfective constrains the temporal location of an event.
3 A birelational analysis of the imperfective aspect

3.1 Solving the culmination puzzle

The analysis of the Russian imperfective proposed in this section is largely motivated by the first part of the discourse in (7), repeated below in (11). Recall that (11) is false if Maria did not successfully receive flowers a week prior to the kissing event.

Week ago Maria PFV-kissed-PST.3s-FEM Dudkin
‘A week ago, Maria kissed Dudkin.’

b. Za nedelju do togo on dari-l ej cvety...
From week to that he giveIPF-PST.3s her flowers
‘A week before that he had given her flowers...

The nuts and bolts of my proposal are as follows. An imperfective operator IPF combines with VP and requires that a VP-event stage be contained within a time denoted by an adverb (henceforth LOCATION TIME). Following Landman 1992, I assume that a stage of an event e is a part of the preparatory process of e that is “big enough and shares enough with e so that we can call it a less developed version of e” (Landman 1992: 23). Applying this idea to (11b), we would say that IPF combines with darit’ cvety (‘give flowers’) and requires that a stage of a flower-giving event be contained within the LOCATION TIME, namely the time interval denoted by za nedelju do togo (‘a week before that’).

Fig. 5 illustrates the parallel between the Russian perfective and imperfective in (11a) and (11b) respectively: in both cases, an event is contained within the LOCATION TIME. The crucial difference is that IPF makes reference to a VP-event stage rather than a VP-event. However, this difference is neutralized in cases such as (11b), where the imperfective sentence describes an atomic event—i.e. a stage of an atomic VP-event is a VP-event.
In sentences like (12), however, the culmination difference is not neutralized. According to the proposal, this sentences entails that some VP-event stage culminated within the time described by *nedelju nazad* (‘a week ago’) and crucially not that the VP-event culminated within this time.

(12) *Nedelju nazad Marija čita-l-a ‘Vojnu i mir.’*  
Week ago Maria read-PST.3s-FEM War and Peace  
‘A week ago, Maria was reading *War and Peace.*’

This prediction is captured by the unirelational imperfective operator in (13), where the t argument is intended to serve as the location time.

(13) **Unirelational Imperfective Operator (1st version)**  
IPF $\implies$ $\lambda P\alpha (\{w, e’, e | \tau(e’) \subseteq t, <e, w> \in \text{Cont}(e’, w_0)\}; P(e, w)$

Several comments are in order. To begin with, note that the representation in (13) combines λ-calculus of Montague Grammar (Montague 1970a,b; 1973) with DRSs of Discourse Representation Theory (DRT) developed by Hans Kamp and colleagues (Kamp 1981, Kamp and Reyle 1993). Such representations are commonly used in the literature on discourse interpretation to show the meanings of sub-sentential expressions. Following Muskens 1995; 1996, I assume that representations like (13) do not get a direct interpretation, but rather serve as syntactic sugar that abbreviates more elaborate terms of typed λ-calculus that are interpreted. Due to space limitations I refer the reader to the aforementioned work for details about Muskens’ abbreviations and interpretation rules.

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Figure 5: Locating a VP-event stage within the location time

Figure 6: Continuation branch (to be amended)

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The other set of comments concern Cont in the meaning above. This is a generalized version of Landman’s (1992) continuation branch function that allows one to trace how an event that is instantiated in the world of evaluation develops in some possible world. Landman’s idea was as follows: when evaluating a progressive sentence, one takes the event stage that warrants the assertion in the world of evaluation and follows this event stage through its development. If it turns into a VP-event in the world of evaluation, then the sentence is true. If the event is interrupted before this happens, we jump to the closest world—which is like the world of evaluation, except that the event was not interrupted in this world—and follow through its development there. If there is another interruption, we jump to the next closest world and carry on following through the development of the event. Sooner or later, either one finds that the original event stage develops into an event of the desired type, in which case the sentence is true, or one decides that we are too far from the original world, in which case the sentence is false.5

In the discussion above, there is an implicit assumption that if an event is on the continuation branch for another event, then the latter is a proper stage of the former. This is captured by the axiom below, which has the predicate Cont* rather than Cont in (13).

AX1 ∀ e ∀ e' ∀ w ∀ w'[<e, w> ∈ Cont*(e', w')) → e' stage e]

Unlike Cont*, which is encoded by the progressive operator, Cont in (13) is more general: if an event is on the continuation branch for another event, then the latter is a stage of the former. This is captured by AX2 below. In turn, it follows that if an atomic event constitutes a single stage, an atomic event develops into itself in the world of evaluation and presumably in every other possible world.

AX2 ∀ e ∀ e' ∀ w ∀ w'[<e, w> ∈ Cont(e', w')) → e' stage e]

Given the proposed difference between the imperfective and progressive operators, we can now explain the differences between (14) and (15):

(14) Mary was arriving at the station (when her cell phone went off).

(15) Marija priježa-l-a na stanciju (vstrečat’svoix detej).

Mary arrivePST.3s-FEM to station meet her children

‘Maria (had) arrived at the station (to meet her children).’

The sentence in (14) has the following paraphrase: “there was an event going on which if not interrupted culminated in Mary’s arrival at the station…” (Rothstein 2004: 48). According to this paraphrase, an arrival is not interpreted as an achievement (as is the case in the sentence Maria arrived at the station) but rather as accomplishment-like. This is expected given AX1 above: when the progressive operator combines with a VP, it requires that there be a proper stage of a VP-event. However, since achievements are atomic, coercion takes place whereby an achievement becomes accomplishment-like (see Moens & Steedman 1988, de Swart 1998, Rothstein 2004 and Bary 2009 for various formal implementations of this idea). On the other hand, given AX2, there is nothing in the grammar that forces an achievement to be coerced into an accomplishment when an achievement denoting VP combines with IPF.

5 The idea of viewing the progressive as modal operator goes back to (at least) Dowty 1979. In addition to Landman’s theory, there have been other implementations of Dowty’s idea (see e.g. Bonomi 1997 and Portner 1998). To the best of my knowledge, they are all compatible with the analysis proposed here.
Consequently, it is not surprising that (15) can be paraphrased as follows: “there was an event which culminated in Mary’s arrival at the station.”

I end this section by noting that (13) does not capture the aforementioned observation that without the adverb in (11b), the understood event ordering remains unaltered. That is, (13) does not account for the observation that the flower-giving event described in (16b) is understood to precede the kissing event described in (16a). This is the heart of the discourse connectivity puzzle described in the previous section and I now turn to providing a solution.

(16) a.  
   *Nedelju nazad Marija po-celovala-a* Dudkina.  
   Week ago Maria PFV-kissed-PST.3s-FEM Dudkin  
   ‘A week ago, Maria kissed Dudkin.’

b.  
   *On dari-l ej cvety...*  
   He giveIPF-PST.3s her flowers  
   ‘A week before that he had given her flowers...’

### 3.2 Solving the discourse connectivity puzzle

In order to make the correct prediction about (16), I propose that IPF not only makes reference to a VP-event stage but also to the consequent state of this stage. This means that a preparatory process of a given event consists not only of event stages, but also their consequent states. This is in accordance with Moens and Steedman’s (1988) idea that “Any or all of [parts of an event] may be compound” (Moens & Steedman 1988: 18). Accordingly, I propose to revise Landman’s continuation branch in Fig. 6 as in Fig. 7, where each stage consists of the entire event nucleus, i.e. a preparatory process, a culmination and a consequent state.

![Figure 7: Continuation branch (final version)](image)

In turn, I propose in the spirit of Webber 1988 that IPF requires that a consequent state of a VP-event stage contain a **topic state**, i.e. a salient consequent state previously mentioned in the discourse. The idea is, then, that the discourse properties of the Russian imperfective follow from relating two consequent states: one described by IPF and one supplied by the discourse context. For example, we would say that IPF in (16b) combines with *darit’ cvety* (‘give flowers’) and requires that a consequent state of a flower-giving event stage contain a **topic state**, which refers to the consequent state of the kissing event described in (16a).
As illustrated below in Fig. 8, the flower-giving event precedes the kissing event because the consequent state of the kissing event is contained within the consequent state of the flowering giving event stage.

![Diagram](image)

Figure 8: \( \tau(\text{TOPIC STATE}) \subseteq \tau(\text{consequent state of VP-event stage}) \)

This prediction is captured by the imperfective operator in (17), where the \( s \) argument is intended to serve as the \( \text{TOPIC STATE} \). Moreover, note that \( \text{Cons} \) is a function from an event to the consequent state of that event.

\[(17) \text{Unirelational imperfective operator (2nd version)} \]

\[\text{IPF} \rightarrow \lambda P_s. [w, e', e | \tau(s) \subseteq \tau(\text{Cons}(e'))], <e, w> \in \text{Cont}(e', w_0)] ; P(e, w)\]

When the imperfective operator in (17), is combined with the imperfective operator proposed in (13), we get the birelational imperfective operator in (18).

\[(18) \text{Birelational imperfective operator (final version)} \]

\[\text{IPF} \rightarrow \lambda P_{s \lambda t}. [w, e', e | \tau(e') \subseteq t, \tau(s) \subseteq \tau(\text{Cons}(e'))], <e, w> \in \text{Cont}(e', w_0)] ; P(e, w)\]

The imperfective operator above is birelational because in addition to requiring a VP-event stage to be contained within a \( \text{LOCATION TIME} t \), it requires a consequent state of a VP-event stage to contain a \( \text{TOPIC STATE} s \). In this way, IPF involves both temporal information and information about discourse connectivity.

A question that comes up is how (18) accounts for the well-known generalization in (19):

\[(19) \text{Generalization about subsequent discourse} \]

The Russian imperfective does not trigger narrative progression.

This generalization is motivated for the aforementioned observation that there is no order that the events described in (20b) and (20c) are understood to have occurred in.

\[(20) \]

a. \( \text{Nedelju nazad Marija po-celova-l-a} \quad \text{Dudkina.} \)   \quad \quad \quad \quad \quad \text{PFV}

Week ago Maria PFV-kissed-PST.3s-FEM Dudkin
‘A week ago, Maria kissed Dudkin.’

b. \( \text{Za nedelju do togo on} \quad \text{dari-l} \quad \text{ej cvety} \)  

From week to that he giveIPF-PST.3s-FEM her flowers
‘A week before that he had given her flowers

\[ \text{IPF} \]

c. \( \text{i priglaša-l} \quad \text{ee v teatr} \)  

and inviteIPF-PST.3s-FEM her to theater
and (then) had invited her to the theater.’

\[ \text{IPF} \]
The IPF in (18) accounts for this observation as follows. Even though the operator makes reference to the consequent state of a VP-event stage—viz. $\tau(\text{Cons}(e'))$—this state is not introduced into the universe of the DRS. This means that the consequent state of a VP-event stage cannot serve as an antecedent for subsequent discourse. Therefore, when searching for a topic state in (20c), the consequent state of the flower-giving event cannot be chosen. The only possible antecedent is the consequent state of the kissing event described in (20a), which I assume is made salient by the perfective aspect. From this it follows that the flower-giving and the theater-inviting events are located with respect to the same topic state. Since both events contain this topic state, there is no order that the events described in (20b) and (20c) are understood to have occurred.

Another question regarding IPF in (18) concerns how it accounts for discourses like (21), where the salient interpretation is one in which the event of the speaker coming in overlaps the event of Dudkin reading a War and Peace.

(21) a. Včera ja vošèl v svoju komnatu. 'Yesterday, I came into my room.'

b. Dudkin tam čital Vojnu i mir. 'Dudkin was there reading War and Peace.'

As illustrated below in Fig. 9, this event ordering is compatible with IPF, and in particular, with the relation $\tau(s) \subseteq \tau(\text{Cons}(e'))$. Here we see the consequent state of the coming in event being co-temporal with the consequent state of the reading event stage. From this, it follows that the reading event stage overlaps the coming in event as desired.

![Figure 9: $\tau(\text{TOPIC STATE}) \subseteq \tau(\text{consequent state of VP-event stage})$](image)

The question that comes up, of course, is why (21) does not have an interpretation parallel to (16), i.e. that the reading event described in (21b) took place prior to the coming in event described in (21a). After all, the proposed meaning of IPF allows this interpretation as well. Conversely, why doesn’t (16) have the interpretation parallel to (21), i.e. that the flower-giving event described in (16b) overlaps the coming in event described in (16a)? The view advocated here is that there are, in fact, two possible event orderings that make (16) and (21) true. However, one of the possibilities is ruled out by world knowledge. With regard to (16), it seems rather unlikely that one kisses someone as they are receiving flowers. Instead, one typically (i) chooses to give flowers as a consequence of being kissed or (ii) kisses someone as a consequence of receiving flowers. The former option corresponds to Kehler’s (2002) occasion defined below in (22), while the latter corresponds to Kehler’s explanation relation, defined below in (23). The idea is that the semantics of IPF rules out the relation in (22), but is compatible with the relation in (23), which is inferred given world knowledge.
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(22) \text{Occasion}(S_1, S_2) \rightarrow E_1 <, E_2 \\
(\text{where the event described by } S_2 \text{ explains, or is caused by, the event described by } S_1)

(23) \text{Explanation}(S_1, S_2) \rightarrow E_1 >, E_2 \\
(\text{where the event described by } S_1 \text{ explains, or is caused by, the event described by } S_2)

With regard to (21), the overlapping reading is derived as follows: the \text{Occasion} relation in (22) is ruled out by the semantics of IPF and world knowledge rules out the \text{Explanation} relation in (23), i.e. it would be odd to think that the coming in and the reading are somehow causally linked.\footnote{One could, of course, imagine a situation in which e.g. the speaker is a detective and comes into his own room to figure out whether Dudkin was there earlier. In such a context, however, the event ordering in (21) would be on a par with (16).} The only remaining relations that are compatible with the meaning of IPF are provided in (24) and (25). The \text{Explanation} relation in (24) is ruled out because (21a) and (21b) do not describe the same event. The \text{Background} relation in (25), on the other hand, fits perfectly.

(24) \text{Elaboration}(S_1, S_2) \rightarrow E_1 =, E_2 \\
(\text{where } S_1 \text{ and } S_2 \text{ describe the same event})

(25) \text{Background}(S_1, S_2) \rightarrow E_1 \circ E_2 \\
(\text{where } S_2 \text{ describes the backdrop for the event described by } S_1)

Let us now consider an imperfective sentence where the \text{Elaboration} relation is chosen. An example of this sort is provided in (26).

(26) a. \text{Poet}oj poternoj ja na-pisal pervoe ljubovnoe pis'mo k Vera \\
\text{In this tavern} PFV-write-PST.1S first love letter to Vera \\
\text{‘In this tavern, I wrote my first love letter to Vera.’}

b. \text{Pis}a-l karandašom. \\
\text{Write.IPF-PST.1S pencil} \\
\text{‘I wrote it in pencil’ (Forsyth 1970, pp. 86).}

The \text{Elaboration} relation is inferred here because (26a) and (26b) describe the same event. Note that this relation is compatible with (18) because IPF allows the consequent state of the letter-writing event described in (26a) to be co-temporal with the consequent state of the letter-writing event described in (26b) and, therefore, the two events may be identical.

In sum, the birelational meaning of IPF in (18) accounts for the generalization in (27), which has received very little attention in the literature in comparison to the generalization in (19), but which is nevertheless a core property of the imperfective aspect that any proper analysis must account for.\footnote{The notion of ‘salience’ is meant to rule out cases in which the imperfective is not used in in narrative discourses of the type considered here.}

(27) \text{Generalization about preceding discourse} \\
\text{The Russian imperfective leads to an entailment that the described event does not follow a salient event previously mentioned in the discourse.}
It follows from (27) that there are two situations that make an imperfective sentence true. I argued that world knowledge determines whether a VP-event stage overlaps or precedes a previously mentioned discourse event. The latter typically involves an inference in which two events are causally related, invoking the EXPLANATION relation, while the former typically does not involve a causal relation, invoking the ELABORATION or the BACKGROUND relation.

I end this section by raising the following question that comes up for the birelational analysis proposed here: Are all aspectual operators birelational or do they have different semantic types? Rather than addressing this question explicitly, I would like to show what a birelational analysis of English progressive is like. Consider the proposed meaning of the English progressive operator in (28):

\[
\text{(28) BIRELATIONAL PROGRESSIVE OPERATOR}
\]

\[
\text{IPF } \rightarrow \lambda P \lambda s \lambda t. [w, e', e | \tau(e') \subseteq t, \tau(s) = \tau(\text{CONS}(e')), <e, w> \in \text{Cont}^*(e', w_0)]; P(e, w)
\]

There are two crucial differences between the progressive operator in (28) and the imperfective operator in (18). The first has to do with the predicate Cont* in (28) versus Cont in (18). This difference was discussed in the previous subsection and I will not say anything more here. The other difference concerns how the consequent state of the VP-event stage is related to the state argument. Whereas the imperfective encodes a subset relation—allowing for two possible temporal orderings of events, viz. Fig. 8 and 9—the progressive encodes an identity relation, thereby allowing for only one possible temporal ordering. For example consider the discourse below, in (29). Applied to the VP in (29b), the birelational progressive operator would require that the consequent state of letter writing event stage be co-temporal with the state argument. Assuming this argument serves as the consequent state the coming home event in (29a), it is correctly predicted that the letter writing and the coming home events overlap; see Fig. 10 below.

\[
(29) \begin{array}{ll}
\text{a.} & \text{Heloise came home at 2 in the morning.} \\
\text{b.} & \text{Abelard was writing a letter to her uncle, the Canon.}
\end{array}
\]

\[
\text{Figure 10: } \tau(\text{TOPIC STATE}) = \tau(\text{consequent state of VP-event stage})
\]

4 Conclusion

In the previous section I proposed a birelational analysis in which an aspectual operator requires two inputs. I assumed that the value of one of these inputs is a time denoted by an adverbal expression (viz. Kamp and Reyle’s location time) and the value of the other input is a salient consequent state previously mentioned in a discourse (viz. Webber’s consequent state-as-a reference point). Given these assumptions, I showed how we can account for the discourse connectivity puzzle motivated in §2. I end this paper by discussing a non-trivial
issue concerning how the inputs required by IPF are supplied.

Reconsider (30) and (31) and the proposed analysis of these discourses diagramed in Fig. 11 and Fig. 12 respectively.

    Week ago Maria PFV-kissed-PST.3s-FEM Dudkin
    ‘A week ago, Maria kissed Dudkin.’

b. *Za nedelju do togo on dari-l ej cvety...*
    From week to that he giveIPF-PST.3s her flowers
    ‘A week before that he had given her flowers...’

Figure 11: Locating a VP-event stage within the LOCATION TIME

    Week ago Maria PFV-kissed-PST.3s-FEM Dudkin
    ‘A week ago, Maria kissed Dudkin.’

b. *On dari-l ej cvety...*
    He giveIPF-PST.3s her flowers
    ‘A week before that he had given her flowers...’

Figure 12: τ(TOPIC STATE) ⊆ τ(sequent state of VP-event stage)

The following question comes up for the analysis of (30) in Fig. 11: Where is the TOPIC STATE and what role does it play? Conversely, the following question comes up for the analysis of (31) in Fig. 12: Where is the LOCATION TIME for e₂ and what role does it play? A possible answer to these questions, pursued in Altshuler 2010, is that the s input required by IPF is supplied by temporal location adverbs. Certain adverbs require that the value of s be determined by the discourse context, while other adverbs leave the value of s unspecified. In examples such as (30b), the adverb *za nedelju do togo* (‘a week before that’) leaves s unspecified; the condition τ(s) ⊆ τ(Cons(e')) amounts to the weak (and harmless) claim that the run time of some state is contained within the consequent state of a VP-event stage. In examples like (31b), however, a covert adverbial that resembles the narrative marker *then* requires that s be identified with a salient antecedent, i.e. a TOPIC STATE (cf. Bäuerle’s 1979 silent ‘once’). Therefore, the condition τ(s) ⊆ τ(Cons(e')) amounts to saying that the run time of a previously mentioned consequent state is contained within a VP-event stage. With regard to the t input required by IPF, a reasonable hypothesis is that it is supplied by the
tense, though its value is constrained (sometimes completely determined) by temporal location adverbs. In cases where no adverb is present syntactically, viz. (31b), t is supplied by the tense but left unspecified by a covert adverbial; the condition τ(e’) ⊆ t amounts to the weak (and harmless) claim that a VP-event stage is contained within some time.

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Modal Concord as Modal Modification

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Abstract

Modal concord is the phenomenon by which certain modal adverbs seem to become semantically vacuous in the presence of modal auxiliaries if the adverb and the auxiliary match in quantificational force (e.g., universal vs existential) and modal flavor (e.g., epistemic vs deontic). We propose that neither concord adverbs nor modal auxiliaries are vacuous: concord adverbs are modal-auxiliary modifiers and the compositional process ensures that both auxiliary and modifying adverb comment on the same proposition (contributed by the same radical), with respect to the same modal base. Agreement in flavor between the two distinct modal claims follows directly, while agreement in force is indirectly derived via the interaction between the assertion contributed by one of the modal claims and the implicatures triggered by the other. Finally, we outline a typology of interactions between modals and their modifiers and study the behavior of three adverbs – absolutely, legitimately and legally – from this perspective.

1 Introduction

The starting point of this paper is the putative lack of contrast between the sentences in (1) – while definitely seems to provide a modal force on its own, in conjunction with a modal, it seems to lose this force:

(1) a. John is definitely home.  
   b. John (definitely) must be home.

This phenomenon of certain adverbs (often speaker-oriented) losing their force in the presence of modal auxiliaries has been dubbed modal concord by Geurts and Huitink (2006), who identify two identity conditions that must hold between the auxiliary and the adverb. They must match in quantificational FORCE (as must and legitimately do not) as well as FLAVOR (as might and legitimately do not):

(2) a. We can legitimately deny your request.  
   b. #We must / have to legitimately deny your request.¹

¹We use # to indicate the unavailability of a concord reading (i.e., a single modal force, not two), while allowing

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Three kinds of analyses have been offered for \textsc{force} and \textsc{flavor}, split between the syntax-semantics divide. Geurts and Huitink (2006) propose a compositional primitive that absorbs two adjacent modals under identity. In contrast, Zeijlstra (2008), building on the syntactic approach to negative concord in Zeijlstra (2004), proposes that modal concord is simply a species of syntactic agreement between a probing modal operator (the adverb) and an expletive goal (the modal). Finally, Huitink (2008) offers a mixed approach: concord adverbs specify ordering source properties for the modal, thereby directly encoding \textsc{flavor}; \textsc{force} is a matter of morphosyntactic featural identity (as for the syntactic concord account). The proposals are schematized below:

\begin{align*}
(4) \quad & a. \text{ SEMANTIC ABSORPTION: } [[\text{adv modal}]] = [[\text{adv}]] \iff [[\text{modal}]] \\
& b. \text{ SYNTACTIC AGREEMENT: } [\text{OP}_\forall D\text{eon} \text{must}_\forall D\text{eon} [\text{John be home}]] \\
& c. \text{ ORDERING+FEATURES (O+F): } [[\text{obligatorily}_u\forall]] \text{ requires deontic ordering source}
\end{align*}

Two additional properties of modal concord variously challenge the above proposals. First, certain modal adverbs show a form of \textsc{strengthening} of the auxiliaries’ force (cf. Zeijlstra 2008, Grosz to appear). Thus, the uses of \textit{absolutely} below seem to, respectively, make the obligation stronger and the possibility more remote.

\begin{align*}
(5) \quad & a. \text{ There is no choice, he absolutely must stay in the lineup.} \\
& b. \text{ It probably wouldn’t make sense for a college professor, but absolutely might make sense for a bus driver.}
\end{align*}

While \textsc{agreement} permits this (the strengthening adverb is the semantically active modal element), \textsc{absorption} and \textsc{O+F} accounts do not. However, the formal feature account of concord in \textsc{agreement} (and, in part, \textsc{O+F}) is problematic for \textsc{force}, which shows sensitivity to \textsc{negation} (cf. Grosz 2008). Thus, in (6), acceptable concord adverbs are universal above \(\neg \exists\) and existential below.

\begin{align*}
(6) \quad & a. \text{ John } \left\{ \begin{array}{l}
\text{ obligatorily} \\
\text{ #legitimately}
\end{array} \right\} \text{ cannot be home.} \\
& b. \text{ John cannot } \left\{ \begin{array}{l}
\text{ *obligatorily} \\
\text{ legitimately}
\end{array} \right\} \text{ be home.}
\end{align*}

Under a purely formal account, this is difficult to capture without recourse to reification of the compositional interpretive process.\footnote{Strictly speaking, it is also a problem for the lexical account in Geurts and Huitink (2006), but not for \textsc{absorption} in general.}

\begin{itemize}
\item[(2)] This is grammatical only insofar as being home is understood habitually.
\item[(3)] for a felicitous non-concord reading is felicitous. In (2-b), a manner reading in which the denial has to be done in a legitimate manner is available.
\end{itemize}
In view of these constraints, we propose that modal concord be analyzed not as a specific interaction between two modal lexical items, but as an interaction of two separate modal assertions. In sum, we argue that modal concord is a species of modification by the modal adverb, which contributes its own modal quantification parasitic on the auxiliary’s modal domain.

\[
\text{[adverb modal]}(f_{\text{modal base}})(p_{\text{sentence radical}}) = 1 \iff \text{[adverb]}(f)(p) = 1 \text{ and } [\text{modal}](f)(p) = 1
\]

This will serve to capture all of the constraints, save FORCE, which we will claim arises from a conflict between a universal assertion and a non-universal implicature. We discuss the details of this proposal in Section 2.

In section 3 we turn to a more general concern, namely, the typology of interactions between modals and their modifiers in general. We argue that the empirical picture in English suggests the following restriction possibilities along the FORCE and FLAVOR dimensions:

(8) a. ATTESTED restrictions: \text{FORCE} \land \text{FLAVOR}, \text{FLAVOR} only, neither
b. UNATTESTED so far: \text{FORCE} only

We close with a discussion of the behavior of three adverbs – absolutely, legitimately and legally – which is just a first step towards a more systematic investigation of modal adverbs and their interactions with modal verbs.

2 A first take on modal concord

2.1 The Basic Facts

As noted at the outset, modal concord has been argued to be sensitive to both modal flavor and force (Geurts and Huijting 2006). Thus, the force mismatch between perhaps and must yields ungrammaticality in (9).

(9) John \{ perhaps$_E$ might$_E$ \}

Modal flavor mismatches – in particular, $E$(epistemic) and $D$(deontic) – are grammatical only when the adverb is epistemic, in line with observations about the scoping of epistemic and deontic modals in English (see, for example, Nauze 2006).

(10) a. John \{ #must$_E$ obligatorily$_D$ \}
    \{ definitely$_E$ must$_D$ \}
    \{ be home. 

Thus, when the adverb is epistemic and auxiliary is deontic, there exists a non-concord reading where the operators stack; demarcating modal concord readings thus will entail demonstration
that the reading in question could not arise via stacking. One case in point is that of two epistemics, as in (9). Given that the putative concord readings are derivable from the introspection principles on two epistemics (Geurts and Huitink 2006), it is unclear if concord mechanisms are necessary. We will therefore focus on deontics and circumstantials.\footnote{It is entirely possible that epistemics likewise have cases of genuine concord; in such cases our analysis will require modification, since epistemic adverbs are non-verdical.}

The three pre-existing analyses deal with the facts above as follows. \textsc{absorption} posits that when two semantically identical modals are sisters, one is deleted. As we noted in the introduction, this assumes logical equivalence of concord and non-concord readings, which is unclear.

\begin{align*}
(11) & \quad \text{a. } [\text{adv modal}] = [\text{F(adv) modal}] = [[\text{adv}]] \\
& \quad \text{b. } [F] = \lambda M_{st, st}' \lambda M_{st, st} : M = M'. M'
\end{align*}

\textsc{syntactic agreement} instead proposes that modal auxiliaries are semantically trivial syntactic formatives, while modal adverbs are the true semantic locus of modality. \textsc{force} and \textsc{flavor} matching is then accomplished purely in the syntax, which ensures agreement with respect to the morphosyntactic features modal elements bear (i.e., force and flavor features).

\begin{align*}
(12) & \quad [\text{OP}_{\forall, aDeon} \text{must}_{\forall, aDeon} [\text{John be home}]]
\end{align*}

The mixed \textsc{O+F} analysis begins from the observation that flavor matching is straightforwardly expressible in terms of constraints on a modal’s ordering source (below, represented as an argument). However, there is no analogous way of accounting for force matching, and so this account assumes syntactic feature matching for \textsc{force}:

\begin{align*}
(13) & \quad \text{a. } [[\text{modal modal-base} \text{ obligatorily}] p] \\
& \quad \text{b. } [\text{obligatorily}_{w, v}] = \lambda w \lambda p. p \text{ is obligatory in } w
\end{align*}

However, as we noted in the introduction, negation inverts \textsc{force}. Thus, the adverbs licit above an auxiliary and its negation are duals, as we see for \textit{cannot} (\(\lnot \exists\)) and \textit{need not} (\(\lnot \forall\)). In contrast, the adverbs allowed below the scope of negation are precisely the same in both negated and non-negated cases, suggesting that negation compositionally changes \textsc{force}.\footnote{This is the reason for the contrast from Hoye (1997) that Huitink (2008) discusses:}

\begin{align*}
(14) & \quad \text{a. } \text{John} \left\{ \begin{array}{c} \text{obligatorily} \\ \text{*legitimately} \end{array} \right\} \text{ cannot be home.} \\
& \quad \text{b. } \text{John cannot} \left\{ \begin{array}{c} \text{*obligatorily} \\ \text{legitimately} \end{array} \right\} \text{ be home.}
\end{align*}
The distributional reversal above negation is unsurprising under a semantic account, but it is difficult to see how formal feature analyses can capture it without recourse to stipulations about negation’s effect on features. We thus take the sensitivity of FORCE to negation as indication that a fully semantic account of modal concord is desirable. We undertake this in the following section.

2.2 Analysis

Our core proposal is that concord adverbs are modal modifiers that assert their own modal claims about the proposition in question. Thus, they never lose their modal force. Rather, the compositional process ensures that both auxiliary and modifying adverb comment on the same proposition, with respect to the same modal base. FLAVOR will follow directly, while FORCE is somewhat trickier to capture.

Note that treating modal adverbs as modifiers (independently of how they modify) immediately accounts for the observation that the modal auxiliary and adverb must be clausemates, as in (17) (Zeijlstra 2008, Huitink 2008).

(17)  a. John must obligatorily be home by 12.
    b. #John must be home by the time the clock obligatorily strikes 12.

We suggest that this is simply the manifestation of a general restriction on adjunct modifiers, as with the eventuality modifier needlessly in (18), whose event target is determined by the clause it is in.

(18)  a. John was needlessly home by twelve.
    b. #John was home by the time the clock needlessly struck 12.

We will not discuss here the complex conditions for clausemate dependencies, but merely limit ourselves to the syntactic simplification that modals and concord adverbs are sisters at LF.

Modal verbs will have their usual denotations (Kratzer 1977, 1981) (we specify only the modal base f for expository simplicity):

(19)  \[ [ \text{adv modal} f_{\text{modal base}} ] \text{ proposition} \]

Modals will have their usual denotations (Kratzer 1977, 1981) (we specify only the modal base f for expository simplicity):

(20)  a. \[[\mu] = \lambda w \lambda f_{p_{st}(st)} \mu p_{st} \cdot \bigcap f(w) \subseteq p\]
Given the syntactic structure in (19), we propose that modal adverbs modify the modal verb and predicate their own modal claim about the argument proposition \( p \) that they ‘share’ with the modal verb. The modal claim is parametrized by the common modal base \( f \), which the adverb may make (additional) demands on. (21) provides an informal denotation for obligatorily, formalized in (22).

(21) \[[\text{obligatorily modal } f \ p]\] is defined iff \( f \) is deontic; if so, \([[\text{obligatorily}](w)(f)(p)\text{ and }[\text{modal}](w)(f)(p)\]

(22) \([[\text{obligatorily}]]\)\(=\lambda M\langle\langle s,\langle st\rangle t,\langle st\rangle t\rangle,\lambda w\lambda f,s,t\lambda p_{st}: f \text{ is deontic.}\)
\(\land \bigcap f(w) \subseteq p\)

Note that in (22) the modal base is presupposed to be deontic, as in the O+F framework, though here it is because, alike with all modal operators (i.e., the auxiliaries), the adverb specifies the modal bases it will quantify over.

While the modal base presuppositions capture FLAVOR, they do not capture FORCE agreement. We propose that non-agreeing situations are illicit not because of a formal requirement (recall NEGATION), but because of a contradiction between an \( \forall \) assertion and a \( \neg\forall \) implicature triggered by the \( \exists \) assertion. Let us consider the example in (23):

(23) #We must legitimately deny your request.

We claim that the universal assertion from must clashes not with the relatively trivial existential assertion from legitimately, but its strengthened implicature. To appreciate this, first consider the denotation of legitimately in (24), which differs from (22) only in quantificational force.

(24) \[[\text{legitimately}]\)\(=\lambda M\langle\langle s,\langle st\rangle t,\langle st\rangle t\rangle,\lambda w\lambda f,s,t\lambda p_{st}: f \text{ is deontic.}\)
\(\land \bigcap f(w) \cap \{w: \neg\text{request denied in } w\} \neq \emptyset\)

Then we have the following two assertions for (23):

a. **Assertion from modal:** all m.b. worlds are denial worlds
\(\bigcap f(w) \subseteq \{w: \text{request denied in } w\}\)

b. **Assertion from adv:** \(\bigcap f(w) \cap \{w: \text{request denied in } w\} \neq \emptyset\)

However, existentials trigger a non-universality implicature, which directly clashes with (25-a):

(26) **Implicature from adv:** some m.b. world is not a denial world
\(\bigcap f(w) \cap \{w: \neg\text{request denied in } w\} \neq \emptyset\)

It is this inference, we think, that clashes with (25-a) and produces the contradiction in (23). As this is an implicature, the natural question is why this is not straightforwardly cancelled. One
attractive option would be to argue that composition of modal adverbs and auxiliaries forces exhaustification, rendering the implicature a *bona fide* assertion of free choice:

\[(27) \quad \text{[legitimately]} = \lambda M_s,([s,(st)],[st]) \lambda w \lambda f_s,([st]) \lambda P_{st} : f \text{ is deontic.}
M(w)(f)(p) \land \bigcap f(w) \cap p \neq \emptyset \land \bigcap f(w) \cap p \neq \emptyset \]

However, such an approach incorrectly predicts that the implicature is uncancellable with an adverb, true for *optionally* / *freely* (the real free choice items in this domain) but not *legitimately*

\[(28) \quad \begin{align*}
a. & \quad \text{We can legitimately deny your request. In fact, we have to.} \\
b. & \quad \text{We can } \{ \text{optionally, freely} \} \text{ deny your request. *In fact, we have to.}
\end{align*}
\]

Instead, we will suggest that the availability of cancellation is proscribed. In particular, it is not available in one simple assertion, but only during subsequent discourse update. This constraint is also active in the individual domain, as shown in the examples below, where there is a clash between the implicatures of an overt quantifier and the generic operator. This suggests that a domain-neutral pragmatic procedure is at work (cf. Magri 2009).

\[(29) \quad \text{Boys will } \{ \text{sometimes, always} \} \text{ be boys.}
\]

\[(30) \quad \begin{align*}
a. & \quad \ast \text{Most dolphins are dolphins.} \\
b. & \quad \text{Every dolphin is a dolphin.}\n\end{align*}
\]

How might we make sense of this constraint on cancellation? We sketch two accounts. Under one proposal, simple assertions are viewed as one package of proposals to update the current state of the conversation. As such, there is a normative requirement of internal consistency, given the agent’s goal (maximal acceptance across all dimensions of meaning). Another account would emphasize the triviality of the existential assertion in the presence of the universal. The constraint on NON-TRIVIALITY of common ground update (Stalnaker 1984) is directional since (32) is acceptable.

\[(31) \quad \text{You must take out the trash. *In fact, you can.}
\]

\[(32) \quad \text{You can take out the trash. In fact, you must.}
\]

However, modal concord cases are not directional, as auxiliary and adverb simultaneously contribute. One might argue that triviality for simultaneous assertion requires checking both directions; if so, one of them will always produce a trivial update.

---

6This procedure is clearly not in force for other modifiers:

(i) John slipped without actually falling.

7Examples (30-a) and (30-b) are from Brasoveanu (2006), where they are attributed to R. Schwarzschild.

8See Singh (2008) for closely related observations.
2.3 Negation

In the previous subsection, we dealt with FLAVOR and FORCE, but were silent about the modulation of FORCE by negation – that when negation scopes over a modal (14-a), it allows the dual deontic adverb to scope over the modal+negation constituent. We must now discuss this in the context of the structure assumed in (19).

In sum, we propose that negation acts as a dual operator on the modal, operating above or below the position of the adverbial modifier. When it operates above, we see the appearance of force-matching adverbs, while when it operates below, we see force reversal:

(33) a. obligatorily cannot — LF: [obligatorily [DUAL can]]
b. cannot legitimately — LF: [DUAL [legitimately can]]

Assuming that DUAL([can]) = [must] and vice versa, we arrive at an interpretation for (33-a) that alters the auxiliary to [must]:

(34) [obligatorily [DUAL can]] = \lambda w \lambda f s (st) \lambda p s t : f \text{ is deontic.}
DUAL([can])(w)(f)(p) \land \bigcap f(w) \subseteq p

However, the dual semantically requires an additional form of negation. Hence, we assume that propositional negation is syntactically present and takes scope over the sentence radical.

(35) John obligatorily cannot be home —
LF: [obligatorily [DUAL can w f] [NEG [John be home]]]

(36) [NEG] = \lambda p s t \lambda w. \neg p(w)

This leads to the following correct truth conditions:

(37) [[obligatorily [DUAL can w f]] [NEG [John be home]]] is defined iff f is deontic;
if so, it is 1 iff DUAL([can])(w)(f)(\neg \text{home}'(j)) \land \bigcap f(w) \subseteq \neg \text{home}'(j)

We provide two kinds of evidence in support for an analysis of modal-verb negation along these lines. First, (a suitable generalization of) propositional negation enables us to account for modal subordination examples like (38) below.

(38) Bill doesn’t have a car. It would be parked in front of the house.

-\checkmark if Bill had a car, it would be parked in front of the house

But there is no parallel ‘propositional’ reading for cases of modal-verb negation like (39) below. If modal-verb negation was simply a propositional operator that could take scope above or below the modal, we predict that the second reading listed below should be available.

(39) Bill couldn’t possibly have a car. He wouldn’t have anywhere to park it.
- ✓ if Bill had a car, he wouldn’t have anywhere to park it
- #if Bill could have a car, he wouldn’t have anywhere to park it

Second, the relative scope of negation and various modals is lexically specified – and this kind of interaction supports the idea that modal-verb negation is different from regular propositional negation. The relative scope of negation and modals can be modeled as the lexically-specified presence vs absence of the dual operator:

(40) a. You needn’t leave.
    b. LF: DUAL(∀) NEG(you leave)

(41) a. You mustn’t leave.
    b. LF: ∀ NEG(you leave)

(42) a. You can’t go home for Thanksgiving.
    b. LF: DUAL(∃) NEG(you go home)

(43) a. You can’t not go home for Thanksgiving.
    b. LF: DUAL(∃) NEG(NEG(you go home))

### 2.4 Interim Conclusion

The system articulated above captures the various constraints we have observed for modal concord, FLAVOR, FORCE, and NEGATION. The first is the result of a constraint a concord adverb places on the common modal base, the middle of clash between a universal assertion and the implication of that assertion’s negation, and the final constraint of the operation of a dual operator in the logical form. We have been silent on STRENGTHENING, which we see as simply the pragmatic reflex of redundancy. Thus, unlike in ABSORPTION, neither statement actually vanishes from the assertion, triggering the inference of strengthening.

### 3 Widening the net

In the remainder of the paper we take up the broader project of attempting to fit modal concord within the general behavior of modal modifiers, both when there is a modal auxiliary present and when there is not. If the skeleton of our proposal is correct, there should be nothing particular about modal concord per se beyond the general logic of modification.

With respect to this, there are two questions of note. The first concerns the typology of concord properties. We have seen adverbs sensitive to FLAVOR and FORCE, but what about independently. Our examination of the adverbs appearing with English modal auxiliaries in the Corpus of Contemporary American English (COCA, www.americancorpus.org) reveals a glaring gap – no adverbs sensitive to FORCE alone.

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9COCA is a large, balanced corpus of 400+ million words that includes 20M words each year from 1990-2009, divided among spoken, fiction, popular magazines, newspapers and academic texts. We examined adverbs
In addition to explaining the sensitivities modal adverbs show to their auxiliary partners, a
general account of these items should also seek to capture the range of readings modal adverbs
can have in extensional environments – and decide whether we should provide a unified account
of (a subset of) these readings. Thus, the two adverbs below show outside of concord the
following kinds of readings (using the terminology of Ernst 2002, 2007):

(44) a. additional readings for legally: domain, means-domain, manner, clausal
b. additional readings for legitimately: manner, clausal

In exemplifying the aims of this project, in this section we will focus on only two classes of
adverbs: absolutely and legitimately / legally. We shall pay particular attention to determining
if modal concord is assimilable to one of the extentional categories, and conclude that as of yet
there is no clear unification.

3.1 Absolutely, Definitely and relatives

3.1.1 Distributional facts

As discussed above, absolutely / definitely and their relatives (certainly, really, and for sure)
are both force and flavor neutral:

(45) a. There is no choice, he absolutely must stay in the lineup.
b. Yes, sir, you absolutely may.
c. It probably wouldn’t make sense for a college professor, but absolutely might
   make sense for a bus driver.10

As we mentioned in section 2, it is important to verify that this is not a case of stacking, or,
more generally, that absolutely isn’t serving as an epistemic or evidential marker. We suspect
not, given that for the first two examples above, the speaker is in fact the deontic authority (or
the authority’s proxy), in which case knowledge does not seem relevant. Intuitively, in such
examples the contribution of absolutely is similar to regardless of circumstance and without
exception.11

appearing with can, could, may, might, must, should, have to, revealing the following list: absolutely, acciden-
tally, apparently, arguably, barely, certainly, clearly, conceivably, definitely, easily, hardly, honestly, ideally, just,
legally, legitimately, literally, maybe, necessarily, obligatorily, obviously, mandatorily, perhaps, plausibly, possibly,
potentially, practically, probably, reasonably, scarcely, simply, surely, for sure, theoretically, truly, (very / damn)
well.

10. www.capitalgainsandgames.com/blog/stan-collender/1052/keith-hennessy-only-asks-part-health-care-reform-
question.
11. This is possibly similar to single in the individual domain – consider the behavior of every single student and a
    single student.
Definitely seems to be interpreted in the same way; when something is not just allowed, but definitely allowed, it is allowed under a subset of the deontic worlds (e.g., those where there are no bad consequences). In contrast, with universals, definitely goes for a large superset of the deontic worlds.

(46) You can / must definitely come in now.
     (vs: You can / must come in now.)

(47) If you come to Monterey, you can / must definitely stay with Craig.
     (vs: If you come to Monterey, you can / must stay with Craig.)

Thus, these items in general select the strongest meaning given the contextual modal bases / ordering sources:12

(48) a. existential: choose the smallest modal base \( \bigcap f(w) \) (i.e., the largest set of propositions \( f(w) \)), so that \( \bigcap f(w) \cap p \neq \emptyset \) is as strong as possible
   b. universal: choose the largest modal base \( \bigcap f(w) \) (i.e., the smallest set of propositions \( f(w) \)), so that \( \bigcap f(w) \subseteq p \) is as strong as possible

3.1.2 Accounting for the data

The above data may be straightforwardly dealt with in terms of quantification, assuming the context provides multiple relevant modal bases (truly: multiple conversational backgrounds determining ordering sources):

(49) \( \text{[absolutely]}^c = \lambda M \lambda p \lambda w. \forall f \in c[M(f)(p)(w)] \).

Another possibility arises from the work of Grosz (to appear), who constructs modal scales of necessity (via ordering sources), defining duals in terms of scale reversal for the negation of the argument proposition:

(50) a. \( \text{[must]} = \lambda d \lambda p \lambda w. \text{NECESSITY}(p)(w) \geq d. \)
   b. \( \text{[may]} = \lambda d \lambda p \lambda w. \text{NECESSITY}(\neg p)(w) < d. \)

Absolutely and its kin are thus degree words, specifying a maximal degree for a scale. This produces precisely the desired result for these adverbs.

12This calculation is local to the modal, not the entire sentence, as we can see by the lack of inversion in downward-entailing environments:

(i) a. Each person who could definitely [i.e., without repercussions] stay with Craig called him.
   b. Each person who definitely had [was maximally obligated] to stay with Craig called him.
Grosz (to appear) extends this to modal concord, encoding the FORCE requirement in terms of a scale structure presupposition (thus, FORCE conflicts are a result of cross-polar anomaly):

\[(51) \quad [\text{completely}] = \lambda M \lambda p \lambda w. M (max_d \in \text{SCALE}(M))(p)(w).\]

This is a very elegant system, but note that the various components (force and flavor requirements, type of degree provided) are independent primitives. Thus, there is nothing truth-conditionally blocking a modal concord adverb which gives a min degree for a universal or which provides a max degree for an existential (that is, goes for the weakest reading). So far, we haven’t found such an item (note that barely is force and flavor neutral).

\[(52) \quad \begin{align*}
\text{a. [obligatorily]} &= \lambda M \lambda p \lambda w : M \text{ is deontic and positive.} \\
&M (max_d \in \text{SCALE}(M))(p)(w) \\
\text{b. [legitimately]} &= \lambda M \lambda p \lambda w : M \text{ is deontic and negative.} \\
&M (min_d \in \text{SCALE}(M))(p)(w)
\end{align*}\]

\[(53) \quad [\text{legitimately may}] = \lambda p \lambda w. \text{NECESSITY}(\neg p) < \max_d \in \text{SCALE(NECESSITY)}
\]
i.e., \(p\) is not absolutely impossible.

### 3.2 Legitimately vs Legally

We now turn to a comparison of legitimately and legally. We compare these because they are both intuitively existential, especially in extensional contexts. And yet, in modal cases, they behave quite differently, since legally is a force-neutral modal base specifier.

#### 3.2.1 Legitimately and Legally in modal environments

We have claimed that legitimately is sensitive to FORCE. In contrast, it would seem that legally is force neutral, but it does have a deontic flavor requirement. It is thus the analog of Kratzer’s in virtue of clauses.

\[(54) \quad \begin{align*}
\text{a. The Boy Scouts claim they are a private organization and legally may set their own standards for membership.} \\
\text{b. Again, we remind you that Ted Kaczynski has not gone on trial yet, so legally he must still be presumed innocent.}
\end{align*}\]
If the above characterization is correct, we should see the contrasts between *legitimately* and *legally* in corpus investigation. (55) shows a contingency table based on COCA searches in environments with existential modals (*can, could, not have to*) and universal modals (*can’t, couldn’t, must, have to*). This difference is highly significant ($\chi^2 = 44.32$, $df = 1$, $p = 2.79e - 11$). As expected, the *legitimately*+universal cell contributes the most to the $\chi^2$ value.

$\chi^2$ contributions

<table>
<thead>
<tr>
<th></th>
<th><em>legitimately</em></th>
<th><em>legally</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>existential</td>
<td>266</td>
<td>658</td>
</tr>
<tr>
<td>universal</td>
<td>26</td>
<td>257</td>
</tr>
</tbody>
</table>

Recall that under our explanation for NEGATION, *legitimately* should be able to appear below negation with existentials. There are four examples in COCA with $\neg \exists$ concord, given in (56) below, suggesting that this is not correct. In addition, as all the examples involve *can*, they may be analyzed as cases of capability above a clausal use of *legitimately* (see section 3.3).

(56) a. Because of widespread corporate belt-tightening, you can’t *legitimately* sum up career status with salary ranges and promotions anymore.
    b. The state can’t *legitimately* cut $700 million.
    c. They couldn’t *legitimately* take pride in it.
    d. I thought music would articulate that which you couldn’t *legitimately* articulate in dialogue.

Thus, the results of our corpus search are mixed for the claims in section 2.

There is a further contrast between *legally* and *legitimately* worth noting. *Legally*’s effect is not clause bounded, even by evidential attitudes (see Simons 2007 for discussion of these forms):

(57) Legally, I think you could probably chew her up [for her testimony].

This is in line with the behavior of conditional antecedents noted by Iatridou (1991), but in sharp contrast with *legitimately*.

(58) {If he hurries, Whether or not he hurries, To get to Harlem}, I suspect that John can be out by noon. (Kyle Rawlins, p.c.)

(59) a. *Legitimately, I think you could probably chew her up.
    b. *Legitimately, I suspect that John can be out by noon.

This behavior suggests that *legally* can be assimilated to a domain restrictor (like conditional antecedents and in virtue of clauses), but *legitimately* should not be; this contrast may be surprising under a mixed approach such as that of Huitink (2008).

15At a time when COCA did not contain the 2009 texts, i.e., it had only approx. 385M words.
16We are indebted to Kyle Rawlins for noticing this connection.
3.2.2 Legally and Legitimately in their extensional uses

In this final section, we consider the behavior of these two adverbs in extensional settings. While the most theoretically parsimonious move would be to unify the modal concord uses of these adverbs with those above, we will conclude that the nature of the reduction is not yet obvious. In extensional contexts, legally has several interpretations (cf. Ernst 2002).

(60) a. DOMAIN (alters the domain with respect to which the predicate is evaluated)
No laws had been broken, and, after all, David was legally an adult.
b. MEANS-DOMAIN (specifies domain of manner of accomplishment)
There’s little the besmirched can do legally, unless there are children involved.
c. MANNER
I mean, we do everything legally.
d. CLAUSAL (comment on nature of event property)
Legally, it’s used as an anesthetic.

It is still unknown how best to unify these readings, but we will ask here whether some of them should be unified with modal concord.

We will now argue that the clausal interpretation is probably not the source of modal concord. There are three approaches to unification of MANNER and CLAUSAL in extensional settings. Wyner (1994) argues that the adverbs are EVENT MODIFIERS, and that the differences above correlate with the sub-event being modified. Ernst (2002) argues instead that they arise from contextual DOMAIN RESTRICTION of the adverb’s quantificational domain. Finally, Rawlins (2008) argues that the manner reading is the result of TYPE-SHIFTING the clausal use into an event-property. Both the event modifier and type-shifting approaches correctly predict correlations between adverb position and interpretation.

(61) a. Legally, Alfonso moved the pawn.
   ‘Alfonso moved a pawn, and all such pawn-moving events by him are permitted.’
b. Alfonso moved the pawn legally.
   ‘Alfonso moved the pawn in a manner which was permitted.’ (Rawlins 2008)

Following Piñón (2007), assume that manners are representable via relations between event properties and events.

(62) \[ \text{[legally]} = \lambda P \lambda e \lambda w. P(e)(w) \land \text{LEGALLY}(P)(e)(w) \]

We will define the legality of a property \( P \) in terms of its manner being instantiated in one of the worlds that obey the laws:

(63) \[ \text{LEGALLY}(P)(e)(w) \text{ iff } \exists w' \in \text{LEGAL}(w)[\exists e'[e' \text{ in } w' \land P\text{-manner}(e)(e')(w')]] \]

CLAUSAL and MANNER readings thus differ on whether the event property contains temporal information (we assume that temporal information is event modification) (cf. Rawlins 2008).
(64) a. Alfonso moved the pawn.
   b. manner: \(\lambda e \lambda w. \text{move}'(a, \iota x. \text{pawn}(x), e, w)\)
   c. clausal: \(\lambda e \lambda w. \text{move}'(a, \iota x. \text{pawn}(x), e, w) \land \tau(e) \subseteq t \land t < t_0\)

Even with this, it is not clear how this can be extended to handle modal modification, since the definition above discusses legal events in terms of legal worlds, and legal worlds are the objects we wish to manipulate in the modal modification cases. That is, the \text{CLAUSAL/MANNER} forms are interdefined with the modal concord forms, suggesting that unification is precisely the wrong tack to take.

This leaves us with \text{DOMAIN} undiscussed. Suggestively, domain \textit{legally} like modal \textit{legally} can cross evidential attitudes, unlike the other two uses:

(65) a. Legally, I think it could make a very big difference.
   b. #Illegally, I think that he moved the pawn.

However, assimilation of concord readings to domain readings is challenged by \textit{legitimately}, which has no domain interpretation, but has manner and clausal interpretations:

(66) a. \textit{MANNER}
   Some did finally give up the ghost \textit{legitimately}, but others doubtless were scuttled.
   b. \textit{CLAUSAL}
   Someone who invites you to lunch \textit{legitimately} wants to get to know you.

Thus, distributionally it would seem that there is a correlation with modal modification and \textit{MANNER} and \textit{CLAUSAL} uses, but it is unclear how to derive them in a similar fashion.

4 Conclusion

We have argued that modal concord (in non-epistemic environments) arises because the adverb is a modifier that makes its own ancillary modal claim. While modal flavor consonance is grammatically determined, we take agreement in modal force to be a pragmatically mediated phenomenon, specifically, due to contradiction between a universal assertion and its implicated negation. Finally, we have argued that the facts of \textit{NEGATION} are problematic for a syntactic account of concord phenomena, but accountable under a semantic treatment.

Nonetheless, we believe the accounts of modal concord (including the present one) should take into account the broader issues articulated in the final section of the paper, namely the typology of the semantic interactions between modal auxiliaries and modal modifiers and the range of readings and the typology of modal adverbs more generally. We argued that a class of modal base strengtheners (like \textit{absolutely}) require a different account than concord adverbs, which show other uses in extensional settings – but indicated that at present there is no clear connection between these other uses and modal uses.
Acknowledgements

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Zeijlstra, Hedde: 2008, ‘Modal auxiliaries are empty’, in SALT XVII.
The Role of the Imperfect in Romance Counterfactuals

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Abstract

The Imperfect in Romance is used in an array of constructions: progressives, habituals, generics and counterfactual conditionals. The first three share all hallmarks of the Romance Imperfect: they describe something ongoing, in the past, and which requires contextual framing. Counterfactual uses, however, do not, and thus present an important challenge for a unified semantics of the Imperfect. In this paper, we try to explain the presence of the Imperfect in counterfactuals. We take counterfactuals to involve both a Future and an Imperfect (Iatridou 2000), but with the modal contribution of the latter neutralized, such that counterfactuals amount to future conditionals. The Imperfect is not entirely vacuous, however: it contributes presuppositions of framing and anteriority, which lead to counterfactual interpretations.

1 The Puzzle

The Imperfect (‘imparfait’) of Romance is used in an array of constructions: progressives (1a), habituals (1b), and generics (1c), as the following French sentences illustrate.

(1) a. Paul traversait la rue, quand il s’est fait écraser.  
Paul cross-impf the street, when he got crushed.  
‘Paul was crossing the street, when he got run over.’

b. Quand elle était jeune, Marie jouait du piano.  
When she was-impf young, Marie play-impf the piano.  
‘When she was young, Mary used to play the piano.’

c. A l’époque, les femmes portaient des corsets.  
In those days, women wore-impf corsets  
‘In those days, women wore corsets.’

The Imperfect is also found systematically in counterfactual conditionals. Counterfactuals like (2), require Imperfect in their antecedent, and conditionnel mood in their consequent, which morphologically looks like the combination of the Future and the Imperfect (Iatridou 2000):

Martin Prinzhorn, Viola Schmitt and Sarah Zobel (eds.):  
Proceedings of Sinn und Bedeutung 14, Vienna, pp. 37—50
Si Paul venait, Marie serait heureuse.

If Paul come-impf, Marie be-COND happy

‘If Paul came, Mary would be happy.’

All of these uses of the Imperfect seem to require an intensional component, and one may thus want to postulate a single underspecified IMPF modal, able to yield these various interpretations by quantifying over different sets of worlds: inertia worlds, generic worlds or counterfactual worlds. A great challenge for such a unified account, however, is that while the progressive, generic, and habitual uses exhibit certain ‘hallmarks’ of the Romance Imperfect, the counterfactual construction doesn’t: Progressives, generics and habituals all describe something ongoing, in the past, and which requires contextual framing (Delfitto and Bertinetto 1995, Bonomi 1997), but counterfactuals have none of these requirements, thus complicating any attempt to unify these uses of the same morphological category.

Our goal in this paper is to attempt a unification of sorts – to explicate why the Imperfect is such a comfortable associate of counterfactual interpretation while being faithful to its lack of the peculiar use conditions of the other interpretations. And thus, despite a desirability of unification, we will propose two different semantic elements responsible for the progressive, habitual, and generic interpretations on the one hand, and counterfactual interpretations on the other: a modal IMPF (morphologically realized as the Imperfect) and a future modal FUT, respectively.

The key semantic assumption in our proposal is that counterfactuals fundamentally involve past metaphysical modality (Condoravdi 2001, Ippolito 2003). We argue that the anteriority and the modality arise from distinct sources. The anteriority we will propose is a consequence of the modal IMPF, which we take to presuppose the anteriority and framing hallmarks of the Imperfect (Giorgi and Pianesi 2004). However, counterfactuals additionally involve the future modal FUT, which is responsible for the metaphysical modality that separates counterfactuals from the other uses of the Imperfect. The technical ingredient allowing this chimerical transformation will be Hacquard’s (2006) event-relative modality, under which two stacked modals render the top one vacuous. Thus, IMPF+FUT will be interpreted as FUT, modulo the presuppositions of IMPF, which trigger the counterfactual interpretation (Iatridou 2000, Condoravdi 2001, Ippolito 2003, Arregui 2005).

After reviewing the Hallmarks of the Imperfect in Section 2, we discuss the semantics of the IMPF modal in Section 3. Section 4 demonstrates how this semantics coupled with a future modal and Hacquard’s event relativity leads to a counterfactual interpretation. Section 5 concludes.

2 Hallmarks of the Imperfect in Romance

As discussed by Delfitto and Bertinetto (1995) and Bonomi (1997) among others, the Romance Imperfect has three characteristics (modulo counterfactual uses). First, it has a requirement that the event in question is anterior to the utterance time, as indicated in (1a-c). Second, it exhibits ongoingness or homogeneity, in that the event/habit described must go on in time. Thus, Paul’s piano playing is taken to last throughout an interval surrounding Marie’s arrival in (3a), and similarly his piano playing habit throughout an interval.
surrounding ‘those days’ in (3b):

(3)  
   a. Quand Marie est arrivée, Paul jouait du piano.  
      When Marie arrived-pfv, Paul played-impf of the piano  
      ‘When Marie came in, Paul was playing the piano’
   b. A l’époque, Paul jouait du piano.  
      In those days, Paul played-impf of the piano.  
      ‘In those days, Paul played the piano’ (habitually)

Finally, it is observed that sentences with the Imperfect are deviant without a salient temporal expression. Thus, (4a) is judged by speakers to be significantly worse than the remaining sentences in (4) which involve, respectively, (b) a temporal adverbial, (c) a when-clause, (d) a quantificational adverb, and (e) a contextually salient time interval:

(4)  
   a. ??Paul jouait du piano.  
      Paul played-impf the piano  
   b. A cinq heures, Paul jouait du piano.  
      At 5 o’clock, Paul played-impf the piano  
   c. Quand Marie est arrivée, Paul jouait du piano.  
      When Marie arrived, Paul played-impf the piano  
   d. A chaque fois que Marie arrivait, Paul jouait du piano.  
      Every time Marie arrived, Paul played-impf the piano  
      What was Paul doing at 5?  B: He played-impf the piano

Of these characteristics, the one that has received the greatest attention in previous literature is the characterization of the ongoingness requirement, though this has often been at the level of the construction in question. Thus, progressives have been analyzed as involving the intellectual descendants of Dowty’s (1979) inertial worlds, continuation branches (Landman 1992) and non-interrupted circumstantial worlds (Portner 1998). This modal quantification yields an ongoing interpretation of the event in the actual world by removing the need for the culmination of the event in the actual world (in particular for accomplishments): what occurs in the actual world is an ongoing event, which is part of a larger completed event in modal worlds in which this event culminates. For instance, the sentence John was crossing the street when he got hit by a car describes a crossing in progress in the actual world, which culminates in John having crossed the street those uninterrupted worlds where he doesn’t get hit by a car.

Many accounts of generics and habituals also involve a modal component, for instance normal/ideal worlds (e.g., Krifka et al. 1995). What unifies these analyses is intensional quantification, but it is possible to unify further in the face of their morphological consonance in Romance. It has been argued that progressives and habituals in fact involve the same modal element (Cipria and Roberts 2000, Bonomi 1997, Lenci and Bertinetto 2000, Ferreira 2005) and that habituals are instances of generics, differing on requirements for verifying instances (Krifka et al 1995). Thus, there is reason to assume that the same modal element is in question for these three uses. The following section will make our proposal explicit in this regard. What is important, however, is that counterfactuals involve quite a different modal element, be it based on similarity (Lewis 1973, Stalnaker 1968, Arregui 2007) or metaphysical alternatives (Condoravdi 2001, Ippolito 2003).
3 A Semantic of IMPF

We adopt a semantics for a single IMPF operator, responsible for progressive, habitual, and
generic readings, which treats it as an instance of Portner’s (1998) progressive operator. This
operator is responsible for the ongoingness and the modal component of the Imperfect. We
further add to this operator felicity conditions to capture the anteriority and framing
properties in terms of presuppositions, as specified by Giorgi and Pianesi (2004):

\[
\text{IMPF} = \text{Past} + \text{Framing} + \text{Ongoingness} + \text{modality} \\
\text{Presuppositions} + \text{modal quantification} \\
\text{(Giorgi and Pianesi 2004)} + \text{(Portner’s 1998 Progressive)}
\]

Note that we adopt Portner’s particular account and Ferreira’s extension to habitu als,
primarily because its event-based semantics allows a straightforward integration into our
proposal. Our proposal, however, should be compatible with other unifying accounts of the
progressive/habitual, provided they be translated in event terms. Our goal here is not to
arbitrate between various accounts of progressives/habituals, but to show how such accounts
can be made compatible with the use of the Imperfect in counterfactuals.

3.1 Modal Quantification

We first consider the modal component of IMPF. Portner’s (1998) analysis of the progressive
is event-relative: it considers circumstantial worlds containing continuations of the event in
question which respect the event property denoted by the verb phrase. Given the necessity
that progressive forecasting excludes interruptions, Portner argues that the circumstantial
worlds are ordered by a requirement for non-interruption:

\[
[[\text{IMPF}(e,P)]]^\# \text{ is true at } w \text{ iff for all worlds } w' \text{ in } \text{Best(Circ, NI, e, P)} \text{ there is an} \\
\text{event } e' \text{ which includes } e \text{ as a nonfinal subpart s.t. } P(w')(e')=1.
\]

Thus, the sentence in (7) gives rise to the truth conditions explicated beneath.

(7) (A 5 heures), Paul jouait du piano.
(At 5pm), Paul was playing the piano.

\text{There is an event } e \text{ such that in all best circumstantial worlds where Paul isn’t} \\
\text{interrupted, there is a superevent } e’ \text{ of } e \text{ which is an event of Paul playing the piano.}

Following Ferreira (2005), we extend Portner (1998) to habitual/generic\textsuperscript{1} cases by
invoking plural events:

(8) (A l’époque), Paul jouait du piano.
(In those days), Paul played the piano.

\text{There’s an event } e \text{ s. t. in all best circumstantial worlds where Paul isn’t interrupted,} \\
\text{there is a superevent } e’ \text{ of } e \text{ which is a plurality of events of Paul playing the piano.}

\textsuperscript{1} We take generics and habitu als to involve the same operator. For special cases of generics that do not require
verifying instances (e.g., this machine crushes oranges), we take the extensional element to be the preparatory
process, i.e., a subpart of the event before culmination occurs, during which the preparations for its occurrence
are completed (Moens and Steedman 1988, Cipria and Roberts 2000, Boneh and Doron 2008).
Note that in both Portner’s original account and Ferreira’s extension, we have an event that occurs in the evaluation world, which we will call the *extensional event* \(e_{\text{Ext}}\), which is part of a larger, completed event or series of events in the modal worlds. This property is what underlies the ongoingness requirement of the Imperfect.

What about the other hallmarks? We will argue that the extensional event \(e_{\text{Ext}}\), is in fact the event on which the framing and anteriority requirements of the Imperfect are imposed. In (7) and (8), the event \(e'\)’s runtime must both precede the utterance time and be framed by the temporal frame adverb in question. \(e_{\text{Ext}}\) is thus a (topical) event that needs to be made salient by the context (and can be viewed as a reformulation of an Austinian *topic*).

### 3.2 Anteriority and Framing Requirements as Presuppositions

The denotation in (6), being that of progressive, does not yet capture the anteriority or framing requirements of the Imperfect. Following Giorgi and Pianesi (2004), we take those to be presuppositions concerning the extensional event:

\[
\text{[[IMPF]]}^{*}\text{ is defined iff:} \]
- a) \(t(e) \subseteq \text{TOP-Time}(c)\) framing requirement
- b) \(\text{TOP-Time}(c) < t_0\) anteriority requirement

If defined, \([[\text{IMPF}]]^{*} = \lambda e \, \lambda P_{\text{NI}} \forall w \in \text{Best(Circ, NI, e, P)} \left[\exists e' \, e' < e' \& P(w)(e') = 1\right]\] ²

In practice, (9) presupposes that the extensional event’s runtime is within a topical interval provided by a context \(\text{TOP-Time}(c)\), which itself must be anterior to the local evaluation time. That the anteriority restriction holds for this interval, and not merely for the event time can be shown by considering intervals that overlap the local evaluation time (here, the utterance time). In the sentence below, *today* is infelicitous because it cannot precede the utterance time, while *this morning* can, and is thus felicitous:

\[
\{\text{Ce matin, *Aujourd’hui}, \text{Paul jouait du piano.}\}
\{\text{this morning, *today} \} \text{Paul was playing the piano-impf}
\]

'This morning/*Today, Paul was playing the piano.'

Given (9), we obtain the following compositional skeleton and denotation for (7):

\[
\text{[[ (7) ]] is defined iff there is a topical event } e \text{ contained in a past topical interval. If so, it is true iff in all best circumstantial worlds with least interruptions, } e \text{ is a subevent of an event } e' \text{ of Paul playing piano.}
\]

Given the definedness conditions in (9), the oddness of (4a) out of the blue results from the *topic time* of the context not being set. This interval may be set overtly by temporal

² \(\varepsilon\) is the type for eventualities.
adjuncts and adverbs of quantification, which serve as temporal topics or update of the topical interval for adverbs). However, as demonstrated in (4e) the framing adverb need not always be syntactically present. As it turns out, nor, does in fact, need to be mentioned in the discourse, so long as it can be retrieved as the lifetime of an entity in the sentence. Take the contrast in (13): (13a) seems felicitous, even in the absence in the discourse of a salient topic, because the extinction of dinosaurs seems to make their lifetime salient. In (13b), however, there is no clear lifetime of corsets or women that can be retrieved, leading to infelicity in the absence of a discourse salient topic time.

(13)  

(a) Les dinosaures mangeaient de la viande.  
The dinosaurs eat-impf of the meat.  
‘Dinosaurs ate meat.’

(b) ??Les femmes portaient des corsets.  
Women wore-impf corsets.  
‘Women wore corsets.’

To sum up, we assume a unified account of IMPF, responsible for generic, habitual and progressive uses of the Imperfect. This operator combines with an event (eExt) and a property of events, and quantifies over uninterrupted circumstantial worlds, accessible from that event (Portner 1998): this derives the ongoingness and intensional nature of the Imperfect. IMPF further imposes felicity conditions on the event it combines with: a framing presupposition requires that the runtime of e be contained in a salient topic time; an anteriority presupposition requires that that this topic time precedes the time of utterance. These two presuppositions are responsible for the framing and past requirements of the Imperfect.

4 The Imperfect and Counterfactuality

Having considered the treatment of canonical uses of the Imperfect, we now move to a discussion of counterfactual uses. As we mentioned at the outset, empirically, counterfactuals show none of the requirements that drove us to the considerations in the previous section. They do not seem to describe past events, they may be said out of the blue, and there is no notion of ongoingness communicated. Thus, in (14) we are talking about possible future or current events of arriving and writing, not past. Furthermore, these events may be understood as completed: a completed (rather than ongoing) arrival would lead Paul to meeting Marie; a completed (rather than merely ongoing) writing event would lead to Marie’s happiness:

(14)  

(a) Si Paul arrivait demain, il renconrerait Marie.  
If Paul arrive-impf tomorrow, he met-COND(fut+impf) Marie

3 Temporal adjuncts serve to set the topical temporal interval via a monstrous operator (cf. Bittner 2007):

(i) \([\text{T-Adv} \, \text{XP}]^{\#} = [[\text{XP}]]^{\#} \), where time(c\(^{\#}\))=[[\text{T-Adv}]]^{\#}.

where \(\text{TOP-TIME}(\chi')\) determined by T-Adv & \(\chi'\) exactly \(\chi\) on other coordinates.

Putting (i) together with (9) yields the presupposition that \(t(e)\subseteq\text{TOP-TIME}(e)\), which is now set to the time interval provided by temporal adverb. This is not the only possibility. We could pursue a dynamic approach, wherein IMPF is anaphoric to a salient past interval, either supplied by discourse or sentence-internally.
'If Paul arrived tomorrow, he would meet Marie.'

b. Si Paul écrivait à Marie, elle serait contente.
If Paul wrote to Marie, she be happy-

COND(fut+impf)

If Paul wrote to Marie, she would be happy.'

Of course, one explanation for this is that counterfactuals do not involve IMPF, and that the morphology is deceiving us. However, if we assume that the morphology is a manifestation of IMPF, it is unclear why counterfactuals should behave so differently from other uses of the Imperfect.

As mentioned at the outset, we will argue that the culprit in all of these differences is the future modal (FUT), whose morphological exponent is the future morphology lurking inside the conditionnel mood of the consequent (Iatridou 2000). Recall that when introducing IMPF, we made it relative to an event argument, whose position is saturated by the extensional event. We will pursue an account of FUT that treats it also as event relative, along the lines of the event relative modality in Hacquard (2006). It too will thus require an event argument, and we will likewise assume that this position is filled by ext. The skeleton of this account is in (15):

(15)

(15) is thus a future conditional, apart from the contribution of IMPF. In the event relative framework, IMPF's modal contribution will disappear under vacuous quantification, while its presuppositions on ext will still remain. Thus, (15) will reduce to a future conditional with respect to a past, framed event, which we will show yields a counterfactual interpretation.

4.1 Event-relative modality

Under Hacquard’s (2006) event-relative modality framework, modals uniformly select an event argument which serves to characterize the modal base quantified over. In Hintikkan systems, modal bases are determined with respect to individual, temporal, and intensional parameters; in the present system it is argued that all of this information is provided by a particular event. The system imposes the constraint that the event arguments of modals be constrained to be variables bound by the closest event binder (in the spirit of Farkas 1994, Percus 2000). This thus requires that two modals stacked without any intervening material will require their event variables to be co-bound, resulting in vacuous quantification of the higher modal.

To see this, consider (16), which schematizes the situation in question. Both modals uniformly quantify over worlds accessible from the event in question. But given that the lower modal is evaluated with respect to its event argument, not the worlds quantified over by the higher modal, the higher modal binds vacuously into its scope:
Hacquard (2006) argues for instance that this happens with epistemic modals under doxastic attitudes, yielding a quantificationally-variable doxastic attitude.

(16) \[
\lambda \psi \left( \forall w \in \text{Acc} \psi \wedge \forall w' \in \text{Acc} \psi \right) [p(w')=1] \end{equation}, \text{or} \quad \forall w \in \text{Acc} \psi [p(w)=1]
\]

As (15) is another instance of this pattern, the modal contribution of IMPF will also be nullified. What differentiates (15) from (16), however, is that, because of its presuppositions, the higher modal IMPF, despite having its modal contribution neutralized, can still impose restrictions on the event argument of the lower modal. We will now investigate the consequences of these restrictions.

### 4.2 Recipe for Counterfactuality

First, we should specify our assumptions about the future modal FUT and the structure in (15). Following Condoravdi (2001) and Copley (2003), we will assume FUT is a metaphysical modal, which combines with two properties of times. In order to make metaphysical modality event-relative, we construct metaphysical alternatives with respect to an event argument of the modal (we assume future shifting of the temporal now following Abusch 1998):

(18) \[
[[\text{FUT}]] \downarrow = \lambda \psi \lambda p \lambda q \forall w \in \text{Best(Meta} \psi) \wedge p([t_0, \infty])(w) \wedge q([t_0, \infty])(w) = 1.
\]

As Iatridou (2000) demonstrated, the conditionnel mood displayed in Romance counterfactuals is the morphological spellout of IMPF above FUT. Given (18), we assume that FUT takes two properties of times. These structures we assume have aspectual elements, whose presence is diagnosed by the availability of ongoing interpretations with counterfactuals:

(19) Si Jean courrait régulièrement, il serait en pleine forme.

If Jean run-impf regularly, he be-COND in good form

‘If Jean ran regularly, he would be healthy.’
Both antecedent and consequent have obligatory imperfective morphology in counterfactuals:

\[(20)\]

a. Si Jean arrivait demain, il rencontrerait Jane.  
   If Jean arrive-impf tomorrow, he met-COND Jane

b. *Si Jean arrivera demain, il rencontrerait Jane. 
   If Jean arrive-fut tomorrow, he met-COND Jane

c. *Si Jean arrivait demain, il rencontrera Jane. 
   If Jean arrive-impf tomorrow, he met-fut Jane

Given that IMPF scopes above FUT and its two arguments, we assume that the obligatory presence of Imperfect morphology is the result of a morphological rule which blocks the appearance of the aspect of the embedded clauses (comparable to sequence of tense rules in terms of morphological agreement). Thus, despite appearances, we assume that the antecedent is type-theoretically equivalent to the consequent (i.e., properties of times), and that the mandatory appearance of the Imperfect in the antecedent is mere agreement. While we leave the precise specification of the morphological realization principles to future research, we note that for counterfactuals in Quebecois French the agreement is complete – both antecedent and consequent show conditionnel morphology – suggesting that we are indeed dealing with a morphological issue:

\[(21)\]

Si Jean serait là, Marie serait heureuse.  
   if Jean be-COND there, Marie be-COND happy

‘If Jean were there, Marie would be happy.’ (Michael Gagnon, p.c.)

These assumptions serve to provide the structure in (22), which is a more detailed version of (15):

\[(22)\]

Given the denotations for FUT and IMPF as well as the principles governing structures such as (15), (22) has the following denotation:4

\[(23) [([22])]^{\text{fg}} = \lambda e_{\text{Ext}}: t(e_{\text{Ext}}) \subseteq \text{TOP\text{-}TIME}(c) \land \text{TOP\text{-}TIME}(c) < t_0 \]

\[
(\forall w' \in \text{Best(Circ, NI, e_{\text{Ext}}, FutP)} : \exists e' [e' < e \land (\forall w \in \text{Best(Meta(e_{\text{Ext}}) where } p([t_0, \infty))(w)) [q([t_0, \infty)](w) = 1].
\]

---

4 Note that as it stands IMPF and FUT will not combine because of a type clash. At present, we assume vacuous type-raising of FUT to yield a property of events (as done in the tense literature, e.g., Katz 2001). While this is clearly undesirable, it is unclear to us how to solve this general problem regarding future scoping below modality. Significantly, Copley (2003) manages this by making aspect take temporal property arguments, but this generally produces problems with accomplishments (Landman 1992).
The denotation of (22) is a future conditional with the presuppositions of IMPF and explicit reference to the extensional event.\(^5\) (24) shows a concrete example:

(24) a. Si Jean arrivait demain, il rencontrerait Jane.
   'If Jean arrived tomorrow, he would meet Jane.'

b. (24a) defined iff there is a past topical event. If defined, in the best metaphysical alternatives compatible with \(e\) where Jean arrives tomorrow, Jean meets Jane.

The question then is what is this \(e_{\text{Ext}}\), which, here, determines the set of metaphysical alternatives. Recall that for the canonical Imperfect forms, \(e_{\text{Ext}}\) was the extensional event part of the P-event in circumstantial worlds. What about counterfactuals? Let’s pause for a moment and consider what counterfactual conditionals express. Arregui (2005) makes the intuitively appealing proposal that counterfactuals are de re claims about some past time. Hence, a sentence like (24) makes a claim about a particular ‘past’, such that if this past had led to Jean arriving tomorrow, it would also have led to him meeting Jane. In this vein, we would like to argue that counterfactuals make claims not just about a particular past time, but a particular ‘forking’ event, following the terminology of Bennett (2003): an event that serves to bifurcate worlds into those where the antecedent holds and those where it does not. Thus, in counterfactuals, we take \(e_{\text{Ext}}\) to be this very forking event.

For (24), this event is Jean’s itinerary-fixing event, i.e., the event that would lead to his arriving tomorrow or at some other time. In a sentence like ‘If McCain were President, GM would be bankrupt’, that forking event is an election event, etc.\(^6\) Assuming this is the case, (24a) roughly asserts that when one considers the futures of the itinerary fixing in which the antecedent is true, the consequent follows. This is as desired. The remaining task is to demonstrate how one arrives at the forking event given the presuppositions introduced by IMPF.

Before we do so, note that while both IMPF and FUT are relative to an extensional event \(e_{\text{Ext}}\), which determines the set of worlds they quantify over, what that event is for each is substantially different: for the former, \(e_{\text{Ext}}\) is actually a subpart of the event that occurs in the modal worlds; for the latter, it is the event that determines what possible futures look like, and hence it is not a proper subpart of the events described in the antecedent and consequent. Thus, while IMPF forces an ongoing event in the actual world, FUT only requires an actual

\(^5\) Note that IMPF does additionally make an existential claim about a larger event in circumstantially accessible worlds. However, note that here the property ordering the worlds is trivially true (by vacuity of the type-raised proposition), which renders the condition merely one such that the event is construable as part of a larger event.

\(^6\) This proposal does face problems from examples such as ‘If gas were $4/gallon, my plane ticket would have been more expensive.’ (G. Katz, p.c.). Our hunch is that in such cases, counterfactuals are not referring to a particular forking event, but to a family of forking events. We leave these to future research.
event that precedes possible (ongoing or completed) events distinct from the actual event. Because the ongoingness requirement of IMPF follows from its modal contribution, which is neutralized in counterfactuals, and because FUT imposes no such ongoingness requirement, we explain why counterfactuals lack the ongoingness hallmark of the Imperfect. What about the two other hallmarks? How are they avoided or satisfied? Given their presuppositional status, their contribution will not be neutralized, and they should thus impose restrictions on e_{Ext}, i.e., the forking event.

4.3 The Anteriority Presupposition

The anteriority presupposition requires that a felicitous use of a counterfactual conditional be made with respect to an event that occurred in a topical interval that is prior to the evaluation time. As has been noted by Condoravdi (2001), Ippolito (2003), and Arregui (2007) the counterfactual component of counterfactual conditionals results from evaluating metaphysical alternatives in the past, as it is the settledness of the past that yields the contrary-to-fact implicature. To consider an example of Condoravdi’s, in a situation where the outcome of an event is uncertain, such as during a baseball game, hazarding a guess about the outcome of the event in progress (i.e., they might still win the game) is making a metaphysical claim about one’s future; there is no sense of the counter to fact simply because there is no fact as of yet. However, once the game is finished and the outcome is foreclosed, the issue in question is settled. Counterfactual reasoning (i.e., they might still have won the game), then, is simply accessing the metaphysical alternatives of the event in question – here the game – before its outcome was settled. In the systems referenced above, it is a temporal element (tense/perfect) that supplies the anteriority requirement on the metaphysical alternatives under consideration. In the event-relative system, anteriority is due to an event constrained to be in the past which determines metaphysical alternatives.

While this allows us to assimilate the contrary-to-fact implicature to prior work, note that the anteriority presupposition does not otherwise determine the extensinal event (that is, it does not fix our sights on the game per se). This is true for the canonical Imperfect sentences as well, where, in the spirit of Landman, we saw that the property argument is what constrains the nature of e_{Ext} (it must be merologically compatible with an event which the property denoted by the VP is true of). We thus need a source comparable to the event property to locate the framing event descriptively. We will argue below that in the case of counterfactuals, it is the framing presupposition which serves to identify the extensinal event’s characteristics.

4.4 The Framing Presupposition

The framing presupposition enforces the runtime of the extensinal event within a contextual topic time. However, conditionals are not temporal adverbs, and hence by assumption do not shift topic time. Nonetheless, recall that we concluded from (13) that the lexical content of DPs could sometimes pragmatically introduce topical intervals (e.g., the lifetime of

\footnotetext{7}{M. Gagnon (p.c.) points out that it is possible to use counterfactuals even if the fork has not yet occurred (e.g., in (24), if Jean has yet to buy his ticket), contrary to our analysis. While this is true, such examples seem predictive (Kaufmann 2005), it’s unclear how they differ from predictive future conditionals, and leave it for future research. See also footnote 5.}
dinosaurs). We will suggest that conditional antecedents function much the same way, introducing an interval relevant to the antecedent proposition. Based on the discussion in 4.3, this interval should be that during which the outcome of the event was unsettled, i.e., as the baseball game was in progress. What we have just described is simply the interval under which the forking event was a historical issue, in the sense of Ippolito (2008).

(25) **Historical Issue** (Ippolito 2008)
For any proposition $p$, world $w$ and time $t$, $p$ is a historical issue in $w$ at $t$ just in case:
(i) $w$ is historically as close to $w_c$ as allowed by the fact that the set of worlds accessible from $w$ at $t$ (call this set A) must include both $p$-worlds and $\neg p$-worlds;
(ii) all the worlds $w'$ in A maximally similar to $w_c$ are worlds where $ps(p)$ are true ($ps(p) =$ presuppositions in $p$).

Historical issues at a time $t$ are properties of times still unsettled at $t$. While there are many historical issues at any given time, recall that in the present case, we are assuming that the antecedent of the conditional is responsible for honing in on the forking event. How? As Ippolito notes, “if $p$ is foreclosed [settled] in $w_c$, $t$ must be a time immediately before the time when $p$ got foreclosed in $w_c$.” Thus, for a counterfactual antecedent, which is settled at the evaluation time, the time interval made salient (i.e., $\top$-$\text{TIME}(c)$) will be one whose right boundary is the settling time of the antecedent. We suggest that the antecedent specifies the left boundary as well, pragmatically setting $\top$-$\text{TIME}(c)$ to an interval immediately bounding the runtime of the event which settled the antecedent property. In sum, the framing presupposition requires that there is an extensional event during an interval bounding the settling event for the counterfactual antecedent. This is sufficient, we suggest, to identify the settling event itself, which serves as a fork (in the sense of Bennett 2003), producing divergence into $p$ and $\neg p$ worlds, and hence the metaphysical alternatives at the time of the event include both types of worlds.

Thus, in canonical Imperfect cases, the framing presupposition serves to temporally locate an extensional sub-event within some independent temporal interval provided by context (or context shifting of temporal adverbs). In contrast, in counterfactual cases, the framing presupposition individuates a forking event via the temporal interval evoked by the antecedent clause.

### 5 Conclusion

The goal of this paper was to account for the presence of the Imperfect in Romance counterfactuals, despite counterfactuals lacking the traditional hallmarks of the Imperfect. We argued that counterfactuals involve both a IMPF and a FUT, as suggested by morphology. We claimed that the differences of the counterfactual were due to quantification by a different modal, the metaphysical modal FUT, while the counterfactual component followed from the anteriority and framing presuppositions that IMPF imposes on the event determining the alternatives for FUT. By rendering both IMPF and FUT event relative, we demonstrated that the modal force of IMPF is vacuous in counterfactual contexts, thereby, in effect, removing it from the picture.

Several thorny issues remain. Within Romance, we have not considered what Ippolito (2004) calls Imperfect Conditionals, the necessarily contrary to fact conditions which do not
have future morphology. More generally, we have not ventured to comment on either the cross-linguistic split between languages which use the past for the counterfactual and those which use the imperfect or the fact that (in contrast to our semantics for IMPF), generics tend to morphologically pattern with counterfactuals and not progressives (Iatridou 2000).

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References


On negative antecedents in deontic conditionals

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Abstract

This paper investigates the semantics of deontic modals. It focuses on the interplay between primary and secondary duties. The paper pays particular attention to secondary duties reported in conditionals with negative antecedents. It is claimed that this kind of example provides relevant insights into the semantics of deontic modals, shedding light on the relation between facts and ideals that is relevant to the evaluation of deontic claims. The paper proposes a semantics for deontic modals (exemplified by should). At the heart of the proposal is a notion of revision (similarity) that is argued to be analogous to that found in counterfactuals. Building on work by Kratzer and Veltman, it is claimed that there is a common core to the semantics of deontics and counterfactuals.

1 Introduction

This paper investigates the semantics of deontic modals. It will be argued that deontic modals bear certain similarities to counterfactual modals (would in English). Both deontics and counterfactuals have a semantics that pays attention to facts in the evaluation world. It will be argued that they both pay attention to the relations between facts in the evaluation world (where the relations are identified by the laws in the evaluation world). It has long been noted in the literature on counterfactual modality that, in order to get the semantics of counterfactuals right, it is necessary to track relations between facts in the evaluation world (e.g. Kratzer 1989, 1991, 2002, Veltman 2005). In this paper, it will be argued that in order to get the semantics of deontics right, it is also necessary to track relations between facts in the evaluation world. A similar characterization of revision (similarity) will be argued to play a role in both types of modality.

Standard Lewis-Stalnaker style semantics for counterfactuals place similarity with respect to actual world facts at the centre of the analysis. An example illustrating the need to take into account the relations between facts in counterfactuals, and not just facts in isolation, was provided in Tichý (1976), and discussed by Veltman (2005). The relevant scenario is provided in (1):
Consider a man, call him Jones, who is possessed of the following dispositions as regards wearing his hat. Bad weather invariably induces him to wear a hat. Fine weather, on the other hand, affects him neither way: on fine days he puts his hat on or leaves it on the peg, completely at random. Suppose moreover that actually the weather is bad, so Jones is wearing his hat.

In the scenario described in (1), we would judge the sentence in (2) false:

(1) Consider a man, call him Jones, who is possessed of the following dispositions as regards wearing his hat. Bad weather invariably induces him to wear a hat. Fine weather, on the other hand, affects him neither way: on fine days he puts his hat on or leaves it on the peg, completely at random. Suppose moreover that actually the weather is bad, so Jones is wearing his hat.

(2) If the weather had been fine, Jones would have been wearing his hat.

Tichý’s point was that a semantics for counterfactuals that pays attention to similarity with actual world facts and naïvely ignores the relations between facts will get the interpretation of counterfactuals like this one wrong. If we pay attention to similarity with actual world facts in a naïve manner, in interpreting (2) we will quantify over the worlds that best match the actual world with respect to facts in which the weather was fine. Given the actual facts regarding Jones’s hat, those worlds will be worlds in which Jones was wearing his hat. The prediction is that (2) should be judged true (contrary to our intuitions). We obtain the wrong interpretation for (2) because we evaluate similarity without paying attention to the relations between facts in the actual world. When we consider the worlds quantified over by the counterfactual modal, we will take into accounts worlds that differ from the actual world with respect to the bad weather. But this was the very reason why Jones was wearing his hat! If we allow variation with respect to the weather, we should also allow for variation with respect to the wearing of the hat (predicting that example (2) is false in this scenario).

Both Kratzer and Veltman have proposed semantics for counterfactuals in which similarity is not evaluated in a naïve manner, but instead is evaluated in a way that pays attention to the relations between facts. In this paper, it will be argued that the semantics of deontic modals should also be formulated in a manner that pays attention to the relations between facts. I will use should as an example of a deontic modal,\(^1\) and propose a semantics that builds on Veltman’s (2005) analysis of counterfactuals (an alternative analysis could also be proposed on the basis of Kratzer’s proposal for counterfactuals, a comparison between the two alternatives lies outside the scope of this paper).

Data supporting the need to allow for relations between facts to play a role in the semantics of deontic modals will come from our intuitions regarding the interaction between primary and secondary duties. Primary duties are the obligations that arise unconditionally, while secondary duties are the obligations that arise in less-than-ideal circumstances. Secondary duties are usually spelled out in a type of conditional known as Contrary to Duty Imperatives (CTDs) (following Chisholm 1963, see also Åqvist 2002 and Carmó and Jones 2002). An example of a primary duty and a secondary duty spelled out in a CTD is presented in (3):

(3) a. There should be a fence around the house. (primary duty)
   b. If there isn’t a fence, there should be a guard dog. (CTD).

Now consider examples (4) and (5), with the assumption that there is no fence around the house and there is no guard dog:

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\(^1\) I will not be able to address differences between deontic modals in this paper. For some discussion, the reader is referred to Copley (2006) and von Fintel and Iatridou (2008).
The housing inspector’s reply in (5) is odd, but it is perfectly reasonable in (4). This may appear unexpected given the CTD in (3b). According to the CTD, if there is no fence, there should be a guard dog. Why are we reluctant to accept as true the housing inspector’s reply in (5)? This paper will provide an answer to this question, showing that we can make sense of the contrast between (4) and (5) with a semantics for should that pays attention to the relation between facts in the same way that the semantics for would does.

The structure of the paper is as follows. In Section 2 I will discuss contrary to duty imperatives and secondary obligations, focusing on features that will be relevant later on. In Section 3 I will lay the groundwork for the proposal, discussing some of the background assumptions and previous proposals. In Section 4 I will spell out a semantics for should that builds on work by Kratzer and Veltman, making use of a notion of revision proposed by Veltman for counterfactuals. Conclusions will be presented in Section 5.

2 Contrary to duty imperatives and secondary obligations

CTD conditionals provide important evidence that we need a semantics for should that pays attention to the relations between facts. In this section I will present a brief overview of the facts about CTDs and secondary duties that will be relevant for our discussion in later sections of the paper (see Arregui 2010 for a more thorough discussion of CTDs).

CTD conditionals serve as a kind of ‘back-up plan’. They are important for most of us need a way of deciding, not only what we ought to do, but also what we ought to do after we fail to do some of the things we ought to do (Chisholm 1963: 35-36). I will not be able to discuss what kind of deontic modality exactly is associated with CTDs. I will take for granted a general ‘ought-to-be’ deontic modality (Feldman 1986). In some cases, there appears to be a temporal dimension to CTDs. These truly seem to indicate what is the best thing to do after we have failed to do what we ought to do. An example of a CTD in which the secondary duty seems to ‘kick in’ at a time that follows the time of the primary duty is provided in (6):

(6)  a. She should return the library book on time.
    b. If she returns the book late, she should pay a fine. (CTD)

There appears to be a temporal distinction between the primary duty in (6a) and the secondary duty presented in (6b). We could not felicitously assert (6a) after she has returned the book late. At that point, we would move on to claim that she should pay a fine. However, not all secondary duties follow primary duties in time. Prakken and Sergot (1996) have provided several examples that illustrate that primary and secondary duties can co-occur in time (they can hold together). Some examples are provided in (7) and (8):

(7)  a. She should return the library book on time.
    b. If she returns the book late, she should pay a fine. (CTD)

(8)  a. If she returns the book late, she should pay a fine. (CTD)
(7) a. The children should not be cycling on the street.
b. If the children are cycling on the street, they should be cycling on the left side of the street.

(8) a. There should be no fence.
b. If there is a fence, it should be a white fence.

In the examples above, both the primary and secondary duties are about stative eventualities and the duties are oriented towards the speech time. There isn’t really a temporal distinction between the primary and secondary duty. If we see the children cycling on the right side of the street, for example, it is both true that they should not be cycling on the street, and that they should be cycling on the left side of the street.

The same point can be made with example (3), discussed above. If we come across a house with no fence, we may choose to assert that there should be a fence, but we may also choose to assert that there should be a guard dog. The conditions for the secondary duty spelled out by the antecedent of the CTD in (3b) are conditions in which we could also assert the primary duty. The important feature of deontic conditionals like this one, with a stative negative antecedent, is that the antecedent describes circumstances in which the primary duty seems to hold. The antecedent does not appear to discriminate between the circumstances in which one or other duty holds (raising questions as to how we decide which one to assert).

The discussion above indicates that we need a semantics for deontic statements that (in some sense) allows primary and secondary duties to co-exist. But the two types of duties are not equivalent. As we have seen, in some cases we appear happy to fall back on a secondary duty (illustrated by (4c)), while in others we are not (illustrated by (5c)). Intuitively, the important difference between examples (4) and (5) is that in (4) circumstances are such that there ‘cannot’ be a fence. When the primary duty cannot be fulfilled, we fall back on the secondary duty (this was also the intuition reported in Prakken and Sergot 1996). When it is possible to fulfil the primary duty, as seems to be the case in (5), we are not willing to fall back on the secondary duty. There seems to be extra modal force driving our willingness to fall back on the secondary duties laid out by CTDs (i.e. if there cannot be a fence, there should be a guard dog). This does not appear to be part of the meaning of the antecedent of the conditional itself. We would like to know where this modal force comes from.

3 Towards a counterfactual analysis

In Section 2 we reached the conclusion that we needed a semantics for should that allows primary and secondary duties to co-exist (i.e. a semantics according to which primary and secondary duties are compatible), as well as an understanding of why in some cases we seem willing to fall back on secondary duties whereas in other cases we are not. In this section we will formulate a preliminary proposal for the semantics of should taking as a starting point a simplified semantics of counterfactuals. We will examine advantages and potential shortcomings. This will lay the groundwork for the proposal to be defended in Section 4.

Our first attempt at the semantics of *should* will build on the treatment of modality in Kratzer (1981, 1991). In this section I will provide a brief overview of some of the basic features of that proposal (the reader is referred to Kratzer’s work for a more sophisticated and thorough discussion).

Kratzer spells out a theory of modality according to which the ‘flavors’ of modality depend on context. The semantics of modals lays down the modal’s quantificational force, and context-dependent parameters work together to identify the kind of modality relevant in each case. I will consider the modal *should* to be a necessity modal (but see von Fintel and Iatridou 2008). Kratzer’s proposal for necessity modals is given in (9):

(9) A proposition p is a necessity in a world w with respect to a modal base f and an ordering source g iff the following condition is satisfied:

For all $u \in f(w)$ there is a $v \in f(w)$ such that $v \leq_g u$ and for all $z \in f(w)$: if $z \leq_g v$, then $z \in p$. (Kratzer 1991)

According to (9), a necessity modal is a universal quantifier over possible worlds. The quantificational domain of the modal is identified on the basis of the interaction between a (contextually given) modal base and a (contextually given) ordering source. Both the modal base and the ordering source are functions from worlds to sets of propositions.

Given (9), the modal base and ordering source act together to identify the domain of quantification of the modal. Intuitively, quantification takes place over the ‘best’ worlds corresponding to the modal base. As Kratzer notes, the definition in (9) has certain complexity to avoid making the ‘limit assumption’: This definition is in the spirit of Lewis (1981). Roughly, it says that a proposition is a necessity if and only if it is true in all accessible worlds which come closest to the ideal established by the ordering source. The definition would be less complicated if we could quite generally assume the existence of such ‘closest’ worlds. (Kratzer 1991). In what follows, I will simplify matters and assume that it is possible to make the limit assumption and find the closest worlds to the ideal:

(10) Given an ordering source g, and possible world w’, w’ is a g(w)-closest world iff there isn’t a world w” such that w” < _g w’. (i.e. w’ is a g(w)-closest if there isn’t a world that is closer).

With this definition in hand, we can then simplify necessity as follows:

(11) A proposition p is a necessity in a world w with respect to a modal base f and an ordering source g iff the following condition is satisfied:

$\forall w' \in f(w)$: if $w'$ is a g(w)-closest world, then $w' \in p$.

Working with Kratzer’s framework, context is crucial in determining the type of modality associated with a modal. In discussing deontics, Kratzer considers two possibilities: (i) the modal is interpreted with respect to an empty modal base and a normative ordering source (where a normative ordering source is function from possible worlds to sets of propositions that correspond to what is ‘good’ in the context, e.g. the laws, library regulations, moral duties, etc.), or (ii) the modal is interpreted with respect to a circumstantial modal base and a normative ordering source (where a circumstantial modal base is a function from possible
worlds to sets of propositions true in the possible worlds, e.g. propositions that describe what is going on in the evaluation world). In the first case, all possible worlds will be ranked by the norms and the modal will quantify over the best possible worlds given the norms. In this interpretation, the deontic modal will make a claim regarding what is best that is independent of facts in the evaluation world. In the second case, only possible worlds that match the evaluation world with respect to the facts encoded in the circumstantial modal base will be considered. The modal will quantify over the best such worlds given the norms. In this interpretation, the deontic modal will make a claim regarding what is best given contextually relevant facts.

Neither of these two interpretations straightforwardly captures our intuitions regarding the interplay between primary and secondary duties. Consider the housing inspector’s reply in the scenarios described in (4) and (5): There should be a guard dog. The claim that there should be a guard dog will not be true with an interpretation of the modal according to which the modal base is empty. The presence of the guard dog is not the best option in an absolute, fact-independent, way. The best thing really would be a fence (the ‘primary duty’). Whether the claim that there should be a guard dog comes out true or not with a circumstantial modal base depends on the propositions in the modal base. If we do include the proposition that there is no fence, then the claim that there should be a guard dog will be true. However, note that there is nothing in the semantics that forces us to include that proposition in the modal base (it is a context-dependent matter). Nothing guarantees that the proposition that there is no fence has to be part of the circumstantial modal base (as is suggested by our intuitions in (4c)). And nothing explains why, in spite of the fact that it is true that there is no fence, in some cases we do not appear to ‘take it for granted’, and include the corresponding proposition in the modal base (as is suggested by our intuitions in (5c)). In order to capture our intuitions regarding the interplay between primary and secondary duties, we would need to elaborate on the proposals for the interpretation of deontic modals described above.

3.2 Revising the premise set

As the previous discussion illustrates, in order to judge the claim that there should be a guard dog true, we need a semantics for deontic should that is sensitive to facts in the actual world, in particular, the fact that there is no fence around the house. We fall back on secondary duties driven by facts in the actual world (the evaluation world). In this section I will sketch a preliminary ‘simple’ semantics for should that is sensitive to facts and use the discussion to motivate a more sophisticated approach, in which the semantics for should is not only sensitive to facts but also to relations between facts.

The puzzle posed by secondary duties (such as There should be a guard dog) is how to set up a semantics for should that ‘sees’ the facts in the world that drive us to fall back on the secondary duty in the appropriate way. One way of guaranteeing sensitivity to the relevant facts is to set up a semantics for should that see all facts in the world (thus seeing all relevant facts). We could achieve this in a Kratzer-style framework by choosing a modal base that is not merely circumstantial, but also totally-realistic (a modal base that assigns to a world a set of propositions that characterizes it uniquely). With such a modal base we could make sure that all the facts that lead us to fall back on secondary duties are ‘visible’ to the deontic modal. This would be so because all facts would be ‘visible’ to the deontic modal. However, this proposal is clearly problematic. Consider again the example above: There should be a
guard dog. In (4), we judged this true. But note that in the actual world, there is no guard dog. A totally realistic modal base will only allow the deontic modal to quantify over the actual world (since this is the only world corresponding to the modal base, the ordering source will identify it as the best world given the norms – it is the only world under consideration!). With a totally realistic modal base, the prediction is that the claim that there should be a guard dog is false, contrary to our intuitions in (4).

It is clear where we have gone wrong. Our modal base contains too many true propositions. We want to quantify over worlds that match the facts in the actual world as much as possible (to make sure that the facts that push us to secondary duties remain visible to the modal) but at the same time we want to make sure that some facts are left out (in the example above, we want to make sure that we leave out the fact that there is no guard dog). To achieve this result, we could start off with a totally realistic modal base and revise it so as to make it compatible with the proposition embedded under the modal (removing the proposition that there is no guard dog). Intuitively, this means the deontic modal would have access to the worlds most similar to the actual world except for the facts pertaining to the absence of a guard dog (and the ordering source would identify the ‘best’ worlds amongst this set). In looking at worlds that are like the actual world except for some facts, we set up a semantics for should that is reminiscent of the semantics for counterfactuals (where quantification takes place over the most similar worlds in which the antecedent proposition is true). Our first attempt to achieve this result is presented in (12):

\[
(12) \text{Semantics for } \text{should} \text{ (preliminary)} \\
[\text{should } \phi]^{\text{f-rev, } g}_{g} \text{ is true in } w \text{ iff} \\
\forall w' \in \cap f_{\text{rev}, g}(w): \text{if } w' \text{ is a } g(w)-\text{best world, } w' \in \phi
\]

The important feature of (12) is the choice of modal base. The modal base \( f_{\text{rev}} \) is a totally realistic modal base minus the propositions inconsistent with \( \phi \). Given this modal base, should will quantify over the best worlds (given \( g \)) in which all the propositions true in the actual (evaluation) world compatible with the proposition embedded under the modal are true. With this proposal, the statements of primary and secondary duties will receive the interpretations below (for a discussion focused on detachment patterns in CTDs, see Arregui 2010).

\[
(13) \text{a. } [\text{should [there be a fence]}]. \\
\text{b. } [((13a))]^{f_{\text{rev}}, g}_{g} \text{ is true in } w \text{ iff} \\
\forall w' \in \cap f_{\text{rev}}(w): \text{if } w' \text{ is a } g(w)-\text{best world, there is a fence in } w'.
\]

\[
(14) \text{a. } [\text{should [there be a guard dog]}]. \\
\text{b. } [((14a))]^{f_{\text{rev}}, g}_{g} \text{ is true in } w \text{ iff} \\
\forall w' \in \cap f_{\text{rev}}(w): \text{if } w' \text{ is a } g(w)-\text{best world, then there is guard dog in } w'.
\]

In (13b) and (14b), \( f_{\text{rev}} \) is a revision of a totally realistic modal base to a modal base compatible with the proposition embedded under the modal (i.e. in (13b) we remove from the totally realistic modal base the propositions incompatible with the proposition that there is a fence, and in (14b) we remove from the totally realistic modal base the propositions

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2 There are other proposals in the literature that tackle the issue of diversity in the domain of quantification of modals (e.g. Frank 1997, Condoravdi 2002, Zvolenszky 2002, 2006). I will not be able to do full justice to this debate here.
incompatible with the proposition that there is a guard dog). This means that in evaluating the secondary duty (14a), quantification will take place over worlds in which there is no fence (the proposition that there is no fence, present in the totally realistic modal base, will remain in the revised modal base, since it is not incompatible with the proposition that there is a guard dog). With this modal base, we ensure that all the facts relevant to the evaluation of secondary duties remain visible to the modal, and at the same time we ensure that actual facts incompatible with the proposition embedded under the modal do not trivialize the interpretation.

Importantly, the proposal in (12) allows primary and secondary duties to be compatible with each other. We can see this in examples (13) and (14). In principle, both (13a) and (14a) could be true in the actual world. Given the proposal for should in (12), we quantify over different worlds in evaluating (13a) and (14a), and nothing prevents the best worlds to be worlds in which there is a fence in the evaluation of (13a), and the best worlds to be worlds in which there is a guard dog in the evaluation of (14a). The worlds corresponding to the modal base are different in each case, and so the best worlds may also be different. The proposal in (12) thus accounts for Prakken and Sergot’s observation that primary and secondary duties may be compatible. While this is a welcome result, it is true, however, that the conjunction of primary and secondary duties at times sounds strange. Even though both primary and secondary duties can be true in (13a) and (14a), it would be rather surprising if a housing inspector, coming across the fence-less house, were to tell the owner (15):

(15) There should be a fence and there should be a guard dog.

I would like to suggest, however, that this could be attributed to performative effects associated with the utterance of deontic statements. In the context above, the claim made by the housing inspector would be interpreted as corresponding to what the inspector wants the home-owner to do (or the reproach the inspector wishes to make), and this would be strange. If we set up a context where such performative effects are discarded, it seems easier to conjoin primary and secondary duties:

(16) Housing inspector 1: Ok, let’s make a list of all the violations this house owner has incurred and figure out the fine
   Housing inspector 2: Well, there are lots! There should be a fence, so let’s fine him $10 for that, there should be a guard dog, so let’s fine him another $10 for that, there should be a fire hydrant, let’s fine him an additional $10, ….

To make a strong argument regarding this point it would be necessary to have a theory of the performative effects associated with deontic statements, missing at this point. But I hope to at least have shown that a semantics for deontic modals that allows primary and secondary duties to be compatible, together with a theory of the performative effects associated with deontic statements, has a good chance of accounting for our intuitions.

While the proposal in (12) provides us with good results in making deontic modals sensitive to the facts in the evaluation world, it cannot be the whole story. The account in (12) does not explain the contrast in our intuitions regarding (4c) and (5c). Why are we willing to fall back on the secondary duty in one case but not in the other? In both scenarios, it is the case that there is no fence around the house. Given the CTD in (3b), this appears to be the relevant condition for the secondary duty. The contrast in our intuitions, however, indicates that this is not all that matters. Whether there is no fence because there was no wood or because the
4 A counterfactual analysis of deontic should

The proposal for should presented in (12) is a first step towards an analysis for deontic modals that builds on the semantics of counterfactuals. As with counterfactuals, the evaluation of the modal requires revising a premise set corresponding to what is going on in the evaluation world. However, the approach in (12) was too naïve. We did not take into account the complexity of the interpretation of counterfactuals. In this section we will present an analysis of counterfactuals that pays attention to relations between facts, and use it to build a more sophisticated semantics for should. The proposal will be built around the analysis of counterfactuals in Veltman (2005) (a comparison with the options made available by other analysis of counterfactuals lies outside the scope of this paper).

4.1 Veltman (2005)

Veltman (2005) spells out a semantics for counterfactuals within a dynamic semantics framework. Veltman’s objective is to propose a semantics for counterfactuals that can handle relations between facts. As illustrated by Tichý’s example (discussed by Veltman), a semantics for counterfactuals that pays attention to similarity without factoring in the relations between facts will get things wrong. Veltman’s insight is that, in a premise-set style semantics for counterfactuals, relations between facts need to be taken into account when revising premise sets. Veltman’s proposal is to identify the set(s) of ‘basic’ independent facts in a world and define revision with respect to this set(s), allowing the laws that operate in the world to ‘fill in’ the rest and bring along the dependent facts. I will briefly present Veltman’s proposal below, and build on it to propose a semantics for should in Section 4.2. In presenting Veltman’s proposal, I will make a series of simplifications. Veltman proposes a semantics for counterfactuals in a dynamic framework. Part of Veltman’s interest lies in identifying the mechanisms that bring about context change in counterfactuals. I will not be interested in the dynamic dimension here, and will simplify the proposal to set aside the dynamic aspects (future work would be needed to explore context change for deontic statements).

I will illustrated Veltman’s proposal with Tichý’s scenario in (1) and counterfactual in (2) (repeated below):

(2) If the weather had been fine, Jones would have been wearing his hat.

I will begin with some of Veltman’s terminology. A world is a valuation function on a finite set of atomic sentences. A situation is a proper subset of a possible world. A proposition is a subset of the set of possible worlds. The modal horizon of a possible world is the set of possible worlds U that obey its laws (I will refer to the modal horizon of the actual world (w̄) as Ū). Some useful auxiliary definitions are provided in (17):
(17) a. A situation $s$ determines a world $w$ in $U_{@}$ iff for all $w'$ in $U_{@}$ such that $s \subseteq w'$, $w' = w$.

b. A situation $s$ is a basis for a world $w$ iff $s$ is a minimal situation that determines $w$ in $U_{@}$.

c. A situation forces a proposition $P$ within $U_{@}$ iff for every world $w$ in $U_{@}$ such that $s \subseteq w$, $P$ is true in $w$.

Let us illustrate these definitions with Tichý’s example above. Suppose that $p = \text{‘the weather is bad’}$, $q = \text{‘Jones is wearing his hat’}$, and $r = \text{‘Jones lives in Amsterdam’}$ (a random sentence to illustrate how the system works). Suppose moreover that the actual world is subject to a law that states that if $p$ is true, $q$ is true (i.e. if the weather is bad, Jones is wearing his hat). Then, the actual world will be a set corresponding of three facts: $w_{@} = \{<p, 1>, <q, 1>, <r, 1>\}$ (where we write $<p, 1>$ to indicate that $p$ is true). The modal horizon of the actual world ($U_{@}$) is made up of worlds that obey the laws of the actual world. So, for example, worlds like $w_1 = \{<p, 0>, <q, 0>, <r, 1>\}$ and $w_2 = \{<p, 1>, <q, 1>, <r, 0>\}$ are members of $U_{@}$, but worlds like $w_3 = \{<p, 1>, <q, 0>, <r, 0>\}$ are not members of $U_{@}$ (since $w_3$ violates the laws of $w_{@}$). The actual world has a single basis: $s = \{<p, 1>, <r, 1>\}$ (for all $w' \in U_{@}$, if $\{<p, 1>, <r, 1>\} \subseteq w'$, $w' = w_{@}$).

With this vocabulary in place, we can now turn to Veltman’s semantics for counterfactuals. The interpretation of counterfactuals requires that we make a ‘counterfactual hypothesis’. This proceeds in two stages: we first identify a set of worlds on the basis of the facts in the actual world that are compatible with the counterfactual assumption taking into account the relevant laws (I will call this set of worlds the ‘revision set’ built on the basis of the counterfactual hypothesis). We then update the revision set with the proposition corresponding to the counterfactual hypothesis. We are particularly interested in the first stage, since this is where revision takes place and Veltman deploys machinery that is able to handle not only facts but also relations between facts.

To identify the revision set for the antecedent proposition, Veltman defines an auxiliary set. The intuition is that the auxiliary set will correspond to the maximal set(s) of independent facts in the world compatible with the antecedent proposition. Given a proposition $P$ and a world $w$, $w \downarrow P$ is the set of situations $s$ such that $s \subseteq w$ and there is a basis $s'$ for $w$ such that $s$ is a maximal subset of $s'$ not forcing $P$. In this way we can identify the maximal sets of independent facts in $w$ compatible with $P$. With this auxiliary definition in hand, we can now tackle the task of defining the revision set for a world $w$ and a proposition $P$ (which I will abbreviate as $\text{Rev}_{w/P}$); a world $w'$ is $\text{Rev}_{w/P}$ iff $w' \in U_w$ and there is some $s \in w \downarrow P$ such that $s \subseteq w'$. Intuitively, given a world $w$ and a proposition $P$, the revision set will be those members of the modal horizon of $w$ that ‘extend’ maximal sets of independent facts of $w$ compatible with the proposition $P$.

Let us go back once more to Tichý’s example to see how this works. As we noted, there is a single basis for the actual world: $s = \{<p, 1>, <r, 1>\}$. Let $P$ be the proposition corresponding to the counterfactual hypothesis $\neg p$ (the proposition that the weather is fine). The set corresponding to $w_{@} \downarrow P = \{<r, 1>\}$ (the unique maximal set of independent facts in $w_{@}$ compatible with the weather being fine). The revision set ($\text{Rev}_{w_{@}/P}$) will be the set of worlds $w \in U_{w_{@}}$ such that $\{<r, 1>\} \subseteq w$. $\text{Rev}_{w_{@}/P}$ will include the actual world ($w_{@} = \{<p, 1>, <q, 1>, <r, 1>\}$ – a lawful world in which $r$ is true), as well as worlds like $w_4 = \{<p, 0>, <q, 1>, <r, 1>\}$.
ON NEGATIVE ANTECEDENTS IN DEONTIC CONDITIONALS

Veltman’s objective is to provide an account of counterfactual conditionals. Having identified the revision set for w₆ given P, it is now possible to take the second step and make the counterfactual hypothesis that ¬p. This requires updating the revision set with ¬p. In our example, Rev₆/P = {w₆, w₄, w₅, …}. If we update this set with ¬p we will end up with {w₄, w₅, …}. Sentence q (‘Jones is wearing his hat’) is not true in all the worlds in this set. The prediction (correct!) is that the counterfactual in (2) (repeated below) is false:

(2) If the weather had been fine, Jones would have been wearing his hat.

By defining the revision set in a way that pays attention to the relations between facts, Veltman’s proposal is able to handle Tichý’s example.

4.2 The interpretation of deontic should

Our proposal for deontic should will be inspired by Kratzer in differentiating between a modal base and an ordering source. We will maintain Kratzer’s views about the ordering source and revise the proposal regarding how to identify the modal base. In evaluating a statement of the form should φ in a world w, we will use a modal base that is compatible with the proposition corresponding to φ. This means that we need to ‘remove’ the proposition corresponding to ¬φ. We would like to do this in a way that pays attention to the relations between facts (as proposed by Veltman 2005). The modified proposal for should is given in (18):

(18) [should φ] w is true in w iff

\[ \forall w' \in \text{Rev}_w/\neg \phi : \text{if } w' \text{ is a g(w)-best world, then } w' \in \phi. \]

According to (18), context is responsible for identifying the ordering source for the interpretation of the modal. The modal base, on the other hand, is identified on the basis of the facts in the evaluation world. A schema corresponding to the revision set in (18) is provided in (19):

(19) Where P is a proposition and w is a possible world,

\[ \text{Rev}_w/P = \{w' \in W : w' \in U_w \text{ and there is some } s \in w \downarrow P \text{ such that } s \subseteq w'\} \]

With this definitions in hand, we can now turn to the evaluation of the secondary duty associated with the CTD in (3b) in the scenarios provided in (4) and (5). As we will see in the next two sections, the proposal in (18) allows us to correctly distinguish between the two cases: (18) will predict that (4c) is true while (5c) is false. A semantics for should that tracks relations between facts can explain the difference between cases in which we are willing to fall back on a secondary duty from cases in which we are not.

4.2.1 When secondary duties come out true

We will begin with example (4):
Let us make the following assumptions. Suppose that \( p = \) ‘the store ran out of wood’, \( q = \) ‘there is a fence’, \( t = \) ‘there is a guard dog’, and \( r = \) ‘Jones lives in Amsterdam’ (a random sentence to illustrate how the system works). With these assumptions, the actual world is: \( w_\@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \). We will assume the generalization if \( p \) is true, \( q \) is false (this is a law in \( w_\@ \)). The worlds in \( U_\@ \) include \( w_\@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_1 = \{<p, 0>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_2 = \{<p, 1>, <q, 0>, <t, 1>, <r, 1>\} \), \( w_3 = \{<p, 0>, <q, 1>, <t, 0>, <r, 1>\} \), \( w_4 = \{<p, 1>, <q, 0>, <t, 0>, <r, 0>\} \), etc. \( U_\@ \) will not include worlds like \( w_5 = \{<p, 1>, <q, 1>, <t, 0>, <r, 1>\} \).

Given the proposal in (18), the statement in (4c) will be true in the following conditions:

(20) a. \[\text{[[ should [there be a guard dog] ]].}\]
    b. \[\text{[[(20a)]]}\]’ is true in \( w_\@ \) iff \( \forall w' \in \text{Rev}_{w_\@/\text{there isn't a guard dog}} \), if \( w' \) is a \( g(w_\@)-\text{best world}, \) then there is a guard dog in \( w' \).

According to (20b), the claim in (20a) will be true in \( w_\@ \) iff in the \( g(w_\@)-\text{best worlds in } \text{Rev}_{w_\@/\text{there isn't a guard dog}} \), there is indeed a guard dog. Which worlds are found in \( \text{Rev}_{w_\@/\text{there isn't a guard dog}} \)? To answer this question, we first need to identify the set \( w_\@/\text{there isn't a guard dog} \). Since there is a single basis for \( w_\@ \) (\( s = \{<p, 1>, <t, 0>, <r, 1>\} \)), this set will consist of a single situation: \( \{s'\} = \{<p, 1>, <r, 1>\} \). \( \text{Rev}_{w_\@/\text{there isn't a guard dog}} \) will consist of the worlds in \( U_\@ \) that extend this situation, e.g. worlds like \( w_\@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \) and \( w_2 = \{<p, 1>, <q, 0>, <t, 1>, <r, 1>\} \). Worlds like \( w_3 = \{<p, 0>, <q, 1>, <t, 0>, <r, 1>\} \) and \( w_4 = \{<p, 1>, <q, 0>, <t, 0>, <r, 0>\} \) are not in \( \text{Rev}_{w_\@/\text{there isn't a guard dog}} \) because even though they are lawful, they do not extend \( s' \). Given (20b), (20a) is predicted to be true iff in the \( g(w_\@)-\text{best worlds in } \text{Rev}_{w_\@/\text{there isn't a guard dog}} \), there is a guard dog. In the toy example we are discussing, this will be the case if \( w_2 \) is better than \( w_\@ \) (as is the case).

Given the circumstances described in (4), when we evaluate whether there should be a guard dog, the modal base will consist of worlds that are like the actual world with respect to the fact that there was no wood in the store and that Jones lives in Amsterdam. Since the worlds obey the actual laws, they will also be worlds in which there is no fence (given the law, in these worlds there can’t be a fence, accounting for the extra modal force noted earlier). In some of these worlds there is a guard dog, and in some there isn’t. The sentence there should be a guard dog will be true iff there is a guard dog in the best worlds in that set (given an ordering source \( g \)). The proposal in (18) makes correct predictions for the scenario in which we judge the secondary duty true.

4.2.1 When secondary duties come out false

We will turn now to example (5):

(5) a. Housing inspector: There should be a fence around the house.
b. House owner: I didn’t feel like following regulations.
c. Housing inspector: #Well, there should be a guard dog.
We will make the following assumptions: \( p = 'the house owner does not follow regulations' \), \( q = 'there is a fence' \), \( t = 'there is a guard dog' \), and \( r = 'Jones lives in Amsterdam' \) (a random sentence to illustrate how the system works). With these assumptions, the actual world is: \( w_@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \). This time, there are two generalizations at play (they may be different aspects of one generalization): if \( p \) is true, \( q \) is false and if \( p \) is true, \( t \) is false (these are laws in \( w_@ \)). The basis for the actual world now is: \( s = \{<p, 1>, <r, 1>\} \). The worlds in \( U_@ \) include \( w_@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_1 = \{<p, 0>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_2 = \{<p, 0>, <q, 0>, <t, 1>, <r, 1>\} \), \( w_3 = \{<p, 0>, <q, 1>, <t, 0>, <r, 1>\} \), \( w_4 = \{<p, 1>, <q, 0>, <t, 0>, <r, 0>\} \), etc. \( U_@ \) will not include worlds like \( w_5 = \{<p, 1>, <q, 0>, <t, 1>, <r, 1>\} \).

As in the earlier case, given (18), the statement in (5c) will be true in the following conditions:

\[
\begin{align*}
\text{(21) a.} & \quad \text{[[ should [there be a guard dog] ]].} \\
\text{b.} & \quad \text{[[(20a)]]}^w \text{ is true in } w \text{ iff } \forall w' \in \text{Rev}_w \text{ that there isn't a guard dog:} \\
& \quad \text{if } w' \text{ is the g}(w)\text{-best world, then there is a guard dog in } w'.
\end{align*}
\]

As before, the truth value of (21a) will depend on which worlds actually end up in \( \text{Rev}_w \text{ that there isn't a guard dog} \) (remember that we are now making different assumptions regarding the facts and laws operational in the actual world). First, we again need to identify the set \( w_@ \text{ that there isn't a guard dog} \). Since there is a single basis for \( w_@ \) (\( s = \{<p, 1>, <r, 1>\} \)), this set will consist of a single situation: \( s^w = \{<r, 1>\} \). \( \text{Rev}_w \text{ that there isn't a guard dog} \) now consist of the worlds in \( U_@ \) that extend this situation. This will include worlds \( w_@ = \{<p, 1>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_1 = \{<p, 0>, <q, 0>, <t, 0>, <r, 1>\} \), \( w_2 = \{<p, 0>, <q, 1>, <t, 0>, <r, 1>\} \), \( w_3 = \{<p, 0>, <q, 1>, <t, 1>, <r, 1>\} \), \( w_4 = \{<p, 1>, <q, 0>, <t, 0>, <r, 0>\} \), etc. Notice that in constructing the revision set this time, we have maintained similarity with the actual world only with respect to the fact that Jones lives in Amsterdam. The revision set includes worlds in which the owner ignores safety regulations (and there is no fence and no dog), worlds in which the owner pays attention to safety regulations and there is a fence, and worlds in which the owner pays attention to safety regulations and there is a dog. The sentence in (21a) will be true iff in the \( g(w_@) \)-best worlds in the revision set, there is guard dog. But this will not be true. In the best worlds in this revision set, there is a fence (and there may or may not be a guard dog). The proposal in (18) predicts that in this scenario, we judge the secondary duty false.

### 5 Conclusions

In this paper I have made use of intuitions about secondary duties to investigate the interpretation of should. Secondary duties are interesting because they arise in response to facts in the world. Our intuitions regarding secondary duties can give us useful insights into how facts and ideals interact in the semantics of deontic modals.

I have used intuitions regarding the interplay between primary and secondary duties to argue for a particular way of understanding how facts enter the picture in the semantics of deontic modals. The main claim has been that in evaluating deontic modals, we pay attention to facts in a manner that is similar to what we do when evaluating counterfactuals. In figuring out what facts matter and what facts can be ignored, we take into account the relations between facts, not just facts in isolation. How facts are related to each other
depends on the laws operational in the world, and the important feature of the semantics of should presented in this paper is that it is designed to allow lawful regularities to play a role in identifying the domain of quantification of deontic modals.

The semantics for should proposed in this paper builds on the insights of a Kratzer-style semantics, incorporating Veltman’s views about revision in the calculation of the modal base. We have maintained Kratzer’s dichotomy in terms of evaluating the modal with respect to two interacting parameters: a modal base and an ordering source, where the ordering source establishes a ranking amongst the worlds corresponding to the modal base. We have made use of Veltman’s proposal for the semantics of counterfactuals to identify the modal base. Veltman’s analysis of counterfactuals identifies the worlds quantified over taking into account the laws of the evaluation world (i.e. the relations between facts in the world, not facts in isolation). Taking into account the relations between facts, Veltman’s proposal for counterfactuals is a useful starting point for the semantics of deontic modals (a comparison between a Veltman-style account of relations between facts and other types of accounts lies outside the scope of this paper). The resulting proposal is a semantics for should that has at its core a notion of revision/similarity that is analogous to that relevant to counterfactuals.

One of the interesting results obtained with the semantics for should proposed in this paper is that it predicts that primary and secondary duties may be compatible. This is a welcome result in light of observations already found in Prakken and Sergot (1996) indicating that we often have the intuition that primary and secondary duties ‘hold’ simultaneously. Further work remains to be made in this area to better understand the differences between cases in which the conjunction between primary and secondary duties appears acceptable vs. cases in which the conjunction is perceived as infelicitous.

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References


Adverbial Quantification and (Un)Reducibility: The Quantification at a Distance Construction in French

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Abstract

In this paper, I present a compositional semantic analysis of the Quantification at a Distance (QAD) construction in the standard dialect of European French. I argue that quantification in a QAD sentence is done by a binary adverbial quantifier over the verb’s event argument and the direct object argument at the same time. I argue that the modeling of the interpretations assigned to QAD sentences necessarily involves a polyadic quantifier, since such a quantifier is unreducible to any iterations of unary quantifiers. I provide a compositional analysis of the construction based on previous treatments of the indefinites that appear in it as semantically incorporated nominals.

1 Introduction

The goal of this paper is to present a new compositional semantic analysis of the Quantification at a Distance (QAD) construction in the standard dialect of European French (SF). Since it was first noticed by Kayne (1975), the QAD construction has been frequently studied for the standard dialect of European French¹ ((Kayne, 1975); (Milner, 1978); (Obenauer, 1983) (Obenauer, 1994); (Rizzi, 1990); (Doetjes, 1997); (Boivin, 1999); (Mathieu, 2004); (Heyd, 2003) inter alia). In French, individual quantification can be realized by use of an adnominal quantifier (ex. beaucoup ‘a lot’) that selects a DP headed by the particle de. Following the literature, when beaucoup appears next to its restriction, I call this sentence a Canonical Quantification sentence.

(1) J’ai lu beaucoup de livres
I have read a lot de books
‘I read a lot of books’

¹The semantic properties of the QAD construction are subject to significant dialectal variation. The paper only analyses the construction in the standard. However, see (Cyr, 1991) and (Burnett, 2009) for a discussion of the semantics of the QAD construction in Qu´ebec French.
The quantifier may also be placed in an adverbial position to form a sentence that, at first glance, seems synonymous with (1). Sentences of this form are known as Quantification at a Distance sentences, and they are the subject of this paper.

(2) J’ai beaucoup lu de livres
I have a lot read de books
‘I read a lot of books’

I argue that, despite the large amount of attention devoted to this construction in the syntactic and semantic literature, it has not yet received a proper semantic analysis. I show that the previous attempts to account for the semantic properties of the construction are problematic, and I propose a new analysis with greater empirical coverage.

In this work, I make two sets of proposals: one syntactic and one semantic. With respect to the syntax of the construction, I argue that the quantification in QAD sentences is done by the adverbial quantifier beaucoup. In other words, I propose that QAD sentences are not transformationally derived from their canonical counterparts, but rather beaucoup is base-generated in a preverbal position, and the quantification it preforms is adverbial in nature. With respect to the semantics of the construction, I argue that QAD sentences in Standard French involve binary quantification by the adverb beaucoup over <event, object> pairs denoted by the verb phrase. I argue that an analysis of QAD that involves polyadic quantification is necessary because, as proven in (Burnett, 2009), the binary quantifier needed to account for the interpretations assigned to the construction is unreducible to iterations of unary quantifiers. I therefore conclude that the Standard French QAD construction serves as another example of properly polyadic quantification in natural language.

The paper is organized as follows: In section 2, I present the data and review the previous approaches to the syntax of QAD. In section 3, I present the only previous analysis of QAD that explicitly deals with its semantics. I argue that, while this analysis can account for many of the puzzling properties of the construction, it makes wrong predictions as to the possible meanings that can be assigned to QAD sentences in certain contexts. In section 4, I present my analysis of quantification at a distance. I propose that the unary adverb beaucoup has a properly binary extension to <event, object> pairs. Finally, I provide a compositional analysis of the construction that shows how pair quantification can arise in a natural manner based on previous analyses of the lexical items that make up the construction and basic principles of semantic composition.

2 Syntactic Analyses

In this section, I contrast two opposing classes of proposals about the syntax of QAD sentences, both of which have received considerable support in the literature on this construction.

The first class of proposals are those that assume that QAD sentences are base gen-
iterated as canonical quantification sentences. The quantifier then raises to a preverbal position. Although the fine details of the landing site of the quantifier and the motivation for its movement vary from author to author, all proponents of this style of analysis propose that the structure of a QAD sentence is similar to (3).

(3) J’ai beaucoup lu [t_i [de livres]]

This analysis is argued for, or implicitly assumed by, (Milner, 1978), (Rowlett, 1996), (Boivin, 1999), and (Labelle & Valois, 2004), among others.

The second class of analyses are those that propose that the *beaucoup* in QAD sentences is not the adnominal quantifier, but the adverbial one, i.e. the one that is found in simple event quantification contexts such as (4).

(4) J’ai beaucoup dormi
    I have a lot slept
    ‘I slept a lot’

Thus the basic structure of a QAD sentence resembles (5).

(5) J’ai [ADV beaucoup [VP lu [DP de livres]]]

I call this style of analysis the *Adverbial Analysis*. Specific analyses that instantiate the adverbial analysis are given in (Kayne, 1975), (Obenauer, 1983), (Doetjes, 1997), and (Mathieu, 2004). This paper also presents a version of the adverbial analysis of QAD.

However, before we examine the adverbial properties of *beaucoup* in QAD, we must note that there are some reasons to think that locality, which is generally taken to indicate the presence of syntactic movement, plays an important role in the construction.

### 2.1 Arguments for the Movement Analysis

The main argument for the movement analysis of QAD is that, in certain contexts, the construction seems to be subject to the same type of locality effects as other cases of movement in French. In particular, QAD is impossible across phrases that we know, independently, are islands for movement. As shown by (Valois, 1991), QAD is impossible across PPs, inverted constituents, and definite DPs.

(6) a. *J’ai beaucoup parlé à de filles
    I have a lot talked to de girls
    (cf. *J’ai parlé à beaucoup de filles)

b. *J’ai beaucoup dormi pour guérir de petits maux
    I have a lot slept to heal de little hurts
    (cf. *J’ai dormi pour guérir beaucoup de petits maux)

c. *J’ai beaucoup considéré intelligents d’étudiants
    I have a lot considered intelligent de students
(cf. *J’ai considéré intelligents beaucoup d’étudiants)

d. *J’ai beaucoup regardé la photo (de) d’enfants
   I have a lot looked at the photo (of) de children
   (cf. *J’ai regardé la photo de beaucoup d’enfants)
   (Valois (1991: 139))

Additionally, QAD sentences are impossible across tensed clause boundaries.

(7) *J’ai beaucoup dit que Jean a lu de livres
   I have a lot said that Jean has read de books
   (cf. *J’ai dit que Jean a lu beaucoup de livres)

While, at first glance, these examples would seem to point to the existence of movement in the construction, movement is not the only possible way to account for them. In fact, there are reasons to think that the ‘locality effects’ observed in QAD do not actually mirror those that we find in clear-cut cases of movement elsewhere in the language. Firstly, as pointed out by (Valois, 1991), since QAD is clearly not a case of A-movement, it is not obvious why this movement would be clause-bound, given that other A-bar movements, like Wh-movement, are not. Secondly, as discussed by (Mathieu, 2004), the locality facts in (6) are actually part of a broader generalization about the distribution of de phrases in argument position, one that is independent from QAD: de phrases in argument position are only grammatical in surface direct object position.

We can repeat the data in (6) using the negative quantifier pas ‘not’ that also licenses de phrases (8), noting that, since pas never forms a DP with a de phrase, the ungrammaticality of the examples in (9) cannot be due to movement violations.

(8) Je (n’)ai pas lu de livres
   I (neg) have not read of books
   ‘I didn’t read any books’

(9) a. *Je (n’)ai pas parlé à de filles
    I (neg) have not talked to de girls
    (cf. *Je (n’)ai parlé à pas de filles)

b. *Je (n’)ai pas dormi pour guérir de petits maux
   I (neg) have not slept to heal de little hurts
   (cf. *Je (n’)ai dormi pour guérir pas de petits maux) etc.

Thus the data in (6) are best explained not as cases of movement being blocked, but as reflections of the special syntax of de phrases in argument position. I will return to the syntactic and semantic behaviour of de phrases in sections 3 and 4.
2.2 Arguments for the Adverbial Analysis

In this section, I present the major arguments for treating beaucoup as an adverb in QAD sentences. Thus, I argue, QAD sentences are not derived from the canonical versions, but are base-generated as adverbial quantification structures.

My first argument for the adverbial status of beaucoup comes from the class of quantifiers that participate in the QAD construction. I argue that the definition of this class is impossible without reference to the notion of ‘adverb’. This fact is unexpected under a movement analysis, where the element that is quantifying is actually an adnominal determiner. The argument goes as follows: suppose there were a QAD movement rule, or, in Minimalist terms, some [+QAD] syntactic feature that caused an adnominal quantifier to raise into the left periphery of the VP. Then there must be some syntactic or semantic criteria that groups the elements that bear such a feature together to the exclusion of all the other adnominal quantifiers. However, it seems that there is no such criteria. The point is made quickly through the use of an example. Consider the French adnominal quantifier plein, lit. ‘full’. For all intents and purposes, plein is syntactically and semantically identical to the adnominal use of beaucoup: it selects for a de phrase, and roughly means ‘a lot’ (10).

(10) J’ai lu plein de livres
    I have read full de books
    ‘I read a lot of books’

Thus any principled algorithm that would assign a [+QAD] feature to beaucoup would have to assign it to plein; however, QAD with plein is ungrammatical.

(11) *J’ai plein lu de livres
    I have full read de books

Nevertheless, there is a generalization that successfully defines the class of QAD quantifiers to the exclusion of other adnominal quantifiers: as originally observed by (Kayne, 1975),

(12) All QAD quantifiers have a corresponding use as an adverbial quantifier.

Thus, the grammaticality of QAD sentences with beaucoup ‘a lot’, peu ‘little’, assez ‘enough’, pas mal ‘fairly’, autant ‘as’, and tellement ‘so’ etc. is explained by the grammaticality of simple adverbial quantification sentences with these elements (13).

(13) a. Elle a beaucoup applaudi
    She has a lot clapped
    ‘She clapped a lot’
b. Elle a peu applaudi
    She has little clapped
‘She clapped little’
c. Elle a assez applaudi que...
   She has enough clapped that...
   ‘She clapped enough that...’
d. Elle a pas mal applaudi
   She has not bad clapped
   ‘She clapped a fair amount’ etc.

*J’ai plein applaudi
I have full applauded

If the quantifier in QAD is the same lexical item as the adverb, we explain why QAD with *plein* (11) is impossible, something that a classical movement analysis cannot do.

The second argument that quantification in QAD is done by the adverbial quantifier is that QAD sentences actually involve quantification over the event variable of the verb. This is extremely unexpected in an analysis where *beaucoup* is a nominal quantifier.

As first noticed by (Obenauer, 1983), QAD sentences can be used in only a subset of the contexts in which canonical quantification sentences are used. In particular, QAD sentences in Standard French are only true if *beaucoup* holds of the set of events denoted by the verb. This generalization is known in the literature as Obenauer’s *Multiplicity of Events* requirement.

**Multiplicity of Events Requirement:** (MER)

QAD sentences are only true in contexts involving many events

In what follows, I present two tests for the presence of the MER in QAD sentences, the majority of which are drawn from the works of Obenauer. I argue that the presence of the MER indicates that, in QAD sentences, the quantifier *beaucoup* is an adverb that applies to the verb.

The first way of testing for adverbial quantification is through the use of point adverbials. We can insert a prepositional phrase, like *dans cette cassette* ‘in this box’ or *en soulevant le couvercle* ‘lifting the lid’ into the sentence, and this serves to create a single event context. As shown below, sentences with canonical quantification are compatible with single-event contexts.

*Dans cette cassette, il a trouvé beaucoup de pièces d’or*
   *In this cassette, he found a lot of gold pieces*

*En soulevant le couvercle, il a trouvé beaucoup de pièces d’or*
   *Lifting the lid, he found a lot of gold pieces*

(Obenauer (1983: 78, his (42)))
QAD sentences with PPs forcing a single-event reading are ungrammatical.

(17) a. *Dans cette cassette, il a beaucoup trouvé de pièces d’or
    In this cassette, he has a lot found of pieces of gold
b. *En soulevant le couvercle, il a beaucoup trouvé de pièces d’or
    In lifting the lid, he has a lot found of pieces of gold

(Obenauer (1983: 78, his (43))

Note that QAD sentences with PPs suggesting a context where there are many events are fine.

(18) a. Dans cette caverne, il a beaucoup trouvé de pièces d’or
    In this caverne, he has a lot found of pieces of gold
    ‘In this caverne, he found a lot of gold pieces’

b. En cherchant partout, il a beaucoup trouvé de pièces d’or
    In searching everywhere, he has a lot found of pieces of gold
    ‘Searching everywhere, he found a lot of gold pieces’

(Obenauer (1983: 78, his (45))

In summary, we see that for a QAD sentence to be felicitous, beaucoup must hold of the verbal event argument.

Secondly, that QAD is adverbial event quantification can be seen by the fact that QAD is impossible in stative contexts. (Obenauer, 1994):121) observes that QAD is impossible with a stative verb like posséder ‘to own’ (19), and (Burnett & Bouchard, 2008) show that, in Standard French, QAD is impossible in existential constructions (20).

(19) *Jean a beaucoup possédé de chevaux
    Jean has a lot owned of horses

(20) *Il y a beaucoup eu de personnes chez nous hier
    It there has a lot had of people at us yesterday

In summary, we have seen that the quantification in QAD sentences actually involves quantification over an event variable: they are only true in contexts involving many events. These truth conditions are unexpected under a movement analysis where beaucoup quantifies over individuals, but are expected in an analysis where beaucoup is an adverb: Straightforward adverbial uses of beaucoup also display the MER. For example, (21) is also only true if there are many events of me going to the movies.

(21) Je suis beaucoup allée au cinéma la semaine passée
    I was a lot gone to the cinema the week last
    ‘I went to the movies a lot last week’
2.3 Summary

In summary, I have argued, following Kayne, Obenauer, and Doetjes, that QAD sentences are not derived from their canonical counterparts. I argued that beaucoup is base-generated as an adverb, and, as such, directly takes the completed VP as its complement. This conclusion is based on 1) the identity between the class of QAD quantifiers and degree adverbs, 2) the fact that QAD involves quantification by beaucoup over the verb’s event argument. In the next section, I present a previous adverbial analysis of the semantics of QAD. I argue that, although it succeeds in accounting for some of the properties listed above, it is insufficient to cover the full range of data that exemplifies QAD.

3 Semantic Analyses

In this section, I present the main formal semantic analysis of QAD in the literature, which I will henceforth refer to as the incorporation analysis. This analysis is really a proposal about the semantics of de phrases in French; however, it has implications for the analysis of QAD. Versions of this proposal are presented in (Heyd, 2003), (Mathieu, 2002), and (Mathieu, 2004). The incorporation analysis claims that de phrases in French undergo semantic incorporation: a semantic process that accompanies syntactic incorporation in languages like Inuktiut (West-Greenlandic) (22)

(22) Amajaraq eqalut -tur -p -u -q
Amajaraq.ABS salmon eat IND [-tr] 3SG
‘Amajaraq has eaten a salmon’ ((van Geenhoven, 1998); cited in (Mathieu, 2004))

Heyd and Mathieu provide a number of arguments for the claim that de phrases are semantically incorporated. Their most important one comes from the inability of de phrases to take scope higher than the position in which they appear. For example, de phrases may never take scope over negation.

(23) Je (n’)ai pas lu de livres
I (NEG) have not read de books
‘I did not read any books’ not ‘There were books that I did not read’

Similarly, as first noticed in (Haïk, 1982), de phrases in QAD sentences must also take scope lower than negation.

(24) Je (n’)ai pas beaucoup lu de livres
I NEG-have not a lot read de books
‘It is not the case that I read a lot of books’
Note, for comparison, that the DP containing *de livres* is free to scope wherever it wants in the canonical sentence.

(25)  
\[
\begin{array}{ll}
\text{Je (n')ai pas lu beaucoup de livres} & \quad \text{\textquoteleft It is not the case that I read a lot of books\textquoteleft or}
\\
\text{\textquoteleft There are a lot of books that I haven\textquoteleft t read\textquoteleft} & \\
\end{array}
\]

Furthermore, the *de* phrase in a QAD sentence must obligatorily scope underneath an intensional verb like *chercher* ‘to look for’. In these constructions, *de* phrases must always be interpreted *de dicto*.

(26)  
\[
\begin{array}{ll}
\text{J'ai beaucoup cherché de livres pour mon travail de syntaxe} & \quad \text{\textquoteleft I looked for a lot of books for my paper of syntax\textquoteleft}
\\
\text{\textquoteleft ...because a long bibliography makes one look smart\textquoteleft} & \\
\end{array}
\]

An incorporation analysis of *de* phrases is suggested in the works of (Heyd, 2003) for *de* phrases that appear under negation and (Mathieu, 2002); (Mathieu, 2004) for *de* phrases that appear in the Split-Combien construction (27).

(27)  
\[
\begin{array}{ll}
\text{Combien as-tu cherché de livres?} & \quad \text{\textquoteleft How many books did you look for?\textquoteleft}
\\
\end{array}
\]

Heyd proposes that verbs selecting *de* phrase complements are *incorporating* verbs, and, as such, they have the argument structure in (28).

(28)  
\[
\lambda x.e.\lambda P_{<e,t>}.\exists y[V(x,y)\& P(y)] \quad \text{(Heyd (2003: 199, her (57)))}
\]

Thus, under this analysis\(^2\), the denotation of the VP *lire de livres* has the form in (29).

(29)  
\[
\langle \text{lire de livres} \rangle = \lambda y\lambda e.\exists x (\text{Reading (e, y, x) \& Book(x)})
\]

\(^2\)I have switched the order of the arguments in Heyd’s (57) so as to have the direct object combine with the verb first, as is standardly assumed.
Presumably, the subject is added, and then negation is applied to the event variable. Therefore, the denotation of *Je (n’)ai pas lu de livres* ‘I did not read any books’ would be as represented in (30)

\[(30) \quad \llbracket \text{Je (n’)ai pas lu de livres} \rrbracket = \text{NOe}(\exists x(\text{Reading}(e, I, x) \land \text{Book}(x)))\]

For Mathieu, the semantic incorporation of *de* phrases is not governed by verbal lexical semantics, but, rather, is a freely occurring process. In his analysis, the determiner *de* is not semantically a determiner; it is “a morphological spell-out of incorporation” (Mathieu, 2004: 7). Despite this difference in implementation, his analysis assigns the same meanings to sentences containing *de* phrases as Heyd’s.

Both of these authors suggest extending their proposal of semantic incorporation to the analysis of the QAD construction. In such an extension, *beaucoup* is presumably treated as a unary event quantifier, and, therefore, a QAD sentence would be assigned the interpretation in (31).

\[(31) \quad \llbracket \text{J’ai beaucoup lu de livres} \rrbracket = \text{BCP}e(\exists x(\text{Reading}(e, I, x) \land \text{Book}(x)))\]

In other words, in the incorporation analysis, *J’ai beaucoup lu de livres* has a semantics closer to the English ‘There were many events of me book-reading’ than to ‘I read a lot of books’.

### 3.1 Merits of the Incorporation Analysis

This analysis has many merits: Firstly, to the extent that, independently, we have a theory of why, cross-linguistically, incorporation seems to be limited to the direct object position, the insight that QAD involves semantic incorporation accounts for the locality effects that have been previously attributed to movement. Secondly, the incorporation analysis accounts for the multiplicity of events requirement. Under this analysis, *beaucoup* is simply the unary event quantifier found in such mundane contexts as *J’ai beaucoup dormi* ‘I slept a lot’. *Beaucoup* applies directly to the event argument of the verb, and therefore QAD sentences will only be true in multiple event contexts. Thirdly, it accounts for the special interpretation of the direct object in QAD sentences: the scopal inertia of *de* phrases is a direct consequence of semantic incorporation. A final merit of the incorporation analysis is its treatment of *beaucoup* in a QAD structure as the same lexical item as in pure event quantification contexts; this reflects both the position of *beaucoup* in the structure, and the identity between the QAD quantifiers and the adverbal degree quantifiers.

However, as we will see in the next section, the quantification in QAD is not pure event quantification. It is something much more interesting, and this is problematic for the incorporation analysis.
3.2 Problems with the Incorporation Analysis

Recall that in the incorporation analysis, the de phrase direct object is existentially closed, and beaucoup is a unary event quantifier.

\[(32) \quad [ \text{J’ai beaucoup lu de livres} ] = BCP_e (\exists x (\text{Reading } (e, I, x) \& \text{Book}(x)))\]

The entire structure receives an interpretation similar to the English ‘I did a lot of book-reading’.

The problem with this analysis is that the quantification involved in QAD is not pure adverbial quantification, i.e. J’ai beaucoup lu de livres is not, in fact, equivalent to the English ‘I did a lot of book-reading’. For a QAD sentence to be felicitous, beaucoup must hold not only of the predicate’s event argument, but also of its direct object. On analogy to the MER, I call this generalization the Multiplicity of Objects requirement.

\[(33) \quad \text{Multiplicity of Objects Requirement: (MOR)}\]

QAD sentences are only true in contexts involving many objects

QAD sentences involving many events but a single object are judged false. For example, (34) cannot be uttered in a context in which I called only my own mother many times.

\[(34) \quad \text{J’ai beaucoup appelé de mères}
\begin{align*}
&\text{I have a lot} \\
&\text{called de mothers}
\end{align*}\]

Similarly, contexts with multiple events and few objects are also judged to be false. For example, it is infelicitous to say J’ai beaucoup lu de livres if I read my two favourite books many times. The fact that the cardinality of the de phrase must be ‘a lot’ suggests that the MOR is due to quantification of beaucoup over the direct object, not the plural marking on the de phrase.

Therefore, it seems that in QAD sentences in Standard European French, beaucoup quantifies over both the verb’s event variable and its direct object variable that is restricted by the de phrase. Since, in the incorporation analysis, beaucoup only applies to the event argument, this analysis cannot account for the MOR.

3.3 Summary

In summary, I presented some previous syntactic and semantic analyses of the Quantification at a Distance construction in the standard dialect of European French. I argued that quantification in QAD sentences is done by the adverbial quantifier, and is over both the event argument and the direct object argument at the same time. Thus, any analysis that proposes that beaucoup applies to a single argument does not account for the construction’s peculiar semantics. In the next section, I present my analysis of the construction, and show how it creates the particular interpretations assigned to QAD
4 Analysis

In this section, I present a new analysis of quantification at a distance in Standard French. I propose that the adverb *beaucoup* can quantify not only over events, but also over <event, object> pairs. I then present a compositional analysis of the construction that shows how the meanings of QAD sentences are constructed from compositional principles and the meanings of their parts. I first outline my assumptions with respect to the semantics of *beaucoup* when it combines with VP that does not contain a *de* phrase.

4.1 The Analysis of Unary Adverbial *beaucoup*

In this section, I present a semantic analysis of the unary use of the adverb *beaucoup*, the one that appears in simple event quantification contexts like (35).

(35) a. J’ai beaucoup dormi
   I have a lot slept
   ‘I slept a lot’

   b. Brutus a beaucoup poignardé César
   Brutus has a lot stabbed Caesar
   ‘Brutus stabbed Caesar a lot’

I follow much recent work that supposes that completed VPs denote sets of events ((de Swart, 1991); (Zwarts, 2006) *inter alia*). In particular, I assume that verbs have an argument structure similar the one proposed in Parsons (1990)(36) for the sentence *Brutus a poignardé César* ‘Brutus stabbed Caesar’.

(36) \(\exists e (\text{Stabbing}(e) \& \text{Subject}(e, B) \& \text{Object}(e, C))\) ((Parsons, 1990): 14))

Thus, a ditransitive verb like *poignarder* ‘to stab’ denotes a set of triples:

(37) \[\llbracket \text{poignarder} \rrbracket = \{<x,y,e>: \text{Stabbing}(e) \& \text{Subject}(e,y) \& \text{Object}(e,x)\}\]

In sentences without adverbial quantifiers, like (36), I assume an *existential closure* operation that targets the event argument.

In the spirit of (de Swart, 1991), I assume that eventive adverbs are generalized quantifiers over sets of events. In addition, following (Peters & Westerstahl, 2006), I assume that what differentiates degree quantifiers like *beaucoup* from other intersective quantifiers like *trois fois* ‘three times’ is that degree quantifiers are *extremely context dependent*: They require a contextual ‘standard’ parameter for the truth of sentences containing them to be evaluated. Therefore, when a degree quantifier like *beaucoup*
occurs as a VP modifier (38), I propose that it denote the function in (39).

(38) a. J’ai beaucoup dormi
    I have a lot slept
    ‘I slept a lot’

b. Je suis beaucoup allée au cinéma l’année passée
    I was a lot gone to the cinema the year last
    ‘I went to the movies a lot last year’

(39) Let $s_1 \in \mathbb{N}$.
    For all $P \in \mathcal{P}(E)$ $BCP_{s_1}^1(P) = 1$ iff $|P| > s_1$

Thus, a sentence like Brutus a beaucoup poignardé César ‘Brutus stabbed Caesar a lot’ is true just in case $BCP^1$ with the parameter $s_1$ holds of the set of events in which Brutus stabbed Caesar.

(40) $[Brutus a beaucoup poignardé César] = 1 \leftrightarrow BCP_{s_1}^1(\{e : \text{Stabbing}(e, B, C)\}) = 1$

4.1.1 The Analysis of Binary Adverbial beaucoup

I now provide a semantic analysis of the adverb beaucoup when it combines with VPs containing de phrase direct objects. To account for the properties of QAD, I propose that the adverbial quantifier $BCP^1$ is extended to deal with binary relations in the following way:

(41) Let $s, t \in \mathbb{N}$ such that $0 < s, t < |E|$, 
    For all $R \in \mathcal{P}(E \times E)$ $BCP_{s,t}^{SF}(R) = 1$ iff 
    $BCP_{s}^1(Dom(R)) = 1 \& BCP_{t}^1(Ran(R)) = 1$

$BCP^{SF}$ takes a set of <event, object > pairs and yields true just in case the cardinality of the set of first co-ordinates is a lot, and the cardinality of the set of second co-ordinates is also a lot.

(42) $[J’ai beaucoup lu de livres] = 1$ iff $|e : \text{Reading}(e, I, x) & \text{Book}(x)| > s_x \&$ 
    $|x : \text{Reading}(e, I, x) & \text{Book}(x)| > t_x$

$J’ai beaucoup lu de livres$ is true just in case there were many events of me book-reading, and I read many books. Thus, I accurately account for both the multiplicity of events requirement and the multiplicity of objects requirement, since these requirements are straightforwardly built into the meaning of the quantifier.

Besides the fact that it gets the interpretations of QAD sentences right, the main argument for a binary quantification approach to QAD is the following fact about $BCP^{SF}$. 
Theorem 1 (Burnett, 2009):

BCP$^{SF}$ is unreducible to any iteration of unary quantifiers.

The proof of Theorem 1 is given in (Burnett, 2009). Informally speaking, BCP$^{SF}$ cannot be decomposed into two unary quantifiers because it is true of relations in which there are many events with few or even a single participant in each event, provided that the total number of participants is large enough to count as beaucoup. The iteration of two unary quantifiers, say the composition of two occurrences of BCP$^1$, builds in a scope dependency between the two quantifiers. Such a binary quantifier is only true of relations in which there are many events with many participants. In QAD sentences; however, there is no such dependency. This is why QAD in Standard French must be modeled with polyadic quantifiers.

4.2 A Compositional Analysis

I now present a compositional analysis of the Quantification at a Distance construction. As shown by the unreducibility proof, the de phrases cannot be interpreted as regular quantified noun phrases. I therefore propose that the intuition that de is a semantically ‘deficient’ determiner presented in the incorporation analysis is right, and, following Heyd & Mathieu, I assume that de phrases denote bare properties. However, in contrast to the incorporation analysis, I propose that combining the verb and the de phrase does not existentially close the direct object. Instead, I propose that de phrases in object position are combined with the verb via an unsaturating compositional rule such as Chung & Ladusaw (2004)’s Restrict. To account for scopally inert direct objects in incorporation-type contexts, Chung & Ladusaw (2004:5) propose a binary operation that composes a predicate directly with a property to yield a predicate without changing the degree of unsaturation. This mode of composition, called Restrict, is illustrated in (44).

\[
\text{Restrict} \left( \lambda y \lambda x \left[ \text{feed'} (y)(x) \right], \text{dog'} \right) = \lambda y \lambda x \left[ \text{feed'} (y)(x) \land \text{dog'}(y) \right]
\]

In many of their examples, Chung & Ladusaw apply existential closure (EC) immediately after they apply Restrict. However, if one were to not apply EC immediately after, but rather to add an another argument (the subject) to the predicate \( \lambda y \lambda x [\text{feed}'(y)](x) \land \text{dog}(y) \), then the subject would be interpreted as the object, which is the wrong result. So we need to add something to the definition of Restrict that moves the argument that is being restricted to the end of the sequence that constitutes the verb. I therefore propose that de phrases are combined with the verb via Restrict’

\[
\text{Restrict'}:
\]

For nodes \( \beta \) and \( \gamma \) such that \([\beta] = \{ < v_1, v_2 \ldots v_n > : P(v_n, v_{n-1} \ldots v_1) \} \) and \([\gamma] = \{ v_k : Q(v_k) \} \), then \([\text{Merge}(\beta, \gamma)] = \{ < v_2, v_3 \ldots v_n, v_1 > : P(v_n, v_{n-1} \ldots v_1) & Q(v_1) \} \)
Chung & Ladusaw are conscious of this consequence of their formulation of Restrict, and so assume the following: “Let us therefore adopt the notational assumption that when an argument is targeted by a composition operation, it is possible to demote it from the top of the lambda prefix to a position just above the event argument.” (p. 10). I assume Restrict’ since it gives no special status to the event argument, but Chung & Ladusaw’s “notational assumption” would also be compatible with my proposal. Under this analysis, the *de* morpheme can be viewed as the spell-out of the application of Restrict’. Assuming Restrict’, the derivation of the QAD sentence is straightforward.

(46) J’ai beaucoup lu de livres

\[
BCP_{SF}^{s,t}(\{<e,x>: \text{Reading}(e,I,x) \& \text{Book}(x)\})
\]

\[
\xrightarrow{BCP_{SF}^{s,t}} \{<e,x>: \text{Reading}(e,I,x) \& \text{Book}(x)\}
\]

\[
\xrightarrow{I} \{<y,e,x>: \text{Reading}(e,y,x) \& \text{Book}(x)\}
\]

\[
\{<x,y,e>: \text{Reading}(e,y,x)\} \quad \{x: \text{Book}(x)\}
\]

4.3 Summary

In summary, I proposed that, in QAD sentences, the adverb *beaucoup* has an unreducible binary extension that combines with VPs formed by the semantic incorporation of property denoting *de* phrases.

I argue that this analysis accounts for the three key empirical properties of QAD presented in the previous sections: Firstly, since my analysis is a variant of the incorporation analysis, I account for the locality effects, to the extent that we have some external theory of the syntax of incorporation constructions. Secondly, since the multiplicity of events requirement and the multiplicity of objects requirement are built into the definition of the quantifier, these aspects of the construction are accounted for. Note that since a lexical element that encodes both of these requirements is properly polyadic, I argue that my proposal has a clear advantage over rival ones based on unary quantification. Finally, because I follow the incorporation analysis in treating *de* phrases as denoting bare properties, I explain their scopal inertia.

5 Conclusion

In conclusion, I have presented a new analysis of the Quantification at a Distance construction in the standard dialect of European French. I proposed that quantification involved in QAD is binary quantification over the event argument and the direct object. I argued that such an analysis is necessary to account for the semantics of the
construction since the binary extension of beaucoup is not reducible to the composition of unary quantifiers. I therefore conclude that QAD constitutes an example of properly binary quantification in natural language.

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References


A unified account of distributivity, 
*for*-adverbials, and pseudopartitives

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Abstract

This paper presents a diagnostic for identifying distributive constructions and shows that it applies to pseudopartitives and *for*-adverbials. On this basis, a unified account is proposed for the parallels between the constructions involved. This account explains why *for*-adverbials reject telic predicates (*run to the store for five hours*), why pseudopartitives reject count nouns (*five pounds of book*), and why both reject certain measure functions like temperature and speed (*30\textdegree C of water, *drive for 5 mph*). These restrictions all follow from a general constraint on distributive constructions. Related concepts such as the \( D \) operator (Link, 1987), the subinterval property (Bennett and Partee, 1972), and divisive reference (Cheng, 1973) can be understood as formalizing special cases of this constraint.

1 Introduction

Pseudopartitives, also called measure constructions, are noun phrases that are used to talk about an amount of some substance (1). *For*-adverbials (2) are a class of adjuncts best known for their aspectual sensitivity: they can only modify atelic predicates (3).

(1) three liters of water

(2) run for five hours

There are two important semantic parallels between *for*-adverbials and pseudopartitives. Both reject predicates that fail to apply to the parts of the entities and events in their denotation. This category includes telic predicates (3-a-b) and count nouns (3-c). And both reject measure functions whose value tends to stay constant across the parts of any object or event they measure. Examples of such functions are speed (4-a-b) and temperature (4-c).

(3) a. run for five hours vs. *run to the store for five hours

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b. run for five miles vs. *run to the store for five miles  
c. five pounds of books/rice vs. *five pounds of book

(4) a. *run (to the store) for five miles an hour  
b. five hours of running vs. *five miles an hour of running  
c. five inches of snow vs. *five degrees Celsius of snow

This set of facts raises several interrelated questions. What is the precise nature of the restrictions on predicates and on measure functions? What part of the semantics of for-adverbials and pseudopartitives is responsible for them? Given that the two constructions share the same restrictions, are they related to each other? And is there a relation between the two restrictions that explains why they cooccur?

This paper argues that the key to answering these questions is distributivity. Entailments from larger to smaller parts, the signature property of distributive constructions, are present in for-adverbials as well as in pseudopartitives. These entailments provide evidence for classifying these constructions as distributive, and their presence can be captured by a general constraint on distributive constructions. The restrictions illustrated in (3) and (4) then turn out to be entailed by this constraint.

While the parallels between the constructions analyzed in this paper have not previously been drawn and formalized in a systematic way, many components of the composite picture presented here have been individually identified before. Krifka (1998) and its precursors are a source for many of the observations about for-adverbials and pseudopartitives; his analysis brings out some of their similarities, but does not establish their connection with distributive constructions. We will see that it undergenerates in certain cases. I have drawn essential insights on pseudopartitives from Schwarzschild (2006); as we will see, our accounts differ in important ways, but they are in the same spirit. This paper’s formal framework is derived from Krifka (1998), Link (1998), Landman (2000), and the papers leading up to them. Some connections that are presented in this paper have been suggested or implied in previous work. For example, the aspectual sensitivity of for-adverbials has often been explained by modeling them as universal – and therefore distributive – quantifiers (e.g. Dowty, 1979; Moltmann, 1991).

2 A diagnostic for distributivity

This section reviews basic facts about distributivity and proposes a diagnostic to classify not only sentence-type but also noun phrase-type constructions as distributive. This is an essential prerequisite for classifying pseudopartitives as distributive constructions.

The signature property of distributivity is its licensing of entailments from larger to smaller parts. For example, sentence (5-a) entails (5-b): every scenario that verifies (5-a) also verifies (5-b). This is in contrast to (6-a): in some (perhaps most) scenarios in which it is true, (6-b) will be false.

(5) a. Al, Bill, and Charles laughed / were boys / were visible.
b. ⇒ Al and Bill laughed / were boys / were visible.

(6) a. Al, Bill, and Charles shared a pizza together.
   b. \(\not\Rightarrow\) Al and Bill shared a pizza together.

VP coordination cases as in (7) show that the source of these *distributive entailments* is the predicate rather than the subject (Dowty, 1987; Roberts, 1987). For this reason, it is usual to classify predicates as distributive (e.g. *laugh, (be) boys, wear a sweater, (be) visible*), in opposition to collective predicates (e.g. *share a pizza together, be a good team*).\(^1\)

(7) a. Al, Bill, and Charles laughed and shared a pizza together.
   ⇒ Al and Bill laughed.
   \(\not\Rightarrow\) Al and Bill shared a pizza together. (adapted from Dowty, 1987)

Numeral quantifiers also give rise to distributive entailments (8). This fact is important for our purpose because *for*-adverbials and pseudopartitives can contain numerals but not nominal conjunctions.\(^2\)

(8) a. Three boys laughed / were visible. ⇒ Two boys laughed / were visible.
   b. Three boys shared a pizza together. \(\not\Rightarrow\) Two boys shared a pizza together.

I am not aware that anyone has given an operational definition of the term “distributive construction”. I think the following diagnostic is in line with the common use of the term in the literature: Distributive constructions are constructions which give rise to distributive entailments (i.e. entailments from larger to smaller parts) through the constraints they impose on their constituents.

A classical example is the construction *DP each VP*. The diagnostic classifies it as a distributive construction because *each* is only compatible with VPs that give rise to distributive entailments:

(9) a. Al, Bill, and Charles each laughed / were boys / were visible.
   b. ⇒ Al and Bill each laughed / were boys / were visible.

(10) *Al, Bill, and Charles each shared a pizza together.

The distributivity/collectivity distinction is easily expressed in mereological semantics (Link, 1998). In this framework, the denotations of noun phrases are formulated

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\(^1\)This popular classification is an idealization. Some of these predicates are ambiguous or underspecified between distributive and collective construals. It is hard to find clear-cut examples of distributive versus collective predicates, so hard that Winter (2001) argues that the distinction should be dropped altogether. Another complication is that distributive readings of noun phrases headed by numerals are dispreferred when a nondistributive reading is available, see Dotlačil (2010).

\(^2\)The entailments shown in (8) reflect a common an – I believe – uncontroversial intuition. Modeling them is surprisingly difficult: neither an *at least* nor an *exactly* semantics for numerals distinguishes between (8-a) and (8-b).
with respect to a model that contains both singular and plural entities, which are partially ordered so that singular entities are atomic (i.e. they have only themselves as parts). For example, Al and Bill refers to a plural entity that is a part of the referent of Al, Bill, and Charles, another plural entity. Numeral quantifiers like n boys denote predicates over plural entities which consist of n boys. Among the parts of a three-boy entity we find boys and two-boy entities. Collective predicates apply directly to plural entities. When distributive predicates like laugh or wear a sweater apply to a plural entity, they also apply to all its atomic parts. Following Link (1987), this property is often formalized by assuming that a predicate P is made distributive by combining with a covert operator $D$, defined such that $D(P) = \lambda x \forall y [y \text{ is an atomic part of } x \rightarrow P(y)]$.

Not only sentence-type but also noun-phrase type constructions can be categorized as distributive. We cannot test directly for entailment relations between noun phrases because they do not denote truth values, so we will use an indirect approach. We have seen that be visible and laugh are distributive predicates, while share a pizza together is collective. In the following example, these predicates are used to identify the parts of entities denoted by noun phrases that contain relative clauses.

(11) a. Three boys who laughed were visible.
   b. $\Rightarrow$ Two boys were visible.
   c. $\Rightarrow$ Two boys who laughed were visible.

(12) a. Three boys who shared a pizza together were visible.
   b. $\Rightarrow$ Two boys were visible.
   c. $\nRightarrow$ Two boys who shared a pizza together were visible.

Due to the distributive predicate be visible, sentences (11-a) and (12-a) both license distributive entailments (11-b) and (12-b). In addition, the distributive predicate laugh inside the relative clause of (11-a) licenses entailments of its own (11-c), while the collective predicate share a pizza together does not (12-c). In a mereological account, these entailments translate to the following: among the parts of any entity denoted by three boys who laughed we find entities denoted by two boys and also by two boys who laughed; and among the parts of any entity denoted by three boys who shared a pizza together, we find entities denoted by two boys but not necessarily entities denoted by two boys who shared a pizza together.

From these facts, we can distill a diagnostic that allows us to decide whether a certain noun phrase licenses entailments to its parts, i.e. distributive entailments: we combine it with a distributive verb phrase and we check whether the predicate denoted by the noun phrase contributes to the distributive entailments, as in (11-c), or not, as in (12-c). If it does, then we conclude that the noun phrase is an instance of a distributive construction. For example, the following entailment shows that Det N’ who each VP is a distributive construction, because the predicate boys who each laughed contributes to the distributive entailments:3

---

3According to this diagnostic, the inference in (i-a) shows that plural numeral noun phrases like three boys are themselves distributive constructions, as opposed to e.g. attributive adjectives (i-b). In
Before we apply these diagnostics to other constructions, it is useful to introduce some terminology. Unfortunately, there is no uniform practice concerning the naming of the constituents involved in a distributive relation. Following Choe (1987, 1991), I will refer by **Key** to the constituent that instantiates the entity about whose parts a distributive construction licenses entailments, and by **Share** to the constituent whose meaning specifies the nature of these entailments. I will use these terms to refer to the constituents themselves as well as to their denotations. In our example (9-a), the DP *three boys* is the Key of the sentential-level distributive construction because the sentence licenses entailments from three boys to two boys, and the VP *laughed* is the Share because it specifies the nature of these entailments (i.e. that they laughed). In (13-a), the sentential-level distributive construction has *three boys who laughed* as a Key and *were visible* as a Share, and the DP-level one has *three boys* as a Key and *who laughed* as a Share. Following Neo-Davidsonian theories (e.g. Parsons, 1990), I assume that the semantic relation between verbs and their arguments is expressed by covert thematic roles such as *agent*, *patient*, etc. and that these thematic roles denote functions from events to individuals. Verbs and verb phrases are taken to denote predicates over events. In (5-a), the thematic role *agent* provides a mapping from events denoted by the Share to individuals in the denotation of the Key. I will call this thematic role the **Map**. More generally I will use this term for any function from the Share to the Key.

The two following sections introduce pseudopartitives and *for*-adverbials in more detail and show that the signature property of distributivity holds in both constructions. This fact provides initial motivation for classifying them as distributive constructions. The Key-Share-Map terminology is extended to these constructions. This will provide us with a language in which we can express generalizations over the three constructions.

### 3 Pseudopartitives

Pseudopartitives, also called measure constructions, are noun phrases that instantiate an amount of some substance (e.g. Selkirk, 1977). Both the amount and the substance involved are specified with a noun; in English, the nouns are separated by the word *of*. Here is an example of a pseudopartitive:

(14) three liters of drinkable water

mereological terms, the inference in (i-a) below shows that any entity which is three boys has a part which is two boys. This shows that there is an intimate relationship between plurality and distributivity. On this point, see Landman (1989).

(i) a. Three boys were visible. ⇒ Two boys were visible.
    b. Three-year-old boys were visible. ≠ Two-year-old boys were visible.

4Here and in the following, I use the term *instantiate* as a cover term for referring and existentially quantifying. Simply put, a predicate instantiates an entity if it can be used to talk about that entity.
In a pseudopartitive, the material to the left of of is a **measure phrase** headed by a **measure noun**. I refer to the noun that comes to the right of of as the **substance noun**, and to the substance noun together with any of its modifiers the **substance nominal**. In (14), the measure noun is *liters* and the substance noun is *water*; the measure phrase is *three liters* and the substance nominal is *drinkable water*.

As described in Sect. 2, we can test for distributivity in noun phrases by combining them with a distributive predicate like *were visible*. The following entailment shows that pseudopartitives are distributive – cf. (5):

(15) 3 pounds of vegetables were visible. ⇒ 2 pounds of vegetables were visible.

It is useful to contrast pseudopartitives with what Schwarzschild (2006) calls **attributives**, e.g. *a three-pound vegetable*. **Attributive** are not distributive, cf. (12): for example, *a three-pound vegetable was visible* does not entail *a two-pound vegetable was visible*.

Sect. 2 introduced the term “**Key**” for the constituent about whose parts entailments are licensed. The above entailment pattern suggests that the measure phrase in pseudopartitives is a Key. The substance nominal specifies the nature of this entailment: in (15), it specifies the substance of which the parts of the Key are amounts. This suggests that it is a Share. Key and Share of a pseudopartitive are related by a covert **measure** (Krantz et al., 1971) such as volume or weight. Schwarzschild (2006) notes that previous authors have repeatedly likened these measures to thematic roles. I will pursue this parallel further. I have called thematic roles in distributive constructions Maps. In keeping with this terminology, I will call measures in pseudopartitives Maps. For example, in (15) the covert relation *weight* is the Map.

One puzzling fact about pseudopartitives is that they only accept mass nouns and plurals as Shares (Krifka, 1998; Schwarzschild, 2006):

(16) a. ten minutes of music  
    b. ten tons of containers  
    c. ?ten minutes of song  
    d. *ten tons of container

It is not surprising that plurals and mass nouns behave alike with respect to pseudopartitives, because they form a natural class with respect to their entailment properties (e.g. Bunt, 1979). Various authors have identified these properties with the notions...
of *cumulative reference* (Quine, 1960) (any sum of parts that are P is P) and *divisive reference* (Cheng, 1973) (any part of something that is P is P).\(^8\) Of course, identifying plurals and mass terms as a natural class is not by itself an explanation of why pseudopartitives call for this class. An explanation is proposed in Sect. 5.

Another puzzle concerns the nature of the Maps (measures) that relate substance and amount in pseudopartitives (Krifka, 1998; Schwarzschild, 2006). This relation is not expressed overtly and is sometimes only recoverable from context. For example, Schwarzschild (2006) points out that the expression *three inches of water* could refer, in different contexts, to a certain amount of water whose depth is three inches, or whose width is three inches. However, pseudopartitives will reject all Maps whose value can remain constant across the parts of entities instantiated by the substance noun. Intuitively, the temperature of any amount of water we encounter remains approximately constant across its parts, in contrast to its volume. While (17-a) is acceptable as a way of referring to water whose volume is thirty liters, it is not possible to refer to water whose temperature is thirty degrees Celsius as (17-b).

(17)
\begin{align*}
\text{a.} & \quad \text{thirty liters of water} \\
\text{b.} & \quad \ast\text{thirty degrees Celsius of water}
\end{align*}

Even setting aside the question of why this constraint exists, it is not easy to characterize the class of measures that occur in pseudopartitives to begin with. For example, it is not literally true that all water has constant temperature. Even if we are willing to disregard small local fluctuations in temperature, it is easy to find counterexamples since water has cumulative reference. Suppose I have a glass of water whose temperature is 20 °C, and suppose you have a glass of water whose temperature is 5 °C. The sum of the content of the two glasses is water, but its temperature is not constant.

My own proposal is presented in Sect. 6 below (in (34), if you wish to skip ahead). Here I review previous proposals. Krifka (1998) claims that all measures that occur in pseudopartitives are extensive. One of the necessary conditions for a measure to be extensive is what Schwarzschild (2006) calls monotonicity: a measure \( \mu \) is monotonic iff for any \( x \) and \( y \), if \( x \) is a proper part of \( y \), then \( \mu(x) \) is less than \( \mu(y) \). Since temperature is not monotonic, it is correctly ruled out on such an account. However, the monotonicity condition is too restrictive as it stands. Suppose we are told that on a certain cold (war) winter night, two feet of snow fell on Berlin. A proper part of that snow is the snow that fell on West Berlin. We may not conclude that less than two feet of snow fell on West Berlin, so height is not monotonic, and therefore not extensive. Yet *two feet of snow* is a fine way to refer to a snow cover whose height is two feet.

From similar examples, Schwarzschild (2006) concludes that pseudopartitives do not test for monotonicity with respect to the mereological part-whole relation, but with respect to a contextually supplied part-whole relation. In our example, the assumption would be that context provides a relation according to which the snow that fell on

---

\(^8\)There is some variation here. Some authors refer to this property as distributive reference. I follow Krifka (1989) in calling it divisive reference.
West Berlin is not a part of the snow that fell on the entire city. The fact that one is a mereological part of the other does not enter the picture. I see several problems with this suggestion. The first problem is lack of predictive power: in the absence of a way of testing whether two entities stand in this contextual part relation, it is unclear how to test the predictions of this account. The second problem is redundancy: many measures like temperature are correctly ruled out by Schwarzschild’s account on the mereological part-whole relation, so the two relations must coincide to a large extent. For these reasons, in contrast to Schwarzschild (2006) but in keeping with Krifka (1998), my own account is based on the mereological part relation; in contrast to both authors, I reject the monotonicity requirement.

In sum, the puzzles posed by pseudopartitives echo the ones posed by for-adverbials and presented in the previous section. Why do pseudopartitives accept only mass terms and plurals as Shares? What is the condition on Maps that determines whether they are acceptable? And why do pseudopartitives impose this condition?

4 for-adverbials

for-adverbials are best known for their aspeutal sensitivity (e.g. Verkuyl, 1972). They can be applied without problems to atelic predicates like run, while telic predicates like run to the store are unacceptable:  

\[(18) \quad \begin{align*}
  &a. \text{John ran for five minutes / for three hours / for miles.} \\
  &b. *\text{John ran to the store for five minutes / for three hours / for miles.}
\end{align*}\]

for-adverbials stand in near-complementary distribution with in-adverbials, which reject atelic predicates and accept telic predicates. The entailment pattern in (19) shows that sentences with for-adverbials, but not those with in-adverbials, are distributive constructions:  

\[(19) \quad \begin{align*}
  &a. \text{John ran for five minutes.} \\
  &\Rightarrow \text{John ran for four minutes.} \\
  &b. \text{John ran to the store in five minutes.} \\
  &\not\Rightarrow \text{John ran to the store in four minutes.}
\end{align*}\]

In terms of Sect. 2, the entailment pattern in (19-a) suggests that the complement of for (e.g. five minutes) is the Key, the predicate with which the for-adverbial combines (e.g. ran or John ran, depending on syntactic assumptions) is the Share, and the semantic relationship between Key and Share (e.g. duration) is the Map. Put in these

---

\(9\) As in the case of the count-mass distinction (see fn. (15)), the telic-atelic distinction shows a certain amount of elasticity. To some extent, run to the store may be reinterpreted as an atelic predicate. I abstract away from this complication.

\(10\) At first sight, the entailment pattern in (19) might look suspect. However, it is important to keep in mind that the entailment that is checked here holds between literal meanings. As noted in Krifka (1998), “John ran for four minutes” implicates but does not entail that he ran for exactly four minutes.
terms, for-adverbials pose the puzzle why they accept only atelic predicates as Shares.

The entailment properties of atelic predicates with respect to a large range of other phenomena, including tense, the progressive, and aspectualizers, can be represented by modeling the denotations in terms of the subinterval property (Bennett and Partee, 1972): if atelic predicates (or sentences headed by them) are true at some interval \( i \), then they are also true at every subinterval of \( i \). As is often noted (e.g. Bach, 1986), this subinterval property is analogous to the concept of divisive reference introduced for mass terms and plurals. So the Shares of for-adverbials are subject to a constraint which parallels the constraint on Shares of pseudopartitives. On the present view, this is not surprising, since both are distributive constructions.

Just like pseudopartitives, for-adverbials impose constraints not only on their Shares but also on their Maps. As was already shown in (3-b) and (18), English has not only temporal but also spatial for-adverbials (Gawron, 2005). It appears, however, that there are no other categories of for-adverbials, for example, there are none based on weight, temperature, or speed:

\[
\text{(20) a. drive } \emptyset / \text{for thirty hours} \quad \text{duration}
\]
\[
\text{b. drive } \emptyset / \text{for thirty miles} \quad \text{spatial extent}
\]
\[
\text{c. *drive } \emptyset / \text{for thirty kilograms} \quad *\text{weight}
\]
\[
\text{d. *drive } \emptyset / \text{for thirty degrees Celsius} \quad *\text{temperature}
\]
\[
\text{e. drive } \emptyset / *\text{for thirty miles an hour} \quad *\text{speed}
\]

To some extent, these gaps are unsurprising. Unlike pseudopartitives, for-adverbials measure events rather than substances, and (20-c-d) as well as common sense suggest that driving events do not have weights or temperatures. What is surprising, however, is that (20-e) is unacceptable with a for-adverbial but acceptable otherwise. It seems that even though we can talk in principle about the speed of an event, for-adverbials reject speed as a Map. One might assume this is just an idiosyncratic fact about for-adverbials. However, we have seen in Sect. 3 that speed is rejected as a Map by pseudopartitives as well. This coincidence would be unexplained on the idiosyncracy assumption. So I will explore the idea that something like the Krifka-Schwarzschild monotonicity constraint is also at work in for-adverbials.

In sum, for-adverbials pose the following puzzles: Why do they accept only atelic predicates as Shares? What is the condition on Maps that determines whether they are acceptable? And why do for-adverbials impose this condition? These puzzles correspond to the puzzles posed by pseudopartitives as described in the previous section, which suggests that whatever solution can be given to one set of puzzles can also explain the other set. I will now propose such a solution.

\[11\] Formally, Subinterval(\( P \)) = \( \forall e \forall i [i < \tau(e) \rightarrow \exists e' [P(e') \land e' < e \land i = \tau(e') ]] \). Here, \( \tau \) is the temporal trace function, described in Sect. 5, that maps events to their runtimes.

\[12\] That speed is among the possible properties of events is also suggested by the example of a sphere that rotates slowly and heats up quickly at the same time (Quine, 1985). Provided that the rotating and the heating up are two separate events, and that quickly and slowly are event modifiers, we can avoid the undesirable conclusion that the sphere is both quick and slow.
5 The account

Let me first introduce some background assumptions. Basically, they are a combination of the frameworks in Krifka (1998) and Landman (2000). As mentioned earlier, I assume a mereological framework in which individuals, events, and intervals are each ordered in part structures (Link, 1998). Intervals are instantiated by measure phrases like one hour and three pounds (Schwarzschild and Wilkinson, 2002) and have other intervals as parts. All scales of measurement are dense (Fox and Hackl, 2006), i.e. there are no atomic intervals.\textsuperscript{13} I assume that measures are functions from entities to intervals.

Following Krifka (1998) and many others, I assume that events are mapped to temporal intervals by a function $\tau$, the \textit{temporal trace}, also sometimes called the runtime function. The runtimes of events are not necessarily equal to the runtimes of their parts; for example, if there is an event of John running from 2pm to 4pm then among its parts there is an event of John running from 2pm to 3pm. However, the interval from 2pm to 3pm is a part of the interval from 2pm to 4pm. More generally, $\tau$ is a homomorphism with respect to the sum operation: we assume that the runtime of the sum of any two events is the sum of their runtimes. Following e.g. Landman (2000) and Kratzer (2007), I assume that event predicates as well as thematic roles are lexically specified as cumulative (closed under sum). Therefore thematic roles are also homomorphisms: the agent of the sum of any two events is the sum of their agents, or as Landman calls it, the \textit{plural agent}.\textsuperscript{14}

As surveyed in the previous sections, the entailment relations of acceptable Shares in all the constructions considered in this paper have all been characterized using similar concepts: the presence of Link’s D operator for distributive predicates; divisive reference for plurals and mass nouns; and the subinterval property for atelic predicates. It is tempting to adopt one of these ideas and extend it to all three cases. However, all these characterizations are binary distinctions. For example, a predicate either has divisive reference or not. For this reason, adopting only one of them would predict that a predicate should be an acceptable Share either in all the constructions considered here, or in none of them. This is obviously wrong. For example, predicates like \textit{run to the store} are distributive but not atelic:

\begin{equation}
\begin{align*}
\text{(21)} & \quad \text{a. Al, Bill, and Charles ran to the store.} \\
& \quad \Rightarrow \text{Al and Bill ran to the store.} \\
& \quad \text{b. *John ran to the store for five minutes.}
\end{align*}
\end{equation}

Intuitively, we want to express a distinction like the following: the predicate \textit{run to the store} is distributive with respect to agents, but not with respect to time. But the

\textsuperscript{13}I assume that the word \textit{zero} is a scope-taking element, as shown by its ability to license negative polarity items as in \textit{Zero deaths have ever occurred with this product.} So measure phrases like \textit{zero hours} quantify over intervals of arbitrary length, rather than denoting atomic intervals of “zero length”.

\textsuperscript{14}Williams (2009) warns that assuming cumulativity for thematic roles leads to problems in connection with the interpretation of resultatives unless thematic roles are verb-specific (instead of agent we have $\text{agent}_{\text{carry}}$, $\text{agent}_{\text{wear}}$, etc.). So I assume that, for example, $\text{agent}_{\text{wear}}(e) \oplus \text{agent}_{\text{carry}}(e')$ is not defined.
notion of divisive reference as previously defined, e.g. by Krifka (1989) as in (22), does not allow us to make such a distinction, because it is a property of predicates. For this reason, I propose to relativize the concept of divisive reference to take an additional parameter into account. (23) defines what I will call relativized divisive reference.\(^{15}\)

\[(22)\quad DIV(P) =_{df} \forall x \forall y [P(x) \wedge y < x \rightarrow P(y)]\]

A predicate \(P\) has divisive reference iff \(P\) holds of every proper part of any entity of which it holds.

\[(23)\quad DIV_f(P) =_{df} \forall x [P(x) \rightarrow \forall z [z < f(x) \rightarrow \exists y [P(y) \wedge y < x \wedge z = f(y)]]]\]

A predicate \(P\) has relativized divisive reference with respect to a function \(f\) iff \(f\) maps every entity \(x\) of which \(P\) holds to a value each of whose proper parts is the value of some proper part of \(x\) that is itself in \(P\).

The \(D\) operator, divisive reference, and the subinterval property are all special cases of relativized divisive reference in the following sense. It is easy to show that for an arbitrary predicate \(P\), the following are all true, where \(id\) denotes the identify function:

\[(24)\]

- \(DIV_{id}(DP)\)
- \(DIV_{\tau}(P) \leftrightarrow \text{Subinterval}(P)\)\(^{16}\)
- \(DIV_{id}(P) \leftrightarrow DIV(P)\)

We can now formulate the central proposal of this paper. Recall the diagnostic proposed in Sect. 1: Distributive constructions are constructions which give rise to distributive entailments through the constraints they impose on their constituents. I propose to formalize this idea as follows:

\[(25)\quad \text{Distributivity Constraint:}\]

Every distributive construction presupposes that \(DIV_{[Map]}([\text{Share}])\).

Let me illustrate with a few examples how this constraint works. In a sentence like *John ran for an hour*, this constraint will presuppose the following:

\[(26)\quad \forall e [\text{run}(e) \rightarrow \forall i [i < \tau(e) \rightarrow \exists e'[\text{run}(e') \wedge e' < e \wedge \tau(e') = i]]]\]

Every proper part of the temporal trace of a running event \(e\) is the temporal trace of another running event which is a proper part of \(e\).

This entails that, for example, if John ran during a certain time, then at each subinterval of this time there was a running. This is compatible with what we know about running since \(\text{run}\) is atelic (it has the subinterval property). By contrast, the sentence *John ran to the store for an hour* is unacceptable because for-adverbials are

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\(^{15}\)The variables \(x, y, z\) in definitions (22) and (23) are unsorted. They range over individuals, events, and intervals. \(P\) ranges over one-place predicates and \(f\) over one-argument functions. \(<\) denotes the mereological proper part relation.

\(^{16}\)For the definition of Subinterval, see fn. 11.
distributive constructions, so the Distributivity Constraint presupposes the following:

\[
(27) \quad \forall e [e \in [\text{run to the store}] \rightarrow \\
\forall i [i < \tau(e) \rightarrow \exists e'[e' \in [\text{run to the store}] \land e' < e \land \tau(e') = i]]]
\]

Every proper part of the temporal trace of an event \(e\) in the denotation of \textit{run to the store} is the temporal trace of another event in the denotation of \textit{run to the store} which is a proper part of \(e\).

This presupposition would require that, for example, if John ran to the store during a certain time, then at each subinterval of this time there was a running to the store. This is ruled out because \textit{run to the store} is telic (as predicted by theories of aspectual composition such as Krifka (1998)).

By contrast, the distributive construction \textit{John and Mary each ran to the store} is acceptable because the Distributivity Constraint produces the following entailment:

\[
(28) \quad \forall e [e \in [\text{run to the store}] \rightarrow \\
\forall x [x < \text{agent}(e) \rightarrow \exists e'[e' \in [\text{run to the store}] \land e' < e \land \text{agent}(e') = x]]]
\]

Every proper part of the (possibly plural) agent of a running-to-the-store event \(e\) is the (possibly plural) agent of another running-to-the-store event which is a proper part of \(e\).

This is compatible with our world knowledge (namely that \textit{run to the store} is distributive). We can represent this kind of world knowledge more formally as meaning postulates (constraints on models) of the following form:

\[
(29) \quad a. \quad \text{DIV}_{\text{agent}}([\text{run}]) \quad \text{run is distributive} \\
b. \quad \text{DIV}_{\tau}([\text{run}]) \quad \text{run is atelic} \\
c. \quad \text{DIV}_{\text{agent}}([\text{run to the store}]) \quad \text{run to the store} is distributive \\
d. \quad \neg \text{DIV}_{\tau}([\text{run to the store}]) \quad \text{run to the store} is not atelic
\]

The Distributivity Constraint embodies the claim that the dimension along which the presuppositions of a distributive construction must hold is determined by the Map (e.g. the measure in pseudopartitives). Evidence for this claim comes from an observation in Schwarzschild (2006): (30) only has the interpretation (30-a), not (30-b).

\[
(30) \quad \text{three inches of cable} \\
a. \quad \text{“cable with a length of three inches”} \\
b. \quad \text{“cable with a diameter of three inches”}
\]

If divisive reference in the strict sense, as formalized in (22), was a necessary condition on substance nouns of pseudopartitives, we would expect (30-a) to be unacceptable because not every part of a cable is a cable: world knowledge tells us that only parts with shorter length but equal diameter are cable, while parts with smaller diameter
are not. Or, we would need to appeal to pragmatics, as Schwarzschild (2006) does. However, the facts are expected on the present account since this world knowledge can be seen as evidence for the meaning postulates in (31). These postulates entail that (30) satisfies the Distributivity Constraint if the Map is length, but not if it is diameter.

\[(31)\]

\begin{enumerate}
  \item \(DIV_{\text{length}}([\text{cable}])\)
  \hspace{1cm} Every cable of length 3in has as part a cable of length 2in.
  \item \(\neg DIV_{\text{diameter}}([\text{cable}])\)
  \hspace{1cm} Not every (in fact, no) cable of diameter 3in has as part a cable of diameter 2in.
\end{enumerate}

Similarly, for-adverbials are compatible with predicates that do not have divisive reference in the strict sense as long as these predicates can be interpreted as having the subinterval property, i.e. as long as having relativized divisive reference with respect to time. Examples are predicates with one bounded and one unbounded argument:

\[(32)\]

\begin{enumerate}
  \item Snow fell throughout the area for two straight days.\(^{17}\)
  \item Wine flowed from the jar to the floor for five minutes. (Beavers, 2008)
\end{enumerate}

The predicate \textit{fall throughout the area} is not divisive because it describes events which have as parts events whose location is some proper part of the area. The predicate \textit{flow from the jar to the floor} is not divisive because it describes events which have as parts events whose location is some proper part of the path from the jar to the floor. But both predicates have a continuous interpretation which has the subinterval property. Simply put, both predicates can describe events which go on and on.

Finally, for-adverbials also show evidence for the claim that the Map determines the dimension along which divisive reference must be relativized. Example (33-a) is acceptable on an iterative interpretation, i.e. John went back and forth and accomplished his task little by little. This is expected if \textit{push carts to the store} has the subinterval property, or in our terms, \(DIV_r([\text{push carts to the store}])\). Example (33-b) is unacceptable on any interpretation, apart from atelic reinterpretation. This is expected if \(\neg DIV_r([\text{push carts to the store}])\), i.e. the predicate \textit{push carts to the store} has relativized divisive reference with respect to time but not with respect to space. Krifka (1998) assumes that for-adverbials essentially test for divisive (not relativized divisive) reference, and undergenerates as a result: his analysis rules out (32-a), (32-b), and (33-b) alongside (33-a). For more discussion of this point, see Champollion (2009).

\[(33)\]

\begin{enumerate}
  \item John pushed carts to the store for five minutes.
  \item \#John pushed carts to the store for fifty meters.
\end{enumerate}

To sum up this section, we have identified a constraint that prevents telic, collective, and count terms from being Shares. Predicates like \textit{run to the store} can be formally described as distributive but not atelic. The next section describes how this constraint

\(^{17}\) Attested example (http://community.lawyers.com/forums/t/17235.aspx).
derives the restriction on measures in *for*-adverbials and pseudopartitives.

6 Why one can’t say “thirty degrees Celsius of water”

In Sect. 3, we have seen that pseudopartitives reject Maps (i.e. measure functions) like *temperature* and *speed* that tend to return constant values on the parts of the entity or event instantiated by the Share (i.e. the substance noun). Sect. 4 has hypothesized that *for*-adverbials and pseudopartitives impose the same constraint on Maps. This section shows that the Distributivity Constraint, which was independently motivated in the previous section, rules out such measure functions in both cases.

I show the reasoning for pseudopartitives only. Let \( \mu \) be the Map of a distributive construction. The following is an immediate consequence of the Distributivity Constraint, and my official prediction on admissible measure functions in pseudopartitives:

\[
\forall x [x \in [\text{substance nominal}] \rightarrow \forall i [i < \mu(x) \rightarrow \exists y [y < x \wedge i = \mu(y)]]]
\]

This constraint will reject, among other things, any measure that is constant on some entity in the denotation of the substance nominal. Proof: Let us call a measure \( \mu \) constant on \( x \) iff \( \forall y [y < x \rightarrow \mu(y) = \mu(x)] \). Suppose that \( \mu \) is constant on some \( x_0 \in [\text{substance nominal}] \). By our background assumptions, \( \mu(x_0) \) is nonatomic, so there exists an \( i < \mu(x_0) \). By (34), there exists a part \( y \) of \( x_0 \) such that \( \mu(y) = i \), so \( \mu(y) < \mu(x_0) \). Since \( \mu \) is constant on \( x_0 \), it holds that \( \mu(y) = \mu(x_0) \). Contradiction.

An interesting prediction of (34) is that even measures like *temperature* should be acceptable in pseudopartitives and in *for*-adverbials as long as their Share only applies to entities or events on which the measure is not constant. Arguably, such nominals include *fever* and *warming* (cf. also the verb *cool*): for example, a sum of two consecutive one-degree warmings is a two-degree warming. Formally, we can express this as \( \text{DIV}_{\text{temperature}}([\text{fever}]) \) and \( \text{DIV}_{\text{temperature}}([\text{warming}]) \) but \( \neg \text{DIV}_{\text{temperature}}([\text{water}]) \). This prediction is confirmed:

\[
\begin{align*}
\text{(35) Constraint on measure functions in pseudopartitives} & \\
\forall x [x \in [\text{substance nominal}] \rightarrow \forall i [i < \mu(x) \rightarrow \exists y [y < x \wedge i = \mu(y)]]]
\end{align*}
\]

\[
\begin{align*}
\text{a. Emilia was lying on her bed, with 41 degrees Celsius of fever.}^{18} \\
\text{b. The scientists from Princeton and Harvard universities say just two degrees Celsius of global warming, which is widely expected to occur in coming decades, could be enough to inundate the planet.}^{19} \\
\text{c. The sample continued to cool for several degrees to point N and then suddenly increased to a temperature between the transition points of Form I and Form II with no indication of the presence of Form 111.}^{20}
\end{align*}
\]

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18 From http://www.fanfiction.net/s/3616691/.
19 Calgary Herald, Two degrees is all it takes – Warming may trigger floods, December 17, 2009, online at http://www.calgaryherald.com/technology/degrees+takes/2350903/story.html.
20 From Daubert and Clarke (1944).
7 Conclusion

This paper has presented a diagnostic for identifying distributive constructions and shown that it applies to pseudopartitives and for-adverbials. The restrictions on their constituents and on their measure functions both follow from a single general constraint on distributive constructions. Evidence for this constraint was claimed to come from distributive entailments. Informally, the explanation proposed for these restrictions is the following:

**Why one can’t say *run to the store for an hour.** Just like the distributive construction *Al, Bill, and Charles each wore a sweater* insists that any plural event denoted by *wore a sweater* should have some proper parts which are themselves sweater-wearing events and whose agents are proper parts of its own sum agent, the for-adverbial insists that any plural event denoted by *run to the store* should have some proper parts which are themselves running-to-the-store events and whose runtime include every proper part of its own runtime. But this is not the case since *run to the store* is telic and therefore does not have the subinterval property. (An analogous reasoning explains why one can’t say *five pounds of book.*)

**Why one can’t say *thirty degrees Celsius of water.** Just like the distributive construction *Al, Bill, and Charles each wore a sweater* insists that any plural event denoted by *wore a sweater* should have some proper parts whose agents are proper parts of its own sum agent, the pseudopartitive insists that anything which is water should have some proper parts whose temperature is lower than its own.

The picture presented in this paper is idealized in several respects. For example, I have ignored the fact that distributive entailments do not always literally hold as far down as they can. for-adverbials are compatible with predicates like *waltz* and *sleep in the attic* that do not satisfy the subinterval property (Dowty, 1979). Similarly, pseudopartitives are compatible with heterogeneous mass nouns like *fruit cake* (Taylor, 1977). To “make room” for such predicates in distributive constructions, one would have to loosen the Distributivity Constraint a little bit so that very small parts of the Share are excluded from its requirement. I have abstracted away from this complication.

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Mario hat gesagt, der und der hätte das und das gemacht: On a Weird Determiner in German

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Abstract
This paper investigates a special kind of DP in German that has not been discussed in the linguistic literature so far, namely DPs with doubled definite determiners (we call them 'DD-DPs' in the following for doubled definite DPs). We argue that they are non-referential expressions that not only constrain the current discourse model in which they can be used felicitously, but also a related speech context. In particular, we suggest that DD-DPs presuppose the existence of a speech act other than the current one, and that a definite or name must be used in the presupposed conversation.

1 Introduction

In German, there is a special kind of determiner that, as far as we know, has gone unnoticed in the linguistic literature so far. This determiner is built up by conjoining two instances of the definite article der/die/das (‘the’) with the conjunction und (‘and’). It can be used with or without overt NP complement (cf. (1a) and (1b), respectively).

(1) a. der und der Student; die und die Flasche; das und das Buch
   the and the student; the and the bottle; the and the book
b. der und der; die und die; das und das
   the and the (masc.); the and the (fem.); the and the (neutr.)

In the following we will call these DPs with doubled definite determiner ‘DD-DPs’. The examples below further illustrate the use of DD-DPs.
Das Erste berichtet, er sei nachts um 24 Uhr von dem und dem angerufen. The ARD reports that he was called by someone (‘the and the’) at 24 hrs and that he did this and that (‘the and the’).\footnote{Die Zeit online 2005: Der Kanzler und die lieben Zwerge.}

Skrupellos eingesetzt [liegt der wissenschaftliche Wert von Umfragen] unscrupulously employed lies the scientific value of surveys nicht viel höher ... als die Behauptung, dass neun von zehn Stars die not much higher ... than the claim that nine of ten stars the und die Seife vorzögén.‘ and the soap prefer ‘If used unscrupulously, the scientific value of surveys is not much higher than that of the claim that nine out of ten stars would prefer a certain soap (‘the and the soap’).\footnote{Die Zeit 33/1996, Modernes Leben: Umberto Eco: Die Umfrage.}

The example in (2) contains a DD-DP without NP complement, whereas the DD-DP in (3) is used with an overt NP complement (Seife (‘soap’)). Strikingly, the DD-DP is embedded under a verb of saying in (2) and under a noun that relates to a speech context in (3) (Behauptung (‘claim’)). We take it that the use of a DD-DP is only licensed if it is embedded under a verb of saying or if a related speech context can plausibly be inferred in some way (for instance, via the use of a noun like Behauptung (‘claim’), which relates to a speech context). In particular, we suggest that DD-DPs presuppose the existence of a speech context that is not the current one, and in which a definite or proper name was used.

In this paper, we will concentrate on DD-DPs used in truly embedded contexts, i.e., in indirect speech only. It should be noted, however, that DD-DPs can also felicitously be used in direct quotes, as the following two examples illustrate:

Da hören wir sehr häufig: Ihr müsst es in dem und dem Zeitraum there hear we very often you must it in the and the timeframe schaffen, egal, was es kostet. get done no matter what it costs ‘We often hear: you have to finish this within this and that (‘the and the’) timeframe, no matter how high the costs are.’\footnote{Die Zeit 42/2000, Wissen, Bildung: Retter in letzter Minute.}

Sie spielen mit der Playstation und unterhalten sich: “Der und der they play with the Playstation and talk themselves the and the hat Ärger gehabt in Buxtehude. Der und der ist von der Schule geflogen.” has trouble had in Buxtehude the and the is from the school expelled ‘They play with their Playstation and talk: “Someone (‘the and the’) got into

\footnote{Die Zeit online 2005: Der Kanzler und die lieben Zwerge.}
trouble in Buxtehude. Someone (‘the and the’) was expelled from school.”

Since DD-DPs are frequently used in indirect speech reports as well, we will here concentrate on an analysis of DD-DPs in such indirect speech reports and leave the analysis of DD-DPs in direct quotes for future work.

Note also that, additionally to conjunctions of the definite article, adverb-conjunctions can be used in German as well (e.g., dann und dann (‘then and then’), da und da (‘there and there’), so und so (‘so and so’)). In this paper, however, we will be concerned with DD-DPs only.

2 Semantic and Pragmatic Characteristics of DD-DPs

DD-DPs exhibit particular characteristics regarding their interpretation, and their felicitous use is restricted to certain contexts. We will explore the behaviour of DD-DPs in detail in this section.

2.1 Non-Referential Readings of DD-DPs

Looking back at the examples in (2) and (3) above, it might be tempting to conclude that DD-DPs not only presuppose a related speech context in which a definite or proper name was used, but also that they are referential expressions themselves and have to refer to particular individuals. In contrast to definite descriptions and proper names, however, DD-DPs can also be used non-referentially, as the following example illustrates.

(6) Wenn ich behaupte, der und der schreibe wie Mankell, glaubt jeder sofort zu verstehen, was ich meine. ‘If I claim that someone (‘the and the’) writes like Mankell, then everyone immediately believes to know what I mean.’

Here, the DD-DP is in the scope of a universal quantifier over possible worlds that is triggered by the conditional. It seems that the value of the DD-DP varies with the
values of another quantifier and can thus not be referentially fixed. In other words, the speaker is not referring to a particular author in (6).

Furthermore, DD-DPs show the same scope ambiguities as ordinary indefinites (cf. (7) and (8)):

(7) Nur zwei Drittel der Leute wollten sich festlegen / haben gesagt, dass ein Teilnehmer gewinnen wird.

only two thirds the people wanted themselves commit have said that some participant win will

‘Only two thirds of the people wanted to commit themselves to saying / have said that some participant will win.’

(8) Nur zwei Drittel der Leute wollten sich festlegen / haben gesagt, dass der und der gewinnen wird.

the and the win will

‘Only two thirds of the people wanted to commit themselves to saying / have said that someone (’the and the’) will win.’

Just like the indefinite in (7), the DD-DP in (8) can take either wide or narrow scope over the numeral (der und der > 2/3 or 2/3 > der und der, respectively). We could paraphrase the wide-scope reading of the DD-DP along the lines of 'There is someone, and two thirds of the people said that this person will win'. In other words, the person that is said to win is the same for each member of the set of 'two thirds of the people'. The narrow scope reading, on the other hand, allows the potential future winner to be different for each one of the two thirds of the people. This could then be paraphrased as 'For each member x of the set 'two thirds of the people' there is someone (y), such that x said that y will win.'

Summing up, the value of a DD-DP is not referentially fixed when the DD-DP is in the scope of another quantifier, and DD-DPs show the same scope ambiguities as ordinary indefinites. We therefore analyse DD-DPs as non-referential expressions, even though, at first glance, they seem to be used to refer to particular individuals.

2.2 Embedding Under Verba Dicendi and the Existence of a Related Speech Context

As we noted above, DD-DPs very frequently occur embedded under so-called verba dicendi, i.e., verbs of saying like say, report, state, etc. If such a verb is missing or a verb that relates to a speech context cannot plausibly be inferred from the context, the use of a DD-DP is unacceptable (cf. the contrast between (9) and (10)).

(9) #Die und die ist von der Schule geflogen.

the and the is from the school expelled

#‘Someone (’the and the’) has been expelled from school.’
(10) Luise hat gesagt, dass die und die von der Schule geflogen ist.
Luise has said that the and the from the school expelled was
‘Luise said that someone (‘the and the’) has been expelled from school.’

The sentence in (9), uttered out of the blue, does not contain a verbum dicendi, nor
can a verb that points to a speech context plausibly be inferred, and the DD-DP can
thus not be used felicitously. The DD-DP in (10), on the other hand, is embedded
under a verbum dicendi (sagen (‘say’)) and its use is felicitous. In contrast, the verbs
in example (11) below (glauben (‘believe’) and bedauern (‘regret’)) are not verbs of
saying, and the standard readings of these sentences are unacceptable.

(11) Luise #glaubt / #bedauert es, dass die und die von der Schule geflogen
Luise believes / regrets it that the and the from the school expelled

is.

‘Luise believes / regrets that someone (‘the and the’) has been expelled from
school.’

We take it that DD-DPs are generally used to indicate that the speaker is conveying
something that was uttered in a speech context that is not the current one. Verba
dicendi are normally used to make this relation to another speech context explicit.
The standard readings of sentences like those in (11) are hence unacceptable at first
sight because the relevant verb is missing. It is, however, sometimes possible to infer a
related speech context in cases where no verbum dicendi is present. The sentences in
(11) could, for instance, in some situations be interpreted as follows: The hearer can
infer from the speaker’s utterance (and, in particular, from her using a DD-DP) that
Luise has indeed voiced her beliefs or regrets explicitly in a conversation the speaker
had with her, i.e., that the speaker is conveying something that has been said in a
speech context other than the current one.

2.3 Relatedness to a Definite or Name

Additionally to indicating that the speaker is reporting something that was uttered in
a speech context other than the current one, the use of a DD-DP also indicates that
a definite description or a proper name was used in that conversation (cf. the contrast
between (12) and (13)).

(12) Previous conversation between the speaker and Luise:

Luise: “Der Student aus München / Ludwig hat schon wieder das
window open left

Fenster offen gelassen.”

‘Luise: “The student from Munich / Ludwig left the window open, yet again.”’
**Speaker to hearer:**

“Luise hat sich mal wieder beklagt, **der und der** hätte schon wieder das Fenster offen gelassen.”

'Luise complained again that someone (‘the and the’) left the window open, yet again.'

(13) **Previous conversation between the speaker and Luise:**

Luise: “Irgendjemand / Ein Freund von mir aus München hat schon wieder das Fenster offen gelassen.”

'Luise: “Someone / A friend of mine from Munich left the window open, yet again.”'

**Speaker to hearer:**

#“Luise hat sich mal wieder beklagt, **der und der** hätte schon wieder das Fenster offen gelassen.”

'Luise complained again that someone (‘the and the’) left the window open, yet again.'

In both cases, the speaker is conveying information she acquired in a previous conversation with Luise. In (12), Luise used a definite (*der Student aus München* (‘the student from Munich’)) or a proper name (*Ludwig*) and the speaker was able to uniquely identify the corresponding referent in that conversation. The use of a DD-DP is felicitous in the report in (12). In contrast, Luise used an indefinite (*irgendjemand* (‘someone’)) or *ein Freund von mir aus München* (‘a friend of mine from Munich’), and the use of a DD-DP in the report in (13) is not acceptable.\(^8\)

### 2.4 The NP Complement of DD-DPs

We saw above that DD-DPs can be used with or without an overt NP complement. It seems that there is an interpretative peculiarity for the use of a DD-DP with an

\(^8\)Note that also the use of the specific indefinite (*ein Freund von mir aus München* (‘a friend of mine from Munich’)) does not render (13) felicitous, although it is usually assumed that the speaker (in this case Luise) can uniquely identify the individual she is referring to when she uses a specific indefinite. It seems to be necessary for the felicitous use of DD-DPs that the speaker and the hearer are able to uniquely identify the referent under discussion so that the use of a definite or proper name is licit in the conversation that is reported.
NP complement, however: it indicates that the restrictor set of the DD-DP is not a singleton. Consider the examples in (14) and (15) for illustration.

(14) *Previous conversation between the speaker and Luise:*

Luise: “Der neuste Mitarbeiter von Peter hat schon wieder das Fenster offen gelassen.”

‘Luise: “Peter’s latest assistant left the window open, yet again.”’

*Speaker to hearer:*

“Luise hat sich beklagt, der und der (Mitarbeiter von Peter) hätte schon wieder das Fenster offen gelassen.”

‘Luise complained that one of Peter’s assistants (‘the and the (assistant of Peter)’) has left the window open, yet again.’

(15) *Previous conversation between the speaker and Luise:*

Luise: “Der Mitarbeiter von Peter hat schon wieder das Fenster offen gelassen.”

‘Luise: “Peter’s assistant left the window open, yet again.”’

*Speaker to hearer:*

“Luise hat sich beklagt, der und der (#Mitarbeiter von Peter) hätte schon wieder das Fenster offen gelassen.”

‘Luise complained that one of Peter’s assistants (‘the and the (#assistant of Peter)’) has left the window open, yet again.’

Luise uses a definite description in both (14) and (15), and in both cases the use of a DD-DP without overt NP complement is felicitous in the speaker’s report of the previous conversation between her and Luise. In contrast, using a DD-DP with an overt NP complement (here, Mitarbeiter von Peter (‘assistant of Peter’)) is only acceptable in (14), but not in (15). In (14), it is clear from Luise’s utterance that Peter has more than one assistant and that she is talking about one of them. This means that the

\[9\text{Note that the English translation one of Peter’s assistants corresponds to this observation.}\]
restrictor set of the DD-DP is not a singleton, i.e., that there are several referents the DD-DP could in principle be related to, and the use of the DD-DP *der und der Mitarbeiter von Peter* ("the and the assistant of Peter") is therefore felicitous. The use of the definite *der Mitarbeiter von Peter* ("the assistant of Peter") in (15), on the other hand, indicates that Peter has only one assistant. The restrictor NP thus denotes a singleton set, and, therefore, the use of a DD-DP with an overt NP complement is infelicitous.

### 2.5 Summary of the Semantic and Pragmatic Characteristics of DD-DPs

Taking all of the above considerations into account, here is a short summary of the characteristics regarding the interpretation of DD-DPs and their distributional restrictions:

**DD-DPs . . .**

(i) . . . are non-referential expressions.

(ii) . . . presuppose the existence of a conversation other than the current one and hence are usually embedded under verba dicendi.

(iii) . . . also presuppose that a definite description or a proper name is used in the relevant conversation.

(iv) . . . indicate that the NP complement denotes a non-singleton set.

### 3 A Formal Analysis of DD-DPs

In the previous section we presented several semantic and pragmatic characteristics of DD-DPs, and a proper analysis of DD-DPs should be able to account for all of these observations. In this section we will argue that DD-DPs presuppose the existence of a speech context other than the current one, in which a definite description or proper name is used. It will also follow from our analysis that the restrictor set of the DD-DP is a non-singleton set if the DD-DP is used with an overt NP complement. In cases where a DD-DP is used without an NP complement, we suggest that some kind of default is at work and that the DD-DP is applied to a semantically vacuous NP denotation such as $\lambda x.x = x$. We will also show that our analysis can account for all of the discussed characteristics of DD-DPs.

#### 3.1 Analysis of DD-DPs

Taking into account all of the observations presented in the previous section, it appears that DD-DPs are used in contexts in which (i) the speaker wants to be as faithful as
possible to a speech context other than the current one and thus does not want to lose all presuppositions (i.e., she wants to indicate that a definite or proper name was used in the reported conversation, cf., e.g., Brasoveanu & Farkas (2007) on say-reports), and in which (ii) the use of a (simple) definite description or proper name would be infelicitous because the relevant existence and uniqueness presuppositions are not part of the common ground of the current conversation and cannot be accommodated either. Suppose, for instance, the speaker and Luise have been talking about Luise’s flatmate, who recently moved in with her, and that the speaker now wants to tell someone else, who has never heard of Luise’s flatmate, about her conversation with Luise. It seems that in such contexts, the speaker has two possibilities: she could introduce new presuppositions which are accommodatable by the hearer (e.g., by using a complex definite like der Student aus München, der Luise so auf die Nerven geht (‘the student from Munich who annoys Luise so much’) or der Typ, der neulich bei Luise eingezogen ist (‘the guy who recently moved in with Luise’)). Or, if the first option is not desired, she could use a DD-DP.

We suggest that a DD-DP carries the following information:

(16) a. At-issue semantics:
\[ \text{[der und der N]}^c = \lambda Q[\exists x[[N]^c(x) \land Q(x)]] \]

b. Presupposition:\nThere is a related speech context \( c' \) such that \( c \neq c' \) and \( x \) can be identified uniquely in \( c' \) with respect to a salient property \( P \subset [[N]^c], P \neq \emptyset \).

Note first that the at-issue semantics we assign to der und der-DPs\(^{11}\) in (16a) is the usual semantics of the indefinite. DD-DPs that are used without an overt NP complement can be seen as cases where the restrictor set \([N]\) denotes a default property with little semantic content, i.e., something like \( \lambda x.x = x \). Note also that, according to our analysis, the restrictor set \([N]\) is a proper superset of \( P \), i.e., it is not a singleton\(^{12}\).

The presuppositional content of DD-DPs we propose in (16b) ensures that the speaker is conveying information from a conversation other than the current one, and that a uniquely identifying expression, i.e., a definite description or a proper name, is used in that conversation.

3.2 Applying the Analysis

In this section, we will show that the analysis proposed in (16) makes the correct predictions, and we will look at each of the four characteristics we presented in Section 2.

\(^{10}\)It should be noted that the variable \( x \) can be dynamically bound by the existential quantifier in the at-issue semantics (cf., e.g., Beaver (1992) for a formal implementation).

\(^{11}\)We use the variant der und der here for simplicity only. It should be noted that the at-issue semantics (and the presuppositional content) we propose are, of course, the same for all DD-DPs, irrespective of different case or gender.

\(^{12}\)We thank Arnim von Stechow for discussion on this issue. For a previous version cf. Cieschinger & Ebert (2009).
3.2.1 Non-Referentiality of DD-DPs

The fact that DD-DPs behave like ordinary indefinites in many respects (e.g., the interpretation under other quantifiers and the scope ambiguities discussed in Section 2.1), and that they should thus be regarded as non-referential expressions, directly follows from our definition of the at-issue semantics in (16a): we assign DD-DPs the standard semantics of the indefinite, thereby accounting for examples like (6) and (8).

3.2.2 Verba Dicendi and the Presupposed Speech Context

From our definition of the presuppositional content in (16b) it follows directly that DD-DPs are related to a speech context that is not the current one: the presupposed speech context \( c' \) is required not to be identical to the current context \( c \).

It also follows from (16b) that DD-DPs are usually embedded under verba dicendi. The existence of a speech context other than the current one \( (c') \) is normally made explicit by using verba dicendi. The presupposition we assign to DD-DPs can then be bound directly to the speech context indicated by such a verb. In other cases, the existence of a verb that relates to a speech context can be inferred from the current context and the relevant conversation can be accommodated (cf. (11) above and (17)).

(17) Politiker, die meinen, dass man [...] für junge Frauen von 28 [...] das
    politicians who mean that one for young women of 28 the
    und das machen muss, sehen das viel zu schlicht.
    and the make must see this much too simple
    ‘Politicians who think that this and that (‘the and the’) should be done for
    28-year-old women, simplify matters too much.’

Here, the DD-DP is embedded under the verb *meinen* (‘think’), which is neither a verbum dicendi nor does it directly relate to a speech context. It is, however, very likely that the speaker knows the opinions of the respective politicians simply because they have stated them explicitly in public discussions. Hence, the existence of a relevant speech context can easily be accommodated, thus making the use of a DD-DP felicitous. As usual, however, there seem to be gradual differences in how easily a given presupposition can be accommodated. Consider the contrast in (18) for illustration.

(18) Luise hat gehört / ??vergessen, dass die und die Prüfung ausfällt.
    Luise has heard / forgot that the and the exam be cancelled
    ‘Luise heard / ??forgot that a certain exam was cancelled.’

The verb *hören* (‘hear’) easily allows for the accommodation of a speech context other than the current one (namely the conversation in which Luise heard something), whereas accommodation appears to be more difficult if a verb like *vergessen* (‘forget’) is used, but not necessarily impossible. As we saw above when discussing the exam-

\[13\text{Die Zeit 1/2003, Politik: Keine Verhandlungen mit einer Schill-Partei.}\]
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In (11) and (17), in many cases it is possible to infer that the speaker knows that someone else believes, thinks, heard, or forgot something just because it was stated explicitly in a particular conversation of which the speaker was a participant. While the fact that Luise heard about a certain event necessarily implies that there has been a speech context concerning this event, the fact that she forgot a certain event does not imply that there was a speech context broaching the issue of this event. Hence the accommodation of a relevant conversation is much harder for **vergessen** ('forget') than for **hören** ('hear'). If, however, the DD-DP is used in a matrix clause, i.e., if it is unembedded, and the existence of a verb related to a speech context cannot plausibly be inferred from the current context, then the use of a DD-DP is infelicitous (cf. (9), repeated here as (19)).

(19)  
**Die und die** ist von der Schule geflogen.  
the and the is from the school expelled  
#’Someone (‘the and the’) has been expelled from school.’

The presupposition that there is a speech context other than the current one can neither be bound nor accommodated in (19), leading to the unacceptability of the DD-DP.

3.2.3 Relatedness to a Definite or Name

Our definition in (16) also accounts for the fact that a definite description or proper name was used in the conversation that the speaker is presupposing: the object $x$ whose existence is asserted according to (16a) is required to have been uniquely identifiable with respect to some salient property $P$ in the presupposed speech context (cf. (16b)). If this is indeed the case, then, following general conversational maxims, a definite description or proper name will have been used in that speech context.

3.2.4 The NP Complement of DD-DPs

As discussed in Section 2.4, if a DD-DP is used with an NP complement, it indicates that the restrictor set of the DD-DP is a non-singleton set. The presuppositional content we propose in (16b) directly accounts for this observation. The restrictor set $[[N]]$ is a proper superset of $P$, i.e., there exists at least one element of $[[N]]$ that is not contained in $P$. And since the set $P$ cannot be empty (it is the salient property with respect to which the object $x$ can be uniquely identified), the restrictor set of the DD-DP is not a singleton. In cases where a DD-DP is used without an overt NP complement, we suggest that, by default, the DD-DP is applied to the semantically vacuous predicate $\lambda x. x = x$. The constraint that this restrictor set be non-empty is trivially fulfilled.

3.3 Summary

In this section we argued for a presuppositional analysis of DD-DPs (cf. (16)), and we have shown that all of the semantic and pragmatic characteristics of DD-DPs can be
accounted for under this analysis. Here is a short summary of the properties of DD-DPs and of the way in which they can be explained:

DD-DPs . . .

(i) . . . are non-referential expressions.
\[\rightarrow\] by definition of the at-issue semantics of DD-DPs in (16a)

(ii) . . . presuppose the existence of a conversation other than the current one and hence are usually embedded under verba dicendi.
\[\rightarrow\] by definition of the presuppositional content of DD-DPs in (16b)

(iii) . . . also presuppose that a definite description or a proper name is used in the relevant conversation.
\[\rightarrow\] by definition of the presuppositional content of DD-DPs in (16b)

(iv) . . . indicate that the NP complement denotes a non-singleton set.
\[\rightarrow\] by definition of the presuppositional content of DD-DPs in (16b)

4 Discussion and Outlook

In the previous section, we presented a formal analysis of DD-DPs that can account for the characteristics regarding the interpretation of DD-DPs and their distributional restrictions. In this section, we discuss our results critically and point to possible directions for further research.


In Japanese, there appear to be expressions that share some of the properties of DD-DPs. As Sudo (2008) has argued, so-called wh-doublets can be used in closed quotations only\(^\text{14}\). Consider example (20) for illustration (cf. Sudo (2008), ex. 15):

\[(20)\] John-wa Bill-ga  dare-dare-o aishiteiru” to itta.
John-TOP Bill-NOM who-who-ACC love” C said
‘John said “Bill loves X”.’

It seems that wh-doublets can only appear in place of referring expressions (i.e., definite descriptions or proper names), and Sudo proposes that ‘they are indefinites [quantifying] over referring expressions’ (Sudo 2008, p. 629). We will not go into the details of this analysis here, for our purposes it suffices to know that the sentence in (20) is interpreted as ‘For some expression X such that X denotes a person, John said “Bill loves X”’.

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(Sudo 2008, p. 622). Japanese wh-doublets are analysed by Sudo (2008) as indefinites that can only substitute referential expressions and that can only be used in closed quotations. The first property is reminiscent of the characteristic features of DD-DPs, and, indeed, also DD-DPs can be used in closed quotations, as we pointed out in Section 1: examples (4) and (5) (the first of which we repeat here as (21)) illustrated this use of DD-DPs.

(21) Da hören wir sehr häufig: Ihr müsst es in dem und dem Zeitraum there hear we very often you must it in the and the timeframe schaffen, egal, was es kostet.
get done no matter what it costs
t‘We often hear: you have to finish this within this and that (‘the and the’) timeframe, no matter how high the costs are.’

Despite these apparent similarities, there are empirical differences between Japanese wh-doublets and German DD-DPs, however. Firstly, wh-doublets can be used embedded among foreign words (cf. (22), Sudo 2008, ex. 12), whereas DD-DPs cannot (cf. (23)):

(22) Galileo-wa [nani-nani si muove to] itta.
Galileo-TOP ‘what-what si muove’ C said
‘Galileo said “X si muove”.’

(23) Galileo sagte: “#Das und das si muove.”
Galileo said the and the si muove
‘Galileo said “#Something (‘the and the’) si muove”.’

Secondly, and crucially, DD-DPs are used not only in closed quotations, but are also frequently used in indirect speech reports, for which we offer an account in this paper. Possibly Sudo’s (2008) analysis of Japanese wh-doublets is applicable to the German cases of DD-DPs in direct quotes, but we leave the task of spelling out the details of an analysis of DD-DPs in direct quotes for future work.

4.2 Our Presuppositional Analysis

A potential problem for our analysis is that, from the perspective of the hearer, the presupposition of DD-DPs we propose in (16b) can never be falsified, since there always is a speaker-hearer asymmetry. This problem may be resolvable, however, if we follow Schlenker (2007): Schlenker, discussing expressives, argues that certain expressions carry a particular kind of presupposition, namely ‘self-fulfilling presuppositions’ which are always satisfied, irrespective of any speaker-hearer asymmetries. A self-fulfilling presupposition is ‘one which is indexical (it is evaluated with respect to a context),

16This problem also arises for certain presuppositional approaches to specific indefinites (e.g., Cresti 1995; Yeom 1998; Krifka 2001; Schlenker 2006; Jäger 2007).
attitudinal (it predicates something of the mental state of the agent in that context), and sometimes shiftable (the context of evaluation need not be the context of the actual utterance)’ (Schlenker 2007, p. 237). The presupposition of DD-DPs could accordingly be regarded as being both indexical and shiftable. The remaining question, however, is whether it is also attitudinal in Schlenker’s (2007) sense. If that were the case, we could regard the presupposition of DD-DPs as systematically informative, i.e., as a self-fulfilling presupposition (cf. Schlenker 2007, p. 240), and the problem that the presupposition we assign to DD-DPs can never be falsified by the hearer could be resolved.

Another puzzle that arises from our analysis is that unembedded DD-DPs are not acceptable, even in cases where the preceding discourse would satisfy the DD-DP’s presupposition. Consider the example in (24) for illustration.

(24) Ich habe gestern mit Luise geredet und sie hat mir von ihrem Arbeitsalltag erzählt. #Der und der lässt immer die Fenster offen.

‘I spoke to Luise yesterday and she told me about her work routine. #Someone (‘the and the’) always leaves the windows open.’

At the point where the DD-DP in (24) is evaluated, it is clear from the speaker’s utterance that there indeed exists a relevant speech context other than the current one, namely a previous conversation between the speaker and Luise. It seems that the presupposition we propose in (16b) can be bound to that context, nonetheless the use of the DD-DP is infelicitous. And, adding to the confusion even more, DD-DPs appear to become acceptable if they appear as items in a list as in the following example:


‘I spoke to Luise yesterday and she told me about her work routine. Someone (‘the and the’) always leaves the windows open, someone else (‘the and the’) always dallies, and someone else (‘the and the’) is always late.’

The analysis we propose in (16) admittedly cannot account for this particular use of DD-DPs in any straight-forward fashion, but further work may provide new insights.

4.3 Evidentiality

Returning to the example in (24), it seems that expressions like sollen (‘shall’) or angeblich (‘alledgedly’) make the use of DD-DPs in matrix clauses, i.e., in unembedded
contexts, acceptable (cf. (26)).

(26) Ich habe gestern mit Luise geredet und sie hat mir von ihrem Arbeitsalltag erzählt. Der und der lässt angeblich immer die Fenster offen. / Der und der soll immer die Fenster offen lassen.

'I spoke to Luise yesterday and she told me about her work routine. Someone (‘the and the’) apparently always leaves the windows open. / Someone (‘the and the’) is said to always leave the windows open.'

In contrast to (24), the insertion of expressions that can be regarded as evidential expressions (like, e.g., sollen (‘shall’) or angeblich (‘allegedly’), cf., e.g., Schenner 2008) leads to the acceptability of DD-DPs in (26). It thus seems that the felicitous use of DD-DPs is somehow connected to evidentiality. This would correspond nicely to our observation that the information the speaker is conveying must have been presented in a certain way (i.e., with the help of a definite description or a proper name) and that the information is based on a certain source (i.e., the speaker in a presupposed speech context). One possible way to account for these observations would be to argue that evidential expressions, as well as subjunctive mood (which is usually used in indirect speech reports), indicate that the current context is not identical to the presupposed speech context (i.e., that $c \neq c'$), which would fulfill the requirement for the felicitous use of DD-DPs stated in our definition in (16b). But, as of yet, we have not pursued this line of thought any further.

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\footnote{We thank Daniel Büring for pointing out this possible explanation.}
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On the (non-)cumulativity of cumulative quantifiers

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Abstract

This paper investigates some differences between partitive and non-partitive count quantifiers with respect to their ability to participate in cumulative readings and their compatibility with collectively interpreted mixed main predicates. An analysis of quantification is adopted in which a quantifier takes an individual as its first argument. The type of this individual argument together with some independent assumptions is argued to be responsible for the observed data. The analysis is subsequently expanded to a related set of facts concerning partitive and non-partitive mass quantifiers: their (in)compatibility with non-homogeneous main predicates.

1 Introduction

The main focus of this paper will be on quantifier phrases of the form [Q (of) [the NP]] and [Q NP], where Q stands for a quantificational expression like e.g. some, many, most and all. An instance of a partitive count quantifier is parenthesized in (1-a), while (1-b) contains a non-partitive count quantifier.

(1) a. [Some of the students] came on time
   b. Sue dislikes [many flavors of chocolate]

We will investigate the distribution of these expressions with respect to non-distributive plural predication. The first set of data that will be studied involves sentences containing collectively interpreted mixed predicates. An example of a mixed predicate is the VP in (2) (cf. Dowty 1986, for classification). On a collective interpretation, the sentence in (2) denotes a set of situations in which there is a single carrying of a piano and the sum of Stan and Olio is the sole collective agent of this carrying, i.e. neither Stan nor Olio carried a piano by themselves (cf. Landman 2000). The sentence in (2) can also be interpreted distributively: it can describe situations in which Stan and Olio each carry a piano.

(2) Stan and Oliver carried a piano
The second set of data that will be featured in our discussion involves cumulative interpretations of sentences with count quantifiers. For example, on a cumulative interpretation, the sentence in (3) describes situations in which there are Jane, Mary and four babies and each of the two women gave birth to at least one of the four babies and all of the four babies were born to one of the two women (cf. Beck & Sauerland 2000). As in the example (2), a distributive reading of (3) is also possible: Jane and Mary each gave birth to four babies.

(3) Jane and Mary gave birth to four babies

Partitive and non-partitive count quantifiers pattern differently in examples containing the main predicates from (2) and (3). While the partitive count quantifiers do allow a collective interpretation of their mixed VP argument, this is not the case for the non-partitives. Furthermore, only the partitive count quantifiers permit cumulative interpretations of sentences in which they occur. That is, the main predicate has the option of being interpreted distributively or non-distributively only when it occurs with a partitive count quantifier; with non-partitives it is always interpreted distributively.

An arguably related set of data is found with partitive and non-partitive mass quantifiers. As the name suggests, the NP in these quantifiers is mass and not count; the quantificational head is in most cases the same as in count QPs (some, most; much). Two examples of partitive and non-partitive mass quantifiers are parenthesized in (4).

(4) a. John drank [all of the beer]
   b. [Most tap water] is as healthy as bottled water

The distinguishing characteristic of main predicates which we will use to delineate the different behavior of partitive and non-partitive mass quantifiers is (in)homogeneity. A predicate is homogeneous if it is both distributive (divisive) and cumulative (Lønning 1987, and others). For example, the predicates in parentheses in (5-a) satisfy these properties: if something is wet then all its relevant parts are wet, and if two substances solidify then their sum solidifies as well. The predicate in (5-b) is neither distributive nor cumulative, i.e. it is non-homogeneous: an object that contains exactly 4g of protein cannot be split into two parts, each of which would contain exactly 4g of protein, and the sum of two objects containing exactly 4g of protein contains exactly 8g of protein. If the modifier exactly is left out of the VP in (5-b), the predicate becomes cumulative but remains non-homogeneous – it is namely still non-distributive.

(5) a. Water [is wet] and sometimes it [solidifies]
   b. This Snickers bar [contains exactly 4g of protein]

The empirical generalization, finally, seems to be that the partitive mass quantifiers can combine with non-homogeneous predicates, while the non-partitives cannot. In this respect, mass quantifiers pattern like count quantifiers – non-distributive predication is available only with the partitives.
We propose that the asymmetry between partitives and non-partitives in both the count and mass cases mentioned above follows from the general properties of quantificational phrases. The architecture for quantification that we thereby assume treats the quantificational head as taking an individual as its first argument in both partitives and non-partitives (Matthewson 2001). If this individual is a kind individual (an individual concept), which is the case in non-partitives, an independent pragmatic principle conditions the interpretation of the main predicate – it can only be interpreted generically. Genericity then gives rise to the distributivity effect. No analogous condition is imposed with the partitives where the argument of the quantifier is a regular plural individual denoted by the definite description.

Section 2 describes the basic asymmetry between partitive and non-partitive count quantifiers with respect to their compatibility with different types of plural predicates. Section 3 elaborates and further develops the analysis of quantifier phrases proposed in (Matthewson 2001). Section 4 derives the facts described in Section 2. Section 5 characterizes partitive and non-partitive mass quantifiers with respect to their compatibility with non-homogeneous main predicates and it extends our analysis to the mass domain to account for the observed facts. Section 6 concludes.

2 Count quantifiers

2.1 Collectivity

The first set of data relates to the compatibility of count quantifiers with collectively interpreted mixed predicates. Mixed predicates include VPs like carry a piano, lift the box and write a book and can besides the collective also receive a distributive interpretation. A collective interpretation of a sentence like Three boys lifted a piano entails that there was a single lifting of a piano performed jointly by a collection of three boys; a distributive interpretation entails that there are three boys such that each of them lifted a piano by himself.

It has been observed by Nakanishi & Romero (2004) that partitive and non-partitive most-phrases exhibit distinct properties when combining with mixed predicates (cf. Brisson 1998, for a related observation concerning all-phrases). On the one hand, if the quantifier phrase is partitive, the mixed predicate can be interpreted collectively. That is, the sentence in (6-a) is a felicitous description of the scenario sketched in (6). This is not the case for the non-partitive quantifiers (6-b)/(6-c): these sentences can only be interpreted distributively. For example, (6-b)/(6-c) can only describe situations in which more than half of the boys have the property of being a single boy who lifted the piano by himself.

(6) [Scenario: Seven out of the ten boys at the party together lifted the piano once; there were no other liftings of the piano.]
   a. Most of the boys at the party lifted the piano
   b. #Most boys at the party lifted the piano
c. #Most boys who were at the party lifted the piano

2.2 Cumulativity

The second set of data involves cumulative interpretations of sentences containing count quantifiers. As a reminder, a cumulative interpretation of (3) can be rendered by a ‘polyadic distributivity’ paraphrase in (7).

(7) Everyone of Jane and Mary gave birth to a baby and everyone of the four babies was born to either Jane or Mary

It has been observed that non-partitive count quantifiers do not allow cumulative interpretations (Zweig 2008). However, this does not seem to extend to partitive count quantifiers. This asymmetry is illustrated in (8): only the sentence with the partitive quantifier (8-a) can be used in the described scenario. The non-partitive sentence (8-b) can only be interpreted as assigning irrational behavior to voters (voting for two opposing parties).

(8) [Scenario: Almost every US voter will vote either for the Democrats or the Republicans in the next election; only few will vote for a third party candidate.]
   a. Most of the US voters will vote for just two parties
   b. #Most US voters will vote for just two parties

This contrast is even clearer in ditransitive constructions where the quantifier is generated in the direct object position, while the other plural NP is in the to-PP. Accordingly, the situation in (9) can be described by using (9-a) but not by using (9-b).

(9) [Scenario: The Catholic Church sent one third of its missionaries to Asia and a different third of its missionaries to Africa.]
   a. The Church sent most of its missionaries to two continents
   b. #The Church sent most missionaries to two continents

To summarize, partitive and non-partitive count quantifiers exhibit distinct patterns when it comes to non-distributive interpretations: only the former occur in sentences where the mixed main predicate receives a collective interpretation and, again, only the former occur in cumulatively interpreted sentences.

2.3 A brief note on plurality

There are different ways of capturing formally the collective readings of mixed main predicates (cf. Brisson 1998, 2003, Nakanishi & Romero 2004, for precise implementations) and cumulative readings. We will for the sake of concreteness adopt the approach to plurality developed by Kratzer (2002) where the verbs are inherently plural (cf. e.g.
Beck & Sauerland 2000, for an alternative). For perspicuity, we will occasionally indicate that the verbs are pluralized by attaching a *-operator to the verb and we will not incorporate into our simplified representations the thematic role predicates like agent, which are also inherently plural.

In the system that we adopt, then, the sentence Three boys lifted a piano is true on a collective reading of the mixed predicate if the denotation of the VP lift a piano contains a pair of a sum of three boys and a lifting-a-piano event, i.e. if there is a piano-lifting event in which a plurality of three boys is the collective agent; the sentence is true under the distributive reading if the VP denotation contains three pairs of (different) boys and piano-lifting events, i.e. if there are three boys such that each is the sole agent of some piano-lifting event. Furthermore, the sentence in Jane and Mary gave birth to four babies is true on a cumulative reading if the denotation of the sentence contains a sum of two birthing events whose cumulative agents are Jane and Mary (each one is an agent of a different birthing event) and in which a total of four babies are born (say, two babies are born in Jane’s birthing event and two babies are born in Mary’s birthing event).

3 Quantification

3.1 Syntactic ingredients

This section succinctly summarizes the approach to quantification advocated by Matthewson (2001). The starting point of Matthewson’s analysis of quantification is the nature of quantificational expressions in St’át’imcets (Northern Interior Salish). (10) contains prototypical examples of St’át’imcets quantifiers: the heads of the quantificational phrases in parentheses are all and many and they c-command full-fledged determiner phrases without any intervening partitive prepositions. The contrast between (10) and (11) indicates that the complement of the quantifier head must be a determiner phrase.

(10) a. léxlek [takem i smelhmûl hats-a] intelligent all DET.PL women-DET
    ‘All the women are intelligent’

   b. [cw7it i smelhmûl hats-a] léxlek many DET.PL women-DET intelligent
    ‘Many of the women are intelligent’

(11) a. *léxlek [takem smelhmûl hats] intelligent all women
    ‘All women are intelligent’

   b. *[cw7it smelhmûl hats] léxlek many women intelligent
    ‘Many women are intelligent’
Matthewson captures these facts by assuming that all Stát’ímctets quantifiers have the structure in (12): the quantifier head selects for a DP complement. Accordingly, at the level of interpretation, the first argument of the quantifier is the (plural) individual denoted by the DP; there is no intermediate steps of predicativization.

(12) $\left[QP \left[Q \text{ tákem}\right] DP \left[D \times\ldots a\right] NP \text{ smelhmúlhat}\right]$

This proposal is extended to English and other languages. The core underlying assumption is thereby that quantifiers take individual arguments and that the partitive preposition is semantically vacuous. The individual arguments can thereby either be extensional (regular individuals), which is the case in partitive quantifiers where the individual is provided by the definite description, or intensional (kind individuals), which is the case in non-partitive quantifiers where the individual is provided by the bare plural (cf. Chierchia 1998). We subsume these two different sorts of individuals under the disjunctive $i$-type $(D_i = D_e \cup D_{se})$.

(13) a. $\left[\langle\langle i,\langle\langle i,\langle\langle i,\langle\langle i,\text{st}\rangle,\text{t}\rangle\rangle,\text{t}\rangle\rangle,\text{t}\rangle\rangle\text{,t}\rangle\rangle\right] \text{most (of)} \left[i\text{ the NP}\right] \left[i,\text{st}\right] \text{VP}$

Matthewson draws some of the support for the assumption that a kind individual is the first argument of the non-partitive quantifier (13-b) from the contextual unrestrictedness of the non-partitive quantifiers in English and their tendency to occur in generic environments. Both of these characteristics are left unexplained in the standard generalized quantifier approaches where a quantifier takes a (contextually restricted) set of individuals as its first argument (Barwise & Cooper 1981). The first property is illustrated in (14): the discourse in (14) can be continued by (14-a) where the universal quantifier is restricted to the hundred linguists at the party, and it can also be continued by (14-b) where the definite description picks out the linguists at the party. The continuation using a non-partitive quantifier (14-c), however, is infelicitous; the sentence may have at most the unintended interpretation that the majority of all the linguists in the world visited New Zealand.

(14) There were hundred linguists and hundred philosophers at the party. We asked everyone, and we found out that...

a. Every linguist went to New Zealand for Christmas last year
b. Most of the linguists went to New Zealand for Christmas last year
c. #Most linguists went to New Zealand for Christmas last year

Matthewson further cites observations by Cooper (1996) and Brisson (1998) that indicate that the non-partitive quantifiers are dispreferred in episodic environments (15).

(15) a. Most of the students arrived late for the bus
b. #Most students arrived late for the bus
To summarize, Matthewson (2001) argues for an extension of her analysis of St’át’imcets quantification to English. In particular, she proposes that both partitive and non-partitive quantifiers take as their first argument an individual: in the former case this individual is an e-type object, while in the latter case it is an se-type object. We follow her proposal in this paper.

### 3.2 Semantic ingredients

In this section we equip our structural assumptions concerning partitive and non-partitive quantifiers with a basic semantics. We primarily adopt and expand the semantics sketched in Matthewson (2001) for partitive quantifiers. Moreover, Matthewson’s treatment is supplemented by an explicit analysis of non-partitive quantifiers. The section is structured in the following way: we begin by looking at the individual arguments featured in quantifier phrases; subsequently, we describe our assumptions about parthood and measurement; finally, the lexical entries for count quantifiers are provided.

As we have pointed out above, the two kinds of objects that quantificational heads like some and most take as their first argument are either e-type or se-type; together these objects form the domain of i-type individuals. We naturally assume that this selection property of quantifiers obtains also in cases where the bare plural complement of the quantificational head is modified by, say, a finite relative clause, e.g. most boys who came to the party. In such cases, the bare plural needs to be type-shifted to be able to combine with the modifier since the modifier denotes a predicate. A further type-shift is then required to be able to combine with the quantifier that selects for individuals. All this is achieved by inserting into the structure operators that shift predicates into kinds and vice versa. These are defined in (16) (Chierchia 1998): (16-a) shifts a kind to its corresponding (two-place) predicate and (16-b) shifts a predicate to its corresponding kind. A quantifier containing a modified bare plural thus has the syntactic representation along the lines of (17); the switching between the i- and e,se-type notation is for perspicuity.

\[
\begin{align*}
(16) \quad & a. \quad [\sqcup] = \sqcup = \lambda x_{se}. \lambda s_{s}. \lambda y_{e}. \ y \leq x(s) \\
& b. \quad [\sqcap] = \sqcap = \lambda P_{(s,et)}. \lambda s_{s}. \sum_{P(s)}
\end{align*}
\]

\[
(17) \quad [((i,st),st)] \text{ most } [i \sqcap [(s,et)] \lambda s [[et s [(s,et) \sqcup [(se \text{ students})[[et who came]]]]]]
\]

Thus, even in the cases of bare plurals modified by finite relative clauses, which at least initially do not seem to have a kind-like denotation, a uniform approach to quantification does not have to be abandoned, as long as the standard type-shifting operations are adopted into the analysis. Let us now proceed to the characterization of the tools that we will utilize in our lexical entries for quantifiers.

The two main ingredients required by our analysis are the part-relation and the measurement function. Both of these need to be defined for different sorts of individuals – regular and kind individuals. The regular individual part-relation is defined as in (18-a) where ‘+’ stands for the sum operation on individuals; some of the parts of the...
The sum of John and Peter are given in (18-b).

(18)  
\begin{align*}
  a. \quad x \leq y \text{ iff } x + y = y \\
  b. \quad \text{Example: John } \leq \text{ John+Peter, Peter } \leq \text{ John+Peter, John+Peter } \leq \text{ John+Peter}
\end{align*}

An extension of the part-relation to kinds is straightforward (19): a kind x is a part of a kind y iff every realization of the kind x is also a realization of the kind y. For example, dogs with pointy ears is a subkind of dogs since for every situation, the maximal plurality of dogs with pointy ears in that situation is a part (in the regular individual sense) of the maximal plurality of dogs in that situation.

(19)  
\begin{align*}
  a. \quad x \leq y \text{ iff for any } s, x(s) \leq y(s) \\
  b. \quad \text{Example: dogs with pointy ears } \leq \text{ dogs}
\end{align*}

The definition of measurement of regular individuals is given in (20): we relativize it to situations and to what the relevant atoms in the situation are. The first relativization is not crucial in the case of regular individuals but the second one is: in measuring the sum of John and Peter we get different results if we consider the relevant atoms to be limbs or persons. We will for the sake of simplicity assume that the context appropriately determines what the relevant atoms are in the respective situation (cf. Moltmann 1997).

(20)  
\begin{align*}
  a. \quad \mu_s(x) = \mu\{y \mid y \leq x \land \text{AT}(y)\} \\
  b. \quad \text{Example: } \mu_s(\text{John+Peter}) = 2
\end{align*}

Unlike the extension of the part-relation to kinds, this is not as straightforward with the measurement function. Namely, it is hardly clear how one should measure kinds qua individual concepts. Accordingly, as with regular individuals, we relativize the measurement of kinds to situations: this effectively means that we measure (in the regular individual sense) the realizations of a kind in the respective situations. It is also possible to measure kinds with respect to the number of their (natural) subkinds, though we will not discuss this option further in this paper.

(21)  
\begin{align*}
  a. \quad \mu_s(x) = \mu\{y \mid y \leq x(s) \land \text{AT}(y)\} \\
  b. \quad \text{Example: } \mu_s(\text{cats}) = 7 \text{ iff there are seven cats in } s
\end{align*}

All the ingredients that we require to provide lexical entries for count quantifiers are now given. (22-a) contains the lexical entry for most: it takes an individual x and a property P as its arguments and returns a set of situations in which there is a part y of the individual x that measures more than half of what x measures in that situation and the property P holds of y. The meaning of some is analogous (22-b): it takes an individual and a property argument and returns the set of situations in which there is a part of the individual argument of which the property holds. The same holds for all, though in this case the verifying part of the individual argument is not a proper part
of the individual argument in the respective situation (22-c).

\[(22)\]
\[
\text{a. } [\text{most}] = \lambda x \cdot \lambda P(i,s,t) \cdot \lambda s \cdot \exists y \leq x \left[ \mu_s(y) > \frac{1}{2} \mu_s(x) \land P(y,s) \right]
\]
\[
\text{b. } [\text{some}] = \lambda x \cdot \lambda P(i,s,t) \cdot \lambda s \cdot \exists y \leq x \left[ P(y,s) \right]
\]
\[
\text{c. } [\text{all}] = \lambda x \cdot \lambda P(i,s,t) \cdot \lambda s \cdot \exists y \leq x \left[ \mu_s(y) = \mu_s(x) \land P(y,s) \right]
\]

Although a further decompositional analysis of some of the entries provided above is possible, we will not pursue it here (cf. Hackl 2009). Furthermore, we have glossed over various complexities involved in the interpretation of all (Brisson 1998); this will be rectified at a different occasion.

3.3 An application and some consequences

The lexical entries introduced in the previous section are put to use in this section: we compute truth-conditions of simple sentences containing partitive and non-partitive most-phrases and strictly distributive main predicates. It is shown that an additional semantic mechanism needs to be employed for the sentences with the non-partitive quantifiers to be interpretable.

We begin with the partitive quantifiers (23): the sentence in (23-a) has the structure in (23-b). The *-operator represented in the structure indicates that the verb is pluralized, i.e. the VP on its own denotes a set of (sums of) situations in which Mary is kissed; in (23-c), S stands for the denotation of the students and \([\text{*kiss Mary}]\) obtains iff, very roughly, every single student part of y is an agent of a kissing-Mary situation part of s and s is a sum of kissing-Mary situations whose agents are the respective students in y. The predicate over situations attained by applying the quantifier to the individual and the property denoted by the VP is existentially closed.

\[(23)\]
\[
\text{a. Most of the students kissed Mary}
\]
\[
\text{b. } [(i,s,t),st] \text{ most (of) } [i \text{ the students}] [(i,s,t) \text{ *kissed Mary}]
\]
\[
\text{c. } [\text{(23-b)}] = [\lambda x \cdot \lambda P \cdot \lambda s \cdot \exists y \leq x [\mu_s(y) > \frac{1}{2} \mu_s(x) \land P(y,s)]] (S) (\{\text{*kiss Mary}\}) = 1 \text{ iff } \exists s, \forall y \leq S, \mu_s(y) > \frac{1}{2} \mu_s(S) \land [\text{*kiss Mary}(y,s)]
\]

The interpretation of the corresponding sentence with a non-partitive quantifier should proceed in a parallel fashion: (24-a) has the structure in (24-b). However, a problem pops up when composing the quantifier with the property denoted by the VP. Namely, the composition of the quantifier with a kind individual and the fact that only kind individuals qua individual concepts can be parts of kinds prohibit the application of the quantifier to the property denoted by the VP – there is a sortal (or type) mismatch. That is, although the property denoted by the VP is \((i, st)\)-type, it is only defined for a subset of \(i\)-type individuals – the regular individuals.

\[(24)\]
\[
\text{a. Most students kissed Mary}
\]
\[
\text{b. } [(i,s,t),st] \text{ most } [i \text{ students}] [(i,s,t) \text{ *kissed Mary}]
\]
\[
\text{c. } [\text{(24-b)}] = [\lambda x \cdot \lambda P \cdot \lambda s \cdot \exists y \leq x [\mu_s(y) > \frac{1}{2} \mu_s(x) \land P(y,s)]] (\{\text{students}\}) (\{\text{*kissed Mary}\})
\]
Mary]) = [\lambda s. \exists y_k \leq \text{[students]}[\mu_s(y_k) > \frac{1}{2}\mu_s(\text{[students]})] \land [*kissed Mary](y_k, s)]

This issue is standardly alleviated in neo-Carlsonian approaches to bare plurals by generating a mediating operator on the VP. This can either be a generic operator or a derived kind predication operator (Chierchia 1998). The meanings of these operators are given in (25): \( y \leq x(s) \) means that \( y \) is a realization of the kind \( x \) in the event \( s \); \( C \) denotes a set of relevant situations (see below for discussion). The meaning of the VP is thus shifted by these operators so that it can apply to kind individuals, i.e. the \( i \)-type argument of these operators can be a kind individual. The two interpretable structures that the sentence (24-a) may thereby have are in (26).

\[
\begin{align*}
\text{(25)} & \quad \text{a. } [\text{DKP}] = \lambda P_{(i, st)\cdot}. \lambda x_i . \lambda s_a . \exists y[y \leq x(s) \land P(y, s)] \\
& \quad \text{b. } [\text{GEN}_C ] = \lambda P_{(i, st)\cdot}. \lambda x_i . \lambda s_a . \forall y\forall s[y \leq x(s) \land C(s') \rightarrow P(y, s')] \\
\text{(26)} & \quad \text{a. } [\langle (i, st), sl \rangle \text{ most } [i \text{ students}]] [(i, st) \text{ DKP } [(i, st) \text{ *kissed Mary}]] \\
& \quad \text{b. } [\langle (i, st), st \rangle \text{ most } [i \text{ students}]] [(i, st) \text{ GEN}_C [(i, st) \text{ *kissed Mary}]]
\end{align*}
\]

Let us now look at the meaning of (26-a): the sentence is true iff there is a situation \( s \) and a subkind of the kind students that measures in \( s \) more than half of what the kind students measures in \( s \) and this subkind has a realization in \( s \) – i.e. a student – that kissed Mary in \( s \).

\[
\begin{align*}
\text{(27)} & \quad [\langle 26-a \rangle] = [\lambda x . \lambda P_{(i, st)\cdot} . \lambda s_a . \exists y[y \leq x(\mu_s(y) > \frac{1}{2}\mu_s(s) \land P(y, s), (\text{[students]},(\text{[students]})([\text{DKP} \text{ *kissed Mary}])] = 1 \text{ iff } \exists s. \exists y_k \leq \text{[students]}[\mu_s(y_k) > \frac{1}{2}\mu_s(\text{[students]})] \land \exists z[z \leq y_k(s) \land \text{[*kissed Mary]}(z, s)]
\end{align*}
\]

These truth-conditions are very weak. Namely, they subsume any situation that contains at least one student that kissed Mary. This is demonstrated by the following reasoning: first, the kind students is a trivial subkind of students; second, the kind students clearly measures in any situation more than half of what the kind students measures in that situation; third, a single student qualifies as a realization of the kind students; thus, in a situation with one student kissing Mary the truth-conditions in (27) are satisfied. That is, the truth-conditions in (27) are equivalent to (28).

\[
\text{(28)} \quad \exists s. \exists x. [x \leq \text{[students]}(s) \land \text{[*kissed Mary]}(x, s)]
\]

The same state of affairs is found with other quantifiers. For example, the structures in (29) both have the same truth-conditions as (26-a): this is trivially so for \textit{some}; in the case of \textit{all}, the reasoning is the same as with \textit{most} described above.

\[
\begin{align*}
\text{(29)} & \quad \text{a. } [\langle (i, st), sl \rangle \text{ some } [i \text{ students}]] [(i, st) \text{ DKP } [(i, st) \text{ *kissed Mary}]] \\
& \quad \text{b. } [\langle (i, st), st \rangle \text{ all } [i \text{ students}]] [(i, st) \text{ DKP } [(i, st) \text{ *kissed Mary}]] \\
& \quad \text{c. } [(29-a)] = [(29-b)] = 1 \text{ iff } \exists s. \exists x. [x \leq \text{[students]}(s) \land \text{[*kissed Mary]}(x, s)]
\end{align*}
\]
We capture the intuition that such systematically weak truth-conditions should be precluded by imposing a pragmatic restriction on the use of scalar items (30) (cf. Spector 2007). Since some, most and all are scalar items on the same scale, the structures in (26-a), (29-a) and (29-b) are scalar alternatives. Accordingly, the equivalence of their meanings, \[[(26-a)] \equiv [(29-a)] \equiv [(29-b)],\] is in violation of (30).

\[
(30) \quad \text{Do not use a scalar item if its host sentence is equivalent to all its alternatives where the scalar item is replaced by a scale-mate.}
\]

Thus, since the structure (26-a) for the sentence in (24-a) is ruled out, the only viable parse of the sentence in (24-a) is (26-b) with the generic operator on the VP. The truth-conditions of (26-b) are computed in (31): the sentence is true iff there is a subkind of students that measures more than half of what the kind students measures in s and every minimal realization of that subkind kissed Mary in the contextually-determined situations. It is obvious that due to the universal quantification invoked by the generic operator, the truth-conditions in (31) are not equivalent to those of the scalar alternatives of (26-b). The condition in (30) is thus satisfied.

\[
(31) \quad \text{[[most students] GEN}_C \quad [*kiss Mary]] = \lambda x. \lambda P. \lambda s. \exists y \leq x [\mu_s(y) > \frac{1}{2} \mu_s(x) \land P(y,s)] \quad (\text{[students]} \quad (\text{[GEN}_C \quad *kissed Mary] = 1 \iff \exists s. \exists y \leq \text{[students]} [\mu_s(y) > \frac{1}{2} \mu_s(\text{[students]} \land \forall z \forall s'[z \leq y(s') \land C(s') \rightarrow [*kiss Mary](z,s')]])}
\]

Let us elaborate on what is meant by the contextually-determined situations. Although Matthewson observed that there is a tendency for non-partitive quantifiers to occur in generic environments and to receive contextually unrestricted interpretations, this tendency seems to be suspended if the quantifier contains a post-nominal modifier (Matthewson 2001), an effect resembling subtrigging facts with free choice any (cf. Dayal 1998, and many others).

\[
(32) \quad \text{a. Most men who came to the party left early}
\]
\[
\text{b. Most people at yesterday’s rally were Democrats}
\]

More precisely, it seems that the markedness of episodic sentences with non-partitive most-phrases disappears if the NP complement of most has a sufficiently restricted denotation. This does not present a problem for our analysis: the episodic nature of such sentences can in our system be encoded in the resource domain variable argument of the generic operator. It is a well-known fact that such event-like restrictions are available in generics (cf. Greenberg 2003, von Fintel 2004).

\[
(33) \quad \text{a. Italian restaurants are closed tonight}
\]
\[
\text{b. In the 1950’s, women never wore blue jeans}
\]

Thus, even in the cases of seemingly episodic sentences, the generic operator may still be present in the structure, though it is contextually restricted to a particular temporal...
interval. For example, the domain of GEN in the sentence *Most students at the party kissed Mary* may be restricted to events, say, occurring at the time of the party. The truth-conditions that we then predict for this sentence are the following: it is true iff the sum of students at the party, each of which kissed Mary at the party, is bigger than half of all the students at the party.

To summarize, in this section we applied the semantic machinery introduced in the previous two subsections to simple sentences containing non-partitive quantifiers and strictly distributive main predicates. It was shown that such sentences need to be generated with a mediating operator on the VP since a sortal mismatch otherwise obtains. Furthermore, it was shown that this mediating operator can only be a generic operator.

### 4 Analysis

In this section the semantics that we have developed above is shown to derive the asymmetries described in Section 2. The crucial factor in the analysis is the obligatory presence of a (temporally restricted) generic operator in sentences with non-partitive count quantifiers. GEN is effectively a distributivity operator, i.e. it precludes non-distributive interpretations of the main predicate.

The partitive count quantifiers can combine with collectively interpreted mixed main predicates; they also allow cumulative interpretations of sentences in which they are contained. (34) illustrates how the first fact is derived in our system: the sentence in (34-a) with the structure in (34-b) has the interpretation in (34-c): the sentence simply states that there is a plurality of students that is a part of the students and measures more than half of the students and this plurality jointly lifted the piano. The sentence may also have a distributive reading: it is true under a distributive reading if the VP contains enough pairs of single students and lifting-the-piano events, i.e. the majority of students has to be such that each student in the majority is an agent of his own lifting-the-piano event.

\[
\begin{align*}
(34) & \quad \text{a. Most of the boys lifted the piano} \\
& \text{b. } [⟨⟨i, st⟩⟩, st, most (of) [i, the boys]] [⟨i, st⟩, lifted the piano] \\
& \text{c. } [34-b] = [\lambda x. \lambda P. \lambda s. \exists y \leq x [\mu_s(y) > \frac{1}{2} \mu_s(x) \wedge P(y,s)](B)([\text{lift the piano}])] \\
& \quad = 1 \text{ iff } \exists y \leq B. [\mu_s(y) > \frac{1}{2} \mu_s(B) \wedge [\text{lift the piano}](y,s)]
\end{align*}
\]

The derivation of a cumulative interpretation of a sentence containing partitive count quantifiers is illustrated in (35). The sentence in (35-a) has the structure in (35-b) where the verb is pluralized; the PP applies to the pluralized verb to yield a set of sums of voting events in which two parties are voted for; a plurality of voters that measures more than half of the voters must then be a cumulative agent of one of such sums for the sentence to be true. That is, the truth-conditions are compatible with events in which none of the voters voted for more than one party, as long as two parties together got the majority of votes.
On the (non-)cumulativity of cumulative quantifiers

(35)  
\[ \text{a. Most of the voters voted for two parties} \]
\[ \text{b. \{most of\} [the voters]} \ \text{*[vote for two parties]} \]
\[ \text{c. \{\{35-b\}\} = 1 \text{ iff } } \exists s. \exists y \leq \text{[voters]} [\mu_s(y) > \frac{1}{2} \mu_s(V) \ \wedge \ \exists z \text{[\{parties\}(z) \ \wedge \ \mu(z) = 2 \ \wedge \ \text{[*vote\}(y,z,s)] } ] \]

It has been shown in the previous section that if we adopt Matthewson’s analysis of quantification, the predicative argument of the non-partitive quantifiers has to be generic. Since genericity involves universal quantification over all the (minimal) realizations of a kind that satisfy certain restrictions, this amounts to having a distributivity operator generated in the structure. We illustrate this by first deriving the obligatorily distributive readings of mixed predicates with non-partitive count quantifiers:

(36)  
\[ \text{a. Most boys at the party lifted the piano} \]
\[ \text{b. \{\langle i, st \rangle, most \{i, boys\}\} \langle i, st \rangle \text{GEN}_C \text{lifted the piano} \]
\[ \text{c. \{\{36-b\}\} = 1 \text{ iff } } \exists s. \exists y \leq \text{\{boys\}} [\mu_s(y) > \frac{1}{2} \mu_s([\text{boys}]) \ \wedge \ \forall z \forall s’ [z \leq y(s’) \ \wedge \ \text{C}(s’) \rightarrow \text{[lift the piano\}(z,s’) ]}] \]

The non-availability of cumulative readings is a consequence of the layered quantification structure as well: the sentence in (37-a) is true in s iff there is a subkind of voters in s that measures more than half of what the voters in s measure and each individual realization of this subkind – i.e. each individual voter – votes for two parties.

(37)  
\[ \text{a. Most voters voted for two parties} \]
\[ \text{b. \{most voters\} \text{GEN}_C \text{[vote for two parties]} \]
\[ \text{c. \{\{37-b\}\} = 1 \text{ iff } } \exists s. \exists y \leq \text{\{voters\}} [\mu_s(y) > \frac{1}{2} \mu_s([\text{voters}]) \ \wedge \ \forall z \forall s’ [z \leq y(s’) \ \wedge \ \text{C}(s’) \rightarrow \text{[vote for two parties\}(z,s’) ]}] \]

To summarize, the obligatory presence of a generic operator in sentences containing non-partitive count quantifiers explains the distributivity pattern observed in these sentences. The collectivity and cumulativity in sentences with partitive count quantifiers are derived in the standard way.

5 Mass quantifiers

5.1 Homogeneity

It is a well-established fact that mass quantifiers tend to combine only with a certain kind of main predicates (cf. Lønning 1987, Moltmann 1991, Higginbotham 1994). A generalization describing this pattern is in (38), whereby an expression is homogeneous iff it is cumulative and distributive.

(38)  
\text{Homogeneous Constraint (Lønning 1987)}

Mass noun phrases combine only with homogeneous expressions to form sen-
The sentences that are usually used to illustrate this constraint contain non-partitive mass nouns. Lønning’s examples are in (39): boil is clearly a homogeneous predicate since if a certain amount of water boils then all its parts boil (distributivity), and if two amounts of water boil then their sum boils as well (cumulativity); weigh two grams, on the other hand, is not homogeneous since it is not distributive. The pattern in (39) thereby roughly resembles the pattern found with non-partitive count quantifiers whose predicate argument cannot be interpreted non-distributively.

(39) a. Much water boiled
    b. *Most water weighed two grams

However, the constraint in (38) does not seem to extend to all occurrences of mass quantifiers: partitive mass quantifiers have been observed to be able to combine with non-homogeneous predicates. An example is in (40) (Bunt 1985, Moltmann 1997).

(40) [Scenario: There are gold bars on the table; each contains 2 g of copper.]
    All the gold (in front of me) has 2 g of copper in it

We further illustrate this asymmetry with most-phrases in (41). In particular, there are different possible non-distributive readings that a sentence with a partitive mass quantifier may have, i.e. (41-a) can be used to describe both of the scenarios given in (41). A non-partitive mass quantifier is illicit in any sentence containing a non-homogeneous main predicate (41-b) (see below for a qualification).

(41) [Scenario #1: There are five bottles of water on the table. 6 ml of poison is poured into each of three of those bottles.]
    [Scenario #2: There are two containers of water (A and B) – A has 10 liters of water in it; B has 2 liters of water. We pour 6 ml of poison into the container A.]
    a. Most of the water (in front of me) contains 6 ml of poison
    b. *Most water (in front of me) contains 6 ml of poison

5.2 Analysis

The approach developed above for count quantifiers naturally extends to the mass case. The only modification that is required involves the measurement function: in measuring substances, we are not measuring the cardinalities of their atoms but certain physical characteristics that they have; in our examples, we measure the volumes of the respective water amounts. A computation of the meaning of partitive quantifiers with non-homogeneous main predicates is illustrated in (42): the sentence simply states that there exists a part of the relevant water amount that contains 6 ml of poison.
On the (non-)cumulativity of cumulative quantifiers

(42) a. Most of the water (in front of me) contains 6 ml of poison

b. \[\{\langle i, st \rangle, st \} \text{ most (of) } \{ i, \text{ the water} \} \{ i, st \} \text{ contains 6ml of poison}\]

c. \[(42-b) = 1 \text{ iff } \exists s. \exists y \leq \text{water}. \mu_s(y) > \frac{1}{2} \mu_s(\text{water}) \land \{\text{contain 6 ml of poison}\}(y, s)\]

The sentence with a non-partitive mass quantifier is analyzed in (43). The truth-conditions of the sentence are problematic and lead to infelicity. Namely, since it is vague what the atoms of water are (Chierchia 2009), the sentence would have to be true in every precisification to be (Super-)true. However, this is not possible since the main predicate is not distributive.

(43) a. *Most water contains 6 ml of poison

b. \[\{\langle i, st \rangle, st \} \text{ most } \{ i, \text{ water} \} \text{ GENC } \{ i, st \} \text{ contains 6ml of poison}\]

c. \[(43-b) = 1 \text{ iff } \exists s. \exists y \leq \text{water}. \mu_s(y) > \frac{1}{2} \mu_s(\text{water}) \land \forall y' \forall s'. [z \leq y(s') \land C(s') \rightarrow \{\text{contain 6ml of poison}\}(z, s')]\]

This analysis makes an immediate prediction: if the atoms of a mass noun denotation are known (e.g. as is the case with furniture), then the non-partitive mass quantifiers should be able to combine with non-homogeneous predicates but still pattern with non-partitive count quantifiers. This prediction is borne out: the sentence in (44) is acceptable but only has the strictly distributive reading.

(44) Most furniture weighs more than one kilogram

To summarize, this section extended our analysis to mass quantifiers which are in their non-partitive instantiations incompatible with non-homogeneous main predicates. We have argued that this incompatibility is due to two factors: the universal quantification triggered by the presence of the generic operator in the structure and the vagueness of what realizations of substances we are quantifying over. If either of these two factors is missing, the status of the sentences with non-homogeneous main predicates improves.

6 Conclusion and outlook

The partitive and non-partitive count quantifiers exhibit distinct patterns when it comes to sentences with mixed main predicates – only in sentences with partitives can the mixed predicates be interpreted collectively – as well as in allowing cumulative readings of sentences in which they occur – only sentences with partitives allow cumulative interpretations. These facts were derived by relying on Matthewson’s approach to quantification. In particular, we have shown that the sentences with non-partitives involve a layered quantification structure, which effectively leads to strictly distributive interpretations. Finally, the analysis was extended to mass quantifiers where a similar pattern of behavior by partitives and non-partitives has been observed with respect to their compatibility with non-homogeneous main predicates.

There are several issues that we have left aside in the current paper. For example, (i) we have not studied the semantics of sentences with kind main predicates (be
widespread), (ii) we have not looked at the behavior of weak quantifiers (three boys), (iii) we have avoided the discussion of the compatibility of partitive and non-partitive quantifiers with genuinely collective and essentially plural main predicates (be a team, meet) (cf. Winter 2001, Hackl 2002), and (iv) we did not explore the similarities between the non-partitives and free choice any concerning subtrigging. We hope to deal with these and other related issues in the future.

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Copular Questions and Concealed Questions

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Abstract

This paper aims at explaining a contrast in meaning between CQs and embedded wh-questions. Greenberg (1977) observe that while a CQ-sentence like John discovered the murderer of Smith can only convey that John solved the question who murdered Smith?, the sentence John discovered who the murderer of Smith is has an additional reading, compatible with John not knowing about the murder, according to which he found out some essential fact about the person referred to as the murderer. In this paper, I argue that the ambiguity of embedded copular questions follows from the ambiguity of the copular clause they contain, which can have a predicational or a specificational interpretation (Higgins, 1973). On the other hand, assuming that CQs do not contain a copular clause at any level of representation, the ambiguity is not expected here.

1 Introduction

Concealed Questions (CQs) are DPs whose interpretation can be paraphrased by an embedded copular question, some examples in (1)a-b below.

1. a. I just found out the gender of my baby! (Google)
   b. John knows the largest town in Italy. (Heim, 1979)

2. a. I just found out what the gender of my baby is!
   b. John knows what the largest town in Italy is.

A reasonable hypothesis is that the underlined DPs in (1)a-b have the meanings paraphrased in (2)a-b above because they do, in fact, denote questions (for approaches along these lines see Grimshaw 1979; more recently, Aloni 2008, Roelofsen & Aloni 2008, Percus 2009).

Aside from its CQ-reading, the sentence in b can also have a reading according to which John is personally acquainted to the largest town in Italy. It is commonly assumed in the literature that these two readings are due to a lexical ambiguity of the English verb know, which is ambiguous between an epistemic and an acquaintance-based meaning. Evidence in favor of the lexical ambiguity hypothesis comes from languages like German and Italian, which lexicalize these as different words wissen and kennen in German, sapere and conoscer in Italian. When wissen and sapere take a DP argument, the sentence cannot have an acquaintance reading. Thus (i) from German and (ii) from Italian can only have CQ-readings:
However, the view that CQs denote questions has been challenged by a brief remark known as Greenberg’s observation. Heim (1979) reports a discussion from Bill Greenberg (1977) about the contrast between the CQ-sentence in (3)a and its $wh$-question paraphrase in (3)b:

\[(3)\]
\[\begin{align*}
\text{a. } & \text{John found out the murderer of Smith.} \\
\text{b. } & \text{John found out who the murderer of Smith was.}
\end{align*}\]

Following Greenberg, Heim observes that (3)b has an ambiguity that is absent from its CQ counterpart:

“[(3)b] cannot only be used to express that John solved the question who murdered Smith, but has a further reading which is perfectly compatible with John’s being entirely ignorant about Smith’s murder, and which only amounts to the claim that John found out some essential fact or other (e.g. that he was his brother) about the person referred to as “the murderer of Smith”. But this is not an available reading for [(3a)], which can only be used in the first-mentioned way.”

(Heim, 1979: pg 53)

The contrast between (3)a and (3)b is clearly problematic for the question-in-disguise approach: under this view, the two sentences are expected to have identical truth-conditions.

In this paper I argue that the ambiguity of embedded questions of the type who DP is derives from the fact that the copular clause [\[$DP \text{ is } t_i$] can have either a specificational or a predicational interpretation (Higgins, 1973) and that only the predicational structure is compatible with a transparent reading of the subject of the copular clause. On the other hand, assuming that CQs do not contain a copular clause at any level of representation, such ambiguity is not expected here. The paper is organized as follows. Section 2 familiarizes the reader with the specificational/predicational distinction. Section 3 introduces the hypothesis that both CQs and specificational subjects denote individual concepts (c.f. Heim 1979, Romero 2005, Frana 2010 for CQs; Romero 2005 for specificational subjects). Section 4 recasts the ambiguity of copular embedded questions along the predicational/specificational distinction. Section 5 outlines my solution.

## 2 Predicational and Specificational sentences

### 2.1. Predicational Sentences (PRs)

Predicational copular sentences (henceforth, PRs) are just run-of-the-mill copular clauses, such as (4)a-b below:

\[(i)\]
\[
\text{Hans weiss Willis Telefonnummer} \quad \text{*acquaintance}
\]
\[
\text{Hans knows Will’s telephone number}
\]

\[(ii)\]
\[
\text{Gianni sa la capitale del Congo.} \quad \text{*acquaintance}
\]
\[
\text{Gianni knows the capital of Congo.}
\]

---

2 Some speakers do not like CQs with find out and a person-denoting DP-object. However, the contrast can be reproduced by replacing find out with discover.
What these sentences express is that the individual picked out by the subject has the property denoted by the post-copular phrase. The copula, in these cases, is assumed to be semantically vacuous, or to denote an identity function, such as (5) below:

(5) \[[\text{BE}_\text{PRED}]\] = \(\lambda P_{\text{e},P}. [P]\)

The examples in (4) above involve a DP subject and an AdjP object; PRs, however, can also involve two DPs as in (6) below:

(6) Susan is the winner of the prize.

Intuitively, (6) is not much different from (4)a-b in that it expresses that the individual picked out by the subject (Susan) has the property of being the winner of the prize. In order to accommodate predicative uses of definite descriptions, it is widely assumed that the referential definite DP undergoes a type-shifter operation and is assigned a property-type meaning. Partee (1986a) proposed the type-shifter in (7) below, which takes an individual and returns the property of being identical to that individual (8).

(7) \[[\text{IDENT}]\] = \(\lambda x. \lambda y. y = x\)      \(\text{(Partee 1986a)}\)

(8) \[[\text{IDENT}(\text{the winner of the prize})]\] = \(\lambda y. y = \iota z [\text{winner-of-the-prize}(z)]\)

2.2 Specificalational sentences (SPs)

On the surface, specificalational sentences (henceforth, SPs) look like inverted PRs. Some examples are given in (9) below.

(9) a. The winner of the prize is Susan.  
b. The temperature in this room is 25C.  
c. The number of planets is nine. \(\text{\textit{(Higgins, 1973)}}\)

When comparing the SPs above with PRs like (6), it looks as if in (9) the referential and the predicative DPs have simply switched places. While in PRs, the subject-DP picks out an individual of whom it is claimed that the property denoted by the post-copular phrase holds, in (9) the predicational roles seem to be reversed (for an account of SPs as “inverted” PRs see Partee (1986b, 2000) and Mikkelsen (2004), among others).

Another common analogy for SPs is with question-answer pairs. For instance, (9)a would be analogous to the question-answer pair in (10) below.

---

3 In this paper, I will only talk about “simple” or “noncleft” SPs, like the ones in , not pseudocleft like What you need is a beer, with a free relative in subject position.

4 Aside from this intuitive distinction, it has been shown that SPs are grammatically different from PRs, in that the former but not the latter exhibit connectivity effects (see Higgins 1973, Jacobson 1994, Heycock and Kroch 1999, Sharvit 1999, among others).
(10) Q: Who is the winner of the prize? 
A: Susan.

Several authors have pursued an analysis along these lines (Ross 1997, den Dikken et al. 2000, Schlenker 2003). Under this view, the subject of SPs is a question in disguise (a CQ) and the post-copular object provides the answer to that question.

Even though there is no agreement in the literature on what the best treatment of SPs is, most of the existing approaches agree on one point: the subject of a SPs is not referential, i.e. it does not denote an individual. Mikkelsen (2004) made this point quite clear by discussing the following pronominalisation contrast:

(11) a. Susan is the winner of the prize. Isn’t she/*it?
   b. The winner of the prize is Susan. Isn’t it/*she?

Under the assumption that the pronoun in the tag refers back to the subject and that the use of a gendered pronoun, like he or she, pronominalises referential DPs (DPs of semantic type e), (11)a shows that the subject of PRs must be referential. In contrast, the preference for the gender-neuter pronoun it in (11)b, indicates a non-referential interpretation of the subject. A similar contrast can be seen in the question-answer pairs below, from Mikkelsen (2004: 7).

(12) Q: What nationality is the recipient of this year’s Nobel Peace Prize?
A: She/*It is Iranian.  

(13) Q: Who is the winner of this year’s Nobel Peace Prize?
A: ??She/It is Shirin Ebadi.

Interestingly, as Romero (2005) points out, CQs pattern with subjects of SPs when it comes to pronominalisation, as shown in (14) below, examples from Romero (2005: 720).

(14) PRs: The winner of the Oscar for best actress walked in. She/*it was wearing a red dress.
SPs: The girl who caused the trouble wasn’t Mary. It/*she was Jane.
CQ: John guessed the winner of the Oscar for best actress before I guessed it/*her.

Summing up, the data on pronominalisation shows that SP-subjects and CQs are not referential, i.e. their denotation is not an individual of semantic type e. If these DPs do not denote individuals, what then do they denote? In this paper, I will adopt the view, defended by Romero (2005), that both SP-subjects and CQs denote individual concepts.

3. Romero’s unified analysis of CQs and subjects of SPs

3.1 CQs as individual concepts

Heim (1979) suggests that a DP with a CQ-interpretation, like the capital of Italy in (15), denotes an individual concept (henceforth, IC), i.e. a function that maps a world w into the individual that is the capital of Italy at w. (16) could be an example of such a function.
John knows the capital of Italy.

Roughly speaking, knowing an IC construed as a function from possible worlds to individuals amounts to the following: if I know the individual concept $f$ in $w_0$, then $f$ yields the same value at $w_0$ and at the worlds compatible with what I believe in $w_0$.

Heim’s analysis of CQs as denoting ICs was inspired by Montague’s (1973)’s analysis of the temperature paradox, attributed to Barbara Partee. Partee’s observation is that in contrast to the valid argument in (17) below, the syllogism in (18) is intuitively invalid: by substitution, the first two sentences appear to lead to the invalid conclusion in (18)c.

(17) a. The mayor of Amherst is Ms Higgins.  
   b. The mayor of Amherst lives on Main St.  
   c. Ms Higgins lives on Main St.

(18) a. The temperature in this room is ninety.  
    b. The temperature in this room is rising.  
    c. Ninety is rising.

Montague’s account of the contrast between the valid argument in (17) and the (invalid) temperature paradox in (18) consists of three major components. First, he argues that definite descriptions like the mayor of Amherst and the temperature in this room do not denote individual entities, but rather ICs, i.e. functions from indices (world/time pairs) to entities. These functions, as opposed to the constant functions denoted by proper names like Ms Higgins and ninety, can yield different values at different indices. Second, Montague assumes that equative be, as in the temperature is 90 or the mayor is Ms Higgins, expresses extensional identity. Thus, as can be seen in (17’) and (18’) below, the first premise of both arguments does not assert that two ICs are identical, but rather that their extensions are the same at the index of evaluation. Finally, according to Montague, the significant difference between the valid argument in (17) and the temperature paradox lies in the kind of predication involved in the second premise. While in (17)b the extensional predicate lives on Main Street applies to the value of the function denoted by the mayor of Amherst ($f$) at the index of evaluation, in (18)b, the (temporally) intensional predicate rise applies to the function denoted by the temperature in this room ($g$), not to its value (intuitively, in order to establish whether the temperature is rising, one needs to look not just at the actual temperature value, but also at the values that the function yields at earlier and later indices):

(17’) a. The mayor of Amherst is Ms Higgins.  
   \[ f(i_0) = g(i_0) \]  
   extensional identity  
   b. The mayor of Amherst lives on Main Street.  
   \[ \text{lives-on-Main St} (f(i_0)) \]  
   extensional predication  
   c. Ms Higgins lives on Main Street.  
   \[ \text{lives-on-Main St.} (g(i_0)) \]
a. The temperature in this room is ninety.
\[ f'(i_0) = g'(i_0) \] extensional identity
b. The temperature in this room is rising.
\[ \text{rise} \ (f')(i_0) \] intensional predication
c. Ninety is rising
\[ \text{rise} \ (g')(i_0) \]

Heim (1979) suggests that definite descriptions with CQ-interpretations may be another example of DPs interpreted as denoting ICs. In analogy to the temperature paradox, she proposes the following invalid argument involving CQ-readings of the DPs in italics.

a. The capital of Italy is the largest town in Italy.
b. John knows the capital of Italy.
c. John knows the largest town in Italy. (Heim 1979:54)

The entailment in (19) does not go through if we assume that the DPs in italics are interpreted as CQs. Intuitively, knowing what the capital of Italy is does not entail knowing what the largest town in Italy is, despite the fact that the two DPs are co-referential at the actual world/time index. As Heim points out, the lack of entailment is expected if the DP-CQs in (19) denote ICs and \( \text{know}_{CQ} \) is a predicate selecting for ICs. On a par with Montague’s analysis of the temperature paradox, (19) can be analyzed as in (20) below.

a. The capital of Italy is the largest town in Italy.
\[ f'(i_0) = g'(i_0) \] extensional identity
b. John knows the capital of Italy.
\[ \text{know} \ (f')(\text{john})(i_0) \] intensional predication
c. John knows the largest town in Italy.
\[ \text{know} \ (g')(\text{john})(i_0) \]

Setting aside the semantic interpretation of \( \text{know} \) for the moment, the failure of entailment can be explained by assuming that equating the value of two concepts at the actual index ((20)a) is not enough to guarantee identity across indices. Therefore, the conclusion in (20)c does not follow from the premises of the argument.

3.2 Romero (2005) on CQs and SP-subjects

Building on Heim (1979), Romero (2005) develops a more detailed analysis of CQs embedded under \( \text{know} \). The denotation she proposes for \( \text{know}_{CQ} \) as a predicate selecting for ICs is given in (21) below (where \( \text{Dox}_x(w) \) stands for the set of worlds compatible with what the attitude holder \( x \) believes in world \( w \), i.e. the set of \( x \)’s doxastic alternatives to \( w \)).

\[ \[[\text{know}_{CQ}]^w = \lambda f_{x,w} \cdot \lambda x_c . \forall w' \in \text{Dox}_x(w) \ [f(w') = f(w)] \]

For simplicity, Romero ignores the factivity of \( \text{know} \) and other considerations about the justification of the subject’s belief. I will also ignore these issues here.
Under this view, a simple CQ-sentence such as *John knows the capital of Italy* is analyzed as shown in (22) below.

\[(22)\]

\[\text{a. } \text{IP}\]

\[\text{John} \quad \text{VP}\]

\[\text{knows}_{\text{CQ}} \quad \text{DP-CQ} <s,e> \quad \lambda w. \, \text{tx}_c \{ x \text{ is cap-of-IT in } w \} \quad \text{the capital of Italy}\]

\[\text{b. } [\text{John knows the capital of Italy}]^w = 1 \text{ iff } \forall w' \in \text{Dox}(w) [\text{tx}_c \{ x \text{ is cap-of-IT in } w' \} = \text{tx}_c \{ x \text{ is cap-of-IT in } w \}]\]

According to (22)b, *John knows the capital of Italy* is true at the world w iff the IC “capital of Italy” yields the same value at w as it does at John’s doxastic alternatives to w.

Turning now to copular sentences, Romero assumes that the copula in English is not always semantically vacuous (as in the case of PRs), but it can denote a special copula of identity, or specification, which requires that its second argument denote an IC. Thus, a simple SPs such as *The capital of Italy is Rome* is analyzed as in (23) below.\(^6\)

\[(23)\]

\[\text{IP}\]

\[\lambda w. \, \text{tx}_c \{ x \text{ is cap-of-IT in } w \} \quad \text{DP-SS} \quad \text{the capital of Italy} \quad i_{\text{SPEC}} \quad \text{Rome} \quad \text{VP}\]

\[(24)\] \[\text{[] [BE}_{\text{SPEC}}] \; ^w = \lambda z \, \lambda f_{<s,e>}. \, [f(w) = z]\]

\[(25)\] \[\text{[The capital of Italy is}_{\text{SPEC}} \; \text{Rome]} \; ^w = 1 \text{ iff } \text{tx}_c \{ x \text{ is cap-of-IT in } w \} = \text{Rome}\]

Summing up, three types of sentences have been discussed: PRs (*Rome is pretty/the capital of Italy*), SPs (*The capital of Italy is Rome*) and CQ-sentences (*John knows the capital of Italy*). PRs are just-run-of-the-mill predicative clauses with a referential subject, a predicative object and a semantically vacuous copula. SPs are a special kind of equative statements, with an IC-denoting subject, a referential object and Romero’s copula of specification (BE\text{SPEC}). Finally, following Heim (1979) and Romero (2005), CQs denote ICs and CQ-embedding predicates require a separate lexical entry that selects for ICs. These assumptions are summarized in (26) below.

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\(^6\)Romero’s analysis of simple SPs is very similar to Montague’s treatment of identity statements like *The temperature is ninety*. However, while in Montague’s analysis the be of identity equates the value of two ICs at the actual world, the post-copular one being a rigid concept, Romero’s BE\text{SPEC} is asymmetric, requiring only its second argument to denote an IC. Presumably, Romero’s analysis will have to rely on a third lexical entry for the copula (aside from BE\text{PRED} and BE\text{SPEC}), to account for identity statements such as *Cicero is Tully*. Perhaps then, a cross-categorial denotation of Montague’s copula of identity (BE\text{ID}: \(\lambda x, \lambda y. \, y = x\)) would be a more economical choice, since it could account for both SPs and true identity statements. However, the resolution of this issue does not have an impact on the account proposed here. As long as SP-subjects denote non-rigid ICs, the issue of whether the post-copular DP denotes a constant concept or an individual, and whether we should adopt Romero’s BE\text{SPEC} or Montague’s BE\text{ID} does not really matter here.
4. Recasting Greenberg’s ambiguity

Let’s now return to our original task, which was to explain why a sentence containing an embedded *wh*-question such as (27)a is ambiguous while its CQ-counterpart in (27)b is not ambiguous in the same way.

(27) a. The Dean discovered who our favorite candidate (for the job) is.
   b. The Dean discovered our favorite candidate (for the job).

Before providing an account of the contrast between (27)a-b, I’d like to suggest that the ambiguity of embedded copular questions discussed by Greenberg is an ambiguity of the specificational/predicational kind and that the PR-variant only is compatible with a transparent reading of the subject of the copular clause (*our favorite candidate*). The scenario below brings out the SP-reading of (27)a.

(28) **Scenario 1 (SPECIFICATIONAL)**

We are having a job search and our favorite candidate for the job is Dr. Brown. However, since the issue is not fully set yet, we do not want to inform the Dean yet. Suppose rumors spread and the Dean finds out that our favorite candidate for the job is Brown.

(29) a. The Dean discovered who our favorite candidate is (**It is** Brown).
   b. Intended reading (**SP**): The Dean discovered that our favorite candidate is Brown.

Under the SP-reading, the expression *our favorite candidate* is obligatorily opaque, in the sense that the Dean must know that our actual favorite candidate is our favorite candidate. However, as Heim and Greenberg point out, a sentence like (27)a has an additional reading, according to which the Dean has simply found out some essential fact about the person referred to as our favorite candidate (without knowing that he is our favorite candidate). To bring out this reading, we need a more complex scenario, like the one given in (30) below.

(30) **Scenario 2 (PREDICATIONAL-TRANSPARENT)**

Our top candidate for the job is Brown. Brown is secretly the chief editor of a paper that has frequently attacked the Dean. The committee members know about this and don’t care, but hope that the Dean would not find out about Brown’s secret identity. The second job-candidate on the shortlist (Smith) works with Brown at the paper and knows that he is the editor responsible for the articles against the Dean. Suppose Smith finds out that Brown is the first person on the shortlist and since he wants the job terribly, starts scheming against him. So, he arranges to have somebody go tell the Dean that the secret editor of the paper is Brown. In this way, he is certain that when the Dean would hear that Brown is the top candidate for the professorship, he would refuse to give him the job. Suppose that this has just happened: the Dean has
been informed that Brown is the secret editor, but he still does not know anything about the short-list or the job-candidates.

Given the scenario above, one member of the committee could utter (31)a to another member, with the intention of expressing what (31)b says.

\begin{enumerate}[\itemsep=0pt]
\item Unfortunately, the Dean found out/discovered who our top candidate is.
\end{enumerate}

b. Intended reading (PR): The Dean found out that Brown is the secret editor.

Under the PR-reading, the DP \textit{our favorite candidate} can be read transparently (in the sense that the Dean does not have to know that our favorite candidate is our favorite candidate) and, in fact, is read transparently in the above scenario.\footnote{One may be wondering whether a third reading (PR-opaque) exists. As a matter of fact it does, even though Greenberg and Heim did not talk about it. I will return to this reading in section 5.4.} Notice that CQs cannot have this reading: none of the sentences in (32) are appropriate in the PR-Transparent scenario.

\begin{enumerate}[\itemsep=0pt]
\item Unfortunately, the Dean discovered/found out our top candidate.
\item Unfortunately, somebody revealed to the Dean our top candidate.
\end{enumerate}

\begin{enumerate}[\itemsep=0pt]
\item Unavailable reading (*PR): The Dean discovered that Brown is the secret editor.
\end{enumerate}

\begin{enumerate}[\itemsep=0pt]
\item a. Unfortunately, the Dean discovered/found out our top candidate.
\item b. Unfortunately, somebody revealed to the Dean our top candidate.
\item c. Unavailable reading (*PR): The Dean discovered that Brown is the secret editor.
\end{enumerate}

\begin{enumerate}[\itemsep=0pt]
\item \textbf{Summary of the readings}
\item a. A discovered/found out who B is.
\item b. SP-reading: A discovered which person is B. It is x.
\item c. PR-reading: A discovered something crucial about the person B refers to. He is P.
\end{enumerate}

5. The Account

5.1 Outline of the proposal

I propose that the ambiguity of embedded copular questions such as (3)b and (27)a follows from the fact that these questions contain a copular clause $\left[\text{IP} \text{DP} \text{is} \_ t_1\right]$, which can have a specificational or a predicational representation, as illustrated in (34) below.

\begin{enumerate}[\itemsep=0pt]
\item \textbf{SP} ... $\lambda 1 \left[\text{IP} \text{our favorite candidate} \text{is}_{\text{SPEC}} t_1 \right]$
\item \textbf{PR} ... $\lambda 1 \left[\text{IP} \text{our favorite candidate} \text{is}_{\text{PRED}} t_{\text{SPEC}} \right]$
\end{enumerate}

The SP-structure corresponds to the resolution of the question “Which x is our favorite candidate?” Here, \textit{who} ranges over individuals and the copula is Romero’s \textit{BE}_{\text{SPEC}}. The PR-structure corresponds to the resolution of the question “Which identifying property does our favorite candidate have?”. Here, \textit{who} ranges over ICs instead of over individuals and the copula is \textit{BE}_{\text{PRED}}. Since \textit{BE}_{\text{PRED}} selects for a property-argument, the trace gets shifted into an identifying property by the type-shifter IDENTIFY, which is just a categorial variant of Partee’s type shifter IDENT.\footnote{Because in the PR-structure, the definite description (our favorite candidate) is used referentially, this LF is compatible with a transparent reading of...}
the subject of the copular clause (DP1), hence the Dean does not have to know of our actual favorite candidate that he is our favorite candidate. Finally, following Heim and Romero’s proposal that CQs are just individual concept-denoting DPs, we expect them to lack the ambiguity caused by the copula in their full-fledged question counterparts.

Before spelling out the account, let me briefly point out that the syntactic structures I will employ contain silent pronouns that denote variables ranging over possible worlds (indexed items of the form \( w_1, w_2, \ldots \)) and variable abstractors over world variables (indexed items of the form \( \lambda w_1, \lambda w_2, \ldots \)). Following Percus (2000), I assume that world pronouns obey strict locality conditions, i.e. they must be bound by a matrix binder or a closer binder when available. I also assume that world pronouns are generated as sisters to all lexical predicates (von Fintel & Heim 2008).

### 5.2 Unambiguous CQs

As anticipated, the lack of ambiguity for CQ-sentences follows from the fact that these sentences are structurally unambiguous. The LF of (27)b would then be (35) below. Following standard rules of semantic composition, and ignoring the semantic contribution of the past tense, we arrive at the truth-conditions in (36) below. The formula in (36) expresses the SP-reading, according to which the Dean now knows which person is our favorite candidate. Here, I am assuming that the meaning of \( \text{discover}_{\text{CQ}} \) is the same as \( \text{know}_{\text{CQ}} \) with the additional presupposition that the subject did not know the value of the concept at a time \( t \) preceding the utterance time, (for simplicity, time variables are not represented at LF).

\[
\begin{align*}
\text{(35)} & & \text{IP} \\
& & \lambda w_0 \text{ IP} \\
& & \text{The Dean } w_0 \text{ VP} \\
& & \text{discovered}_{\text{CQ}} w_0 \text{ DP-CQ } \langle s, e \rangle \lambda w. \ 1x, [\text{fav-candidate}(x)(w)] \\
& & \text{our favorite candidate}
\end{align*}
\]

---

8 One may be wondering why I did not assume that \( \text{who} \) in the PR-structure ranges over properties directly. The reason is that there is independent evidence for allowing \( \text{who} \) to range over ICs, as shown by the fact that we can sometimes answer a \( \text{who} \)-question with an IC-denoting expression, as in (i) below. On the other hand, in order to argue that \( \text{who} \) can also range over properties, we would have to provide an explanation of why it is not possible to answer a \( \text{who} \)-question with a predicate, as in (i)b. However, assuming we find a satisfying answer to this question, the account can be easily amended.

(i)  
\[ \begin{align*}
\text{a. Who will win next election?} \\
\text{b. The candidate with the biggest campaign budget (whoever that will be).} \quad \text{(Engdahl 1986)}
\end{align*} \]

(ii)  
\[ \begin{align*}
\text{a. Who will win next election?} \\
\text{b. #Smart} \\
\text{c. A smart person.}
\end{align*} \]

9 The reason why I am turning now to a system with overt world variable in the syntax is that it provides a handy way of discussing transparent/opaque ambiguities.

10 Romero’s denotation of \( \text{know}_{\text{CQ}} \) would then be relativized to a temporal parameter as well.
(36) \[ \text{[[The Dean discovered our favorite candidate]]}(w_0) = 1 \iff \\
\forall w' \in \text{Dox}_t(w_0) [\lambda x_e. [x \text{ is fav-candidate in } w'] = \lambda x_e. [x \text{ is fav-candidate in } w_0]] \]

(37) \[ \text{[[discover}_{CQ}]] = \lambda w. \lambda t. \lambda f_{<s,e>}. \lambda x_e. [\exists t' (t' < t) \land \\
\neg \text{[[know}_{CQ}]](w)(t')(f(x))]. \text{[[know}_{CQ}]](w)(t)(f(x)) \]

5.3 Specificational wh-Q

Our hypothesis is that the SP-reading of (27)a, repeated below, derives from an LF in which the copular clause inside the embedded question has a SP-structure.

(38) a. The Dean discovered who our favorite candidate is.
    b. Intended reading (SP): The Dean discovered which person is our favorite candidate.

The LF for (38)a is provided in (39) below, only relevant parts included. In this LF, the copula is Romero’s BE_{SPEC}, the DP in subject position denotes an IC and the trace is a bound variable of type e. Following standard assumptions (Heim & Kratzer 1998), movement of the wh-pronoun triggers the insertion of a \( \lambda \)-binder, which binds the trace at the bottom of the chain (for simplicity, who does not have semantic content here). Assuming a semantic analysis of questions à la Groenendijk & Stokhof (1982), the question operator in (40) applies to the predicate derived by abstraction to yield the question intension in (41).

(39) \[
\begin{align*}
\ldots & \quad \lambda w_1. \lambda x_e. [x = \iota z_e [\text{fav-candidate}(w_1)(z)]] \\
\lambda w_1 & \quad \lambda x_e. x = \iota z_e [\text{fav-candidate}(w_1)(z)] \\
\lambda 1 & \quad x_1 = \iota z_e [\text{fav-candidate}(w_1)(z)] \\
\lambda w. \iota z_e [\text{fav-candidate}(w)(z)] & \quad \text{our f. candidate} \\
& \quad \lambda f_{<s,e>}. f(w_1) = (x_1) \\
& \quad \text{is}_{SPEC} \lambda t_1 \quad \text{t}
\end{align*}
\]

(40) \[ \text{[[?]]} = \lambda w. \lambda w'. \lambda P_{<s,<t>,...}. [P(w') = P(w)] \quad \text{(Groenendijk & Stokhof, 1982)} \]

(41) \[ \text{[[Q}_{INT}]] = \lambda w. \lambda w'. [\lambda x_e. [x = \iota z_e [\text{f-candidate}(w')(z)]]] = \lambda x_e. [x = \iota z_e [\text{f-candidate}(w)(z)]] \]

The question intension in (41) creates a partition that groups together worlds in which the individual who is our favorite candidate is the same. Following Groenendijk & Stokhof again, I assume that the proposition-embedding verb discover, applies to the extension of \( \text{Q}_{INT} \) (a proposition). The resulting truth-conditions are given in (43) below.

(42) \[ \text{[[Q}_{EXT}]] = \text{[[Q}_{INT}]](w_0) = \lambda w'. [\lambda x_e. [x = \iota z_e [\text{f-candidate}(w')(z)]]] = \lambda x_e. [x = \iota z_e [\text{f-candidate}(w_0)(z)]] \]

(43) \[ \text{[[The Dean discovered who our favorite candidate is]]}(w_0) = 1 \iff \\
\forall w' \in \text{Dox}_t(w_0) [\lambda x_e. [x = \iota z [\text{f-candidate}(w')(z)]]] = \lambda x_e. [x = \iota z [\text{f-candidate}(w_0)(z)]] \]
What (43) above expresses is that the individual who is our favorite candidate in the actual world and the individual who is our favorite candidate in the Dean’s belief worlds are one and the same individual. Hence, the Dean knows that Brown is our favorite candidate (the meaning component having to do with the Dean’s discovery of the fact is encoded as a presupposition in the lexical entry of *discover*). As the reader can see, the meaning just derived is equivalent to the meaning of the CQ-sentence.

### 5.4 Predicational wh-Qs

Let’s turn now to the PR-reading of (27)a, repeated below. Our hypothesis is that the reading paraphrased in (44)b derives from an LF in which the copular clause inside the embedded question has a PR-structure and the subject of the clause is interpreted transparently.

(44) a. The Dean discovered who our favorite candidate is.

   b. Intended reading (PR): The Dean discovered something crucial about the person referred to as “our favorite candidate” (i.e. that he is the secret editor).

The LF for (44)a is provided in (45) below, only relevant parts included. In this LF, the copula is the intensional BE\textsubscript{PRED} in (46), the DP in subject position is referential and the trace is a bound variable of type \(<s,e>\). Since BE\textsubscript{PRED} needs to combine with a property, the trace must be shifted into a property of individuals via IDENTIFY ((46)). Like before, movement of the *wh*-pronoun triggers the insertion of a \(\lambda\)-binder, which binds the trace at the bottom of the chain. The PR-structure has some crucial consequences with respect to the indexing of the world variables. Following Percus (2000), I assume that only the world variable selected by the verb must be bound by the most local binder (Generalization X), while the world variable in the DP subject (*our favorite candidate*) could be bound either locally, or by a higher binder. Because of these two possible co-indexations, an application of the (categorial variant of) Groenendijk & Stokhof’s question operator in (48) will yield two possible question intensions, as shown in (49).

(45) …

\[ \lambda w_1. \lambda f_{<s,e>}. [f(w_1) = tx. [\text{fav-candidate}(w_{1/0})(x)]] \]

\[ \lambda w_1. \lambda f_{<s,e>}. [f(w_1) = tx. [\text{fav-candidate}(w_{1/0})(x)]] \]

\[ \lambda f_{<s,e>}. [f(w_1) = tx. [\text{fav-candidate}(w_{1/0})(x)]] \]

\[ \lambda f_{<s,e>}. [f(w_1) = tx. [\text{fav-candidate}(w_{1/0})(z)]] \]

\[ \lambda f_{<s,e>}. [f(w_1) = (x)] \]

\[ \lambda x. f_i(w_i) = (x) \]

\[ \lambda x. f_i(w_i) = (x) \]

\[ \lambda w. \lambda x. f_i(w_1) = (x) \]

\[ \lambda w. \lambda x. f_i(w_1) = (x) \]

\[ \text{IDENTIFY} f_{i,<s,e>} \]

\[ \text{IDENTIFY} f_{i,<s,e>} \]

\[ \text{IDENTIFY} f_{i,<s,e>} \]

\[ \text{IDENTIFY} f_{i,<s,e>} \]

\[ \text{IDENTIFY} f_{i,<s,e>} \]

---

11 Here too, I assume that proposition-embedding *discover* is just like *know* with the additional presupposition that the attitude holder did not know the proposition expressed by *Q\textsubscript{EXT}* at a time \(t\) preceding the utterance time. For simplicity, reference to the time variables is left implicit in the formulae.
(46) \([\text{BE}_{\text{PR-OP}}]\) = \(\lambda w. \lambda p_{s,e,t}. P(w)\)

(47) \([\text{IDENTIFY}]\) = \(\lambda f_{s,e}. \lambda w. \lambda x_e. f(w) = x\)

(48) \([?]\) = \(\lambda w. \lambda w'. \lambda p_{s,e,t} . [P(w') = P(w)]\)

(49) \([Q_{\text{INT}}]\) = \(\lambda w. \lambda w'. [\lambda f_{s,e}. [f(w') = \iota x_e [\text{our-favorite-candidate}(w')(x)] = \lambda f_{s,e}. [f(w) = \iota x_e [\text{our-favorite-candidate}(w)(x)]]]\)

Depending on the choice of the \(\lambda w\)-binder, two question extensions are possible. Choosing the most local binder yields the question extension in (50), which I will call PR-opaque:

(50) \(Q_{\text{EXT1}}\) (PR-opaque)

\(\text{[[Q}_{\text{EXT1}}\text{]]} = \lambda w'. \text{[[f}(w') = \iota x_e \text{[our-favorite-candidate}(w')(x)] = \lambda f_{s,e} \text{[[f}(w) = \iota x_e \text{[our-favorite-candidate}(w)(x)]]}\)

Intuitively, \(Q_{\text{EXT1}}\) picks out the set of worlds in which the individual who is our favorite candidate in those worlds fits exactly the same descriptions that he fits in the actual world ("descriptions" is just an intuitive way of referring to ICs). To illustrate the kind of partition induced by \(Q_{\text{EXT1}}\), consider the toy model in (51), consisting of three concepts/descriptions and four possible worlds, \(w_0\) being the actual world.

(51) \(f_1:\) our favorite candidate \(f_2:\) the mean editor \(f_3:\) the Dean’s nephew

\(w_0\) b \(w_0\) b \(w_0\) c

\(w_1\) b \(w_1\) b \(w_1\) b

\(w_2\) b \(w_2\) b \(w_2\) a

\(w_3\) a \(w_3\) a \(w_3\) c

Given the circumstances described in (51), \(Q_{\text{EXT1}}\) picks out the set of worlds \(\{w_0, w_2, w_3\}\). \(w_1\) is out because the individual who is our favorite candidate in this world (b) fits a description he does not actually fit in \(w_0\) (i.e. he is also the Dean’s nephew), \(w_2\) is in because our favorite candidate in this world (b) fits all and only the descriptions he actually fits in \(w_0\); finally, \(w_3\) is also in because the individual who is our favorite candidate in this world (c) fits all and only the descriptions that our actual favorite candidate fits in \(w_0\). Thus, as the truth-conditions in (52) below show, (44a) would be true in our toy model iff the set of worlds consisting of the Dean’s doxastic alternatives to \(w_0\) is a subset of \(\{w_0, w_2, w_3\}\). Notice, that these truth-conditions do not produce the reading that we were after, instead they yield another possible PR-reading that we hadn’t noticed before. According to (52), our sentence is predicted to be true if, for example, the Dean found out that our favorite candidate (whoever that is) is the mean editor (whoever that is).

(52) \(\text{[[The Dean discovered who our favorite candidate is]]}(w_0) = 1 \iff \forall w' \in \text{Dox}_E(w_0) [\lambda f_{s,e} . [f(w') = \iota x_e [\text{our-favorite-candidate}(w')(x)] = \lambda f_{s,e} . [f(w_0) = \iota x_e [\text{our-favorite-candidate}(w_0)(x)]]]\)

(53) Reading with \(Q_{\text{EXT1}}\) (PR-opaque): The Dean discovered that our favorite candidate and the mean editor are the same person, but he does not know which person.

The other question extension obtains by co-indexing the world variable inside the DP-subject with the top-most binder, I will call this question extension PR-transparent:
(54) \(Q_{\text{EXT2}}\) (PR-transparent)

\[
[Q_{\text{EXT2}}] = \lambda w'. [\lambda f_{s,e}: [f(w') = \iota_x [\text{our-favorite-candidate}(w_0)(x)]] = \\
\lambda f_{s,e}: [f(w_0) = \iota_x [\text{our-favorite-candidate}(w_0)(x)]]]
\]

Intuitively, \(Q_{\text{EXT2}}\) picks out the set of worlds in which the set of descriptions that our actual favorite candidate fits in those worlds are exactly the same that he fits in \(w_0\). Assuming the toy model from before, it is easy to see that \(Q_{\text{EXT2}}\) picks out a different set of worlds, namely the set \(\{w_0, w_2\}\). Indeed, this time, we are only looking at our actual favorite candidate (Brown = b) and collect those worlds in which Brown fits exactly the same descriptions he fits in \(w_0\). So, \(w_1\) is out because, in this world, Brown is also the Dean’s nephew (a description he doesn’t actually fit), \(w_2\) is in because Brown fits exactly the same descriptions he fits in \(w_0\), whereas \(w_3\) is out because Brown does not even exist in this world. Now, if the set of worlds consisting of the Dean’s doxastic alternatives to \(w_0\) is a subset of \(\{w_0, w_2\}\), i.e. if he believes the proposition expressed by \(Q_{\text{EXT2}}\), the sentence should be true. According to our hypothesis, this should give us the PR-reading that we were after. Is that so? Not quite. Take a look at the predicted truth-conditions in (55) below:

(55) \([\text{The Dean discovered who our favorite candidate is}]\) \((w_0) = 1\) iff

\[
\forall w' \in \text{Dox}_{\text{ext}}(w_0)(\lambda f_{s,e}: [f(w') = \iota_x [\text{our-favorite-candidate}(w_0)(x)]] = \\
\lambda f_{s,e}: [f(w_0) = \iota_x [\text{our-favorite-candidate}(w_0)(x)]]]
\]

According to the truth-conditions in (55), (44)a is true iff the Dean found out that Brown (our actual favorite candidate) has all the descriptions he actually has, including the description of being our favorite candidate! This is clearly not the reading paraphrased in (44)b. The reading we want to predict, instead, is a reading according to which the Dean found out about Brown that he fits a description he actually fits. Which one? The one that the Dean was not supposed to find out (in our PR-scenario, the description “the mean editor”).

It seems to me that the problem we found is more general and may not turn out to be a problem just for this particular analysis. Consider the following scenario:

(56) John and Mary recently split up and are avoiding each other. Suppose I know this, but I nevertheless, decide to invite them both to my party. Now, suppose that the following dialogue takes place between my friend A and me.

A: John said he is not coming to your party.
Me: Why?
A: Cause he found out who is coming.

It is clear that for the sentence he found out who is coming (to the party) to be true in this context, John does not need to know of all the people who are coming to my party that they are coming, which is what (57) would require. Instead, what A’s sentence conveys is that John found out that Mary is coming.

(57) \([\text{John found out who is coming to the party}]\) \((w_0) = 1\) iff

\[
\forall w' \in \text{Dox}_{i}(w_0)(\lambda x. [\text{coming-to-party}(w')(x)] = \lambda x. [\text{coming-to-party}(w_0)(x)]
\]
Now the question to ask is the following. In order to capture the PR-transparent reading in (44)b, would it be possible to restrict the domain of ICs to include just the relevant concept (the mean editor) in the same way that, in the party scenario, we restrict the domain of salient individuals to contain just Mary? If one can do that, then the truth-conditions in (55) correctly characterize the PR-transparent reading paraphrased in (44)b.

To wrap up, I proposed to derive the ambiguity of embedded copular questions discussed by Heim (1979) and Greenberg (1977) from the independently motivated ambiguity of copular clauses, which can have either a specificational or a predicational interpretation. Under the view adopted here, PRs and SPs project different structures with different binding possibilities for the world variables at LF. In particular, it follows from the analysis that the PR-structure only is compatible with a transparent reading of the subject of the copular clause (our favorite candidate). Whereas, assuming that both SP-subjects and CQs denote ICs, a (completely) transparent interpretation of these DPs is ruled out.

6. Conclusions

In this paper, I proposed an account for a truth-conditional contrast between CQs and their full-fledged question counterparts, known as Greenberg’s observation. Greenberg (1977) points out that a sentence containing a copular question, such as John discovered who the murderer of Smith is, has a reading which is absent from its CQ counterpart John discovered the murderer of Smith: while the CQ-sentence can only mean that John found out the identity of the murderer of Smith, the sentence with the embedded question can also mean that John discovered something crucial about the person the speaker refers to as the murderer of Smith. My proposal is that the ambiguity of embedded questions of the type who DP is derives from the fact that the copular clause [IP DP is t] can have either a specificational or a predicational representation and that only the predicational variant is compatible with a transparent reading of the subject. On the other hand, following Heim (1979) and Romero (2005)’s proposals that CQs are just individual concept-denoting DPs, the analysis predicts them to lack the ambiguity caused by the copular clause in their full-fledged counterparts.

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Additivity in the Domain of Eventualities (or: Oliver Twist's more)

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Abstract

This paper examines the English additive particle more (more_{add}), in both its 'nominal' and 'verbal' uses (as in I read 3 more books and I ran 3 kilometers more, respectively). It makes a number of novel observations, showing that 'nominal' more_{add}, obeys constraints in both the nominal and the verbal domains and suggests that this particle denotes a derived additive measure function on eventualities, using a homomorphism form eventualities to their individual participants. The analysis can account for a number of distributional and interpretational constraints on nominal more_{add}. The paper further shows how the analysis can be extended to verbal more_{add} and proposes that it denotes an additive measure function too, which can be either derived, using a homomorphism (measuring the run time, or path of eventualities), or non-derived, (measuring the cardinality of eventualities directly). The analysis can account for a number of aspectual constraints on verbal more_{add}.

1 Introduction

The English particle more is usually discussed in the semantic literature with respect to its comparative meaning as in (1), with adjectives, or as in (2), with NPs:

(1) Mary is more intelligent than John (see e.g. Kennedy 1999, 2005)
(2) Mary bought more books than John (see Hackl 2001)

But more has another, additive, use. For example, when Charles Dickens' hero Oliver Twist says "Please sir, I want some more", he uses the additive, and not the comparative reading of more. I.e. he does not ask to get now more gruel than he got before, but rather to get some gruel now, in addition to what he got before. The difference between these readings can be seen clearly when we consider a sentence like (3), which is ambiguous between the comparative reading (today John interviewed more than 3 students (e.g. 4)), and an additive reading (today John interviewed additional students (perhaps only 1, or 2):

\[1\] Cf. Thomas 2009A and 2009B, who also analyzes this use of more, and calls it 'incremental'.

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Yesterday John interviewed three students. Today he interviewed more (students)

Other languages use a distinct lexical item for the additive reading. This is the case, for example, in French, Italian and Chinese (see Tovena & Donazzan 2008), German (see Umbach 2008) and Modern Hebrew (see Greenberg 2009C). In this paper, though, I concentrate on the additive use of the English more (more\textsubscript{add} henceforth).

In section 2 of this paper I examine some novel observations concerning the distribution and interpretation of more\textsubscript{add} and show that, despite its apparent 'nominal' nature, this particle obey constraints in both the nominal and verbal domains. In section 3 I present an analysis of the data, suggesting that nominal more\textsubscript{add} denotes a derived additive measure function on eventualities (following ideas in Krifka (1989, 1998), Moltmann (2004), Nakanishi (2007)). That is, it expresses indirect measurement of the development and growth of the sum of eventualities (in the assertion and presupposition), by measuring the sum of individuals participating in these eventualities (using a homomorphism from events to individuals). In section 4 I examine how the analysis accounts for the observations in section 1. Section 5 extends the analysis to verbal more\textsubscript{add} as in John slept some more and proposes that it denotes an additive measure function too, which can be either derived, using a homomorphism (measuring the run time, or path of eventualities), or non-derived, (measuring the cardinality of eventualities directly). Finally, section 6 summarizes the main claims made in the paper and examines several directions for further research.

1 Some novel observations

Consider (3), repeated here as (4), focusing on the additive reading:

(4)  (Yesterday John spoke with 3 students). Today he spoke with more (students)

Intuitively this sentence involves an assertion and a presupposition. It asserts that John spoke with some students today, and presupposes that there is another occasion where John interviewed students. This latter implication indeed survives under, e.g. questions and negations, as in (5):

(5)  a. Did John speak with more students today?
    b. It is not true that John spoke with more students today.

Notice that we get very similar assertion and presupposition with the much more well-studied additive particle too, as in (6):

(6)  (Yesterday John interviewed three students). Today he interviewed students too.

But the rest of the observations I will examine now are only true of more\textsubscript{add}. Among other things, unlike too, nominal more\textsubscript{add} has a double nature, as both 'nominal' and 'verbal'. Thus, on the one hand, it seems indeed to be nominal, as it is associated with a nominal predicate (e.g. students in (4)). Moreover, it obeys three constraints in the nominal domain: First, the nominal predicate in the assertion should be present in the presupposition as well. For example, in the context of (7a), (7b) sounds infelicitous on the additive reading, and has a salient comparative reading (where I bought more than three carrots):
ADDITIVITY IN THE DOMAIN OF EVENTUALITIES

(7) a. I bought 3 apples this morning.
   b. Later on I bought more carrots.

   Notice that this constraint holds even if we do not explicitly mention the nominal predicate before. For example, a strong implication of (8) is that John is a teacher:

(8) Mary spoke with John. Tomorrow she will speak with some more teachers.

   Unlike more_{add}, too is not subject to this constraint. For example, (9b) is perfectly felicitous in the context of (9a), and (10) does not implicate that John is a teacher:

(9) a. I bought three apples this morning.
   b. Later on I bought carrots too.

(10) Mary spoke with John. Tomorrow she will speak with teachers too.

The second 'nominal' constraint on nominal more_{add} is that the individuals in the denotation of the nominal predicate in the assertion and presupposition should be different. For example, (11) implies that John and Mary spoke with different students. Again, we do not find this implication with too. For example, in (12), some, or even all students that Mary spoke with can be the same students John spoke with:

(11) Yesterday John spoke with 4 students. Today Mary spoke with 4 more students.
(12) Yesterday John spoke with 4 students. Today Mary spoke with 4 students too.

   Finally, nominal more_{add} can be modified by numerals or by other measure phrases (2 liters, 2 kilos), as in (13), respectively, but not by measure phrases like 12 carat, 10 degrees, as in (14):

(13) a. John drank 2 liters of water, and then one liter more.
   b. I've already bought 3 kilos of potatoes. I will buy 2 kilos more later on.

(14) a. Yesterday John bought 10 carat gold. #Today he bought 12 carat more.
   b. 30 degree Celsius water was spilled on the carpet. #10 degree Celsius more was spilled on the bed.

   Despite this 'nominal' nature of more_{add}, however, it is also subject to three constraints in the verbal domain (the domain of eventualities). First, the eventuality in the presupposition should not occur later than the one in the assertion. For example, unlike (4), repeated here, which is ambiguous between the comparative and the additive readings, the minimally contrasting (15) has a comparative reading only. In contrast, too is not subject to this constraint, as can be seen from the felicity of (16):

(4) (Yesterday John interviewed three students). Today he interviewed more (students) (comparative / additive)

(15) Today John interviewed three students. Yesterday he interviewed more (students). (comparative / # additive)

(16) Today John interviewed three students. Yesterday he interviewed students too.

   Notice that the presupposed eventuality with more_{add} need not be temporally prior to the
asserted one: It can also hold at the same time, e.g. unlike (4), (17) is felicitous under the additive reading:

(17) This morning Danny interviewed 3 students in his office. At the same time Susan interviewed more students in the library (comparative / additive)

It seems, then, that $more_{add}$ requires that there is some eventuality, which is not later than the asserted eventuality, and which involves different members of the same nominal predicates.

Second, unlike the nominal predicates, the verbal predicates in the assertion and presupposition of $more_{add}$ can differ. But this can only happen if these predicates can be characterized by a common, 'superset' verb (see also Tovena & Donazzan (2008) for a similar observation). E.g. consider the contrast between (18) and (19):

(18) a. John baked 3 cakes for the party. Mary will buy one more ('prepare cakes')
   b. Today I found 4 coins. I received 2 more from my father. ('got coins')

(19) a. John baked 3 cakes for the party. #Mary will eat one more
   b. I found 4 coins on the ground. #Then I lost 2 more

Thomas 2009A attempts to explain this constraint by analyzing $more_{add}$ as focus sensitive, and by assuming that the verbal predicates the presupposition of $more_{add}$ should be a member of the set of contextually relevant alternatives which constitute the focus semantic value of the verbal predicate in the assertion. This suggestion, however, does not seem to work for at least two reasons. First, it predicts that the focused element in the sentence is the verbal predicate. Although we can get such a focus pattern when we intend to express contrast, in the more usual case we get a different focus pattern where $more_{add}$ itself is stressed, together with various other elements in the sentence (but not the verbal predicate), which get a (rise-) fall-rise intonation, i.e. a 'topic-focus'-like intonation:

(20) a. John spoke with 3 students [Sara]$_{TF}$ interviewed some [more]$_{F}$
   b. Today I spoke with 3 students. [Tomorrow]$_{TF}$ I will interview some [more]$_{F}$
   c. In the box there are 10 cookies. [In the oven]$_{TF}$ there are 4 [more]$_{F}$

In addition, even if the non-stressed verbal predicates are considered focused, thus triggering a set of alternatives, this cannot explain the infelicity in (19). This is because the constraints on $more_{add}$ are much stricter than what we usually find with focused predicates. In the latter case the alternatives in the focus semantic value are only required to belong to a contextually relevant set, and not necessarily to be subsumed under a 'superset' predicates. Thus, lost and found, or bake cakes and eat cakes, for example, can be easily considered

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2 This makes the focus pattern of sentences with nominal additivity similar to that of sentences with involving contrastive topics, e.g. with too as in (i) (see e.g. Krifka 1999)

(i) a. Today Danny bought books. [Tomorrow]$_{TF}$ he will buy books [too].
   b. Today Danny bought books. [Mary]$_{TF}$ will buy books [too].

Notice, however, that Umbach 2008 claims that German correlate of $more_{add}$, noch, can come with another focus pattern: where noch is not focused, and the nominal predicate in the assertion is focused, and differs from the one in the presupposition, unlike what seen in (7) and (8) above. In English such a focus pattern seems possible as well:

(ii) "Danny spoke with a few teachers. [Laer on]$_{F}$ he spoke with some more [students]."

Further research should examine how the analysis proposed below for moreadd can be applied to both focus patterns.
members of the same focus semantic value. Indeed, such predicates can naturally appear in the assertion and presupposition of real focus sensitive particles, like *only* as in (21):

(21)  
   a. John baked the cakes. I only ate them
   b. John finds money. I only lose money

The contrast on the variability of the verbal predicates with \( \text{more}_{\text{add}} \) then, cannot be derived from its focus sensitivity. Instead I propose that it results from the fact that the operation of nominal \( \text{more}_{\text{add}} \) is not only to add or sum individuals (e.g. the students spoken to in (4)), but also to add and sum the *eventualities* in the assertion and presupposition. In the case of e.g. (18a) and (18b), the eventualities can be summed, although they are in the denotation of two different verbal predicates, since they can be also thought of as being in the denotation of a single ('superset') verbal predicate (e.g. 'prepare cake' and 'got coins', respectively). But when no such common predicate can be found, (as in (19a) and (19b)), the presupposed and asserted eventualities cannot be summed, and we get infelicity.

Finally, notice that sentences like (22a) and (22b) are infelicitous on the additive reading, although the verbal predicates in the assertion and the presuppositions are the same:

(22)  
   a. I have many friends who are busy writing papers. John has written 5 papers. Mary has written more (papers) (comparative / # additive)
   b. I baked 3 cakes for my son's birthday party. A woman I know in New Yorked baked more (cakes) for her son's birthday party (comparative / # additive)

In contrast, minimally contrasting sentences with *too* are perfectly felicitous:

(23)  
   a. I have many friends who are busy writing papers. John has written 5 papers. Mary has written papers too
   b. I baked three cakes for my son's birthday party. A woman I know in New York baked cakes for her son's party too

Why is \( \text{more}_{\text{add}} \) infelicitous in (22)? It seems that the presupposed and asserted eventualities particle cannot be too 'unrelated'. In particular, they need to be summed together not only to yield a plural eventuality, but also to one which can be intuitively considered 'more developed'. This does not seem to happen in (22a,b): Two eventualities of writing papers by two unrelated individuals, or baking cakes by different people, in different places, for different parties, are not perceived as leading to some more developed eventualities, only to plural ones with more participants (more papers, more cakes). Indeed, in the following contexts, where the summed eventuality *can* be considered 'more developed' the additive reading is much better:

(24)  
   a. (Context: John and Mary work in the same research project, and they are supposed to write the annual report. John has written 5 papers. Mary has written more (papers) (additive reading possible)
   b. (Context: Some rich man suggests donating a certain sum of money for poor children for every birthday cake baked in the world) I baked three cakes for my son's birthday party. A woman I know in New York will bake more (cakes) for her son's party (additive reading possible)

To summarize, we observed that the additivity expressed by \( \text{more}_{\text{add}} \) differs from that of *too*. More importantly, we saw that nominal \( \text{more}_{\text{add}} \) has a double nature: it is subjects to
constraints in both the nominal and the verbal domains, and it seems to express summing of both individuals and eventualities in the assertion and presupposition. In addition to capture each of the constraints above, then, the main challenge we are facing is to find a way to capture this double nature.

2 An analysis in terms of a derived measure function on eventualities

I suggest that through the addition and growth of the nominal set (the set of individuals) nominal \textit{more}\textsubscript{add} expresses addition, development and growth in the domain of eventualities. More precisely, it denotes a \textit{derived additive measure function} on eventualities (for a similar measurement-based analysis of \textit{more}\textsubscript{add}, see Thomas (2009A) and (2009B)).

Let me start with some background terminology. First, following Schwarzschild (2002) and Nakanishi (2007) I take a measure function (\(\mu\)) to be a nonevent measurement scheme, like \(\mu\):cardinality, \(\mu\):spatial length, \(\mu\):volume, etc. Such a function is used, for example, in Nakanishi's 2007 interpretation of (25) in (26) (with \(\mu\):spatial length):

\begin{align*}
(25) & \text{Two meters of rope} \\
(26) & \lambda x. \text{rope}(x) \land \mu(x) = 2 \text{ meters (\(\mu\):spatial length)}
\end{align*}

An additive or a monotonic measure function (to use Krifka's (1998) and Schwarzschild's (2002), respectively) is such that if \(f(x) = d_1\) and \(f(y) = d_2\) then \(f(x+y) = d_1 + d_2\). Nonadditive (or nonmonotonic) measure functions are those where this condition does not hold. Intuitively, nominal \textit{more}\textsubscript{add} has an additive component, e.g. (27a) says that the cardinality of the cookies that John ate is altogether 4+3=7, and (27b) says that the weight of the potatoes that John bought is altogether 5 kilos:

\begin{align*}
(27) & \text{a. John ate 4 cookies in the morning, and 3 more in the afternoon} \\
& \text{b. John bought 3 kilos of potatoes in the morning, and 2 more in the afternoon}
\end{align*}

This additivity component, however, is not enough to capture the fact observed above, that \textit{more}\textsubscript{add} is subject to constraints in the eventuality domain, and seems to sum eventualities as well. To capture that we look at the notion of \textit{derived measure functions} (\(\mu'\)) (Krifka 1998, Nakanishi 2007), namely those functions which indirectly measure elements in a certain domain by measuring elements in another domain, homomorphically related to the first domain. Such functions are expressed, for example, by adverbial measure phrases as in (28) and (29):

\begin{align*}
(28) & \text{John walked \textbf{two meters}.} \\
(29) & \text{John walked \textbf{for 10 minutes}}
\end{align*}

Krifka (1989, 1998) claims that such expressions do not measure the events directly. This is because events themselves do not have spatial or temporal length, only their spatial paths and run times do. To get from events to run time or from events to paths. We use a homomorphism, \(h\). Thus, derived measure functions - \(\mu'\) – indirectly measure events by measuring the range of a homomorphism on events: \(\mu(h(e))\). For example, in (28) and (29)
the measure functions measure the ranges of the homomorphisms from events to their spatial path and their run time, respectively.

Nakanishi (2007), claims that derived measure functions are also relevant for the interpretation of split measure phrases in Japanese, which measure individuals, but are subject to constraints in the domain of eventualities (similarly to what observed with the nominal more\textsubscript{add}). Hence, such measure phrases also involve derived measure functions: They indirectly measure eventualities, by measuring the range of a homomorphism from events to their individual participants. E.g. the interpretation of the Japanese split measure construction in (30) would be (31):

(30) Gakusei-ga ie-ni san-nin kaet-ta (koto) student-NOM home-to three-CL go-PAST "Three students went home"

(31) \(\exists e \exists x [*\text{boy}(x) \land \text{Ag}(e) = x \land \text{*went} \text{home} (e) \land \mu(h(e)) = 2 \text{individuals}]\) "There is a (plural) walking home eventuality, whose agent is boys, and the cardinality of the individuals participating in this eventuality is 3 individuals".

I will now integrate the idea of an additive measure function, and a derived measure function, and suggest that nominal more\textsubscript{add} involves a DERIVED ADDITIVE measure function. More specifically, following ideas about the syntax and semantic type of nonoverlaid measure functions in Schwarzschild (2002) and Nakanishi (2007), I propose that nominal more\textsubscript{add} is an overt lexicalization of a derived additive measure function \(\mu\) which first combines with a degree phrase, type \(d\) (e.g. 3 or 3 kilos), then with a nominal predicate, type \(<e,t>\) (e.g. \(\text{boys} / \text{potatoes}\)), and then with a verbal relation (type \(<e, v,t>\), where \(v\) is the type of eventualities). Hence the type of nominal more\textsubscript{add} is \(<d,<e,t>\), \(<<e, v,t>>\), \(<v,t>>\), and its denotation is as in (32):

(32) Nominal more\textsubscript{add} \(\lambda d_1, \lambda Q_{<e,t>}, \lambda P_{<e,<v,t>}, \lambda e_{1v} \). \(\exists x \ [Q(x) \land P_1(x)(e_1) \land \mu(h(e_1)) = d_1 \land \exists e_2, P_2, d_2, y \ [P_2(y)(e_2) \land Q(y) \land \mu(h(e_2)) = d_2 \land \tau(e_2) \leq \tau(e_1) \land \exists e_3, P_3, z \ *P_3(z) (e_3) \land e_3 = e_1 + e_2 \land Q(z) \land z = x+y \land \mu(h(e_3)) = d_1 + d_2 \land e_3 > \text{developed} e_1 ]\)

In (32) \(h\) is a homomorphism from eventualities to individuals, the asserted eventuality is \(e_1\), and there are two presuppositions (underlined): the first concerns the presupposed eventuality, \(e_2\), and the second concerns the sum of \(e_1\) and \(e_2\) (\(e_1 + e_2\)), i.e. \(e_3\). To illustrate how this definition works, consider the compositional derivation of (33), in (34) (to simplify the derivation I add the presupposition at the beginning and the end of the derivation only):

(33) 4 children sang. 3 more children danced.

(34) Derivation of Three more\textsubscript{add} boys danced:

\(3 \text{d} \rightarrow 3 \text{individuals}\)

more\textsubscript{add} \(\rightarrow \lambda d_1, \lambda Q_{<e,t>}, \lambda P_{<e,<v,t>}, \lambda e_{1v} \). \(\exists x \ [Q(x) \land P_1(x)(e_1) \land \mu(h(e_1)) = d_1 \land \exists e_2, P_2, d_2, y \ [P_2(y)(e_2) \land Q(y) \land \mu(h(e_2)) = d_2 \land \tau(e_2) \leq \tau(e_1) \land \exists e_3, P_3, z \ *P_3(z) (e_3) \land e_3 = e_1 + e_2 \land Q(z) \land z = x+y \land \mu(h(e_3)) = d_1 + d_2 \land e_3 > \text{developed} e_1 ]\)

3 more\textsubscript{add} \(\rightarrow \lambda Q_{<e,t>}, \lambda P_{<e,<v,t>}, \lambda e_{1v} \). \(\exists x \ [Q(x) \land P_1(x)(e_1) \land \mu(h(e_1)) = 3 \text{individuals}]\)

3 more boys\textsubscript{add} \(\rightarrow \lambda P_{<e,<v,t>}, \lambda e_{1v} \). \(\exists x \ [*\text{boy} (x) \land P_1(x)(e_1) \land \mu(h(e_1)) = 3 \text{individuals}]\)
dance_{e,p} \rightarrow \lambda e. \text{dance}(e) \land \text{Agent}(e) = x

dance_{e,q,e,p} \rightarrow \lambda x. \lambda e. \text{dance}(e) \land \text{Agent}(e) = x \text{ (by predicate formation) (Rothstein 2001)}

3 more boys danced_{e,p} \rightarrow \lambda e_1. [\exists x [\exists \text{boy}(x) \land \text{dance}(e_1) \land \text{Agent}(e_1) = x \land \mu(h(e_1)) = 3 \text{ individuals}]]

3 more boys danced_{e,q,e,p} \rightarrow \exists e_1 \exists x [\exists \text{student}(x) \land \text{dance}(e_1) \land \text{Agent}(e_1) = x \land \mu(h(e_1)) = 3 \text{ individuals} \land \exists e_2, P_2, d_2, y [P_2(y)(e_2) \land \exists \text{boy}(y) \land \mu(h(e_2)) = d_2 \land \tau(e_2) \leq \tau(e_1) \land \exists e_3 \exists P_3, z \exists P_3(z)(e_3) \land e_2 = e_1 + e_2 \land \text{boy}(z) \land z = x + y \land \mu(h(e_3)) = 3 \text{ individuals} + d_2 \land e_3 > \text{developed } e_2] ]

In prose: (34) asserts that there is a dancing eventuality, e_1, whose agent is a plural individual boy, and the cardinality of this agent of e_1 is 3 individuals. It has the following two presuppositions: (A) There is an eventuality e_2, in the denotation of a verbal predicate P_2 (not necessarily 'dancing'), whose run time is prior or equal to that of e_1, and it has a plural individual boy as an agent. The cardinality of this e_2 event is some degree d_2, i.e. some number of individuals. (B) There is an eventuality e_3, which is the sum of e_1 and e_2, in the denotation of a verbal predicate P_1 (e.g. perform), the agent of e_3 is the sum of the agents of e_1 and e_2 in the denotation of boy. The cardinality of the agent of e_3 is the sum of the cardinality of the agent of e_1, plus the cardinality of the agent of e_2, i.e. 2 individuals + d_2. And e_3 is more developed than e_2.

A direction for defining the last component (e_3 > \text{developed } e_2) is based on the observation that the distinction between felicitous and infelicitous sentences with more add, as in (22) vs. (24) correlates with the possibility to paraphrase these sentences using a 'comparative correlative' (or 'conditional comparative') construction. In the infelicitous (22a,b) above, such paraphrases cannot be naturally made. In contrast, in the contexts in (24) these sentences can be paraphrased with comparative correlatives like (35) and (36):

(35) The more papers are written (for the research project), the more funding we get / the better the Dean thinks of the projects, etc.

(36) The more cakes are baked, the more money we have for poor children.

Based on Beck's (1997) modalized approach to conditional comparatives, we take an event e to be more developed than e' if (a) the number of participants of e in w_0 is higher than the number of participants in e', and (b) this higher number of participants leads to, or correlates with a change on a scale measuring another event or entity. More precisely, the following characterization of 'a more developed' eventuality is suggested:

(37) An event e is 'more developed' than an event e' (e > \text{developed } e'), iff
In w_0 e has a higher number of participants than e', and in all accessible worlds w', and w'', if the number of participants of e_3 in w' is higher than the number of participants of e_3 in w'', then there is another measure function, \mu', measuring another entity (eventuality or individual) x, such that \mu'(x) in w' > \mu(x) in w''

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3 This is in contrast to the characterization given in Greenberg (2009B), in terms of the 'stage-of' relation.
3 Some Consequences of the analysis

The analysis of nominal \textit{more} \textit{add} above can directly account for some of the observations made in section 1, including the invariability of the nominal predicate in the assertion and presupposition (Q in (32)), the potential variability of the verbal predicates (P\textsubscript{1} and P\textsubscript{2} in (32)), the temporal constraint on the asserted and presupposed eventualities (\(\tau(e) \leq \tau(e)\)), and the 'more developed' constraint on the summed eventuality (written as \(e \geq_{\text{developed}} e\)).

In addition, the analysis can more indirectly account for other observations. First, we can now explain the contrast in measure phrases compatible with \textit{more} \textit{add} illustrated again in (38):

\begin{enumerate}
  \item 3 Liters of water spilled on the carpet. 2 liters more was spilled on the bed.
  \item 30 degree Celsius water was spilled on the carpet. #10 degree Celsius more was spilled on the bed
\end{enumerate}

The distinction between measure phrases like \textit{3 kilos / 3 liters} as opposed to \textit{12 carat / 10 degrees Celsius} has already been shown to play a role in the felicity of pseudo-partitive constructions (Krifka 1989, 1998 Schwartzschild 2002), as in (39):

\begin{enumerate}
  \item 3 liters of water / 3 kilos of potatoes
  \item #30 degree Celsius of water / #12 carat of gold
\end{enumerate}

According to Krifka (1989, 1998) \textit{3 liters} is an \textit{additive} measure phrase, whereas \textit{20 degree Celsius} is not additive: 3 liters of water + 2 liters of water = 5 liters of water, but 20 degree water + 10 degree water \(\neq\) 30 degree water. Given this distinction we can attribute the infelicity of (39b) to the fact that the additivity requirement in the presupposition of \textit{more} \textit{add} (\(\mu(h(e)) = d_1 + d_2\)) cannot be met with nonadditive measure phrases.

A second consequence of the definition above concerns the observation above, that an implication of a sentence like (40) is that Mary spoke with different students:

\begin{enumerate}
  \item Yesterday John spoke with 4 students. Today Mary spoke with 3 more students
\end{enumerate}

This implication follows from the additivity component too. Krifka (1998) and Moltmann (2004) already took nonoverlap as a precondition on additivity. In our case, for example, if even one of the students that Mary spoke with was also a student that John spoke with, then the number of students participating in \(e_3\) is not 4+3=7. I.e. the additivity presupposition fails.

Finally, the claim that \textit{more} \textit{add} always denotes a (derived and additive) measure function, and combines with a degree phrase seems problematic when we consider sentences like (41), where there is no measure phrase, and we don't know anything about the precise degree measuring the number of individuals participating in the interviewing eventuality:

\begin{enumerate}
  \item Yesterday John interviewed some students. Today he interviewed (some) more
\end{enumerate}

I suggest that in such cases the degree argument that \textit{more} \textit{add} combines with is bound by existential closure, or by \textit{some}. That is, (41) asserts that there is an eventuality, \(e_1\) where John spoke with a certain, \(d_1\) number of students, and presupposes (roughly) that there is another eventuality, \(e_2\), involving a certain, \(d_2\), number of students, and that the number of students
involved in the summed (and more developed) eventuality $e_3$ is the sum of $d_1$ and $d_2$.

The general lesson to learn from such cases is that the goal of nominal $more_{add}$ is to indicate that the development of the summed eventuality depends on the sum of degrees measuring the participants in its subevents. Crucially, this goal is achieved even if we do not know what the actual summed degree is, i.e. even if we do not know what the exact value of the additive measure function is. The main thing is the dependency on the sum of degrees.

4 Extending the analysis to verbal $more_{add}$

Above we analyzed nominal $more_{add}$ as denoting a derived additive measure function on eventualities. We now want to try and extend this analysis to cases of verbal $more_{add}$, as in (42a-b):

(42) a. John ran 2 miles in the morning. In the afternoon he ran some more.
    b. Mary slept 20 minutes in the morning. In the afternoon she slept some more

Notice that in (42) the meaning of $more$ is indeed additive, and not comparative: For example, the second sentence in (42a) is perfectly felicitous if in the afternoon John ran less than 2 miles.

As with nominal $more_{add}$, here too we seem to have an assertion and a presupposition, and here too, I propose, the use of $more_{add}$ indicates measurement of the sum of presupposed and asserted eventualities, which obeys very similar constraints to the ones found with nominal $more_{add}$. First, as with nominal $more_{add}$, the presupposed eventuality should not be temporally later than the asserted one, as can be seen from the infelicity of (43):

(43) # John worked on his paper today. Yesterday he worked on it some more

Second, here too the verbal predicates in the assertion and presupposition can differ, as long as they can be subsumed under a single 'superset' predicate:

(44) a. Mary ran for a little while. Then she walked some more ('progressed')
    b. # Mary ran for a little while. Then she slept some more.

Third, here too the asserted and presupposed eventualities should be summed into an eventuality which can be reasonably perceived as 'more developed' than its subevents. Consider (45)-(47):

(45) In the morning Mary slept a bit. In the evening she slept some more
(46) # In the morning Mary slept a bit. In the evening Sara slept a bit more
(47) Mary ran for 10 minutes. Then Sara ran some more.

(45) is fine, since intuitively summing Mary's two sleeping eventualities leads to an eventuality which can be considered more developed. For example, we can say that the longer Mary sleeps, the better she feels later on. On the other hand, (46), which differs from (45) only in that the agents of the presupposed and asserted eventualities are not the same, is infelicitous. This is presumably due to the fact that summing Mary's and Sara's sleeping
eventualities, and their running times, only leads to a plural sleeping eventuality, which cannot be considered more developed, from any reasonable perspective. Finally, (47) is again felicitous, although we have two different agents. This is presumably since the summed eventuality can be reasonably considered again more developed. For example, we can imagine a situation, during a relay race, where summing Mary's and Sara's running times and comparing these with the running times of another group can make Mary's and Sara's group win. In contrast, in a context where Mary and Sara do not know each other and run in two distinct, unrelated settings so their summed running eventualities cannot be reasonably considered 'more developed', the sentence becomes infelicitous, like (46).

Just like nominal more\textsubscript{add}, then, I will assume that verbal more\textsubscript{add} denotes an operation which measures a sum of two eventualities, in the assertion and presupposition, and that this summed eventuality should be also 'more developed' than its subevents. However whereas with nominal more\textsubscript{add} the summed eventuality is indirectly measured by measuring the sum of individuals (in the denotation of the nominal predicate) participating in it, in (42a) this is done by measuring the spatial length of the spatial path of the summed running eventuality, and in (42b) this is done by measuring the temporal length of the run time of the summed sleeping eventuality. In addition, verbal more\textsubscript{add} can also directly measure the cardinality of the summed eventuality, and hence denote a non-derived measure function, without using any homomorphism, as in (48):\footnote{Cf. Nakanishi's (2004) analysis of the Japanese particle sugiru (which can be roughly translated as too much), which involves similar types of indirect and direct measure functions over eventualities.}

\begin{equation}
\text{In the morning John ran 3 times. In the afternoon he ran twice more}
\end{equation}

We can now give the denotation of verbal more\textsubscript{add}. Unlike nominal more\textsubscript{add}, which has to combine with a nominal, \(<e,t>_1>\) type, verbal more\textsubscript{add} (+ the degree phrase) directly combines with the verbal predicate, type \(<v,t>_1>\). Hence its type is \(<d, <<v,t>_1, <<v,t>_2>>>_1>\), and its denotation is as in (49):

\begin{equation}
\text{Verbal} \text{ more\textsubscript{add}} : \lambda d_1. \lambda P_{1e1}. \lambda e_1v. \ [P_1(e_1) \land \mu(e_1) = d_1 \land \exists e_2. \ P_2. \ d_2 \ [P_2(e_2) \land \mu(e_2) = d_2 \land \tau(e_2) \leq \tau(e_1) \land \exists e_3. \ P_3. \ *P_3(e_3) \land e_3 = e_2 + e_2 > \text{developed} \ e_2 \land \mu(e_2) = d_1 + d_2] ]
\end{equation}

(Where \(\mu\) can be a \textit{derived} measure function, i.e. \(\mu'((\mu(h(e))))\), or a \textit{non-derived} function)

To illustrate how this definition works consider the derivation of (50) in (51):

\begin{equation}
\text{John ran 3 kilometers more}
\end{equation}

\begin{equation}
\text{3 kilometers}_d \rightarrow 3 \text{ kilometers}
\end{equation}

\begin{equation}
\text{more\textsubscript{add}}_d, <<v,t>, <<v,t>>, \rightarrow \lambda d_1. \lambda P_{1e1}. \lambda e_1v. \ [P_1(e_1) \land \mu(h(e_1)) = d_1 \land \exists e_2. \ P_2. \ d_2 \ [P_2(e_2) \land \mu(h(e_2)) = d_2 \land \tau(e_2) \leq \tau(e_1) \land \exists e_3. \ P_3. \ *P_3(e_3) \land e_3 = e_2 + e_2 > \text{developed} \ e_2 \land \mu(h(e_2)) = d_1 + d_2] ]
\end{equation}

\begin{equation}
\text{3 kilometers more} \rightarrow \lambda P_{1e1}. \lambda e_1v. \ [P_1(e_1) \land \text{spatial length (spatial path (e_1))} = 3 \text{ kilometers}]
\end{equation}

\footnote{To capture the condition that \(e_2 > \text{developed} \ e_1\) in a way which covers 'development' with both nominal and verbal more\textsubscript{add}, we change the characterization in (37) above to (i)\footnote{Cf. Nakanishi's (2004) analysis of the Japanese particle sugiru (which can be roughly translated as too much), which involves similar types of indirect and direct measure functions over eventualities.}

\begin{itemize}
  \item (i) \(e_3 > \text{developed} \ e_2\) if for any measure function \(\mu\) measuring \(e_3\) and \(e_2\) it holds that in \(w\), \(\mu(e_3) > \mu(e_2)\)
  \item and in all accessible worlds \(w'\), and \(w''\), if \(\mu(e_3)\) in \(w' > \mu(e_3)\) in \(w''\), then there is another measure function, \(\mu'\), measuring another entity (eventuality or individual) \(x\), such that \(\mu'(x)\) in \(w' > \mu(x)\) in \(w''\)
\end{itemize}
\textit{Ran} _{e_{2};e_{3}} \rightarrow \lambda e. \text{ran} (e) \land \text{Agent} (e) = x

\text{ran} 3 \text{ kilometers more} _{e_{2};e_{3}} \rightarrow \lambda e_{1}. \text{ran} (e_{1}) \land \text{spatial length} (\text{spatial path} (e_{1})) = 3 \text{ kilometers}

\text{Ran} 3 \text{ kilometers more} _{e_{2};e_{3}} \rightarrow \lambda x. \text{ran} (x) \land \text{Agent} (x) = e_{1}

John ran 3 kilometers more _{e_{2};e_{3}} \rightarrow \exists e_{1}. \text{ran} (e_{1}) \land \text{spatial length} (\text{spatial path} (e_{1})) = 3 \text{ kilometers} \land \text{Agent} (e_{1}) = john

The \(e_{3}\) \(\text{developed} e_{2}\) component (50) and (51) should be now defined in a way appropriate for verbal \textit{more}\textsubscript{add} so contrasts as in (45-47) above can be accounted for. Thus, we cannot define the development of the summed eventuality \(e_{3}\) in terms of a higher number of \textit{participants} involved only, as in (37) above. Rather, we have to think in more general terms about a higher degree measuring the event, which can be the value of various types of measure functions: those measuring the number of individuals involved, the length of the run time of the event, the length of the spatial path of the event, the cardinality of the event, etc. That is, the development of the summed eventuality should be characterized in terms of the correlation between the change in the value of the measure function measuring this eventuality, and a change in the value of another measure function, measuring another event or entity. Together with Beck’s 1997 modalized approach to comparative correlatives we can require, then, that for any measure function \(\mu\) measuring \(e_{1}\) and \(e_{2}\) it holds that in \(w_{0}\) \(\mu(e_{3}) > \mu(e_{2})\) and that in all accessible worlds \(w’, w''\), if \(\mu(e_{1})\) in \(w’ > \mu(e_{1})\) in \(w''\), then there is another measure function, \(\mu’\), measuring another entity (eventuality or individual) \(x\), such that \(\mu’(x)\) in \(w’ > \mu(x)\) in \(w''\).

The analysis just presented can help us explain why verbal \textit{more}\textsubscript{add} is compatible with \textit{for x time}, modifying activities, but not with \textit{in x time}, modifying achievements and accomplishments:

\begin{enumerate}
  \item a. John ran for 20 minutes (more)
  \item b. John arrived to the station crossed the road in 20 seconds (#more)
\end{enumerate}

I suggest that this contrast is due to the fact that while \textit{for x time} is an additive temporal measure function, \textit{in x time} is non-additive. For example, if (53a) and (53b) are true, then, assuming that there are no additional walking eventualities by me this week, (53c) is entailed:

\begin{enumerate}
  \item a. On Sunday I walked for 30 minutes
  \item b. On Tuesday I walked for 20 minutes
  \item c. This week I walked for 50 minutes.
\end{enumerate}

In contrast, assuming that no other eventualities of crossing the road by John happened today, the truth of (54a) and (54b), does not entail (54c):
(54) a. In the morning John crossed the road in 30 seconds
b. In the afternoon John crossed the road in 20 seconds
c. Today John crossed the road in 50 seconds.

The additive presupposition of verbal $more_{add}$ in (49) above, then, fails with the nonadditive measure phrase in $x$ time, in a similar way to the failure of the additive presupposition of nominal $more_{add}$ with nominal nonadditive measure phrases like 12 carat, as discussed in section 4 above.

5 Summary and some directions for further research

We saw, then, that both nominal and verbal $more_{add}$ are overt realizations of measure functions in the eventuality domain, which trigger presuppositions of additivity. In the case of nominal $more_{add}$, a nominal predicate (type $<$e,t$>$) is always involved. Hence this measure function has to be derived: That is, it indirectly measures the growth and development of a summed eventuality by measuring the individuals participating in its subevents (using a homomorphism). In contrast, in the case of verbal $more_{add}$ the function can be derived or nonderived: It can indirectly measure the summed eventuality by using homomorphisms, or it can directly measure the cardinality of the summed eventuality, without using any homomorphism.

We saw that the analysis accounts for a number of novel observations concerning the distribution and interpretation of $more_{add}$. It also raises, of course, some open questions and directions for further research. One such direction concerns the fact that in addition to its use as an additive operator on eventualities, $more$ has other associated meanings in various languages. One such meaning, already mentioned at the beginning of the paper, is comparison. Intuitively, both comparison and additive measurement involve measurement and degrees. We can attempt exploit this similarity in order to develop a unified analysis of both readings by relying on the notion of 'difference functions' used by e.g. Kennedy & McNally 2005, Kennedy & Levin 2008 for capturing the semantics of comparatives and degree achievements. Under the view, for example, the comparative in (55) says that the difference between John's height and Mary's height is 20 cms:

(55) John is 20 cms taller than Mary

A similar intuitive interpretation can be assigned to the verbal comparative in (56):

(56) (In the morning John ran 3 kilometers). In the afternoon he ran 2 kilometers more_comparative than he ran in the morning.

Suppose the afternoon running is $e_1$ and the morning running is $e_2$. The use of $more_{comparative}$ in (56) indicates that the difference between the length of the spatial path of $e_1$ and $e_2$ is 2 kilometers. Therefore, John ran 5 kilometers in the afternoon, and altogether he ran 8 kilometers.

Now consider the verbal additive, $more_{add}$ in (57):

(57) (In the morning John ran 3 kilometers). In the afternoon he ran 2 kilometers more_{add}

...
Assuming again that the afternoon running is $e_1$ and the morning running is $e_2$, the use of $more_{add}$ in (57) indicates that the difference between the length of the spatial path of $e_3$ (i.e. the sum of $e_1$ and the presupposed $e_2$) and $e_2$ (where John ran 3 kilometers) is 2 kilometers. Therefore, John ran 5 kilometers altogether (i.e. the length of the spatial path of $e_3$ is 5 kilometers).

The operation of both verbal $more_{comparative}$ and $more_{add}$, then, can be intuitively characterized in terms of difference functions. The contrast between them lies in the input to these functions, i.e. in the choice of the two eventualities between which the difference is calculated. In Greenberg (in progress, A) I attempt to make this intuitive similarity precise, and to derive the contrast from the different syntax of $more_{comparative}$ and $more_{add}$.

Notice, though, that English seems to be quite unique in using one and the same particle for comparison and addition. The situation in other languages is more varied: Some languages (German (e.g. Umbach 2008), Chinese (Tovena & Donazzan 2008) seem to have two lexical items: One for additivity, and one for comparison. Other languages (e.g. Italian (G. Chierchia, p.c.) or French (G. Thomas, p.c.) seem to have one unambiguous item and / or one which is specified for comparison only, or for additivity only. Hebrew may be a language like that too, since there are constructions where the comparative yoter can function as an additive. For example yoter in the positive (55) is comparative, but in the negative (56) it is additive (A. Cohen, p.c.):

(58) yeS li yoter ugiyot (mi-le-rina): "I have more_{comparative} cookies (than Rina)"

(59) ein li yoter ugiyot (I have no more_{add} cookies =I don't have cookies at all")

A much more common meaning associated with $more_{add}$ however, is aspectual additivity (see e.g. German (Umbach 2008), French, Italian and Chinese (Tovena & Donazzan 2008, Hebrew (Greenberg 2009C). For example, in Hebrew both $more_{add}$ and the aspectual additive particle still are translated as od:

(60) a. ba-boker dani yaSan od ("In the morning Danny slept some more_{add}")
   b. ba-boker dani od yaSan ("In the morning Danny was still asleep")

In fact, this is seen in English as well, since the negative counterpart of the aspectual additive particle still, is the NPI anymore, as in (61):

(61) John is not asleep anymore.

This makes a unified analysis for additive measurement and aspectual additivity desirable. When considering such a potential analysis, we should take into account three interesting differences between aspectual still and additive $more_{add}$: First, unlike additive $more_{add}$ still can only combine with homogeneous predicates, e.g. statives and progressives (e.g. Michaelis 1993). Second, unlike what we saw with $more_{add}$ the presupposed and asserted eventualities with aspectual still must be temporally continuous. Third, unlike the variability between the presupposed and asserted eventualities with $more_{add}$ (which can have different participants (as in (12) above), hold in different spatial locations (as in (16) above), and be even denoted by different verbal predicates (as in (18) above)), with aspectual still these eventualities cannot vary. E.g. in Mary is still singing in the shower the presupposed eventuality must be also a singing eventuality by Mary in the shower.
A preliminary suggestion to account for these facts is to assume that these differences may result from the fact that with additive \textit{more} the presupposed and asserted eventualities are distinct, while with aspectual \textit{still} the presupposed eventuality is the same as the eventuality in the assertion, whose run time is simply prolonged. This direction is theoretically supported by Ippolito's 2007 claim that the eventualities in the assertion and presupposition of \textit{still} are the same.\footnote{See Greenberg 2009A for a discussion of this claim.} If this is indeed the underlying difference between \textit{more} and aspectual \textit{still}, it can account for the three observations just mentioned: A single eventuality in the assertion and presupposition of \textit{still} cannot be temporally discontinuous and cannot have distinct participants, hold in distinct locations or be in the denotation of different verbal predicates. In addition, only prolonging the run time of an event in the denotation of a homogeneous predicate guarantees that we end up with a single eventuality (and not with a plural one). Further research should examine the similarities and differences between \textit{more} and \textit{still} more closely, and derive them from the different syntactic position of these two particles (see Tovena & Donazzan 2008 for a preliminary proposal).\footnote{I develop such an examination and analysis in Greenberg (in progress, B).}

Finally, above we saw that verbal \textit{more} is compatible with activities (modified by \textit{for x time}), but not with telic predicates, e.g. accomplishments and achievements (modified by \textit{in x time}). We would thus expect that verbal \textit{more} would be felicitous with accomplishments with bare plural objects, which, as is well known, are atelic and can be modified by \textit{for x time} (as in (62a)). However, as seen in (62b), this prediction is not borne out:

(62) a. John picked flowers for 20 minutes
   b. #John picked flowers some more

Further research should examine this data more closely, as well as further interactions between \textit{more} and aspectual categories in detail.\footnote{I develop such an examination and analysis in Greenberg (in progress, B).}

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Number and Markedness: A View from Dagaare

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Abstract

Semantic theories of number currently debate whether the plural is weak (referring to both collections and individuals) or strong (referring to collections but not individuals). The former view holds that the plural is ‘unmarked’ as it is less specific; for the latter view, the singular is simpler and therefore ‘unmarked’. This paper examines the inverse number marking system of Dagaare (Gur; Niger-Congo), which proves problematic for both sides of the debate. The data demonstrate that the cross-linguistic facts are more complicated than if only the singular or plural were unmarked, instead markedness is conditioned upon a nominal’s level of individuation. Applying the logic of both strong and weak plural analyses shows that the strong plural analysis has better empirical traction in such systems.

1 Introduction

Semantic theories of number have long debated the nature of the contrast between singular and plural denotations. Since at least Link (1983), most formal analyses of the semantics of number share a consensus of the basic ingredients of the count domain: (i) a set of atomic objects in some domain $A$, which correspond to individual entities such as a dog or a chair and (ii) a domain $E$, where $E \subseteq A$, containing sets generated from the atomic objects in $A$, which is structured by a part-whole or subset relation relating the sets of atoms. The singular of a noun denotes the atomic entities for which the noun is a true description, while the plural of a noun denotes, at least, sets of atomic entities for which the noun is a true description. The whole domain, $E \subseteq A$, possesses the structure of a join semi-lattice.

The consensus breaks down, however, on differences concerning (i) the model-theoretic structure of the domain of plurals and (ii) whether the singular or plural is ‘unmarked’. Link (1983) models the plural as denoting the closure of atoms under join less the atoms themselves, thus the denotation of the plural excludes that of the singular. In this treatment, the singular (atomic) denotation is simpler, and thus the unmarked form. Farkas and de Swart (to appear) argue that this proposal has the additional virtue of aligning with morphological markedness patterns, where the singular is usually considered unmarked and the plural is considered marked (Greenberg,
On the other side, Krifka (1989) (and later Sauerland (2003) and Sauerland et al. (2005)), favor a weaker plural motivated by inference patterns under negation and in question-answer pairs such as “Do you have children?—Yes, I have one.”, where an answer about one or more is required, thus modeling the plural more weakly as the entire semi-lattice structure. In this approach, the denotation of the plural includes that of the singular and straightforwardly captures the ‘inclusive plural’ reading of one or more. Under this analysis, the singular is more specific than the plural, and the plural surfaces as the unmarked number.

This paper contributes to this debate by examining the inverse number marking system of Dagaare (Gur; Niger-Congo), which proves problematic for both sides. Dagaare provides a number system which demonstrates that the cross-linguistic facts are more complicated than if only the singular or plural were unmarked, either morphologically or semantically, rather markedness is conditioned upon a nominal’s level of individuation. Section 2 investigates the number system of Dagaare in detail, demonstrating that the distribution of Dagaare’s inverse number marker -ri correlates with different levels of individuation: nouns unmarked in the singular pattern with highly individuated entities whereas nouns unmarked in the plural pattern with entities which are less individuated and/or tend to appear in groups. Section 3 adduces support for this from cross-linguistic facts that surface in a wide array of language types, including English frequency patterns. The paper concludes by applying the logic of both strong and weak plural analyses which demonstrates that the strong plural analysis has better empirical traction in such systems.

2 The Semantic Basis of Number in Dagaare

Dagaare exhibits an initially surprising system for marking number. The basic paradigm is given for the Dagaare words ‘child’ and ‘seed’ in (1), showing a near minimal pair where both nouns share the same stem, yet the morpheme -ri marks the plural interpretation for ‘child’ and the singular interpretation for ‘seed’.

<table>
<thead>
<tr>
<th>Gloss</th>
<th>Singular</th>
<th>Plural</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘child’</td>
<td>bie</td>
<td>bi-rie</td>
<td>bi-</td>
</tr>
<tr>
<td>‘seed’</td>
<td>biri</td>
<td>bi-rie</td>
<td>bi-</td>
</tr>
</tbody>
</table>

Upon first view, this pattern would appear arbitrary and unstable in comparison with number marking systems from Indo-European languages—for how would one know if a particular noun is to be marked in the singular or the plural except on a noun-by-noun basis? Such systems are rare but attested at least in North America (Kiowa) and the Pacific (New Ireland) (see Corbett 2000).

Number marking in the nominal system of Dagaare is, from all appearances, not predictable from the phonological form of the stem. This is made clear by sets of minimal pairs, similar to the example in (1), shown in table (1). (Note that -ri assimilates before nasals and liquids and capital letters for vowels indicate +/- ATR). This is the
predominant pattern in the Dagaare nominal system, accounting for 60% of the nouns in the current database.

<table>
<thead>
<tr>
<th>-V Singular</th>
<th>-rI/-nI Plural</th>
<th>Gloss</th>
<th>rI/-nI Singular</th>
<th>-V Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>tíë</td>
<td>türí</td>
<td>‘tree’</td>
<td>lügrí</td>
<td>lúgó</td>
<td>‘prop, pillar’</td>
</tr>
<tr>
<td>gbję</td>
<td>gbérí</td>
<td>‘forehead’</td>
<td>nyágrí</td>
<td>nyágá</td>
<td>‘root’</td>
</tr>
<tr>
<td>pič</td>
<td>pérí</td>
<td>‘basket’</td>
<td>filí</td>
<td>filé</td>
<td>‘sores’</td>
</tr>
<tr>
<td>nàñá</td>
<td>nànní</td>
<td>‘scorpion’</td>
<td>ílí</td>
<td>ílè</td>
<td>‘horn’</td>
</tr>
</tbody>
</table>

Table 1: Number in Dagaare: Marked Plural and Marked Singular Patterns

In previous work on the nominal system of Dagaare, two main approaches have been employed. The first approach establishes noun classes in Dagaare based upon a given noun’s behavior with respect to number marking. In particular, the line of research in Bodomo (1997) and Dakubu (2005), in coarse terms, presents one class as comprised of nouns ending in vowels in the singular and -ri in the plural, while another class is comprised of nouns ending in -ri in the singular and vowels in the plural. In contrast, Anttila and Bodomo (2009) give a set of phonological generalizations about the morphophonology of Dagaare which are relevant for plural formation. While both approaches have increased the understanding of the organization of Dagaare, neither provides a predictive answer to why certain nouns have -ri in the singular while others have -ri in the plural. This section explores the hypothesis that general semantic principles play the organizing force in the nominal system of Dagaare, namely those associated with individuation, a principle stating that speakers discriminate between entities which are distinct and countable and those which are non-distinct and uncountable. While this principle has most often been invoked for the syntactic distinctions concerning the differential syntax of count and mass terms, I will show that such a principle also makes predictions in the count domain, and is predictive of the data observed in Dagaare.

2.1 Number Marking and Individuation

In English as well as cross-linguistically, nouns which refer to count entities differ from nouns which refer to mass entities in their morphosyntactic realization. Commonly cited properties include the ability to be modified by certain quantifiers—mass nouns accept quantifiers such as “much” or “little” (“much/little wine”) while count nouns accept quantifiers such as “many” and “few” (“many/few books”), yet the converse does not hold for either class (“?much books”/”?few water”). The literature attempting to account for such distinctions is vast and various, yet much of it reacts in one way or another to the principle of individuation. There are of course divergent perspectives on what individuation designates, but generally the thesis relates cognitive or perceptual qualities of objects to the grammatical realization of count and mass nouns. An early view from Quine (1960) held that count syntax provided an apparatus for individuating objects, viz. delimiting the relevant object from others and tracking its spatio-temporal identity, while mass syntax does not. This view leads to positing a
sort of correspondence between syntax and entities in the world. On a strong version of this correspondence theory, language users should “conceptualize the referents of count nouns as distinct, countable, individuated things and those of mass nouns as non-distinct, uncountable, unindividuated things” (Wisniewski et al., 1996, p. 271). Varieties of this distinction have been picked up in the formal semantics literature, e.g. the atomic/non-atomic distinction in Link (1983), as well as in the psycholinguistic literature (e.g. Bloom 1994; Wisniewski, Imai, & Casey, 1996).

While the individuation hypothesis was primarily elaborated in relation to the mass/count divide, it is reasonable to suppose its influence is relevant within the count domain. First, although the divide between count and mass domains is often loosely spoken of as dichotomous, much work following on Allan (1980) has shown that not all countable nouns are created equal. Rather, evidence from interaction between different determiners and quantifiers demonstrates that there are different levels of countability between true count terms and uncountable mass terms. Accordingly, it is plausible that individuation is related to different levels of countability, and in turn, to the nominal morphology of Dagaare.

While individuation is a commonly cited concept, it suffers in the same manner as other commonly cited conceptual factors in linguistics, such as animacy and agentivity, in that individuation is far from rigorously defined. A rigorous definition will not emerge here either, but rather the strategy is to use individuation as a heuristic to gain insight into the nominal structure of Dagaare and consequently into the functioning of inverse number marking. I will consider four factors linked to the individuation hypothesis and their potential influence on the realization of nominals in Dagaare, which I now discuss along with the evidence for considering them relevant.

The first factor, animacy, receives a good deal of independent support. Animacy, relative to some sort of animacy scale ranging from humans to larger than smaller animals which in turn correlates to a scale of individuation, is known to influence number marking cross-linguistically (Smith-Stark 1974; Corbett 1996, 2000). In particular, the higher the entity designated by a noun rates on an animacy hierarchy, i.e. the closer to human, the greater the likelihood that the noun expresses a singular/plural contrast.

Two other factors relating to individuation were proposed by Wierzbicka (1985), and subsequently investigated experimentally by Middleton et al. (2004). First, Wierzbicka argues that nouns designating entities for which the constituents are more easily distinguishable are more likely to be used as a count nouns, while those nouns designating entities for which the constituents are not easily distinguishable will be used as mass nouns. For example, she argues that beans is more likely to be a count term than rice since individual beans are in principle easier to distinguish than individual grains of rice. Middleton et al. (2004) examined this hypothesis experimentally, where subjects had to match a nonce count or mass term with one of two graphical displays of novel aggregates which varied in distinguishability. The graphical displays of novel aggregates were sets of 40 elements where “each element was a simple shape with a black-to-white gradient that appeared slightly 3-dimensional and did not obviously resemble the constituents of any familiar aggregate. (p. 382)” They then presented subjects with pairs
of aggregate displays which varied along the dimensions or spatial proximity to other elements (Close versus Apart) and size of elements (Large versus Small). Thus, a subject would see two sets of an element where for one set, each element was spatially separated from the other and for the other set each element was spatially contiguous with other elements. The subject would then decide which picture aligned with a phrase such as “This is worgel.” The general results were that subjects’ choices of count or mass terms were significantly influenced (p < .001) by spatial proximity, but not by the size, of the elements. These results are compelling as the design of the experiment using nonce items ensures that such factors are general.

The second factor argued for by Wierzbicka (1985) is the canonical manner of interaction with a given entity. She exemplifies this with examples such as the naming of berries in Polish, generally count terms because, she claims, people interact with them one by one, viz. picking/eating them, while farmers selling berries typically use mass syntax to describe berries since they interact with them in quantities rather than individually. This factor was investigated via novel objects, again by Middleton et al. (2004). They presented subjects with a novel aggregate, “yellow decorative coarse-grained sugar” in a cardboard box, which the subjects then needed to match with one of two phrases in count and mass syntax (e.g. “This is worgel/These are worgels”). The experimenters manipulated the mode of interaction with the aggregate. In the baseline condition, the subjects simply observed the material and then were presented with a response sheet to decide which phrase was appropriate. In the interaction condition, the experimenter and the participants used a thin paper-clip implement to scoop up individual grains of the material and insert each grain into a hole of a board distinct from the box containing the material. The participants then were presented with the response sheet to decide which of two phrases was appropriate, one with mass and one with count syntax. The responses for the baseline and interaction conditions were inversely related: a majority of participants in the baseline condition (69%) selected a mass phrase while a majority of participants in the interaction condition (61%) selected a count phrase. While this result is not definitive, it would appear that the mode of interaction with an aggregate can affect the manner by which it is referred to.

The final factor I consider is the likelihood of a noun to be “inherently plural”, in other words the likelihood that individual referents of a noun canonically appear as a member of a pair or group, as, for example, is the case for paired body parts (e.g. kidneys). Recent work by Acquaviva (2008) has emphasized the distinctive morphosyntactic behavior of entities which canonically appear in collectives, duals and other “marked” number categories. While individuation is normally considered only in light of mass/count syntax, it is seems probable that entities that canonically appear as a member of a pair or group, as in the case of duals and collectives, are qualitatively different from those which canonically appear as individuals. This distinction is independent from the previous factors. Corbett (1996) previously pointed out that dual/collective paradigms are orthogonal to the animacy scale. Very general number marking patterns, such as the occurrence of plural marking, are correlated with the animacy scale: the higher on the animacy scale the referent of a noun falls, the more likely it is to allow

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1This distribution is significantly above chance (p < .05).
plural marking. Yet, nouns which accept or require dual/collective marking do not systemically align with the animacy scale, thus, such a factor is independent of animacy. Further, propensity to appear in a group of more than one is also distinct from the factors of distinguishability and interaction: Middleton et al. (2004) showed effects when examining only aggregates all the items were already assumed to be prone to coming in groups, in other words, the inherent plurality of the aggregates was held constant. Thus, distinguishability and interaction are relevant for aggregates in addition to and distinctly from a given entity’s propensity to occur in an aggregate or group.

2.2 Individuation and Inverse Marking

The individuation factors discussed immediately above have been argued to independently affect the realization of number marking, primarily in English. It is not unreasonable to suppose that their influence would extend to inverse number marking in Dagaare. This gives rise to a clear prediction: the more likely the entity is to be viewed as individuated, the more likely the singular noun will be unmarked and -\textit{ri} will mark the plural; and conversely, the more likely the entity is to be viewed as coming in groups or non-individuated, the more likely the plural noun will be unmarked and -\textit{ri} will mark the singular. The information about a noun’s individuation level therefore would be lexical information. Nouns would come with a ‘basic’ number, determined by its semantic properties, while application of -\textit{ri} gives the inverse value. This can be schematically pictured as in (2):

\begin{equation}
\begin{aligned}
[\text{Highly Individuated N}] + -\text{ri} & \Rightarrow \text{plural} \\
[\text{Less Individuated/Inherently Plural N}] + -\text{ri} & \Rightarrow \text{singular}
\end{aligned}
\end{equation}

The considerations of individuation lead straightforwardly to testable predictions. If individuation has an effect on the distribution of -\textit{ri}, one should observe distributional asymmetries in the appropriate semantic domains. In part guided by how transparent verification in a lexicon would be, I explored four relevant predictions:

(i) Nouns for higher-level (more salient) animals are more likely to be unmarked in the singular than nouns for insects (animacy)

(ii) Nouns for trees should be in unmarked in the singular in comparison to nouns for vegetation (distinguishability)

(iii) Nouns for tools should be more likely to be unmarked in the singular than the converse (one canonically interacts with them individually)

(iv) Nouns for body parts which inherently come in pairs or groups should be more likely to be unmarked in the plural than not; while nouns for body parts which inherently come a singular items should be more likely to be unmarked in the singular than not (inherently plural)

I now turn to the results of fieldwork which bear on these hypotheses.
2.3 Results from Fieldwork

To test the predictions elaborated in the preceding section, I conducted fieldwork in Ghana with native speakers to develop a wordlist to determine the behavior of inverse number marking. The findings below are based on a wordlist of nearly 1500 words which I compiled during my field research\(^2\).

As the hypotheses involved distributions over semantic domains, I coded each word for (relatively transparent) semantic domains, where possible. The chart in figure 2.3 displays the results with respect to hypotheses (i)-(iii). The x-axis displays various semantic domains while the y-axis displays the number of lexicon entries. The blue-shaded regions show the number of lexicon entries in a given semantic domain with the singular unmarked, while the red-shaded regions show the number which are unmarked in the plural and marked by -ri in the singular. For instance, the category of mammal shows 43 entries in the lexicon that are unmarked in the singular and 5 entries which are unmarked in the plural and marked in the singular by -ri. In these counts, I excluded derived forms, since they follow their own patterns which tends to obscure any generalization.

Figure 2.3 demonstrates reliable asymmetries visible across the semantic domains. Nouns for higher-level animates, namely mammals, birds and reptiles are typically unmarked in the singular; however, nouns for insects generally have a plural that is unmarked. Similarly, nouns for trees are typically unmarked in the singular, while most nouns for vegetation are unmarked in the plural. Nouns for tools, which were hypothesized to be individuated as a result of the typical manner with which one interacts with them, also showed strong tendency towards being unmarked in the singular.

\(^2\)I would like to acknowledge Arto Antilla and Adams Bodomo for generously permitting me to incorporate elements from their wordlist, Anttila and Bodomo (2006)
Figure 2.3 shows similar results for the fourth hypothesis, viz. nouns for body parts which inherently come in pairs or groups should be more likely to be unmarked in the plural while nouns for body parts that inherently come as singular items should be more likely to be unmarked in the singular. The x-axis displays whether the noun is inherently singular, e.g. the term for *head* where canonically humans only have one, or inherently dual/plural, e.g. *eye* or *rib* where canonically humans have two and multiple of each, respectively. Again the y-axis displays the number of items in the lexicon for each category.

2.4 Discussion

The above results indicate that Dagaare morphology is sensitive to the degree of individuation for the referent of a noun, i.e. *-ri* marks the singular when a noun is considered to be low in individuation/inherently plural, otherwise it marks the plural. Section 2.1 laid out a number of hypotheses which made specific predictions about particular semantic domains. When the individuation hypothesis is applied systematically to the lexicon of Dagaare, it uncovers many exceptions, often the marking results from practices elsewhere in the grammar, viz. derivational morphology. Frequently, nouns that do not conform to the general trend of the domain often display semantic sub-regularities. One instance from the animate domain is that most of the nouns for insects unmarked in the singular are for insects capable of causing harm (e.g. scorpion, wasp, spider). In the domain of tools, while the vast majority of nouns were marked by *-ri* in the plural, exceptions included nouns such as *fūmini* (sg) / *fūminé* (pl) ‘needle’, which are clear candidates for canonically appearing in collections, or not participating in the initial assumption that one interacts with them individually. Additional apparent counter-examples result from semantic shift in the history of the lexical item. One instance
is ɣiri (sg.) / ɣi (pl.), which synchronically designates ‘house’. While this would be an apparent example of an individuated entity, the word has antecedent collective uses meaning ‘compound’ (Durand 1953) as well as ‘family’ or ‘family members’ (Mark Ali, p.c.) aligning more closely with the notion of inherently plural/collective entities.

Viewing individuation as an organizing force in the choice of nominal inflection in Dagaare makes further predictions for dialect variation. Given that degrees of individuation are akin to a scale-structure, one would expect to see dialect variation in the mid-region of the scale, i.e. entities which are not clearly individuated or group-like would be predicted to vary. Bodomo (2004) notes that there are instances where the direction of number marking differs among dialects, as shown for the noun stem pi- ‘rock’:

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>piri</td>
<td>pie</td>
<td>‘rock’ (Central Dialect)</td>
</tr>
<tr>
<td>pie</td>
<td>piri</td>
<td>‘rock’ (Southern Dialect)</td>
</tr>
</tbody>
</table>

Table 2: Dialect Variation: Variation in Directionality of Marking

While nouns such as ‘human’ and ‘rib’ are naturally associated with individual and collective interpretations, respectively, items such as ‘rock’ could in principle be associated with either individual rocks or collections of rocks. Such claims must be assessed through further research, yet even so, aligning number formation with the propensity towards individuation provides an explanation for variation where purely morphophonological considerations would be hard-pressed to do so.

A second source of variation is found in the choice between -ri and a singulative marker, -ruu, which Dagaare employs to designate “a piece of” for a limited set of nouns. The singulative appears mainly with clearly mass terms as well as aggregates with are particularly close-knit, as shown in table 2.4.

<table>
<thead>
<tr>
<th>Singular/Base</th>
<th>Gloss</th>
<th>Singulative</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>mō3</td>
<td>‘grass’</td>
<td>mō3nuo</td>
<td>‘blade of grass’</td>
</tr>
<tr>
<td>sūnni</td>
<td>‘gum’</td>
<td>sūnnū</td>
<td>‘piece of gum’</td>
</tr>
</tbody>
</table>

Table 3: Singulative Paradigm

Several words in Dagaare, as shown in table in 2.4, vary between whether a noun marks its singular form with -ri or -ruu. This dialect variation in turn supports the main hypothesis that -ri marks the singular for objects which are inherently plural. The use of the two different markers implies that there is overlap between inherently plural and mass/aggregate terms.
Additional support for the assumptions underlying the hypothesis that individuation underlies the organization of Dagaare’s nominal number marking system can be adduced from cross-linguistic data. Section 2 identified a set of semantic domains that are typically unmarked in the plural. In the same manner in which one expects certain features of the mass terms to be consistent across languages, viz. not accepting cardinal terms without a measure term, one would expect the behavior of the nouns associated with semantic domains unmarked in the plural to have parallel behavior across languages. Although necessarily cursory due to space, this section will point to three cross-linguistic correlates of the unmarked plural in Dagaare in three domains: structuring nominal paradigms, morphological processes and text frequency. Despite different encodings languages may make, all these different systems seem to make similar divisions on a scale of individuation.

**Nominal Paradigms** Semantic domains similar to those discussed in section 2 are cross-linguistically relevant for collectives and duals (see discussion in Acquaviva (2008)). One example that accords quite well with the findings in Dagaare is the collective/singulative class in Welsh, discussed in Stolz (2001). Welsh disposes of a singular/plural distinction for count nouns just as in, say, English, where the plural is marked; however, for select semantic domains, a collective interpretation is unmarked, while a singular interpretation is marked by a singulative marker -yn or -en. Of interest are the semantic domains where this holds: small animals and insects, vegetables/cereals/fruits, body parts (‘ribs’, etc.), and what Stolz terms “uncountable substance”, essentially granular mass terms (‘turf’, ‘embers’, ‘sand’), all of which accord with the semantic domains seen as unmarked plurals in Dagaare. A similar division is in effect for languages with nominal class systems, e.g. Swahili (Contini-Morava, 2000) and Lingala (Mufwene, 1980), where some noun classes appear to be unmarked in the plural. Once again, the relevant semantic domains are strikingly similar to those in play for Dagaare, e.g. vegetation, pairs and collectives.

**Morphological Processes** The semantic domains discussed in section 2 also manifest unexpected behavior with respect to morphological processes. Tiersma (1982) noted that classes of nouns for entities that “naturally occur in pairs or groups” tend to show surprising behavior with respect to morphological leveling, borrowing and dou-
ble plural formation. For instance, morphological paradigms typically level towards the unmarked members of the paradigm, i.e. normally the singular stem, yet in certain cases nominal paradigms level in favor of the plural stem, which Tiersma (1982) exemplifies with Modern Frisian.

As with leveling, borrowing typically proceeds by taking the unmarked singular stem; however, there are cases, and not surprisingly in the same semantic domains, in which the plural form is borrowed in preference to the singular. A clear example is provided by Welsh borrowings from English shown in table 3, discussed in Stolz (2001), where the borrowed plural form from English serves serves as the basic term which can then be inflected for the singulative.

<table>
<thead>
<tr>
<th>Singulative</th>
<th>Collective</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ffigys-en</td>
<td>ffigys</td>
<td>figs</td>
</tr>
<tr>
<td>gwsbery(s)-en</td>
<td>gwsberys</td>
<td>gooseberries</td>
</tr>
<tr>
<td>pys-en</td>
<td>pys</td>
<td>peas</td>
</tr>
</tbody>
</table>

Table 5: Borrowing in Welsh

Tiersma infers from such examples that “when a referent of a noun naturally occurs in pairs or groups, and/or when it is generally referred to collectively, such a noun is locally unmarked in the plural.” This characterization aligns well with the distributional patterns established for Dagaare and converges with the individuation hypothesis.

Evidence from English Frequency Patterns  Throughout my discussion of Dagaare, and the above morphological patterns from other languages, I have referred to “unmarked plurals”. This term has been appropriate insomuch as these plurals have had less morphological material as opposed to a clearly suffixed singular, and thereby qualifying as basic. Yet, for an element to be “unmarked” has another implication in terms of text frequency, as in Greenberg (1966) where unmarked forms were shown to have greater text frequency than marked ones. If the semantic domains I have discussed are truly unmarked, one would expect to see “unmarked plurals” in languages which do not display any morphological evidence of such a pattern reflected in terms of text frequency. In order to evaluate this prediction, I examined frequencies for the semantic domains of animal and insect from the COBUILD corpus (18 million words) provided by CELEX. Using basic terms and terms consistent with the vocabulary of Dagaare, I calculated the plural-to-singular ratio for these two domains, shown in figure 3, where the x-axis represents the number of lexical items and the y-axis represents the ratio of the token frequency of plurals to the token frequency of singulars. The graph indicates that there is a clear trend for insect terms to have a plural/singular ratio greater than 1, i.e. insect terms occur more frequently in the plural, while animal terms tend to have a plural/singular ratio less than 1, i.e. animal terms occur more frequently in the singular. This finding lends additional support to the arguments about morphological patterns in this section, as well as to the assumption that the plural of certain domains as “unmarked”.

4 A Formal Account of -ri

I have established that Dagaare is sensitive to the degree of individuation and inherent plurality associated with the referents of nominal elements. Indeed, this should not come as a surprise since such facts have been consistently assumed with respect to the count/mass divide. Here, I have made the case that individuation is matter of degree, sensitivity to which pervades the nominal system and is not limited to mass terms. Having secured an understanding of the Dagaare’s nominal system, the number marking system can be related to formal models of number and be brought to bear on the controversy among the different analyses of the plural discussed in section 1.

Recall that the exclusive plural analysis, as in Link (1983), models the plural as denoting the closure of atoms under join ($\oplus$) less the atoms themselves ($\text{sums} - \text{atoms}$), thus the denotation of the plural excludes that of the singular, while the inclusive plural analysis models the plural as denoting both atoms and their closure under join ($\text{sums} \cup \text{atoms}$). In order to evaluate these proposals in light of the data from Dagaare, I consider two analyses, one consistent with the exclusive and the other consistent with the inclusive plural. Applying the logic of both analyses to data from Dagaare shows the exclusive plural analysis makes the better predictions for inverse number marking systems.

**The Exclusive Plural** Assuming inherent plurality, and thereby singularity, becomes available as lexical information, as argued in the above sections, and assuming the exclusive plural, the semantics of inverse number marking is relatively straightforward: -ri is simply treated as a form of negation of the lexical denotation of the base. This is an intuitive version of the function of inverse number marking, and is in essence
a formal semantic update of the analysis of Kiowa in Wonderly (1954)\textsuperscript{3}. Further assuming along with Ojeda (1998) that the base or root of the noun has a denotation of the entire space generated by the atoms and their sums (\textit{atoms} $\cup$ \textit{sums}), i.e. the base is compatible with singular and plural individuals, then \textit{-ri} can be modeled as the operation of complementation ($C$) with respect to the domain of the base. The degree of individuation determines whether a noun is considered lexically plural or singular, whereupon \textit{-ri} applied to a lexically singular noun will yield a plural denotation, while if \textit{-ri} is applied to a lexically plural noun, it will yield a singular denotation.

Representative derivations are given in table 4, demonstrating that this analysis clearly secures the desired interpretations. In prose, for lexically singular nouns, the application of \textit{-ri} gives the complement of the denotation of a singular noun, viz. the complement of the relevant set of atoms. The value returned is the sums formed from the atoms, less the atoms themselves, which is in turn exactly the value of the noun’s plural denotation. For lexically plural nouns, the application of \textit{-ri} gives the complement of the denotation of a plural noun, viz. the complement of the relevant set of sums. The value returned is the atoms which form the sums, which is in turn exactly the value of the noun’s singular denotation.

\begin{table}[ht]
\begin{tabular}{l|l}
Lexically Singular & Lexically Plural \\
\hline
$[\text{bi-}] := \lambda x(\text{CHILD}(x))$ & $[\text{bi-}] := \lambda x((\text{SEED}(x))^{\oplus} - \text{SEED}(x))$ \\
$[\text{bi-}] + \text{ri}$ & $[\text{bi-}] + \text{ri}$ \\
$([\text{bi-}])^{C}$ & $(([\text{bi-}])^{C}$ \\
$\lambda x(\text{CHILD}(x))^{C}$ & $\lambda x((\text{SEED}(x))^{\oplus} - \text{SEED}(x))^{C}$ \\
$\lambda x(\text{CHILD}(x))^{\oplus} - \text{CHILD}(x)$ & $\lambda x[\text{SEED}(x)]$ \\
$= \text{PL(bi-)}$ & $= \text{SG(bi-)}$
\end{tabular}
\caption{Derivations of Lexically Singular (‘child’) and Plural (‘seed’) Nouns with the Exclusive Plural}
\end{table}

The Inclusive Plural An alternate analysis\textsuperscript{4}, which is consistent with weak plural analyses, models \textit{-ri} as designating the “completion of the space”, viz. \textit{-ri} is the operation of closure under join and meet. The weak plural analysis of English plurals claims that the plural is unmarked, denoting closure under sum, while the singular, designating atoms is more specific. When the singular form is used, the plural interpretation is excluded by pragmatic blocking. The same inferences motivating the weak plural analysis in English were elicited in Dagaare, thus one could analyze \textit{-ri} when marking the plural similarly to the English plural, designating closure under join, with the singular interpretation disallowed by blocking. By parity, and to give \textit{-ri} a uniform interpretation, for lexically plural nouns where \textit{-ri} marks the singular, it must also yield the entire semi-lattice, viz. closure under meet, with the plural interpretation disallowed by blocking. Thus, \textit{-ri} is uniformly analyzed as the closure of the space under join and

\textsuperscript{3}This line has also been developed independently in Bach (2007) and Bach (2008) for Kiowa.

\textsuperscript{4}I am indebted to Uli Sauerland for suggesting this line of analysis.
Number and Markedness: A View from Dagaare

Representative derivations are given in table 4, where Cl represents a closure operator. In prose, for lexically singular nouns, the application of -ri gives the closure of the denotation of a singular noun, which is the entire semi-lattice. For lexically plural nouns, the application of -ri gives the closure of the denotation of a plural noun, which is again the entire semi-lattice.

<table>
<thead>
<tr>
<th>Lexically Singular</th>
<th>Lexically Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{bi-}] := (\lambda x(\text{CHILD}(x)))</td>
<td>[\text{bi-}] := (\lambda x((\text{SEED}(x))^\oplus - \text{SEED}(x)))</td>
</tr>
<tr>
<td>[\text{bi-}] + ri</td>
<td>[\text{bi-}] + ri</td>
</tr>
<tr>
<td>([\text{bi-}])^\text{Cl})</td>
<td>([\text{bi-}])^\text{Cl})</td>
</tr>
<tr>
<td>(\lambda x((\text{CHILD}(x))^\oplus))</td>
<td>(\lambda x((\text{SEED}(x))^\oplus - \text{SEED}(x))^\text{Cl})</td>
</tr>
<tr>
<td>= inclusive(bi-)</td>
<td>= inclusive(bi-)</td>
</tr>
</tbody>
</table>

Table 7: Derivations of Lexically Singular (‘child’) and Plural (‘seed’) Nouns with the Inclusive Plural

Behavior under negation would demonstrate whether such a suggestion was feasible, for in many languages, such as English and as was elicited in Dagaare, negation of the plural always also excludes the truth of the singular. This proposal predicts that the form marked by -ri should always be the one excluding the truth of both singular and plural. Example (3) (Adams Bodomo p.c.) shows that this turns out not to be the case:

(3) N 1st.pro bá dà bë/*bìrì (ząà) 
I didn’t buy (any) seeds.

The same entailment patterns hold in Dagaare as in English and in (3) the negated plural also indicates that the speaker did not buy a single seed; however, the form negated is not marked by -ri, but rather is the unmarked form. As the data does not align with the logic of the inclusive plural analysis, this analysis must be rejected in favor of the exclusive plural analysis.

5 Conclusion

This paper has demonstrated that number marking in Dagaare, and more generally inverse number marking, which while at first sight surprising, under closer inspection is a clever exploitation of widespread markedness patterns, namely less individuated/inherently plural entities are unmarked in the plural. Once the lexical generalizations are clearly established, the formal implementation is straightforward.

Number marking systems such as that of Dagaare make it evident that the marking of singular or plural comprises more than simply marking a dichotomy between ref-
erence to atoms or reference to sums, rather the canonical properties of the referents themselves influence how the marking is achieved. In parallel, the data examined here make it clear that the notion of markedness must be relativized with respect nominal semantics—considering either the singular or the plural as ‘unmarked’ across-the-board leaves much unexplained, both in Dagaare and cross-linguistically as discussed in section 3. Articulating the precise connections between the lexical properties of nouns and number realization remains a fertile area for further exploration.

Acknowledgements

This paper would not have been possible without generous efforts of the Dagaare scholars Mark Ali, Adams Bodomo, and J.A. Saanchi. In particular, Dr. Ali devoted much time to discussing Dagaare vocabulary with me and Dr. Bodomo has provided encouragement and aid at every step of the project. I would also like to thank the following for discussion and comments on various drafts: Matt Adams, Arto Anttila, Eve Clark, Jeff Good, Paul Kiparsky, Beth Levin, Uli Sauerland and Tom Wasow. The field research on Dagaare was made possible by the generous support of the Stanford Center of African Studies. The usual disclaimers apply.

References


Grading Modality
A New Approach to Modal Concord and its Relatives

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Abstract
This paper addresses modal matching configurations, i.e. constructions where two modal elements co-occur in a sentence but modal force is only expressed once. It shows that the co-occurring elements only need to match in logical strength (e.g. necessity combines with impossibility) and do not have to match in modal force. It argues that previous approaches to modal matching (specifically: to modal concord), such as Geurts & Huitink (2006) and Zeijlstra (2008), cannot account for such matching in strength. A new approach to modal matching is presented, which treats it as degree modification over gradable modals, solving this puzzle: The matching requirement is argued to be a polarity presupposition on the modal degree modifier. The paper concludes by extending the analysis to the German particles ruhig, bloß and JA (see Grosz to appear).

1 The Puzzle
1.1 Background: Modal Matching
I use the theory-neutral term modal matching to refer to configurations where two modal elements co-occur in a sentence but modal force is only expressed once. It subsumes modal concord, (1)¹, but also covers the distribution of certain modal particles (shown in section 3).

Visitors {must / #may} mandatorily sign this form.
≈ Visitors must sign this form. / It is mandatory that visitors sign this form.

Crucially, we also find modal-concord-like configurations that involve matching in logical strength (by which I mean that necessity matches impossibility, illustrated in (2a), and possibility matches non-necessity, discussed in section 3). Crucially, the context in (2) rules out any sensible reading where modal force is expressed twice (i.e. we have to require

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¹ For expository reasons, section 1 and 2 focus on deontic necessity statements. However, the proposal covers other types of modality, as illustrated for non-dynamic root necessity and possibility in section 3.
you to). Therefore, (2b) is infelicitous for speakers who do not permit modal matching across clausal boundaries. (Note that there are some native speakers who do permit such matching.)

(2) Context: “You are now entering a secure area of this public facility. We would now like to specify the rules that make up our special security standards. Nothing forces us to have these security standards, yet we have them, as we are special.”

a. In view of our special security standards, you **mandatorily may not** cross the yellow line without a special permit issued by the facility headquarters.
   ≈ You may not cross … / It is mandatory that you do not cross …

b. # In view of our special security standards, it is **mandatory** that you **may not** cross the yellow line without a special permit issued by the facility headquarters.

Generalizing from (1) and (2), the adverb *mandatorily* can enter a modal matching configuration with a necessity modal (*must*) and with a negated possibility modal (*may*). In contrast, it cannot combine with non-negated possibility (3a) or negated necessity (3b).

(3) a. # You **mandatorily may** / **may mandatorily** stay in this area.
   ≠ You may stay in this area.

b. # You **mandatorily need not** / **need not mandatorily** stay in this area.
   ≠ You need not stay in this area.

Modal Matching exhibits three core properties (cf. Geurts & Huitink 2006, Zeijlstra 2008, Grosz to appear). First, the two elements must match in logical strength (illustrated in (1)-(3) above). Second, the range of ordering sources that the modal statement selects is restricted. Third, the modal force is felt to be strengthened (or, rarely, weakened). Examples (4) and (5) illustrate the second property: *mandatorily* requires a deontic ordering source (e.g. *what the law prescribes*) and cannot combine with a bouletic ordering source (e.g. *what I want*).

(4) **Modal Concord**
   a. In view of what the law prescribes, visitors **must mandatorily** sign this form.
   b. # In view of what I want, you **must mandatorily** clean my room once a day.

(5) **Modal Concord-like Matching for Strength**
   a. In view of our special security standards, you **mandatorily cannot** enter sector 7 without a member of our facility.
   b. # In view of what I want, you **mandatorily cannot** enter my room.

Example (6) and (7) illustrate the strengthening effect in terms of informal paraphrases.

(6) **Modal Concord**
   In view of what the law prescribes, visitors **must mandatorily** sign this form.
   ≈ In view of what the law prescribes, it is necessary to a high degree that visitors sign this form.

---

2 Zeijlstra (2008) and Huitink (2008, to appear) call this "the emphatic effect" of modal concord.
A uniform theory of modal matching should account for these three properties: the strengthening effect (here: the degree of necessity is raised), the matching effect (i.e. the modal expressions must match in logical strength) and the restrictions on the modal type of the utterance. After discussing a puzzle for current approaches to modal matching in section 1.2, I propose an analysis in section 2. While the new analysis is motivated by the fact that it can account for a problem that neither of the previous analyses can account for, a novelty of my proposal is that it builds on the strengthening effect, rather than on the matching effect (contra Geurts & Huitink 2006, Zeijlstra 2008). On the one hand, this accounts for Zeijlstra’s (2008) observation that modal concord always leads to emphatic strengthening of the modified modal statement. On the other hand, it accounts for the German particles JA, bloß, and ruhig, which clearly qualify as modal matching elements (see section 3 and Grosz to appear); these are typically perceived as strengtheners of sorts (e.g. Thurmair 1989 argues that JA and bloß strengthen a command, and ruhig makes a permission more encouraging).

1.2 A Problem for Previous Theories

Geurts & Huitink (2006) propose that one of the modal elements has a type-shifted ‘functional’ meaning under which it merely checks the type of the other modal element; this is modeled in terms of an operator ©, as illustrated in (8).

\[
\text{(8)}
\begin{align*}
\text{a. } &\quad \left[\left[\text{© mandatorily}\right]\right] \text{[} \text{must} \text{] visitors sign this form before entering the facility} \\
\text{b. } &\quad \lbrack\text{mandatorily}\rbrack = \lbrack\text{must}\rbrack = \lambda p.\lambda w.\forall w'[R(w)(w') \to p(w')] \\
\text{c. } &\quad \lbrack\text{©}\rbrack = \lambda p.\lambda Q : P = Q . P \\
&\quad (\text{my rendering of Geurts & Huitink 2006:18-19})
\end{align*}
\]

The main problem for Geurts & Huitink’s account is that it cannot derive modal matching in strength, (9a), as the identity condition is too strong. While possibility under negation is equivalent to impossibility (i.e. “necessity that not”), yielding universal force, it is not the case that may not and mandatorily end up being synonymous. This is shown in (10).

\[
\text{(9)}
\begin{align*}
\text{a. } &\quad \text{You mandatorily may not cross the yellow line without a special permit} \\
&\quad \text{issued by the facility headquarters} \\
&\quad \approx \text{You may not cross the line. / It is mandatory that you do not cross the line.} \\
\text{b. } &\quad \left[\left[\text{© mandatorily}\right]\right] \left[\text{not may}\right] \text{[} \text{[} \text{you cross the yellow line without a special permit} \text{]}
\end{align*}
\]

\[
\text{(10)}
\begin{align*}
\text{a. } &\quad \lbrack\text{not may}\rbrack = \lambda p.\lambda w.\exists w' [R(w)(w') \& p(w')] \\
&\quad = \lambda p.\lambda w.\forall w'[R(w)(w') \to \neg p(w')] \\
\text{b. } &\quad \lbrack\text{mandatorily}\rbrack = \lambda p.\lambda w.\forall w'[R(w)(w') \to p(w')] \\
\text{c. } &\quad \lbrack\text{not may}\rbrack \neq \lbrack\text{mandatorily}\rbrack
\end{align*}
\]
Zeijlstra’s (2008) syntactic account faces the same problem. He treats modal concord as syntactic agreement between an item with an interpretable [iMOD] feature and one with a matching uninterpretable feature [uMOD]. To account for the matching requirement, he assumes two sets of modal features: [i∃-MOD] / [u∃-MOD] and [i∀-MOD] / [u∀-MOD].

(11) Visitors must mandatorily sign this form.
≡ mandatorily_[i∀-MOD] visitors must_[i∀-MOD] sign this form.

| licensing by agreement |

Modal matching that involves negation does not provide the relevant feature configurations for Zeijlstra’s analysis, illustrated in (12) (contrasting with (11)).

(12) Visitors mandatorily may not cross the yellow line.
≡ mandatorily_[i∀-MOD] visitors may_[i∃-MOD] not cross the yellow line.

| licensing predicted to fail |

It might be argued for English that in these cases may not forms one lexical item specified for universal modality (i.e. [u∀-MOD]), as it expresses impossibility (Hedde Zeijlstra, p.c.). However, this explanation does not carry over to German, where verpflichtend ‘obligatory’, (13a), and müssen ‘must’, (13b), correspond to English obligatory/mandatory and must.

(13) at the hot springs

a. Es ist verpflichtend, dass Badegäste vor dem Baden duschen.
   it is obligatory that bath.guests before the bathing shower
   ‘It is obligatory that bathers shower before entering the pool.’

b. Badegäste müssen vor dem Baden duschen.
   bath.guests must before the bathing shower
   ‘Bathers must shower before entering the pool.’

In German, müssen ‘must’ and verpflichtend ‘obligatory’ can enter a modal matching relationship like English must and obligatorily, shown in (14).

(14) Badegäste müssen vor dem Baden verpflichtend duschen.
   bath.guests must before the bathing obligatorily shower
   ‘Bathers must obligatorily shower before entering the pool.’
   ≈ ‘Bathers must shower before entering the pool.’

Such modal matching is subject to the usual constraints on matching in logical strength, as shown in (15).

(15) Badegäste dürfen während des Badebesuches (#verpflichtend).
   bath.guests may during the bath.visit obligatorily
   einen Bademantel des Schwimmbades benutzen.
   a dressing gown of.the baths use
   ‘Bathers may (#obligatorily) (borrow and) use a dressing gown from the bath administration.’

Crucially, (16) shows that verpflichtend ‘obligatorily’ enters a modal matching relation with negated dürfen ‘may’. What is significant is that nicht dürfen ‘may not’ cannot be analyzed as one lexical item with a [u∀-MOD] feature in such configurations.
We can thus conclude that matching in logical strength, as illustrated for matching between necessity and impossibility, cannot be explained by previous accounts of modal concord. In section 2, I propose a novel analysis of modal matching, which naturally accounts for these data. The main claim of my analysis is that modal matching is degree modification over degrees of modality. I argue that the requirement on matching in logical strength and the restrictions on modal type are definedness conditions on degree modifiers like mandatorily. The posited truth conditions are given in (17) and (18).

(17) Matching in Modal Force (here: necessity and necessity)
   a. Visitors must mandatorily sign this form.
   b. LF: [[[mandatorily must] [visitors sign this form]]]
   c. truth conditions:
      ||[[[mandatorily must] [visitors sign this form]]]||
      is defined iff the first argument of mandatorily (here: must) expresses universal deontic modality, and if defined, it is true iff it is necessary to a high degree d that visitors sign this form and false otherwise.

(18) Matching in Logical Strength (here: necessity and impossibility)
   a. Visitors mandatorily may not cross this yellow line.
   b. LF: [[[mandatorily [not may]] [visitors cross this yellow line]]]
   c. truth conditions:
      ||[[[mandatorily [not may]] [visitors cross this yellow line]]]||
      is defined iff the first argument of mandatorily (here: not may, equivalent to must not) expresses universal deontic modality, and if defined, it is true iff it is necessary to a high degree d that visitors do not cross the yellow line and false otherwise.

2 The Analysis

This section formalizes the proposal in (17) and (18). Section 2.1 provides an analysis of graded modality, based on a proposal by Portner (2008). Section 2.2 shows how to formalize degree modification over modals. Section 2.3 proposes an analysis of the matching requirement. Section 2.4 summarizes and illustrates the complete proposal.

2.1 Grading Modality

The overarching claim in this section is that possibility, necessity, impossibility and non-necessity can be graded, and degrees of necessity are based on the weight of a proposition with respect to a contextually salient ordering source. Consider the data in (19), which are naturally occurring instances of graded modality, found by way of the google search engine and verified with native speakers.
Graded modality in comparative constructions

a. It is more necessary than anything else to arm one’s self.
b. Some equipment is more mandatory than other pieces.
c. Sometimes a chain of events is more possible than a single event.
d. Why is it more impossible to believe that the universe created itself than that god created it?
e. We’re looking for films that are even more unnecessary than Predator 2.

Graded modality in “how”-questions

a. How necessary is human resource training?
b. How mandatory is the EU biofuel directive?
c. How possible is it to escape your own ideology?
d. How impossible is it to get a mortgage?
e. How bad is idling vehicles, and how unnecessary is it?

To account for such examples, I propose an analysis based on Portner’s (2008) approach to graded possibility. Portner assumes that scales of possibility are construed by considering alternative ordering sources with respect to which different propositions are possible. This models the weight of a proposition in a global ordering source. Assume that the three propositions in (21) are all contained in some deontic ordering source. Clearly, the weight of a proposition correlates with the height of punishment when it is violated; i.e. punishment is most severe for killing, less severe for stealing, and least severe for parking in driveways.

Propositions of different weights in a deontic ordering source g

a. k = You do not kill. = highest weight in g
b. s = You do not steal. = medium weight in g
c. p = You do not park in driveways. = lowest weight in g

The statements in (22) show that Portner’s insight that weight correlates with the degree of possibility or necessity holds for the situation in (21). As (22a) and (22d) show, is more necessary roughly corresponds to carries more weight, and is more unnecessary / less necessary roughly corresponds to carries less weight. In accord with treating necessity and possibility as duals (i.e. ∼p is possible if p is not necessary), it follows that a proposition ∼p is more possible than a proposition ∼k with respect to an ordering source if k has more weight than p, as confirmed by the statement in (22b). Correspondingly, in the same situation, ∼k is more impossible than ∼p, shown in (22c).

a. In view of the law, it is more necessary [k that you do not kill] than [p that you do not park in driveways].
b. In view of the law, it is more possible [∼p that you park in driveways] than [∼k that you kill].
c. In view of the law, it is more impossible [∼k that you kill] than [∼p that you park in driveways].

---

3 Note that the utterances in (22) sound a bit stilted, and there is clearly inter-speaker variation as to how natural they are judged to be. However, the intuition is shared by those speakers who accept them that the statements in (22) most appropriately capture the situation described in (21).

4 The reason that more unnecessary is somewhat odd is that unnecessary seems to be evaluative in some sense: p is more unnecessary than k intuitively entails both p and k are unnecessary.

5 Alternatively, one might introduce these types of utterances by in view of what you have to do in order to pass as a law-abiding citizen.
d. In view of the law, it is **more unnecessary** (i.e. less necessary) [\(p\) that you do not park in driveways] than [\(s\) that you do not kill].

In Portner’s system, we can model the weight of the propositions in (21) as follows. Consider three alternative ordering sources\(^6\) that are salient in the context: \(g_1\), \(g_2\) and \(g_3\). The least inclusive ordering source (\(g_1\) in Table 1) includes only the rules that carry most weight; the most inclusive ordering source (\(g_3\) in Table 1) includes all rules mandated by the law in this context. I assume that each ordering source under consideration contains a finite number of propositions, including the most restrictive and least restrictive ordering sources. This has the consequence that the scales of necessity and possibility are totally closed, a correct prediction, as shown in section 2.2.

**Table 1: An example scale of necessity / possibility (based on Portner 2008 and adapted)**

<table>
<thead>
<tr>
<th>Ordering Source</th>
<th>Necessities</th>
<th>Possibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>(g_3 = {k, s, p})</td>
<td>(k, s, p)</td>
<td>(k, s, p)</td>
</tr>
<tr>
<td>(g_2 = {k, s})</td>
<td>(k, s)</td>
<td>(k, s, p, \neg p)</td>
</tr>
<tr>
<td>(g_1 = {k})</td>
<td>(k)</td>
<td>(k, s, \neg s, p, \neg p)</td>
</tr>
</tbody>
</table>

We can now define a formal relation of being more necessary than, written as \(>_{\text{NEC}}\), using the subset-superset relations between the alternative ordering sources, which represent weight of a proposition with respect to the global ordering source \(g\). The definition is given in (23), adapting Portner’s (2008:6) definition of more possible than. (The difference is based on expository choice, as I focus on necessity, whereas Portner focuses on possibility.)

\[
\text{(23)} \quad \text{The relation } >_{\text{NEC}} \text{ (’is more necessary than’) is defined as follows} \\
\text{For any } p, q \text{, and contextually given set of alternative ordering sources } X, p >_{\text{NEC}} q \\
\text{iff } \exists g [g \in X \land p \text{ is necessary with respect to } g \land \forall h [[h \in X \land q \text{ is necessary with respect to } h] \rightarrow g \subset h]]
\]

**in words:** “\(p\) is more necessary than \(q\) with respect to a contextually given set of alternative ordering sources \(X\) iff some \(g\) in \(X\) with respect to which \(p\) is necessary is properly included in every \(h\) in \(X\) with respect to which \(q\) is necessary.”

Applying this definition to Table 1 above, \(k\) is more necessary than \(s\), because \(k\) is necessary with respect to some ordering source in \(X\) (namely \(g_1\)), which is properly included in every ordering source in \(X\) (here: \(g_2\) and \(g_3\)) with respect to which \(s\) is necessary.

We can now define the scale of necessity and its degrees in terms of equivalence classes. Define the Equivalence Relation \(\approx_{\text{NEC}}\) as in (24) (adapted from Villalta 2006, following Cresswell 1976).

\[
\text{(24)} \quad p \approx_{\text{NEC}} q \text{ iff } \forall z: (p >_{\text{NEC}} z \text{ iff } q >_{\text{NEC}} z) \land (z >_{\text{NEC}} p \text{ iff } z >_{\text{NEC}} q)
\]

**in words:** “\(p\) is as necessary as \(q\) iff”

any proposition \(z\) that is less necessary than \(p\) is also less necessary than \(q\), and

any proposition \(z\) that is more necessary than \(p\) is also more necessary than \(q\).”

---

\(^6\) For ease of exposition, I treat ordering sources as sets of propositions in this section, rather than, for instance, as functions from possible worlds into sets of propositions.
The degree \( p \) to which a proposition \( p \) is necessary can then be assumed to equal the set of all propositions that are in an equivalence relation with \( p \). I adopt Villalta’s (2006) rendering of Cresswell’s (1976) idea; I use \( F \) to refer to a field of a relation (i.e. the set of things that are related to other things by this relation). We can now define degrees and relations between degrees as given in (25a) and (25b) respectively.

\[
(25) \quad \begin{align*}
\text{a. } & \quad p \in F(\succ \text{NEC}) \iff \exists p \in F(\text{NEC}): p = \{ z : z \approx \text{NEC} \ p \} \\
\text{in words: } & \quad \text{“A degree } p \text{ is on the scale of necessity iff there is a proposition } p \text{ which is related to other propositions by the necessity relation and } p \text{ equals the set of propositions that are in an equivalence relation with } p.”
\end{align*}
\]

\[
\text{b. } \quad p \succ \text{NEC} q \iff p \succ \text{NEC} q
\]

\[
\text{in words: } \quad \text{“A degree } p \text{ is higher on the scale of necessity than a degree } q \text{ iff any proposition } p \text{ which has the necessity degree } p \text{ is more necessary than any proposition } q \text{ which has the necessity degree } q.”
\]

Based on the definitions in (25), we can now write the full meaning of a simple necessity modal as in (26).

\[
(26) \quad ||\text{must}|| = ||\text{necessary}|| = \lambda d \lambda p \lambda w . \text{NECESSITY}(p)(w) \geq d \\
\text{where } d \in F(\succ \text{NEC})
\]

To have lexical entries for all four corners of the Square of Opposition, (27), I define possible, impossible and unnecessary below in (28) and (29).

\[
(27) \quad \begin{align*}
\text{necessity (□p)} & \quad \text{contrariness} & \quad \text{impossibility (□¬p, ¬□p)} & \quad \text{strong} \\
\text{entailment} & \quad \text{contradictoriness} & \quad \text{entailment} \\
\text{possibility (◇p)} & \quad \text{subcontrariness} & \quad \text{non-necessity (¬□p, ◇¬p)} & \quad \text{weak}
\end{align*}
\]

Given that unnecessary can be assumed to be the antonym of necessary, we can derive its meaning based on the negation theory of antonymy (see Heim 2008 for a recent version); treating negative antonyms as the negation of their positive counterparts, we posit (28).

\[
(28) \quad ||\text{need not}|| = ||\text{unnecessary}|| = -[\lambda d \lambda p \lambda w . \text{NECESSITY}(p)(w) \geq d] = -\lambda d \lambda p \lambda w . \text{NECESSITY}(p)(w) < d \\
\text{where } d \in F(\succ \text{NEC})
\]

Making the further uncontroversial assumption that necessity and possibility are duals in natural language (i.e. \( \neg □ \neg \equiv □ \neg \neg \equiv \Diamond \)), we can propose the entry in (29a) for possible. In words, possible (to the degree \( d \)) that \( p \) translates to not necessary (to the degree \( d \)) that \( \neg p \). Correspondingly, impossible, as the antonym of possible, is defined in (29b). Given the lexical entry in (29b), impossible that \( p \) correctly translates to necessary that \( \neg p \).

---

2.2 Degree Modification over Modals

As outlined above, I assume that the core semantics of mandatorily is that of a degree modifier over modal elements. In addition, I assume that the matching requirement in logical strength and the restrictions on the modal type are definedness conditions. Below, I give a first approximation of the meaning of mandatorily in modal matching contexts.

First of all, to capture the core meaning of mandatorily, I adapt Kennedy & McNally’s (2005:369) semantics for completely to modals, given in (33a). Compositionally, completely necessary and completely impossible have the meanings in (33b) and (33c) respectively.

\[
\begin{align*}
(33) \quad & \text{a. } ||\text{completely}\| = ||\text{completely possible}\| = \lambda d \lambda p \lambda w . \text{NECESSITY}(\neg p)(w) < d \\
& \quad \text{where } d \in F (\succ \succ \text{NEC}) \\
& \text{b. } ||\text{completely necessary}\| = ||\text{completely impossible}\| = \lambda d \lambda p \lambda w . \text{NECESSITY}(\neg p)(w) \geq d \\
& \quad \text{where } d \in F (\succ \succ \text{NEC})
\end{align*}
\]

In words:

- “There is a degree d to which p is necessary in w and d is the maximum of the scale of necessity.”
- “There is a degree d to which \(\neg p\) is necessary in w and d is the maximum of the scale of necessity.”

If we approximate the meaning of mandatorily in terms of degree maximization\(^8\), we can assume that its core meaning component is the same as that of completely, with additional definedness conditions that account for the matching requirement and restrictions on modal type. For a first sketch, we can assume that mandatorily is lexically specified as an element that only combines with constructions that express deontic necessity. This will be further refined in section 2.3. A first approximation of the meaning of mandatorily is given in (34).

\[
\begin{align*}
(34) \quad & \text{First sketch of the formalization of “mandatorily” (to be revised in section 2.3)} \\
& ||\text{mandatorily}\| = \lambda M \lambda p \lambda w : M \text{ expresses deontic necessity} \\
& \quad \exists d [d = \max(M) \land M(d)(p)(w)] \\
& \quad \text{where } \max(M) \text{ is the maximum of the (upper or totally closed) scale of } M
\end{align*}
\]

8 Some native speakers feel that (i) is equally strong as (ii) and (iii); others intuit that (i) is weaker. For expository ease, I give an analysis for the former group; an analysis for the latter might be framed as in (iv), based on Kennedy & McNally’s (2005:353) definition of most of the way.

i. You mandatorily must sign this form.
ii. You absolutely must sign this form.
iii. It is completely necessary that you sign this form.
iv. ||mandatorily|| = \(\lambda M \lambda p \lambda w : M \text{ expresses deontic necessity} \)
\[
\exists d [d = \max(M) \land M(d)(p)(w)] \\
\quad \text{where } \max(M) \text{ is the maximum of the (upper or totally closed) scale of } M,
\]

\[\min(M) \text{ is the minimum of the (lower or totally closed) scale of } M,\]

\[\text{and } diff \text{ is a function that maps two degrees onto the difference between them}\]
This analysis posits modal modifiers that refer to endpoints on the scale, rather than to relative standards. In (34), *mandatorily* refers to the maximum; later we will see that other modifiers (such as German *ruhig*) seem to refer to the minimum. This analysis thus assumes that the scale of necessity/possibility is a totally closed scale (i.e. it has both a minimum and a maximum). The argument for the assumption that gradable modals such as *(un-)*necessary and *(im-)*possible use totally closed scales (i.e. scales that have both a minimum and a maximum) can be based exactly on the behavior of endpoint modifiers like *completely*.

Kennedy & McNally (2005) show that only totally closed scales allow endpoint modifiers like *completely* to modify both the positive and the negative elements of antonym pairs.

(35)  
- **Open scale (neither maximum nor minimum)**  
  Her brother is completely *tall* / *short*.
- **Lower-closed scale (no maximum)**  
  The author is completely *famous* / *unknown*.
- **Upper-closed scale (no minimum)**  
  The treatment is completely *safe* / *dangerous*.
- **Totally closed scale (both maximum and minimum)**  
  The glass was completely *full* / *empty*.  
  (Kennedy & McNally 2005:355)

It can be shown for German (avoiding idiosyncrasies of English that rule out some of the English counterparts) that modal elements generally exhibit compatibility with an endpoint modifier (here: *vollkommen* ‘completely’).

(36)  
- **Meiner Meinung nach ist es vollkommen möglich, dass jemand**  
  *mit diesen Fähigkeiten geboren wird.*  
  ‘In my opinion, it is completely possible that someone is born with these abilities’  
  (http://www.blairwitch.de/index.php?seitenid=20&specialid=41)
- **Es ist vollkommen unmöglich, kostenlose DVD-Programme zu finden, denn es müssen Lizenzgebühren für die Implementierung des MPEG-2-Encodings gezahlt werden.**  
  ‘It is completely impossible to find free DVD-programs, as one has to pay license fees for the implementation of the MPEG2-encoding.’  
  (http://forum.de.selfhtml.org/archiv/2005/12/t120372/)
- **Diese Schlappe war vollkommen unnötig.**  
  ‘This failure was completely unnecessary.’  
  (http://www.ngz-online.de/public/article/nachrichten/235800/Diese-Schlappe-war-vollkommen-unnoetig.html)
d. Beeindruckend sind zu Anfang die doppelten Fenster, die aber
impressive are to start the double windows that but
vollkommen notwendig sind, was man vor allem bei schlechtem
completely necessary are what one before all at bad
Wetter merkt.
weather notices
‘To begin with, the double windows are impressive, but they are completely
necessary, which becomes clear during the bad weather periods.’

(\url{http://www.staff.uni-mainz.de/kamphus/jfj.html})

We can thus conclude that (un-)necessary and (im-)possible make use of a totally closed
scale, motivating an analysis of modal matching as degree maximization / minimization.

### 2.3 How to Derive the Matching Requirement

This section further refines the definedness conditions on modal matching elements such as
*mandatorily*. Rather than positing a global definedness condition that \( M \text{ expresses deontic necessity} \) as given in (34), I propose to decompose it into \( M \text{ expresses deontic modality} \) and \( M \text{ is positive} \) (meaning that \( M \) is the positive element of an antonym pair).

\[
\text{(37) Final analysis of “mandatorily”}
\]

\[
||\text{mandatorily}|| = \lambda \text{M} \lambda \text{p} \lambda \text{w} : M \text{ expresses deontic modality} \land M \text{ is positive}.
\]

\[
\exists d \in \text{max}(S_M) \land M(d)(p)(w)
\]

where \( \text{max}(S_M) \) is the maximum of the (upper or totally closed) scale of \( M \)
is positive means that \( \text{NECESSITY}(p)(w) \) exceeds the degree that \( M \) combines with

Recall that both necessary and impossible (i.e. the strong modals) have been defined as
positive, see (38), whereas possible and unnecessary (i.e. the weak modals) have been
defined as negative, see (39). (Examples (38) and (39) are repeated from (26), (28) and (29)).

\[
\text{(38) a. } ||\text{must}|| = ||\text{necessary}|| = \lambda \text{d} \lambda \text{p} \lambda \text{w} \cdot \text{NECESSITY}(p)(w) \geq d
\]

\[
\text{b. } ||\text{must not}|| = ||\text{impossible}|| = \lambda \text{d} \lambda \text{p} \lambda \text{w} \cdot \text{NECESSITY}(\neg p)(w) \geq d
\]

\[
\text{where } d \in F(\succ \_\text{NEC})
\]

\[
\text{(39) a. } ||\text{need not}|| = ||\text{unnecessary}|| = \lambda \text{d} \lambda \text{p} \lambda \text{w} \cdot \text{NECESSITY}(p)(w) \leq d
\]

\[
\text{b. } ||\text{may}|| = ||\text{possible}|| = \lambda \text{d} \lambda \text{p} \lambda \text{w} \cdot \text{NECESSITY}(\neg p)(w) \leq d
\]

\[
\text{where } d \in F(\prec \_\text{NEC})
\]

By decomposing the definedness conditions on modal modifiers, we arrive at two
definedness conditions that are independently motivated. On the one hand, the condition \( M \text{ expresses deontic modality} \) reflects the fact that modal type is often lexically encoded, as in
the more restricted modal dürfen ‘may’ versus the more liberal können ‘can’. On the other
hand, the condition \( M \text{ is positive} \) seems to reflect a more pervasive type of definedness
condition on certain degree modifiers.

Specifically, it can be shown that modal matching is not the only instance of such a
matching requirement. Other types of degree modification are analogous, cf. (40) and (41)\(^9\).

\(\footnote{9}{\text{Many thanks also to Pranav Anand for pointing out supporting evidence from Hoeksema (1997), who}}\)
(40) a. Die Fliege war {riesig / ?? winzig} groß.  
the fly was gigantically tinily big  
‘The fly was really big. / The fly was gigantic.’

b. Der Elefant war {winzig / ?? riesig} klein.  
the elephant was tinily gigantically small  
‘The elephant was really small. / The elephant was tiny.’

(41) a. Die Prinzessin war {grässlich / ?? bezaubernd} hässlich.  
the princess was terribly enchantingly ugly  
‘The princess was really ugly (lit. terribly ugly).’

b. Die Prinzessin war {bezaubernd / ?? grässlich} schön.  
the princess was enchantingly terribly beautiful  
‘The princess was really beautiful (lit. enchantingly beautiful).’

What unites the German constructions in (40) and (41) is that the adjectival counterparts of the degree modifiers have the same directionality on the scale as the adjective that they modify. Specifically, riesig ‘gigantic’ / bezaubernd ‘enchanting’ / mandatory are positive and their adverbial counterparts combine with positive groß ‘big’ / schön ‘beautiful’ / must\textsuperscript{10}. I conjecture that certain adjectives (like riesig ‘gigantic’) undergo a derivational process (in English marked by the derivational affix -ly) that turns them into into degree modifiers with polarity presuppositions\textsuperscript{11}.

2.4 Summary of the Analysis

I proposed that mandatorily (and similar elements) in modal matching configuration has as its core meaning component the meaning of a degree modifier over modals. It differs from regular degree modifiers in that it also has definedness conditions, which require its complement \( M \) to express deontic modality and to be positive with respect to the scale of necessity. The formal analysis is repeated in (42) from (37).

(42) \[ ||\text{mandatorily}|| = \lambda M \rho \lambda p \lambda w : M \text{ expresses deontic modality } \land M \text{ is positive}. \]
\[ \exists d [ d = \text{max}(S_M) \land M(d)(p)(w)] \]

where \( \text{max}(S_M) \) is the maximum of the (upper or totally closed) scale of \( M \) is positive means that necessity\((p)(w)\) exceeds the degree that \( M \) combines with

Derivations of the compositional semantics of two statements that involve modal matching are given in (43). Example (43a) illustrates matching between mandatorily and must, whereas (43b) illustrates matching between mandatorily and negated may. In both cases, the arrows indicate how the matching requirement is implemented.

documents adverbs in Dutch that are sensitive to scale-orientation. For instance, the Dutch degree adverb knap ‘pretty’ only seems to modify negative evaluative adjectives, such as vervelend ‘annoying’, and beroerd ‘lousy’; furthermore, the PPI bar ‘very’ only seems to modify negative members of antonym pairs, whereas the NPI bijster ‘very’ only modifies positive members.

\textsuperscript{10} A different question concerns the fact that the more extreme adjective must become a degree adverb, i.e. we find bezaubernd schön ‘enchantingly beautiful’ but not schön bezaubernd ‘beautifully enchanting’. Further research should address which adjectives can become degree adverbs of this type. This is beyond the scope of this project.

\textsuperscript{11} The idea that (certain) adverbials are linked to degrees and scales has a precedent in Nilsen (2004).
(43) a. Necessity (i.e. □)

\[ \lambda p \lambda w . \exists d [ d = \max(S_M) \land \text{NECESSITY}(p)(w) \geq d ] \]

\[ \text{||mandatorily||} \]

\[ \lambda M \lambda p \lambda w : M \text{ expresses deontic modality} \quad \lambda d \lambda p \lambda w . \text{NECESSITY}(p)(w) \geq d \]

\[ \land M \text{ is positive} \quad \exists d [ d = \max(S_M) \land M(d)(p)(w) ] \]

b. Impossibility (i.e. ¬◇ ≡ □¬)

\[ \lambda p \lambda w . \exists d [ d = \max(S_M) \land \text{NECESSITY}(¬p)(w) \geq d ] \]

\[ \text{||mandatorily||} \quad \rightarrow \lambda d \lambda p \lambda w . \text{NECESSITY}(¬p)(w) < d \]

\[ \lambda M \lambda p \lambda w : M \text{ expresses deontic modality} \quad = \lambda d \lambda p \lambda w . \text{NECESSITY}(¬p)(w) \geq d \]

\[ \land M \text{ is positive} \quad \exists d [ d = \max(S_M) \land M(d)(p)(w) ] \]

\[ \text{||not||} \quad \text{||may||} \]

\[ \lambda X . ¬X \quad \lambda d \lambda p \lambda w . \text{NECESSITY}(¬p)(w) < d \]

Crucially, as (43b) shows, may on its own would not satisfy the definedness condition on mandatorily, as it is negative before combining with negation.

Note that my analysis predicts that elements such as mandatorily should not be able to act as modal operators on their own (against the assumptions of Geurts & Huitink 2006 and Zeijlstra 2008). As a matter of fact, the prediction seems to be carried out, as shown in (44a) versus (44b-d). Even though mandatorily can occur on its own in generic statements, it seems to be impossible in episodic statements. This observation carries over to other adverbs that modify deontic necessity and have been analyzed as modal concord elements, such as necessarily and obligatorily.

(44) Why did John sign this form?

a. * He mandatorily / necessarily / obligatorily signed it.

b. He had to sign it.

c. He mandatorily / necessarily / obligatorily had to sign it.

d. It was mandatory / necessary / obligatory (for him) to sign it.

This can be taken to indicate that mandatorily in (45) combines with a covert generic operator that acts as a universal modal of sorts.

12 It is an open question whether the constituency assumed in (43) makes the right predictions in other areas. Compare Anand & Brasoveanu (2009) for an alternative that makes use of a dual operator.
In these days, visitors mandatorily signed this form.

Epistemic modals *perhaps* and *maybe* contrast with *mandatorily*, *necessarily* and *obligatorily*, in that they can occur on their own with a modal operator meaning. This might suggest that in “modal concord” with *perhaps* and *maybe* we are dealing with a different phenomenon from the phenomenon discussed in this paper.

### 3 Extending the Empirical Coverage

Grosz (to appear) shows that the German particles *ruhig*, *JA* and *bloß* also qualify as modal matching elements. On the one hand, they impose requirements on the modal force of an utterance (as Grosz to appear shows, all three must combine with modals that make reference to an authority, e.g. somebody’s commands, wishes or goals); on the other hand, they instantiate all four possible matching relations that involve (im-)possibility and (non-)necessity: (*bloß* has the same distribution as *JA* and is thus omitted from the examples.)

\[(44)\]

a. **Possibility (i.e. ◇) and “ruhig”**

Der Hans *darf* {ruhig / *JA*}. den Kühlschrank ausräumen.
the Hans may RUHIG JA the fridge empty
‘Hans may {ruhig / *JA*} empty the fridge.’

≈ In view of what I want / In view of my rules, it is completely possible that Hans empties the fridge (i.e. there is not the least objection).

b. **Impossibility (i.e. ¬◇ ≡ □¬) and “JA”**

Der Hans *darf* den Kühlschrank {JA/*ruhig} *nicht* ausräumen.
the Hans may the fridge JA ruhig not empty
‘Hans {JA / *ruhig} may not empty the fridge.’

≈ In view of what I want / In view of my rules, it is absolutely necessary that Hans do not empty the fridge (i.e. there are no mitigating circumstances).

c. **Necessity (i.e. □) and “JA”**

Der Hans *soll* {JA / *ruhig}. aufessen!
the H. shall JA ruhig eat up
‘Hans shall {JA / *ruhig} eat up!’

≈ In view of what I want / In view of my rules, it is absolutely necessary that Hans eat up (i.e. there are no mitigating circumstances).

d. **Non-Necessity (i.e. ¬□ ≡ ◇¬) and “ruhig”**

% Du *brauchst* eh {ruhig / *JA} *nicht* auf(zu)essen!
you need PRT ruhig / *JA* not (to.)eat up!
‘You {ruhig / *JA} need not eat up!’

≈ In view of what I want / In view of my rules, it is completely possible that you do not eat up (i.e. there is not the least objection).

---

13 More generally speaking, the research of Anand & Brasoveanu (2009) suggests that modal concord is a much more heterogeneous phenomenon than one might initially think.
14 See Schwager (to appear) and Portner (2010) for a different approach to the particle *ruhig*.
15 More precisely, these particles require a circumstantial modal base and a non-dynamic, non-epistemic ordering source, in terms of Kratzer (1981, 1991); this corresponds to Portner’s (2007) *priority* type.
As indicated by the paraphrases, these particles also maximize the degree of necessity or possibility in the respective constructions. We can thus conclude that JA, bloß and ruhig have exactly the same properties as other modal matching elements (like mandatorily). Their meanings can be rendered as follows, in (45) and (46).

(45) \[||JA / bloß|| = \lambda M \lambda p \lambda w : M \text{ expresses non-dynamic root modality } \land M \text{ is positive}.\]
\[\exists d [d = \max(S_M) \land M(d)(p)(w)]\]
where \(\max(S_M)\) is the maximum of the (upper or totally closed) scale of \(M\) is positive means that NECESSITY\((p)(w)\) exceeds the degree that \(M\) combines with

(46) \[||ruhig|| = \lambda M \lambda p \lambda w : M \text{ expresses non-dynamic root modality } \land M \text{ is negative}.\]
\[\exists d [d = \min(S_M) \land M(d)(p)(w)]\]
where \(\min(S_M)\) is the minimum of the (lower or totally closed) scale of \(M\) is negative means that NECESSITY\((p)(w)\) is lower than the degree that \(M\) combines with

4 Conclusion

In section 1, I have shown that we find modal-concord-like constructions in which a necessity modal combines with a negated possibility modal. I argued that such constructions cannot be easily explained under an approach such as Geurts & Huitink (2006) or Zeijlstra (2008). In section 2, I proposed an alternative analysis, which treats modal matching as degree modification over degrees of modality, based on the strengthening effect perceived in modal matching. Finally, in section 3, I showed that the German particles ruhig, JA and bloß can be analyzed as modal matching elements and that my analysis of modal matching can be straightforwardly extended to these particles. I conclude that the present analysis uniformly accounts for modal concord, modal-concord-like matching with negated modals and the distribution of German modal particles.

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Abstract

The article investigates the interpretation of two types of pronouns in Kildin Saami (Uralic, Northwestern Russia). We show that the interpretation of the pronouns sôn and iž’es’ as coreferential (strict) or bound (sloppy) under VP-ellipsis and in the scope of only-DPs shows some unexpected patterns when compared to English or German. The observable facts are derived from the interaction of two independent factors. The lexical specification of sôn and iž’es’ as syntactically free or bound in their local binding domain, and an interpretive principle SYN-SEM-BIND, which forces (locally) syntactically bound pronouns to be interpreted as semantically bound. While the new principle accounts for all the observable facts, we also show that standard interpretive principles introduced for the analysis of pronouns in English do not.

1 Introduction

We discuss the interpretation of two kinds of pronouns in Kildin Saami (henceforth: KS), a highly endangered Uralic language spoken in the Northwest of Russia. In particular, we concentrate on the availability of so-called strict and sloppy readings with reflexive and non-reflexive possessive pronouns under VP-ellipsis, on the one hand, and in focus constructions with the exclusive particle ‘only’, on the other. On the empirical side, we show that KS has two series of (possessive) pronouns, which exhibit some unexpected patterns when compared to pronouns in English, German, and Russian. We propose an analysis of KS pronouns that is based on the following assumptions: (i.) personal and possessive pronouns in KS are lexically specified as either syntactically bound (= reflexive) or free in their binding domain, which – unlike in English – is constituted by their immediate clause; (ii.) an interface rule on the interpretation of pronouns, which we call SYN-SEM-BIND, forces pronouns that are syntactically bound in their local binding domain to be interpreted as bound variables, unless semantic binding changes the interpretation as compared to the coreferential construal. The latter constraint on semantic identity is familiar from Reinhart’s (1983) coreference rule and Büring’s (2005) Have Local Binding!, but the interaction of the conditions in (i) and (ii) gives rise to slightly different predictions, which we show to be borne out by the KS facts.
The structure of the article is as follows. Section 2 introduces the phenomenon of strict and sloppy interpretations with English possessive pronouns (in simple cases), as well as a standard analysis based on Reinhart (1983) and Heim & Kratzer (1998). Section 3 provides background information on KS and its pronominal system, and it also introduces the core data concerning the interpretation of KS pronouns as coreferential or bound under VP-ellipsis and in the c-command domain of only-DPs. Section 4 puts forward our analysis of pronoun interpretation in KS, and it also offers arguments against an alternative analysis in term of Büring’s (2005) interpretive principle Have Local Binding!. Section 5 sums up the differences in pronoun interpretation between KS and English and discusses a possible reason for the syntactic reflexivity of one type of pronouns in KS. Section 6 concludes.

2 The Strict-Sloppy Ambiguity in English

English possessive pronouns are ambiguous between a sloppy reading and strict reading under VP-ellipsis and in the c-command domain of only-DPs, or only-focus constructions (henceforth: OFC); cf. Reinhart (1983), Pollard & Sag (1992), Reinhart & Reuland (1993), Heim & Kratzer (1998), Kiparsky (2002), Büring (2005), Roelofsen (2008). On the sloppy reading, the referent of the possessive pronoun co-varies with that of its respective antecedents, whereas on the strict reading it stays fixed either to an antecedent in the preceding linguistic context (strict I), or to a contextually salient 3rd party (= c) (strict II). The different readings for VP-ellipsis and OFCs are illustrated in (1) and (2), respectively.

(1) Michael butchers his reindeer, and John does, too.
   i. ‘M butchers M’s reindeer and J butchers J’s reindeer.’ (sloppy)
   ii. ‘M butchers M’s reindeer and J butchers M’s reindeer.’ (strict I)
   iii. ‘M butchers c’s reindeer and J butchers c’s reindeer.’ (strict II)

(2) Only Michael butcher his reindeer.
   i. ‘Nobody but Michael butchers his own reindeer.’ (sloppy)
   ii. ‘Nobody but Michael butchers Michael’s reindeer.’ (strict I)
   iii. ‘Nobody but Michael butchers c’s reindeer.’ (strict II)

Reinhart (1983) and Heim & Kratzer (1998) derive the strict-sloppy ambiguities in (1) and (2) from the interpretation of the possessive pronoun as either semantically free or semantically bound. The strict readings arise when the pronoun is semantically free and thus interpreted by means of an assignment function $g$. This function maps the pronoun’s index $n$ to a contextually salient individual, which may or may not be identical to the referent of a clause-mate DP. For the sloppy readings to arise, the pronoun has to be semantically bound by (the binder index of) a c-commanding DP-antecedent, which has raised at LF. Assuming VP-resolution under semantic identity (plus focus match, Rooth 1992, Roelofsen 2008), the resulting semantic representations are shown for the strict readings of (1) and (2) in (3a) and (4a), and for the sloppy readings in (3b) and (4b), respectively:

1 In what follows, we index R-expressions merely for the sake of exposition; see, Büring (2005) for discussion.

\[ \begin{align*}
\text{(3) VP-ellipsis:} \\
\text{a. } & M_1 \{ \text{butchers } \text{his}_i \text{ reindeer}, \text{ and } J_1 \{ \text{butchers } \text{his}_i \text{ reindeer}. \} \text{ (strict I & II)} \\
& \Rightarrow [\lambda x. x \text{ butchers } g(1/3)\text{’s reindeer}] (m) \land [\lambda x. x \text{ butchers } g(1/3)\text{’s reindeer}] (j) \\
\text{b. } & M_1 \{ \text{2t butchers } \text{his}_i \text{ reindeer}, \text{ and } J_1 \{ \text{2t butchers } \text{his}_i \text{ reindeer}. \} \text{ (sloppy)} \\
& \Rightarrow [\lambda x. x \text{ butchers } x\text{’s reindeer}] (m) \land [\lambda x. x \text{ butchers } x\text{’s reindeer}] (j)
\end{align*} \]
OFCs:

a. Only Michael₁ butchers his₁/3 reindeer.  
⇒ ∀z ∈ ALT(michael): [λx. x butchers g(1/3)’s reindeer](z) → z = michael

b. Only Michael 2 [ t₂ butchers his₁ reindeer].  
⇒ ∀z ∈ ALT(michael): [λx. x butchers x’s reindeer](z) → z = michael

3 The interpretation of pronouns in Kildin Saami

This section gives some background information on KS. We also introduce the two pronoun series (3.1) and introduce the basic facts concerning their interpretation as bound (sloppy) or coreferential (strict) under VP-ellipsis and in OFCs (3.2). KS is a highly endangered East Saami (< Saami < Uralic) language spoken on the Kola Peninsula in Northwestern Russia by approx. 300 speakers (cf. Rießler & Wilbur 2007, the only existing descriptive grammar of KS including only little syntax is Kert 1971). KS is an inflectional language with almost exclusive suffigation. Nominal expressions inflect for case and number (9 cases and two numbers); verbs inflect for person, number, tense and mood. The predominant word orders in KS are SVO (5), and SOV, and it has no definite articles but DP-initial demonstratives (6).

The data presented were directly elicited by the second author with 9 speakers in Lovozero on various occasions between September 2008 – August 2009.

3.1 Two pronominal series in Kildin Saami

KS has two series of pronominal expressions, which can be informally characterised as the reflexive series and the free series. Both pronominal series can inflect for person and number (phi-features). KS has no true possessive pronouns, but the GEN forms of reflexive and free pronouns are used to mark pronominal possession (Kert 1971). The reflexive form iž’es’ ‘REF:3SG,GEG/ACC (≠ idž’ REFL:3SG)’ is illustrated in (7ab), where iž’es’ functions as a pronominal argument of the verb and a possessor argument inside DP, respectively. The data in (8) show that the reflexive root iž’- can have not only 3rd person antecedents, but also 1st and 2nd person antecedents under person and number agreement (with sg antecedents).

a. Mehkal₁ iž’es’₁/² ressuvajj 
Mehkal REF:3SG,ACC draws
 illicit draws himself.’

b. Mehkal₁ [ iž’es’₁/² pudje] axxt pudże] reindeer butchers
Mehkal REF:3SG,GEG butcher his own reindeer.’
In (7b, 8b), the licensing domain for the possessive reflexives seems to be the entire clause. This observation play an important role in the analysis in section 4.

The free pronominal form sōn ‘3SG.GEN/ACC (< sōnn 3SG)’ is illustrated in (9ab) in its function as a pronominal argument and possessive pronoun, respectively:

(9)  

a. Mehkal₁  sōn₁/3  ressuvajj  
Mehkal  3SG.ACC  draws  
‘Mehkal draws him.’

b. Mehkal₁  [ sōn₁/3  pudze]  axxt  
Mehkal  3SG.GEN  reindeer  butchers  
(≠ English)  
‘Mehkal butchers c’s (not Michael’s!) reindeer.’

The non-coreference of the subject DP Mehkal and sōn in (9a) presumably follows from PRINCIPLE B of the Binding Theory. However, while the reflexive form iž’es’ in (7b) had to refer back to the clause-mate subject Mehkal in (8b), the free form sōn in (9b) behaves differently from the English possessive pronouns his/her in that it must not be coreferent with the clause-mate subject Mehkal. Again, this follows directly if the syntactic domain relevant for the application of PRINCIPLE B in (9b) is not the DP, as it is in English, but the finite clause. This assumption is confirmed by the fact that sōn can indeed be coreferent with a DP-antecedent in a higher clause, as illustrated in (10ab).

(10)  

a. Mehkal₁  sarrn   [Jovan₂  pall  sōn₁/2  pudze ]  
Mehkal  says  Jovan  slaughters  3SG.GEN  reindeer  
‘Mehkal says that Jovan slaughters his (= Mehkal’s) reindeer.’

b. Mehkal₁  sarrn   [sōn₁/2  pudze  poačke]  
Mehkal  says  3SG.GEN  reindeer  run.away  
‘Mehkal says that his (= Mehkal’s) reindeer ran away.’

Finally, observe that the pronominal system of KS differs in two important respects from the Russian one, which also features two pronominal series and reflexive pronouns (Kiparsky 2002). First, the Russian reflexive pronouns sebjja/ svoj never show person/number agreement with their DP-antecedents, unlike their Saami counterparts iž’es’/ iž’an in (7) and (8). Second, the free form sōn in KS is more restricted in its syntactic distribution than its Russian (and English/German) counterparts. Unlike in Russian (11a), where the 1st person form moju has to corefer with the 1st person subject antecedent and gives rise to a strict I-reading, the 1st person form mūn in KS (11b) cannot be coreferent with the 1st person subject, and the sentence is ungrammatical. In order to express the intended reading, the reflexive form iž’an is required instead.

(11)  

a. Ja  lublu  moju  ženu.  
1SG.NOM  love  1SG.ACC  wife:ACC  
‘I love my wife.’
3.2 Bound and free interpretations with Kildin Saami pronouns

This section presents the core findings concerning the interpretation of both pronoun types in KS under VP-ellipsis and in OFCs. The two major generalizations are as follows: (i.) The free form sōn only allows for strict II-readings (3rd party) under short VP-ellipsis and in OFCs, unlike non-reflexive his/her in English; (ii.) the reflexive form iž’es’, by contrast, does not show a uniform semantic behaviour under short VP-ellipsis and in only-focus constructions: Under VP-ellipsis, iž’es’ only allows for a sloppy interpretation, as expected (see Outakoski 2003 for parallel findings in North Saami), but, surprisingly, iž’es’ allows for a coreferential strict I-interpretation in OFCs, next to the sloppy reading.

Looking at VP-ellipsis first, both free and reflexive (possessive) pronouns are interpreted unambiguously under short VP-ellipsis. With the free form sōn in the antecedent clause the only available interpretation is a 3rd party-reading (strict II) with reference to a contextually salient individual c in (12a). With the reflexive form iž’es’ in the antecedent clause, the only available interpretation is the bound sloppy-reading, cf. (12b):

     Mehkal 3SG GEN reindeer butchers Jovan too
     ‘Mehkal butchers c’s reindeer, John does too.’ (only strict II)

b. Mehkal iž’es’ pudze axxt, Jovan nydtše.
   Mehkal REF:3SG GEN reindeer butchers Jovan too
   ‘Mehkal butchers his own reindeer, John does too.’ (only sloppy)

The same patterns are observed when the pronouns occur as pronominal object arguments, cf. (13ab):

(13)  a. Mehkal sōn šoabašt, Jovan nydtše.
     Mehkal 3SG ACC loves Jovan too
     ‘Mehkal loves c, John does too.’ (only strict II)

b. Mehkal iž’es’ šoabašt, Jovan nydtše.
   Mehkal REF:3SG ACC loves Jovan too
   ‘Mehkal loves himself, John does too.’ (only sloppy)

As mentioned above, (12a) differs from comparable English cases with non-reflexive his/her in not allowing for a strict I-interpretation with coreference to the antecedent Mehkal. The counterpart of (12b) is also not attested in English, which lacks reflexive possessives. Finally, there are no differences between KS and English with respect to pronominal arguments, as in (13). We submit that this is due to the fact that the syntactic binding domain for the pronouns is the same for both languages, namely the clause, and that the strict I-reading in KS (13a) and its English counterpart is ruled out by Principle B.

Turning to OFCs next, the following picture emerges. First, OFCs with the free form sōn, just like the VP-ellipsis case in (12a), only allow for a strict II-interpretation, cf. (14).
Pronoun Binding and Reflexivity in Kildin Saami

(14) Lyse Mehkal sōn pudze axxt
    only Mehkal 3SG.GEN reindeer butchers
    ‘Only Mehkal butchers c’s reindeer.’ (only STRICT II)

Something unexpected happens with the reflexive form iž’es’, though: In (15), iž’es’ not only allows for the expected sloppy-reading (15i), but, in addition, it can also give rise to a STRICT I-reading under coreference with the antecedent Mehkal (15ii).

(15) Lyse Mehkal iž’es’ pudze axxt
    only Mehkal REF:3SG.GEN reindeer butchers
i. ‘Only Mehkal butchers his own reindeer’
ii. ‘Only Mehkal butchers Mehkal’s reindeer.’ (STRICT I)

Again, parallel patterns obtain when the pronouns occur as pronominal object arguments:

(16) a. Lyse Mehkal sōn šoabašt
    only Mehkal 3SG.ACC loves
    ‘Mehkal is the only one that loves that person.’
   (only STRICT II)
b. Lyse Mehkal iž’es’ šoabašt
    only Mehkal REF:3SG.ACC loves
   i. ‘Mehkal is the only one that loves himself.’
   ii. ‘Mehkal is the only one that loves Mehkal.’

The available interpretations with the two pronoun types under the two structural conditions are summarised with example numbers in (17):

(17) VP-ellipsis OFC
    sōn STRICT II (12a, 13a)
    iž’es’ STRICT II (14, 16a)

The analytical challenge is posed by the availability of the STRICT I-reading with the reflexive form iž’es’ in (15) and (16b), which remains unaccounted for on any analysis that treats iž’es’ as obligatorily semantically bound. Among others, the analysis presented in section 4 will have to answer the following questions: (i.) Why does the pronoun iž’es’ behave differently under short VP-ellipsis and only-focus, and, in particular, why is the STRICT I-reading for iž’es’ unavailable under VP-ellipsis?; (ii.) Can the reflexive pronoun iž’es’ be semantically free in some contexts, and, if so, why?; (iii.) Is reflexivity in KS a syntactic or a semantic phenomenon?; (iv.) Is the pronoun sōn semantically free in all contexts, or can it also be semantically bound?

4 Analysis

Our analysis of pronoun interpretation in KS rests on two central assumptions: First, pronouns in KS are lexically specified either as syntactically free (sōn-series) or syntactically bound (iž’es’-series) in their local binding domain, which is their immediate clause (see also Outakoski 2003 for North Saami):

(18) a. sōn: must be syntactically free in their immediate clause
    b. iž’es’: must be syntactically bound in their immediate clause
As mentioned above, the only difference between KS pronouns and their English counterparts consists in the size of the local binding domain of possessive pronouns, both reflexive and free: Possessive pronouns in English must be syntactically free (PRINCIPLE B) inside their embedding DP, whereas in KS they must be bound (PRINCIPLE A) or free (PRINCIPLE B) inside their finite clause, same as their argumental counterparts. Second, we assume the following interface principle on pronoun interpretation to be active in KS:

(19) SYN-SEM-BIND:
If a pronoun is syntactically bound (= co-indexed under c-command) in its local binding domain, i.e. its immediate clause, then it must be interpreted as semantically bound if the resulting interpretation is equivalent to the coreferential construal.

The principle SYN-SEM-BIND in (19) is reminiscent of a related, but still different principle in Heim & Kratzer (1998: 264), and also of Reinhart’s (1983) coreference rule. Unlike these alternatives, though, (18) makes no predictions for situations in which a pronoun is not syntactically bound in its local binding domain. This relaxation of the principle plays a crucial role in the analysis of the pronoun sōn to come. As sōn can never be locally bound, SYN-SEM-BIND will never be applicable in the interpretation of this pronoun. We now turn to the question of how the lexical specifications in (18) and the interpretive principle SYN-SEM-BIND in (19) interact in order to account for the KS data.

4.1 Accounting for the data: SYN-SEM-BIND

First, we derive the obligatory STRICT II-interpretation for the pronoun sōn under VP-ellipsis (12a, 13a) and in OFCs (14, 16a) from its lexical specification. Being lexically specified as syntactically free in its clause (= binding domain), sōn cannot be co-indexed, and hence not be interpreted as coreferent, with a clause-mate subject antecedent, as this would impose a PRINCIPLE B violation, cf. (20a). The lexical constraint thus effectively rules out both the coreferential STRICT I-reading and the sloppy interpretation. It follows that the only available interpretation for sōn in non-embedded clauses is the STRICT II-reading, on which it refers to a 3rd party, cf. (20b) (granting ancillary notions such as Büring’s (2005) PACO):

(20) a. *[[(only)-DP1 … sōn1 …] *STRICT I, *SLOPPY (principle B)
b. [((only)-DP1 … sōn1 …] STRICT II (3rd party)

Next, we turn to the non-ambiguity of the pronoun iž’es’ under VP-ellipsis in (12b) and (13b). The absence of the coreferential STRICT I (and STRICT II) interpretation follows since iž’es’ must be syntactically bound in its finite clause – because of its lexical specification in (18b) – and hence be interpreted as semantically bound – because of SYN-SEM-BIND in (19). This is schematically illustrated in (21):

(21) \[ CP \ NP_i \ iž’es’_i \ \ldots \ ] \Rightarrow \text{LF: } [CP \ NP_i \ \lambda_1 \ldots \ iž’es’_1 \ \ldots \ ] \text{ SYN-SEM-BIND}

Finally, we turn to the problematic case posed by the ambiguity of the pronoun iž’es’ in OFCs, where it allows both for a STRICT I- and a SLOPPY interpretation (15b, 16). Again, we argue, the observed ambiguity is essentially due to the workings of SYN-SEM-BIND. First, observe that there are two ways of satisfying the lexical requirement that iž’es’ be syntactically bound. It could be co-indexed directly with the c-commanding only-DP, as in (22a), or else it could be co-indexed with a c-commanding binder index, as in (22b):
Now recall that, according to the definition of $\text{SYN-SEM-BIND}$ in (19), the semantic binding construal in (22b) is only enforced over the coreferential construal in (22a) under semantic equivalence. Crucially, though, semantic equivalence is not given in the presence of $\text{only}$ in (22ab), unlike with VP-ellipsis in (21) above. For illustration, given an individual $x$, an activity $\text{VP}$ and an $\text{NP}$ possessum, the two abstract structures in (22ab) are paraphrasable as ‘$x$ is the only one that $\text{VPs}$ $x$’s $\text{NP}$’ (22a) and ‘$x$ is the only one that $\text{VPs}$ his/her own $\text{NP}$’ (22b), which are not true under the same conditions.

Apart from accounting for the core data in (12) to (16), the proposed analysis in terms of $\text{SYN-SEM-BIND}$ makes a number of further welcome predictions. First, it accounts for the fact that $\text{sōn}$ can be co-referent with a $\text{DP}$-antecedent in a higher clause, as already observed in (10ab) above. The abstract configurations in (23ab) show that $\text{sōn}$ is not syntactically bound in its local binding domain (here: CP2) by the higher antecedent, and hence free to corefer with it without incurring a $\text{PRINCIPLE B}$ violation. This is in full parallel to the behaviour of personal pronouns in English which can also be coreferent with $\text{DPs}$ in higher clauses.

Finally, $\text{sōn}$ can even be semantically bound by a quantified $\text{DP}$ if that quantified $\text{DP}$ is located in a higher clause, as illustrated in (24):

\[
\text{(24) } \text{Nikie}_1 \text{ sarrn } [\text{CP2 (čto) sōn}_1 \text{ puaz poačke}] \\
\text{Nobody}_1 \text{ says that 3SG.Gen reindeer ran.away} \\
\text{‘Nobody}_1 \text{ says that his, reindeer ran away.’}
\]

This observation follows from the fact that $\text{sōn}$ is not lexically restricted to be semantically free. Since $\text{sōn}$ can be co-indexed with elements outside its local binding domain, cf. (23ab), it can also be co-indexed with, and hence bound by, a binder index, as shown in (25):

\[
\text{(25) } [\text{CP1 } \ldots \text{QNP } \ldots \lambda_1 \ldots [\text{CP2 } \ldots \text{sōn}_1 \ldots ]] \\
\]

To summarise: The proposed analysis accounts for the uniform semantic behaviour of $\text{sōn}$ as well as for the variable behaviour of $\text{iž’es’}$ under VP-analysis and in OFCs, respectively. The obligatory $\text{STRiCT II}$-reading for $\text{sōn}$ in both contexts follows from its lexical specification as being syntactically free in its local binding domain, independent of $\text{SYN-SEM-BIND}$. The variable behaviour of $\text{iž’es’}$ follows from its lexical specification as syntactically bound in its binding domain and from the workings of $\text{SYN-SEM-BIND}$, an interpretive principle that forces (locally) syntactically bound pronouns to be interpreted as semantic variables as long as this does not affect the truth-conditional content.

### 4.2 An alternative account and why it fails

The above analysis has succeeded in accounting for the data at the cost of introducing (yet) another interface principle on the interpretation of pronouns. In light of this, it might seem attractive to try and analyse the data by recourse to principles that have already been
suggested in the previous literature, such as, for instance, Büring’s (2005) *Have Local Binding!*, which – prima facie – looks quite similar to *SYN-SEM-BIND*. In this section, we briefly sketch such an alternative account and show why it fails.

The alternative analysis would be based on the three central assumptions in (26):

(26) i. KS pronouns are lexically specified as semantically (not syntactically!) free 
    (*sōn*-series) or unspecified (*iž’es’*-series), respectively.

   ii. The interpretive principle *Have Local Binding!* (Büring 2005) is active in KS.

   iii. A constraint on syntactic reflexivity in terms of syntactic binding

The lexical specification of the different pronoun types in (26i) as semantically free or unspecified is reminiscent of proposals for English, which take the reflexive pronoun *himself/herself* to be lexically specified as semantically bound (Grodzinsky & Reinhart 1993), whereas the free (possessive) pronouns (*he/she/his/her*) are unspecified and can be either bound or free. If the analysis were correct, we would thus deal with an interesting case of cross-linguistic variation in the pronominal lexicon. As for the principle *Have Local Binding!* (henceforth: HLB), Büring (2005) defines it as in (27). The crucial difference between HLB and our *SYN-SEM-BIND* consists in the fact that HLB – despite its name – can apply globally across sentential domains, whereas the application of *SYN-SEM-BIND* is restricted to the local binding domain of a given pronoun, in our case its immediate clause.

(27) *Have Local Binding!* (HLB!) (Büring 2005:121)

   For any two NPs α and β, if α could bind β (i.e. if it c-commands β and β is not
   bound in α’s c-command domain already), α must bind β, unless that changes the
   interpretation.

The assumptions in (26i) and (26ii) do indeed account for most of the data observed in (12) to (16). Since *iž’es’* can be either semantically bound or free, it is expected to give rise to *STRICT I*- and sloppy-readings in OFCs, cf. (15, 16b), identical to the behaviour of possessive pronouns in English. Crucially, HLB does not apply since the structures with and without binding are not semantically equivalent. Under VP-ellipsis, by contrast, the unavailability of the *STRICT I*-reading for *iž’es’* does follow from the application of HLB. Since the coreferential construal (28a) and the binding construal (28b) of the antecedent clause are semantically equivalent, HLB kicks in and forces the interpretation of the pronoun as a bound variable, hence its obligatory interpretation as sloppy.

    b. Mehkal λ₅ [ iž’es’₅ pudze ] axxt. SLOPPY: ✓

As for the absence of all but a *STRICT II*-interpretation with the putatively semantically free form *sōn*, the analysis only accounts for one half of the data, though. Under VP-ellipsis, the unattested *STRICT I*-reading for (12a) would require the co-indexing in (29a) in the antecedent clause, which is blocked by the semantically equivalent binding-structure in (29b) under HLB. Of course, (29b) itself is blocked by the lexical specification of *sōn*, which has to be semantically free. This leaves *STRICT II* as the only available interpretation.

    b. *Mehkal λ₅ [ sōn₅ pudze ] axxt. SLOPPY: *LEX
Unfortunately, this analysis cannot explain why sōn does not license a strict I-reading in OFCs. Rather, it incorrectly predicts (14) to allow for a strict I-reading, for the very same reason that its counterpart (15) with iz’es’ is ambiguous in such contexts, see above. In particular, the unattested coreferential construal in (30a) is not semantically equivalent to the binding configuration in (30b) and hence should not be blocked by HLB. Again, the binding configuration is ruled out by the lexical specification of sōn, just as in (29b).

(30) a. Mehkal₅ [ sōn₅ pudze ] axxt.     \text{strict I:}
   b. *Lyse Mehkal λ₅ [ sōn₅ pudze ] axxt. \text{sloppy: *lex}

There are further problems with this alternative account. For once, it does not account for the fact that the pronoun sōn can be coreferent with a DP in a higher clause, as was shown in (10ab) above. The argument goes as follows. Since the coreferential construal and the binding configuration are semantically equivalent with individual-denoting antecedents, the binding configuration in (31) should be the only available structure, in violation of the lexical requirement for sōn to be free.

(31) Mehkal λ₅ says [ that … sōn₅ … ]

An even more serious problem for the analysis is constituted by the fact that sōn can be semantically bound by quantified DPs from a higher clause, as shown in (24) above, in blatant violation of its putative specification as semantically free.

Finally, there are also a number of conceptual problems. First, if HLB were to apply both in KS and in English, we would be at a loss to explain why English pronouns do allow for a strict I-interpretation under VP-ellipsis, as shown in (1), whereas the KS pronoun sōn does not, unless we assume two different resolution mechanisms for VP-ellipsis in the two languages, namely semantic identity for KS and NP-parallelism for English (Büring 2005, see also Roelofsen 2008 for discussion). The question is, then, if we prefer to locate cross-linguistic variation in the mechanisms for VP-resolution, or rather in the interface principles for pronoun interpretation. Here, we opt for the latter option for reasons that will become especially clear in section 4.3. Finally, notice that the alternative analysis cannot do without a third ingredient, which is required in order to account for the obligatory coreference of the pronoun iz’es’ with a clausemate antecedent, as shown in (32):

(32) Mehkal₁ iz’es’₁/₃₁₃ pudze axxt.
    Mehkal REF:3SG.GEN reindeer butchers
    ‘Mehkal₁ butchers hi₁₃₁₃ reindeer.’

The unattested reading without coreference would be compatible with the underspecification of iz’es’, which could be either semantically bound or free. Moreover, the intended non-coreferent interpretation is not semantically equivalent to the anaphoric construal with reference to the subject DP, and hence should not be blocked by HLB either. So, in order to account for the obligatory coreference of iz’es’, the alternative analysis will have to resort to a syntactic notion of reflexivity, stipulating that iz’es’ must be syntactically bound in its local binding domain. As a result, the alternative analysis is less parsimonious than the analysis proposed above, and is therefore to be dispreferred on general conceptual grounds.
4.3 A final argument for SYN-SEM-BIND

A final argument in favour of our analysis based on SYN-SEM-BIND over alternative analyses in terms of HLB comes from the semantic behaviour of KS pronouns under long VP-ellipsis. Long VP-ellipsis is illustrated for English in (33a), which is again ambiguous between a strict I/II- and a sloppy interpretation, and for KS in (33b)

(33) a. Mehkal says [that his reindeer calved], and so does Jovan.
   b. Mehkal sarrn [sōn allt šennted’], Jovan nydše
   Mehkal says 3sg.gen she.deer calved Jovan also

The two analyses from above make different predictions concerning the interpretation of long VP-ellipsis in KS for the following reasons. First, the alternative analysis in section 4.2, which takes sōn to be semantically bound, and HLB to be active, predicts the KS sentence in (33b) to have only a strict II-interpretation, as was the case with instances of short ellipsis in (12b) and (13b) above. The strict I-interpretation with coreference to the antecedent Mehkal would be blocked by HLB (under semantic equivalence), but the resulting binding configuration, as well as a sloppy-interpretation relative to Jovan, would be blocked by the lexical specification of sōn, which must be free. By contrast, the analysis put forward in section 4.1 predicts (33b) to have all three readings: strict I, strict II, and sloppy. This is because sōn is syntactically free in its immediate clause, for which reason syn-sem-bind does not apply. As a result of this, sōn is free to corefer with the antecedent Mehkal (under co-indexation) (34a), giving rise to the strict I-interpretation; or it can corefer with a contextually salient 3rd party (34b), giving rise to strict II; or, it can be bound by a binder index that is situated below Mehkal (34c), giving rise to the sloppy interpretation.

(34) a. Mehkal₁ sarrn [sōn₁ allt šennted’], ...
   b. Mehkal₁ sarrn [sōn₅ allt šennted’], ...
   c. Mehkal λ₁ sarrn [sōn₁ allt šennted’], ...

As it happens, (33b) does indeed have all the three readings indicated in (34), providing yet more evidence in favour of our analysis put forward in section 4.1.

(33) b. Mehkal sarrn [sōn allt šennted’], Jovan nydše
Mehkal says 3sg.gen she.deer calved Jovan also
‘…and Jovan also says that Mehkal’s she-reindeer calved.’
‘…and Jovan also says that c’s she-reindeer calved.’
‘…and Jovan also says that his (=Jovan’s) she-reindeer calved.’

4.4 Conclusion

We have argued for the following analysis of the two series of pronouns in Kildin Saami. First, the two pronoun types are lexically specified as syntactically bound (iž’es’) or free (sōn) in their local binding domain. Second, unlike in English, the local binding domain for KS pronouns is the finite clause, no matter whether the pronouns occur in argument position, or as possessive pronouns inside a DP. Third, the interface principle syn-sem-bind governs the interpretation of the syntactically bound pronoun iž’es’, which has to be interpreted as semantically bound since it is always syntactically bound. Because of syn-sem-bind, iž’es’ can only receive a sloppy interpretation under VP-ellipsis, whereas it gives rise to both sloppy
and **strict** I-interpretations when interpreted in the c-command domain of *only*-DPs. Fourth, in case of a long-distance anaphoric relationship between an antecedent DP and the free form sõn across a sentential boundary, SYN-SEM-BIND does not apply and sõn can be semantically bound by such long-distance antecedents.

Finally, in KS at least, the phenomenon of reflexivity is primarily a syntactic phenomenon, and not a semantic one, because of the lexical specification requiring the reflexive pronoun iž’es’ to be syntactically bound in its clause. We discuss a possible source for this syntactic restriction in section 5.

### 5 Cross-Linguistic Variation and Syntactic Reflexivity

This section discusses two additional issues that arise in connection with our analysis of pronoun in Kilidn Saami. In section 5.1, we consider once more the cross-linguistic variation between KS, on the one hand, and English, on the other, when it comes to the interpretation of pronouns. In section 5.2, we propose to derive the syntactic reflexivity of the KS pronoun iž’es’ from its morpho-syntactic nature as a minimal pronoun in the sense of Adger (2008) and Kratzer (2009). Section 5.3 concludes with a final curious observation concerning iž’es’.

#### 5.1 Cross-linguistic variation in the interpretation of pronouns

On our analysis, the lexical specifications of KS pronouns and their English counterparts do not differ. Both the free form sõn and the non-reflexive English forms he/she/his/her/etc. are specified as syntactically free in their local binding domain, whereas the reflexive forms iž’es’ as well as English himself/herself are taken to be syntactically bound in their local binding domain. In other words, reflexive pronouns are not lexically specified as semantically bound in KS, nor are they in English. Evidence for this from English comes in form of the optional availability of **strict** I-readings with reflexive pronouns in the c-command domain of *only*-DPs, which is in full parallel with the KS-facts observed in 3.2:

1. ‘Idi is the only one that voted for himself.’ (**sloppy**)
2. ‘Idi is the only one that voted for Idi.’ (**strict I**)

One source for the observed variation in pronoun interpretation between KS and English, and more generally across languages, is the actual size of the local binding domain. In English, pronominal arguments must be free within their clause, whereas possessive pronouns must be free within their embedding DP. The behaviour of pronouns is more uniform in KS, by contrast, as the local binding domain for pronominal arguments and possessive pronouns is invariably their immediate clause. From a cross-linguistic perspective, differences in the size of the local binding domain are a well-established phenomenon, though (see, e.g., Büring 2005, for extensive discussion and an overview).

A more fundamental difference has to do with the fact that KS and English employ different interpretation mechanisms for structures with co-indexed DPs. For English, the **interface rule** has been proposed as a promising candidate for the interpretation of pronouns (see e.g. Reinhart 2006, Roelofsen 2008), as it correctly predicts the strict-sloppy ambiguity of pronouns under both short and long VP-ellipsis. For KS, by contrast, we have proposed
the interface rule SYN-SEM-BIND, which correctly predicts only sloppy-reading under short VP-ellipsis. Incidentally, the same prediction would be made by Reinhart’s (1983) coreference rule and by Büring’s (2005) HLB, which is precisely the reason for why these rules are often considered inadequate for the analysis of pronouns in English. Notice, though, that the predictions of SYN-SEM-BIND and the coreference rule or HLB only correlate for the anaphoric relations inside the local binding domain of the pronoun, i.e. inside the immediate clause, while they make different predictions for long anaphoric dependencies across sentential boundaries. In such configurations, SYN-SEM-BIND no longer requires semantic binding under co-indexation, unlike HLB, for instance, and hence we correctly predict ambiguities in cases of long VP-ellipsis in KS. Interestingly, now SYN-SEM-BIND patterns with the interface rule, such that the following picture emerges:

(36)  

i. local dependencies: SYN-SEM-BIND ⇔ coreference rule/ HLB  
ii. long dependencies: SYN-SEM-BIND ⇔ interface rule

We thus arrive at the interesting situation that SYN-SEM-BIND subsumes the functions of different interpretive principles that have been independently proposed for English, but only partially so for different syntactic domains. In long anaphoric dependencies, SYN-SEM-BIND functions like the interface rule, whereas in local dependencies it functions more like the coreference rule or HLB. Still, for English, it is the interface condition that seems to make better predictions for both local and for long anaphoric dependencies.

5.2 On the source of syntactic reflexivity: Iž as a minimal pronoun

Having argued that the KS pronoun iž’es’ is syntactically reflexive, we are left with the question of whether this property is just a primitive feature in the lexicon, or whether the syntactic reflexivity of iž’es’, i.e. the need for a clause-mate antecedent, follows for more principled reasons. In this section, we tentatively suggest that it does, and that the syntactic reflexivity of iž’es’ follows from its underlying nature as a minimal pronoun in the sense of Adger (2008) and Kratzer (2009).

We begin with two observations concerning the morpho-syntax of pronouns of the iž’es’-series. First, as shown in 3.1, iž’es’-pronouns exhibit person agreement, and seemingly also number agreement, with singular DP-antecedents, as illustrated again in (36ab):

(36)  

a. Mehkal₁ [iž’es’₁₁/2 puzde] axxt  
   Mehkal REF:3SG,GEN reindeer butchers  
   ‘Mehkal butchers his own reindeer.’  

b. Munn₁ [iž’an₁₃ puzde] axxte  
   1SG,NOM REF:1SG,GEN reindeer butcher  
   ‘I butcher my own reindeer.’

Second, unlike with the free form sōn, phi-feature agreement for person (and number) is not coded on the stem, but is suffixed onto the stem iž, as shown in (37a). Moreover, the stem iž can occur independently as in intensifier, even with pronouns of the sōn-series (37b). Notice that iž is not marked for phi-features when it occurs as an intensifier and does not form the syntactic head of the nominal expression.
(37) a. ıž-en/et/es’/…  
   ıž-1SG/2SG/3SG

b. munn ıž  
   1SG.NOM INT
   ‘I myself’

Taking this observation seriously, we propose to treat ıž-pronouns as minimal pronouns in the sense of Adger (2008) and Kratzer (2009). Unlike the regular pronouns of the sön-series, which come with a full phi-feature specification from the lexicon (coded on the lexical stem), minimal ıž-pronouns are not lexically specified for phi-features and enter the syntactic derivation without them. Adopting the analysis of pronouns as covert definite descriptions from Elbourne (2005, 2008), and in particular Adger (2008), we propose the following structure for ıž-pronouns, in which ıž constitutes the head of the pronominal DP:

(38) \[
\text{[DP } \text{ıž- [phiP } \emptyset \text{ [ID x ]]])}
\]

In the Adger-scheme, the functional layer of phiP mediates between the variable core ID, a placeholder of type <e>, and the D-head ıž which has the standard semantic of a definite determiner and is thus of type <et,e>. In particular, phiP shifts the type of ID from <e> to <et>, as is required for interpretability at the semantic interface, but in order to do so, the ıž-DP needs to acquire phi-features from its syntactic context. Adopting a concrete proposal by Kratzer (2009), we propose that ıž-DPs acquire their phi-features from clause-mate DP-antecedents (possibly mediated by the verbal predicate in ways outlined in Kratzer 2009) in a process of feature transmission, as schematically illustrated in (39).

(39) \[
\text{[CP Mehkal } \ldots \text{ [DP1 [DP2 ıž-i [phiP } \emptyset \text{ [ID ]] pudze ]]}}
\]
   [3pers] ---------> [3pers]

In brief, the syntactic reflexivity of ıž-pronouns derives in a principled way from their underlying nature as minimal pronouns and their need to acquire phi-features from a clause-mate antecedent.

Crucially, phiP in (39) need not be completely specified for person and number features for semantic well-formedness to obtain, and, lo and behold, this is what we find for ıž-pronouns in Kildin Saami. On closer scrutiny, it shows that ıž-pronouns must inflect for person, but not for number. This is witnessed by the corpus example (40) from Kuruč et al. (1985), in which the reflexive pronoun occurs in its singular form ıž’es’, and not in the independently attested plural form ıž’edan, even though it takes a plural DP as antecedent.

(40) mīn āj ja až toavsenn’e  
    1PL:GEN grandfather:NOM.PL and father:NOM.PL bravely  
    [DP ıž-es’ šannt-jēmm’n’e ] pīnen’  
    REFL-3SG:GEN birth-earth defend:3PL:PST  
    ‘Our grandfathers and fathers defended their own homelands bravely.’

Leaving the issue for further research, we take the number mismatch in (40) as welcome support for our analysis of ıž-pronouns as minimal pronouns, which in turn accounts for their syntactic reflexivity: ıž-pronouns need to recover phi-features from clause-mate antecedents.
5.3 A final observation

We conclude the discussion of pronoun interpretation in KS with the observation that, interestingly, two co-valued occurrences of *iž’es’ are not licit, cf. (41a). While we are unable to identify the precise reasons for the ungrammaticality of (41a) (possibly, they may follow from constraints on feature transmission under co-indexation), we observe that the substitution of one instance of *iž’es’ with the free form *sōn results in ungrammaticality as well, cf. (41b). This is expected since the pronoun *sōn must not be syntactically bound in its clause.

(41) a. *Mehkal1 lajhe [iž’es’, ahhka] [iž’es’, pudze]
    Mehkal gave REF: 3SG.GEN woman REF: 3SG.GEN reindeer
b. *Mehkal1 lajhe [iž’es’, ahhka] [sōn1 pudze]
    Mehkal gave REF: 3SG.GEN woman 3SG.GEN reindeer
c. Mehkal1 lajhe [ahhka-*ś’] [sōn1 pudze]
    Mehkal gave woman-POSS:3SG 3SG.GEN reindeer
‘Mehkal gave his own wife his own reindeer.’

In this deadlock situation, the possessive suffix -ś’, which is otherwise unattested in contemporary KS (unlike in other Saami varieties), is inserted in order to express the intended meaning, according to which Mehkal gave his own reindeer to his own wife (41c).

6 Conclusion

Despite first appearances to the contrary, KS pronouns do not differ from their English counterparts in their lexical specification as syntactically free or bound: Pronouns of the *sōn-series must be syntactically free in their local binding domain, whereas pronouns of the reflexive *iž’es’-series must be syntactically bound. Still, the difference in size of the local binding domain for possessive pronouns (immediate clause vs. DP) and a different interpretive principle on anaphoric relationships (SYN-SEM-BIND) result in some unexpected patterns in the distribution and interpretation of KS pronouns, when compared to English. In particular, reflexive *iž’es’ in Kildin Saami can be interpreted as coreferent when SYN-SEM-BIND does not apply, namely when semantic binding and coreference are not semantically equivalent. It is hoped that the foregoing observations will instigate more work in the semantic interpretation of pronouns in the many varieties of Saami.

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\section*{References}


Japanese Mo ‘Also/Even’ and Shika ‘Except for/Only’

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Abstract

This paper discusses Japanese particles mo ‘also/even’ and shika ‘except for/only’ that follow a noun X as [X-mo/shika]. Syntactically, X-mo and X-shika are argued to be predicate modifiers. Semantically, the conditions of the exception construction noted in the literature are relevant for both mo- and shika-sentences: They both express (i) the relationship between X and the argument construed with X, and (ii) the relationship between X and the predicate (von Fintel 1993, Moltmann 1995). The minimal difference with respect to condition (ii) gives rise to an inclusion interpretation (mo) or an exclusion interpretation (shika). In addition, I argue that they both require the presence of another element which has the properties of the argument and the predicate, though it is a semantic condition for mo, while it is a pragmatic condition for shika.

1 Introduction

Japanese particles mo ‘also/even’ and shika ‘except for/only’ are, in the simplest form, postposed to a DP, as shown in (1). The overt subjects in these sentences are optional, but the referent is provided from the context when they are phonetically null:

(1) a. (gakusei-ga) Taro-mo hashira-nakat-ta.
    student-NOM Taro-MO run-NEG-PAST
    ‘Taro also didn’t run (as is the case for other students as well),’
    ‘Even Taro didn’t run (contrary to expectation, he behaved like the other students),’

b. (gakusei-ga) Taro-shika hashira-nakat-ta.
    student-NOM Taro-SHIKA run-NEG-PAST
    ‘Only Taro ran (other students did not).’

Mo and shika are both complex lexical elements. They are semantically quantificational and pragmatically presuppositional. Their linguistic significance has naturally led to much controversy in the syntax, semantics and pragmatics literature. However, although there has been much written about each of these particles, they have generally been discussed separately. For example, in the semantics literature, a number of linguists have investigated
mo (e.g. Ohno 1989, Nishigauchi 1990, Shimoyama 2001, 2006) and shika (e.g. Fukukawa 2006, Kinuhata 2007, Yoshimura 2007), but they all concentrate either on one or the other particle. In this paper, we examine the two particles in a comparative manner and argue that they are parallel in the sense that they have the same well-formedness criteria. In the next section we will first discuss their syntax, in pursuit of a strictly compositional semantic analysis. We will see that X-mo and X-shika are best analyzed as predicate modifiers. On the basis of this syntactic assumption, a semantic analysis will be constructed in section 3. Here, the three conditions will be the focus. These concern (i) the relationship between X of X-mo/X-shika and the argument of the predicate it is construed with, (ii) the relationship between X and the predicate itself, and (iii) the obligatory presence in the context of an object which has the property of the argument of the predicate and the predicate at the same time. It will be argued in section 4 that the third condition applies in different modules of the language faculty for mo and shika.

2 Syntax

At first let us establish what the syntax of the mo- and shika-phrases is, since this will be the basis for a compositionally adequate semantic analysis. One of the complications in analyzing mo and shika is that what these particles combine with is not monocategorial. Consider the following well-formed sentences:

(2) a. [Taro-ni]-mo/shika hanasa-na-i.
   Taro-to-MO/SHIKA tell-NEG-PRES
   ‘I won’t tell Taro, either. / I will tell only Taro.’

b. [Tokyo-kara]-mo/shika ko-na-i.
   Tokyo-from-MO/SHIKA come-NEG-PRES
   ‘It won’t come from Tokyo, either. / It will come only from Tokyo.’

c. kore-wa [kasetsu-de]-mo/shika na-i.
   this-TOP hypothesis-COPULA-MO/SHIKA NEG-PRES,
   ‘This is not a hypothesis, either. / This is only a hypothesis.’

d. [aruite]-mo/shika ik-e-na-i.
   walking-MO/SHIKA go-POSS-NEG-PAST
   ‘We can’t go there on foot, either. / We can go there only on foot.’

e. [shachoo-ga kite-kara]-mo/shika kanpai-ga deki-na-i.
   president-NOM come-from-MO/SHIKA toast-NOM do-POSS-NEG-PRES
   ‘We cannot make a toast after the president arrives, either. / We can make a toast only after the president arrives.’

Moreover, (2) is not an exhaustive list of all the syntactic categories that mo and shika can combine with. Clearly, both particles can compose with a variety of different types of syntactic constituents. In (2a) they combine with an indirect object with dative ni, with a PP

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1 English even and only are discussed together by Horn (1969), with respect to the presuppositional property.

2 This property is shared with English even and only, which roughly correspond to Japanese mo and shika, respectively, though syntactically English even and only are independent words, while Japanese mo and shika appear to be bound morphemes.

3 In order to construct minimal pairs for mo and shika, I present both sentences in (2) in the negative. This is because shika requires a negative context, though this does not apply to mo. In section 4 this negative polarity constraint of shika will be shown to be a pragmatic constraint.
in (2b), with a nominal predicate in (2c), with a verb in (2d), and with an adjunct clause in (2e). This distribution might be an indication of a type-flexibility of mo/shika’s. In any event, such data make our task of formulating a syntactic generalization quite difficult. Although this itself is an important issue, in this paper, I will concentrate on the simplest case such as (1), in which mo/shika combines with a DP.

2.1 Modifier status of mo/shika-phrase

It has been proposed that the mo-phrase is a quantificational DP when it is in construction with an NP (e.g. Shimoyama 2001, 2006, Yatsushiro 2009). However, as I have argued elsewhere (Kobuchi-Philip 2008a, 2009), when we take into account the empirical observations of Aoyagi (1994), it is clear that the mo-phrase is an adjunct in the verbal domain, even when it is conjoined with an NP. Note that in (1a) above, the sentence can optionally be associated with an overt subject with nominative ga, and the sentence is perfectly grammatical. This indicates that the mo-phrase in (1a) is not the subject, given the assumption that a sentence can have only one logical subject (e.g. Heycock 1993). It is well-known that Japanese is one of the languages which allow null arguments. Thus, the reasonable assumption is that, even though the subject is not overtly present, the sentence does have a subject, only covertly.

Furthermore, consider the following sentences, which contain more than one mo-phrase:

(3) a. gakusei-ga Taro-mo Jiro-mo hashi-tta.
    student-NOM Taro-MO Jiro-MO run-PAST
    ‘The students ran, including Taro and Jiro.’

b. Taro-wa LI-o kyonen-no-mo kotoshino-mo yon-da.
    Taro-TOP LI-ACC last year’s-MO this year’s-MO read-PAST
    ‘Taro has read LI including last year’s and this year’s.’

The fact that more than one mo-phrase can co-occur in a single clause strongly suggests that it is not an argument but an adjunct.

Turning to shika, it can be seen that the adjunct status of mo also applies to shika. In (1b), just like (1a), an overt subject can be inserted without loss of grammaticality. This suggests that the shika-phrase is not a quantificational argument DP, contra Yoshimura (2007).

2.2 Predicate modifier status of mo/shika-phrase

Given that mo- and shika-phrases are both adjuncts, the next question is whether they occur in the nominal domain or the verbal domain. The following data demonstrate that they are adjuncts in the verbal domain:

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4 Native speakers of Japanese might feel the sentences in (1) slightly awkward if the subject is overtly inserted. I assume that this awkwardness is due to the general pragmatic principle of Japanese that known or contextually understood arguments are generally referred by means of a phonetically null pronoun.

5 Due to its meaning, it is impossible to construct sentences like (3) that contain several instances of shika. For the same reason an English sentence having more than one instance of [except for NP] gives rise to a semantic anomaly:

(i) # Every boy left, except for John, except for Bill.
As in (4b) and (5b), both the *mo*-phrase and the *shika*-phrase can be moved together with the predicate to form a cleft construction from the non-cleft construction (4a) and (5a). However, they cannot move together with the preceding DP to form a pseudo-cleft construction, as shown in (4c) and (5c). From this set of data, it is clear that *mo*- and *shika*-phrases belong to the verbal domain. In light of this, we can conclude that they are predicate modifiers, like an adverb. If so, it is also reasonable to hypothesize that their semantic type is \( \langle \langle e,t \rangle, \langle e,t \rangle \rangle \).

3 Semantics

Having outlined the syntactic assumptions, I will now discuss three conditions which are common in the interpretations of sentences with a *mo*-phrase and sentences with a *shika*-phrase.

3.1 Argument membership

The first semantic condition is what Moltmann (1995) calls the ‘condition of inclusion’ in her analysis of English exception construction involving *except for/but*. Consider the following sentences:

(6) a. Every boy except for/but John ran.
    b. # Every boy except for/but Mary ran.
The well-formedness of such sentences is determined by whether the exceptional object is included in the quantified domain of individuals. In (6a), John is a boy and this can be a member of the set of individuals referred to by every boy. For this reason, (6a) is well-formed. On the other hand, because Mary in (6b) is a girl, the sentence ill-formed. Mary cannot be in the presupposition set of every boy.

This condition turns out also to be applicable to Japanese sentences with mo or shika. Consider the following set of data:

\begin{enumerate}
\item (7) a. kyooju-ga Suzuki-sensei-mo hashit-ta.
\hspace{1cm} prof.-NOM Suzuki-teacher-MO run-PAST
\hspace{1cm} ‘The professors ran, including Prof. Suzuki.’
\item b. # gakusei-ga Suzuki-sensei-mo hashit-ta.
\hspace{1cm} student-NOM Suzuki-teacher-MO run-PAST
\hspace{1cm} (Lit. ‘The students ran, including Prof. Suzuki.’)
\end{enumerate}

\begin{enumerate}
\item (8) a. kyooju-ga Suzuki-sensei-shika hashira-na-katta.
\hspace{1cm} prof.-NOM Suzuki-teacher-SHISHKA run-NEG-PAST
\hspace{1cm} ‘The professors didn’t run, except for Prof. Suzuki.’
\item b. # gakusei-ga Suzuki-sensei-shika hashira-na-katta.
\hspace{1cm} student-NOM Suzuki-teacher-SHISHKA run-NEG-PAST
\hspace{1cm} (Lit. ‘The students didn’t run, except for Prof. Suzuki.’)
\end{enumerate}

Sentences (7a) and (8a) are well-formed, since Prof. Suzuki can readily be taken as a member of the set of professors denoted by the subject DP. On the other hand, (7b) and (8b) are ill-formed, because Prof. Suzuki is not a student. Thus, X of X-mo or X-shika must be a member of the set denoted by the argument DP which is construed with the mo- or shika-phrase. I will call this condition the ‘Argument Membership’ condition.

### 3.2 Predicate membership

The next semantic condition is what von Fintel (1993) calls ‘domain subtraction’ and what Moltmann (1995) calls the ‘negation condition’ in their respective analyses of the English exception construction. This condition concerns the contrast between the exceptional and the non-exceptional objects. Consider the following example sentence:

\begin{enumerate}
\item (9) No boy except for John ran.
\end{enumerate}

In the interpretation of this sentence, John is the exception and he is a runner. The rest of the boys in the context have the property that they are not runners, or lack the property of being a runner.

This condition is also applicable to the shika-phrase. Recall the following sentence:

\begin{enumerate}
\item b. (gakusei-ga) Taro-shika hashira-nakat-ta.
\hspace{1cm} student-NOM Taro-SHISHKA run-NEG-PAST
\hspace{1cm} ‘Only Taro ran (the other students did not).’
\end{enumerate}

In this sentence, Taro is the exceptional entity and he is a runner. The rest of the students must all be non-runners; if not, Taro looses its exceptionality. Thus, in the shika-sentence
Let us now consider *mo*. Unlike *shika*, it turns out that X of X-*mo* does have predicate membership. Consider the following sentences:

(10) \[\text{gakusei-ga Taro-mo hashit-ta.}\]
    \[\text{student-NOM Taro-MO run-PAST}\]
    ‘Taro also ran, like the other students.’ (‘The students ran, including Taro.’)

(1)   a. \[\text{gakusei-ga Taro-mo hashira-nakat-ta.}\]
      \[\text{student-NOM Taro-MO run-NEG-PAST}\]
      ‘Taro also didn’t run (among the students).’

The affirmative sentence in (10) gives rise to the interpretation that the relevant set of students ran, and Taro is one of them, satisfying the property denoted by the affirmative predicate *hashitta* ‘ran’. Turning to the negative context in (1a), the students relevant in the context did not run, and Taro is again one of them, this time satisfying the property denoted by the negative predicate *hashiranakatta* ‘didn’t run’. Thus, regardless whether the predicate is affirmative or negative, X of X-*mo* must be a member of the set denoted by this predicate.

In sum, *mo* and *shika* contrast in this respect. In the *shika*-sentence X of X-*shika* must not be a member of the predicate denotation, while in the *mo*-sentence X of X-*mo* must be a member of the predicate denotation. I will call this the ‘Predicate Membership’ condition.

### 3.3 Additivity

There is another condition to consider. This has to do with the obligatory presence of an additional individual, other than X of X-*mo* and X-*shika*. First, consider the following sentence with *mo*:

(10) \[\text{gakusei-ga Taro-mo hashit-ta.}\]
    \[\text{student-NOM Taro-MO run-PAST}\]
    ‘The students, including Taro, ran.’

In the interpretation of this sentence, Taro is a student runner. In order for the sentence to be true, there must be another student runner aside from Taro. Thus, if there are some students other than Taro, but none of them ran, then (10) is not well-formed. Obviously, if there is no student other than Taro, i.e. if Taro is the only student, (10) is not well-formed either. Therefore, the presence of some element which satisfies the argument membership condition and the predicate membership condition at the same time is a necessary part of the truth conditions of *mo*.

This condition seems to be applicable to English as well. Consider the following sentences:

(11) a. John also submitted the homework.
    b. John submitted the homework, too.
    c. John submitted the homework as well.

When the lexical elements *also*, *too*, and *as well* are construed with *John*, these sentences are
ill-formed if John is the only individual who submitted the homework. Thus, an additional individual other than John who has the property indicated by the predicate must be assumed to be in the context. I will call this third condition the ‘Additivity’ condition.

Now, what about shika? Consider the following sentences:

(12) a. gakusei-ga Taro-shika hashira-na-katta. (=1b)
    student-NOM Taro-SH'IKA run-NEG-PAST
    ‘The students didn’t run, except for Taro.’

b. ? Taro-no okusan-ga Mariko-shika hashira-na-katta
    Taro-GEN wife-NOM Mariko-SH'IKA run-NEG-PAST
    ‘No wife of Taro ran, except for Mary.’

In the interpretation of (12a), Taro is a student runner, and he is the exception. The rest of the students relevant in the context are all non-runners. That is, it is most natural to assume that there is at least one other student who did not run. Thus, the presence of some individual who has argument membership and predicate membership is assumed, just as we have seen in (10) with mo. For the sentence in (12b), we take that Mariko to be Taro’s wife and to be exceptional in that she is a runner. That is, we assume that there are some unexceptional wives of Taro’s who are not runners. In a monogamous society, this sentence sounds odd (hence the ‘?’ judgment). The effect here shows how strong the additivity condition is in a shika-sentences.

In a way, the additivity condition is quite logical. By definition, an exception is something abnormal or deviating from some norm. Such a concept can only arise if there exists a norm or ordinary state of affairs in the first place. If one focused on a single entity without comparing it with anything else, there could be no talk of what is normal nor of what is exceptional. From this point of view, the additivity condition seems to be a logical consequence of the very meaning of ‘except’.

In light of these considerations, the following data are puzzling at first:

(13) a. gakusei-ga Taro-shika hashira-na-katta. (=1b)
    student-NOM Taro-SH'IKA run-NEG-PAST
    ‘The students didn’t run, except for Taro.’
    nazenara, gakusei-wa Taro-dake-dakara-da.
    because student-TOP Taro-only-from COPULA
    ‘Because Taro is the only student.’

b. Taro-no okusan-ga Mariko-shika hashira-na-katta
    Taro-GEN wife-NOM Mariko-SH'IKA run-NEG-PAST
    ‘No wife of Taro ran, except for Mary.’
    nazenara, Taro-no okusan-wa Mariko-dake-dakara-da.
    because Taro-GEN wife-TOP Mariko-only-from COPULA
    ‘Because Taro’s wife is only Mariko.’

c. kono gakubu-wa ichinensei-ga Taro-shika i-nai.
    this department-TOP 1st year student-NOM Taro-SH'IKA be-NEG
    ‘In this department, there is no 1st year student except for Taro.’

In (13a), the first sentence invites the presupposition that there exists some student who is a student but is not a runner. However, in the continuing second sentence, this presupposition
is immediately cancelled: Actually, there is no student other than Taro, meaning that there is not any student who is not a runner. Yet, surprisingly, the sequence of these two sentences is not at all ill-formed. It is only slightly humorous. Likewise, in (13b), the first sentence invites the presupposition that there is someone else other than Mariko who is a wife of Taro’s and who did not run. Again, in the second sentence this is straightforwardly corrected. The second sentence asserts that there is no other wife of Taro, entailing that there is not any non-runner who is Taro’s wife. However, again, the sequence of these sentences is well-formed. Finally, (13c) is an existential sentence and asserts that Taro is the only first year student. This sentence is especially peculiar. Shika focuses on Taro and thus it should trigger a presupposition that there is at least another first year student who does not exist. This last proposition itself seems to be a contradiction. But this sentence is perfectly well-formed and acceptable. In sum, what data in (13) shows is that the additivity condition is actually not part of the truth conditions of shika. Truth conditions cannot be cancelled, only implicatures can be cancelled. Thus, we seem forced to conclude that the additivity condition lies outside the formal semantics of shika.

Let us consider English exception construction. Consider the following fragments:

(14) (John submitted the homework.)
    No student except for John did.
    Because John is the only student.

Sentence (14) sounds humorous. But this is precisely because the third sentence in these fragments makes use of the implicature of the second sentence with except for and cancels it. However, these fragments are not exactly considered contradictions. Thus, here, too, we can see that the additivity condition is the implicature rather than a truth condition.

Thus, although the additivity condition is applicable to both mo and shika, the component of the language faculty where this condition applies to differs for the two particles. In the case of mo-sentences, it applies as a truth condition in the semantic component, and in the case of shika-sentences, it applies in the pragmatic component, i.e. as an interface condition.

### 3.4 Formal analyses

In this section we will attempt to formalize the semantics of mo and shika. First let us look at the mo-construction. The analysis here follows Kobuchi-Philip (2009), which proposes a unified analysis of Japanese mo.\(^6\) In order to make the comparison with the shika-

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6 The same does not hold in the following instance of an exception construction in an affirmative context:

(i) (John did not submit the homework.)
    Every student except for John did.
    #Actually John is the only student.

The ill-formedness here seems to derive from the semantics of every.

7 Kobuchi-Philip (2009) proposes a unified analysis of Japanese mo which covers (i) the universal quantificational use of mo with an indeterminate; (ii) mo within a negative polarity item containing an indeterminate; (iii) mo within a negative polarity item functioning as a minimizer, and (iv) additive mo. An example for each type of mo is shown below:

(i) dono hito-mo hashit-ta. ‘Everybody ran.’ (universal quantificational mo)
   which person MO run PAST
(ii) dare-mo hashira-na-katta. ‘Nobody ran.’ (indeterminate NPI mo)
   who MO run NEG PAST
(iii) hito-ri-mo hashira-na-katta. ‘Not one person ran.’ (minimizer NPI mo)
construction more perspicuous, we will focus on negative mo-sentences. For the syntactic analysis of the mo-sentence in (15a), the semantic values of the lexical entries can be analyzed as shown in (15b), and the outcome of the compositional derivation of sentential meaning as shown in (15c):

\[
\text{(15) a. } [ [ \emptyset_{\text{the gakusei}}]-ga \ [ \text{Taro-mo hashira-nakat-ta } ] ] . \\
\text{student NOM Taro MO run NEG PAST} \\
\text{‘The students didn’t run, including Taro.’} \\
\text{b. gakusei (student): } \lambda x \ [ \text{stu}(x) ] \\
\emptyset \ (\text{the}): \lambda X \lambda Y [ Y(\oplus X) ] \\
\text{Taro: } \lambda x [ \text{taro}(x) ] \\
\text{mo: } \lambda P \lambda R \lambda x [ ( \text{at}(\oplus P) \subset \text{at}(x) ) \ (\text{arg. mem}) \\
\lambda ( ( \text{at}(x) - \text{at}(\oplus P) ) \cap R ) \neq \emptyset ) \ (\text{add}) \\
\lambda ( \text{at}(\oplus P) \subset R ) \ (\text{pred. mem}) \\
\text{hashiranakatta (didn’t run): } \lambda x [ \text{non-ran}(x) ] \\
\text{c. } ( \text{at}(\oplus \text{taro}) \subset (\text{at}(\oplus \text{stu})) \\
\lambda ( ( \text{at}(\oplus \text{stu}) - \text{at}(\oplus \text{taro}) ) \setminus \text{non-ran} ) \neq \emptyset \\
\lambda ( \text{at}(\oplus \text{taro}) \subset \text{non-ran} ) \\
\]

For the analysis in (15a), I assume that there is a null determiner, in the Japanese DP, which can be interpreted either as definite or indefinite. The justification for this assumption, discussed in Kobuchi-Philip (2006), is that it yields empirical and theoretical advantages when taken in conjunction with the plurality theory of Link (1983) and Landman (2000), which I assume here as well. Following Partee (1987), I assume the proper name Taro is of type <e,t>. Adopting the internal negation of Horn (1989), I assume a verb with the negative morpheme as a single word. This is because a mo-phrase takes scope over negation in the universal quantificational use of mo (all>not, rather than not>all). Now, the outcome of the computation of sentential meaning consists of three propositions, as shown in (15c). (15a) asserts (i) that Taro is a student, (ii) that there is some student who did not run, and (iii) that Taro did not run.

Next, let us consider the shika-construction. For the syntactic analysis of the shika-sentence in (16a), the lexical entries can be analyzed as shown in (16b), and the outcome of the derivation of sentential meaning as shown in (16c):

\[
\text{(16) a. } [ [ \emptyset_{\text{the gakusei}}]-ga \ [ \text{Taro-shika hashira-nakat-ta } ] ] . \\
\text{student NOM Taro SHIKA run NEG PAST} \\
\text{‘The students didn’t run, except for Taro.’} \\
\text{b. gakusei (student): } \lambda x [ \text{stu}(x) ] \\
\emptyset \ (\text{the}): \lambda X \lambda Y [ Y(\oplus X) ] \\
\text{shika: } \lambda x [ \text{non-ran}(x) ] \\
\text{c. } ( \text{at}(\oplus \text{taro}) \subset (\text{at}(\oplus \text{stu})) \\
\lambda ( ( \text{at}(\oplus \text{stu}) - \text{at}(\oplus \text{taro}) ) \setminus \text{non-ran} ) \neq \emptyset \\
\lambda ( \text{at}(\oplus \text{taro}) \subset \text{non-ran} ) \\
\]

In Japanese, a bare NP such as gakusei ‘student’, as exemplified in (i), can be interpreted as definite or as indefinite and as either singular or plural, as shown in (ii):

\[
\text{(i) gakusei-ga kaet-ta.} \\
\text{Student-NOM leave-PAST} \\
\text{Some students left.} \\
\text{A student left.} \\
\text{Some students left.} \\
\]

The four-way ambiguity here can be accounted for straightforwardly if we assume the presence of an indefinite determiner or a definite determiner.
Taro: \( \lambda x [\text{taro}(x)] \)

shika: \( \lambda P \lambda R \lambda x [\text{(at}(\text{⊕P}) \subseteq \text{at}(x)) \quad \text{(arg. mem)} \)
\( \Lambda [\text{at}(\text{⊕P}) \notin R) \quad \text{(pred. mem)} \)
\( \Lambda [\text{(at}(x)-\text{at}(\text{⊕P})) \subseteq R)] \quad \text{(pred. mem)} \)

hashiranakatta (didn’t run): \( \lambda x [\text{non-ran}(x)] \)

c. \( (\text{at}(\text{⊕taro}) \subseteq \text{at}(\text{⊕stu})) \)
\( \Lambda (\text{at}(\text{⊕taro}) \notin \text{non-ran}) \)
\( \Lambda ((\text{at}(\text{⊕stu}) - \text{at}(\text{⊕john})) \subseteq \text{non-ran}) \)

(16a) differs minimally from (15a) in that \textit{mo} in (15a) is replaced with \textit{shika} in (16a). The predicate \textit{hashiranakatta} ‘did not run’ is analyzed as internal negation as before.\(^9\)

Note that the denotation of \textit{shika} in (16b) differs from the denotation of \textit{mo} in (15b) with respect to predicate membership and also with respect to additivity. First, the predicate membership condition of \textit{mo} in (15a) determines that Taro is a member of the predicate denotation, i.e. that Taro is included in the set of non-runners. However, in the case of \textit{shika} in (16a), Taro is excluded from the predicate denotation, i.e. Taro is not a non-runner but rather a runner. Here, Taro is contrasted with the rest of the students, i.e. the other students who are non-runners. Hence, the predicate membership condition is expressed by two propositions, as indicated on the right in (16b). Second, as discussed above, additivity was part of the truth conditions of \textit{mo}, but part of the pragmatics of \textit{shika}. Thus, the denotation of \textit{shika} does not include the additivity condition.

Given this contrast with \textit{mo}, the \textit{shika}-sentence (16a) yields the meaning shown in (16c), which expresses (i) that Taro is a student, (ii) that Taro is a runner, and (iii) that the rest of the students did not run.

The crucial truth-conditional difference between \textit{mo} and \textit{shika} is the predicate membership condition. The \textit{mo}-construction gives rise to an ‘inclusion’ meaning, while the \textit{shika}-construction gives rise to an ‘exclusion’ meaning. Aside from the additivity condition, then, Japanese \textit{mo} and \textit{shika} are parallel. To make this parallelism more perspicuous, consider the following paraphrasing of (15a) and (16a):

(17) a. The students didn’t run, including Taro.
    b. The student didn’t run, excluding Taro.

As we discussed above, the additivity condition for \textit{mo} is part of its truth conditions, while that for \textit{shika} is pragmatic.\(^{10}\) In the pragmatic component, however, the additivity condition of \textit{shika} is a crucial part of the well-formed condition. In the next section, we will discuss pragmatics of \textit{mo} and \textit{shika} and see how this is so.

4 Pragmatics

In this section, we shift our perspective and explore the pragmatic domain. This part of the paper is somewhat tentative.

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\(^{9}\) This is also justified in the literature: Kataoka (2006) convincingly argues that \textit{shika}-phrase always scopes over negation.

\(^{10}\) A justification for the claim that the additivity condition of \textit{mo} is part of its semantic value, see Kobuchi-Philip (2009).
In the discussion of the formal semantics in section 3, we have seen that *mo* and *shika* have at least the same two truth conditional criteria, namely, the argument membership condition and the predicate membership condition, and we showed the contrastive nature of *mo* and *shika*. They are opposite in the sense of inclusion vs. exclusion as regards the predicate membership condition.

The third condition, i.e. the additivity condition, is included in the formal semantics of *mo*. However, for *shika*, we concluded that it was outside of the formal semantics on the basis of empirical data including an existential sentence. Yet, the consideration of pragmatics of *mo* and *shika* reveals that the additivity condition is in fact a necessary condition for them in the pragmatic component. At the same time, this leads to an account of the well-known fact that a *shika*-sentence requires a negative predicate.

### 4.1 Truth conditions and expectation

Consider the following set of sentences, each of which contain a numeral quantifier (NQ), which has the form [numeral+classifier]:

\[
\begin{align*}
\text{(18)} & \quad \text{a. } \text{gakusei-ga } 20\text{-nin hashit-ta.} \\
& \quad \text{student-NOM 20-CL run-PAST} \\
& \quad \text{‘20 students ran.’} \\
& \quad \text{b. } \text{gakusei-ga } 20\text{-nin-mo hashit-ta.} \quad (20>\text{expectation}) \\
& \quad \text{student-NOM 20-CL-MO run-PAST} \\
& \quad \text{‘As many as 20 students ran.’} \\
& \quad \text{c. } \text{gakusei-ga } 20\text{-nin-shika hashira-na-katta.} \quad (\text{expectation}>20) \\
& \quad \text{student-NOM 20-CL-SHIKA run-NEG-PAST} \\
& \quad \text{‘Only 20 students ran.’}
\end{align*}
\]

In (18a), the NQ stands by itself and the sentence simply reports the fact that 20 students ran. In contrast, in (18b) and (18c), the NQ is associated with *mo* and *shika*, respectively, and, as seen in the English gloss, these particles contribute to the interpretation of the sentences in a significant manner. In (18b), the sentence asserts that the number expressed in the sentence, namely 20, is higher than what the speaker expected. On the other hand, in (18c) it is the opposite. This sentence asserts that 20 is lower than what the speaker expected. Thus, we observe here that the presence of the expectation is an important element in the interpretation of these sentences. Furthermore, the data in (19) and (20) more explicitly show the contrastive relationship between the expectation and the truth condition in determining the well-formedness of the *mo*- and *shika*-sentences:

\[
\begin{align*}
\text{(19) } & \quad \text{Mo} \\
& \quad \text{a. } \# \text{gakusei-ga } 20\text{-nin hashiru-to omotteita-ga 10-nin-mo hashit-ta.} \\
& \quad \text{student-NOM 20-CL run-COMP was thinking-but 10-CL-MO run-PAST} \\
& \quad \text{‘I assumed 20 students would run, but as many as 10 students ran.’} \\
& \quad \text{b. } \text{gakusei-ga } 20\text{-nin hashiru-to omotteita-ga 30-nin-mo hashit-ta.} \\
& \quad \text{student-NOM 20-CL run-COMP was thinking-but 30-CL-MO run-PAST} \\
& \quad \text{‘I assumed 20 students would run, but as many as 30 students ran.’}
\end{align*}
\]
(20) Shika

a. gakusei-ga 20-nin hashiru-to omotteita-ga
   student-NOM 20-CL run-Comp was thinking-but
   10-nin-shika hashira-na-katta.
   10-CL-shika run-NEG-PAST
   'I assumed 20 students would run, but only 10 students ran.'

b. gakusei-ga 20-nin hashiru-to omotteita-ga
   student-NOM 20-CL run-Comp was thinking-but
   30-nin-shika hashira-na-katta.
   30-CL-shika run-NEG-PAST
   'I assumed 20 students would run, but only 30 students ran.'

In (19) and (20), the expectation is expressed by the first clause before ga ‘but’, and the second (main) clause expresses the actual state of affairs. In the mo-sentences in (19), only (19b) is well-formed, since only (19b) expresses the relationship between the two propositions correctly with respect to mo. Likewise, in the shika-sentences in (20), only (20a) is well-formed.

The function of mo and shika is to express a discrepancy between expectation and actual state of affairs (observation). The sentence with mo/shika asserts the observation relative to the expectation.

Now, the expectation and the observation of (19) and (20) can be represented in terms of the scalar implicature, as shown in (21):

(21) Expectation 20 students run
    low---------------------20-------------------------high

    ↑                  ↑

    Observation 10 students run 30 students run

    Particle       shika        mo

The presence of the expectation and the observation behind a surface sentence, especially with respect to a shika-sentence, might remind the reader of the (positive and negative) inferences of an English sentence with only, as exemplified below (e.g. Bever and Clark 2008):

(22) a. Only Mary smokes.
    b. Positive inference: Mary smokes. ('prejacent')

---

11 Japanese particle ga is perhaps most often seen in the linguistics literature as a nominative case marker (without semantic content), which is postposed on a DP. Another particle ga, which is relevant here, is postposed on a clause, having the same semantic content as English but.

12 X of X-mo is associated with a less-likelihood in the sense of Karttunen and Peters (1979) just like X of even X in English. Generally, a higher number corresponds to a lesser-likelihood with respect to mo ‘even’ associated with a numeral. See Nakanishi (2007) and Kobuchi-Philip (2008b) for this correspondence.

13 In the literature ‘prejacent’ generally refers to the English sentence containing only minus only. (von Fintel 1993, Horn 2002, Ippolito 2008, Beever and Clark 2008, etc.). In Japanese, however, determining the prejacent of a shika-sentence is not this simple, since a shika-sentence does not imply the same sentence without shika, if it is at all grammatical. Compare (i) vs. (ii) and (iii) vs. (iv):

(i) gakusei-ga Taro-shika hashirana-katta.
   'No students other than Taro ran.'

(ii) * gakusei-ga Taro hashirana-katta.
   'Only Taro ran.'

(iii) gakusei-ga 20-nin-shika hashirana-katta.
   '20 students ran.'

(iv) gakusei-ga 20-nin hashirana-katta.
   '20 students didn’t run.'

If shika is associated with an ordinary DP such as Taro, as in (i), then the shika-less version in (ii) is totally
c. Negative inference: Nobody other than Mary smokes.

Note, however, what we see in (22) does not exactly map to (21). In the present paper, the positive inference and the negative inference of Japanese shika-sentence are both included in the formal semantics as the truth condition, as discussed in the previous section. Furthermore, (22) does not include the expectation in (21). In the view taken in the current paper, the presence of the expectation is a crucial part of the well-formedness of the sentence with focussed mo and shika.

For shika, then, we might represent what is relevant in our discussion as shown in (23):

(23) a. gakusei-ga 20-nin-shika hashira-na-katta. (=18c)  
.student-NOM 20-CL-SHIKA run-NEG-PAST  
‘Only 20 students ran.’

b. Expectation: More than 20 students run.

c. Truth condition: 20 students ran but it is not that more than 20 students ran.

Similarly, we obtain the following representation for the mo-sentence in (18b):

(24) a. gakusei-ga 20-nin-mo hashit-ta. (=18b)  
.student-NOM 20-CL-MO run-PAST  
‘As many as 20 students ran.’

b. Expectation: Less than 20 students run.

c. Truth condition: 20 students ran.

As mentioned above, since the function of mo and shika is to express the discrepancy between the expectation and the observation, these particles are obviously not licensed without an expectation. Furthermore, what is important here is the relationship between the proposition which refers to the observation and the proposition which refers to the expectation. As shown in the diagram in (21), in the case of shika, the expectation is higher than the observation on the scalar implicature, i.e. the former entails the latter. while in the case of mo, it is the other way around.

4.2 Pragmatic application of the additivity condition to shika

The necessary presence of an expectation supports the presence of the additivity condition of shika in the pragmatics component. Consider the following sentence again, together with the two propositions:

ungrammatical for Case reasons. If shika is associated with an NQ (ex. iii) or some other phrase, and if the shika-less sentence is grammatical (ex. iv), then the meaning of the two sentences are quite different from each other, as seen in the English gloss of (iii) and (iv). If (i) and (iii) are true, (v) and (vi) below are true of the focussed element, respectively. Kinuhata (2007) identifies prejacent of a Japanese shika-sentence in this manner:

(v) Taro-ga hashitta.  (vi) gakusei-ga 20-nin hashitta.  
‘Taro ran.’ ‘20 students ran.’

In the literature, one of the most discussed issues in terms of only is the status of the positive inference and the negative inference. The question is whether these are entailment, presupposition, or conversational implicature (see Ippolito 2008 and references in it). The current paper does not directly address this issue in terms of Japanese shika. Rather, I simply assume that both positive and negative inferences are entailments of the shika-sentence, as formalized in section 3.
(25) a. gakusei-ga Taro-shika hashira-na-katta. (=12a=1b)  
student-NOM Taro-SHKA fun-NEG-PAST  
‘The students didn’t run, except for Taro.’

b. Truth condition: Taro ran and no student other than Taro ran.

c. Expectation: Someone other than Taro (e.g. Jiro) will run.

For this sentence to be pragmatically well-formed, there must be some student other than Taro who was expected to run, as shown in (25c). Furthermore, consider the following problematic sentence we have seen earlier:

(26) a. kono gakubu-wa ichinensei-ga Taro-shika i-nai. (=13c)  
this department-TOP 1st year student-NOM Taro-SHKA be-NEG  
‘In this department, there is no 1st year student except for Taro.’

b. Truth condition: Taro exists as 1st year student and no 1st year student other than Taro exists.

c. Expectation: There is some 1st year student other than Taro exists.

Here, too, the expectation is that there is at least one person, other than Taro, who is a first year student. If this expectation is not present in the speaker’s mind (or context), then the sentence (26a) is pointless. Therefore, even if there is no actual existence of another element specified in the additivity condition, this must apply to shika as well, at least pragmatically.

4.3 Negation requirement of shika

As is well-known, shika requires a negative predicate. This has attracted a lot of attention in Japanese linguistics (e.g. Muraki 1978, Kato 1985, Konomi 2000, Teramura 1991, Numata 1991, Aoyagi and Ishii 1994, Tanaka 1997, Kuno 1999, Kataoka 2006). However, none of the research has a formal pragmatic discussion.

In the formal semantic analyses of shika (e.g. Furukawa 2006, Yoshimura 2007, Kinuhata 2007), the explanation of why shika requires a negative predicate remains unclear. For example, Furukawa (2006) treats X-shika as semantically equivalent to English except for/but X, and, as these elements do not require a negative predicate, he does not particularly address the question as to why Japanese shika does. Yoshimura (2007) assumes that X-shika is an NPI and argues that, just like NPIs in other languages, shika must be under the scope of negation, closely following Giannakidou’s (2005) treatment of NPIs. However, this conflicts with Kataoka’s (2006) demonstration that X-shika regularly takes scope over negation. Kinuhata (2007) hypothesizes that shika is equivalent to another Japanese focus particle dake ‘only’, which also denotes exclusion but does not require negation. He argues that, while dake contains negation as its lexical semantic content, shika does not, and thus, shika must be associated with an overt negation. However, both the hypothesis and the formal mechanisms he proposes raise many questions.\(^{15}\)

On the other hand, our discussion above provides a possible account for the negation requirement of shika. Consider (23), repeated here:

\(^{15}\) Kobuchi-Philip (in press) briefly reviews these works and points out that there is a compositional problem in each.
Semantically, the meaning calculation of (23a) yields the proposition that 20 students ran and no more, as in (23c). In addition, as we discussed in 4.1 above, given [. . . X-shika P-NEG .], X satisfies the property P, and whatever entails X satisfies the property P-NEG, as indicated in (21). Given this, consider the following ill-formed sentence with an affirmative predicate:

(27) *gakusei-ga 20-nin-shika hashira-na-katta. (=18c)
    student-NOM 20-CL-shika run-NEG-PAST

‘Only 20 students ran.’

b. Expectation: More than 20 students run.
c. Truth condition: 20 students ran but it is not that more than 20 students ran.

The same thing can be said for the following sentence:

(28) *gakusei-ga Taro-shika hashira-na-katta.
    student-NOM Taro-shika run-PAST

This yields a contradiction. (28) asserts that Taro did not run, yet a set of students containing Taro (e.g. Taro and Jiro) did run. Thus, when we have an affirmative predicate, the sentence always gives rise to a contradiction. That is, only the negative predicate can yield a logical interpretation for a shika-sentence. Note that such contradictions could never arise in a mo-sentence, since it has the opposite value regarding the predicate membership.

5 Summary and further tasks

In this paper, I first showed that Japanese X-mo and X-shika are both predicate modifiers. Semantically, I argued that the two particles are similar in the sense that they encode both the argument membership condition and the predicate membership condition. The latter gives rise to the meaning of inclusion for mo and the meaning of exclusion for shika. In addition, I argued that there is a third condition, namely the additivity condition. This is included in the truth conditions for the mo-sentence, and systematically yields the additive meaning. We have seen that this is not necessarily applicable for shika semantically. However, I showed that this is in fact a crucial element in pragmatic component.

As the present paper is an interim report of an on-going research, there are a number of tasks ahead of us. First, the pragmatic part of our discussion needs to be formalized, so that it is possible to examine the validity of this mechanism in an objective manner. Second, in this paper the meaning component that the additivity condition applies to was argued to be
different for mo and shika. It might be yet possible to pursue a unified analysis, if we employ intensionality (for shika, an additional entity must exist in the speaker’s expectation, which could be argued to be a possible world accessible to the speaker). Third, if the line of thought in this paper is correct, then the next question is to investigate what is going on in English exclusives such as only and except for, in comparison with inclusives such as also and too.

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References


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Focus-sensitive operators in Nłeʔkepmxcin
(Thompson River Salish)

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Abstract

Based on new fieldwork data, this paper gives the first overview and analysis of focus sensitive operators in Nłeʔkepmxcin. Free foci in discourse exchanges are obligatorily marked using a predicative strategy, resulting in a clefting strategy for DPs. Exclusive and additive readings are expressed using the same predicative strategy, and we show that exclusive ƛ̓uʔ ‘only’ and additive ʔełƛ̓uʔ ‘also, even’ are adverbial: as 2nd position clitics, they occupy a high functional projection in the left periphery. There is no specific marker of scalarity like English even. Finally, although exclusive ƛ̓uʔ is strictly f-sensitive in the sense of Beaver and Clark (2008), additive ʔełƛ̓uʔ has the more flexible syntax and association behaviour of Q-adverbials like always.

1 Introduction

This article presents the first overview and the first syntactic and semantic analysis of focus-sensitive operators in Nłeʔkepmxcin (Thompson River Salish), a severely endangered Salishan language of southwestern Canada. We concentrate on the expression of exclusive (only) and additive (also, too) readings, and show that there is no specific marker of scalarity like English even.

After briefly outlining some general properties of Nłeʔkepmxcin (§2), we review data showing that free foci are obligatorily marked using a predicative strategy, which results in a clefting strategy in case of DP-foci (§3). In section 4, we show that the formal expression of exclusive and additive readings is based on the same predicative strategy. Section 5 presents the syntactic analysis, according to which focus-sensitive operators ƛ̓uʔ ‘only’ and ʔełƛ̓uʔ ‘also’ are adverbial in nature: as 2nd position clitics (2CL), they occupy a high functional projection in the left periphery of the clause.

Despite superficial similarities, the syntactic and (discourse-)semantic behaviour of exclusive and the additive particle differs in a number of ways (§6): unlike exclusive ƛ̓uʔ ‘only,’ which is strictly f-sensitive in the sense of Beaver and Clark (2003, 2008), the additive particle ʔełƛ̓uʔ shows the more flexible association behaviour of Q-adverbials like...
always. We conclude that exclusive and additive particles do not form a natural class of f-sensitive expressions in Nleʔkepmxcin, as in some West African languages (Hartmann and Zimmermann 2008).

2 General language background

Nleʔkepmxcin is one of 23 Salish languages, and is spoken in southwestern British Columbia, Canada (see Thompson and Thompson 1992, Kinkade 1992, Kroeber 1999, Davis and Matthewson 2009). Like in all Salish languages, word order is predicate initial, typically Verb-Subject-Object-Oblique-Adjunct (though post-predicative order is quite flexible). Transitivity and argument agreement is obligatorily marked on the verb/predicate (1), and topical arguments are typically null (pro in 1c). The Salish languages are well-known for their predicate-argument flexibility, since any open-class category can function as the predicate (e.g. bare NP predicates - 1d) without the use of a copula (e.g. Kuipers 1968, Thompson and Demers 1994, Kroeber 1999, Koch and Matthewson 2009). Like in all Salish languages, word order is predicate initial, typically Verb-Subject-Object-Oblique-Adjunct (though post-predicative order is quite flexible).

Second position clitics (2CL) include situational deictics (xeʔ in 1a-d), modal evidentials

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1 Abbreviations used in the glosses (based on Thompson and Thompson 1992, 1996; Kroeber 1997) are as follows: *' = affix, *' = clitic, * = ungrammatical structure or interpretation, # = pragmatically infelicitous, APP = applicative, AUG = augmentative reduplicant, AUT = autonomous [intransitive suffix], AUX = auxiliary, CAUS = causative, CLEFT = cleft predicate, CNCL = conjunctive subject clitic, COMP = complementizer, DET = determiner, DEM = diminutive reduplicant, DRV = directive transitivizer, EMPH = emphatic, EVID = evidential, FUT = future, IDF = indefinite, IMPF = imperfective, INCH = inchoative, INCL = indicative subject clitic, INTRANS, INTR = intransitive, IRL = irrealis, LINK = attributive link marker, LOC = locative, MDC = middle, MOD = modal, N = negation, NOM = nominalizer, OBJ = object, OBL = oblique, PERF = perfective, PL = plural, PoCl = possessive subject clitic, POSS, PS = possessive, PRT = particle, Q = yes/no question marker, RED = reduplicant, REL = relational [transitive suffix], SG = singular, STAT = stative prefix, SUBJ = subject, TRANS, TR = control transitivizer.

Data are presented in the orthography developed in Thompson and Thompson (1992, 1996). Acute accent ’ on vowels indicates word-level stress. The phonemic key to the orthography follows: symbols not listed have the standard International Phonetic Alphabet interpretation. See Thompson and Thompson (1992) in particular for the phonetic realizations of phonemic vowels across contexts.

c = [t], ç = [ts], Ĥ = [ts̚], e = [ae, a, e, e], ṣ = [s], s̚ = [ʃ], ʃ = [s], x = [χ], y = [j, i].
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(ekʷu in 1b and 1d), clause-typers (us in 2), and (to be shown) focus-sensitive operators with exclusive and additive meanings. Clitic strings can include up to five or six elements:

(2)  
<table>
<thead>
<tr>
<th>Aux</th>
<th>2CL</th>
<th>............................................</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>ŋex</td>
<td>=us</td>
<td>=mel</td>
<td>=ʔƛ̓uʔ</td>
</tr>
<tr>
<td>IMPF</td>
<td>=3CnCl</td>
<td>=indeed</td>
<td>=still</td>
</tr>
<tr>
<td>‘Better let him sleep.’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Direct arguments (S of V_{INTRANS}, S and O of V_{TRANS}) must be marked by one of the determiners (h)e, ł, or k (3a-c). Oblique arguments (e.g. O of formally V_{INTRANS}) additionally have an oblique marker t (1a, 3d). Determiners do not encode a definite/indefinite-distinction, nor a uniqueness presupposition (c.f. Matthewson 1998, 1999, 2006, von Fintel and Matthewson 2008 on St’át’imcets Salish).

(3)  
| a. | kʷéw-Ø-Ø-es=xeʔ | e=Jóhn | e=syép. |
| float-TR-3o-3s=DEM | DET=John | DET=tree |
| ‘John is floating the logs down the river.’ [DPs visible] |

| b. | zóqʷ=ƛ̓əḿn̓í | neč̓ʔ | ʔ̓|n̓x̓ík. |
| die=PERF | 1SG.EMP | DET=1SG.POSS=older.sister |
| ‘My older sister died.’ [DP not visible/deceased; cf. Burton 1997] |

| c. | c̓ík=ƛ̓əm̓í | k=sq̓eytn. |
| use.up=PERF | IRL=salmon |
| ‘The salmon is all gone.’ [DP no longer in existence] |

| d. | wík-m=kʷíw̓ | t=k=smíyc. |
| see-MDL=2SG.INCnCl=Q | obl=IRL=deer |
| ‘Did you see any deer?’ [DP OBLIQUE of V_{INTRANS}] |

Finally, relative clauses are head external (typically head initial). One determiner introduces the head NP, while a second introduces the relative clause. The second determiner reflects operator movement of the clause-internal DP to Spec,CP (Kroeber 1997, Davis 2004, Koch 2006, Koch 2008b): the determiner of the fronted DP is pronounced and functions as a quasi-relative pronoun (predicate abstraction – Heim and Kratzer 1998). An attributive LINK marker between the head NP and the relative clause marks predicate modification (Kroeber 1997), c.f. (4a), but is absent in locative relative clauses (4b):

(4)  
| a. | e=ci.wx̓ t | [CP [dp t] ] | s=cuw-éfx̓ʷ=s |
| det=house | link | det NOM=build-house=3PoCl | det=John t |
| ‘the house which John built’ |

| b. | e=npūytn | [CP [np n=e ] ] | xʷúyw̓=wn | ʕʷóy̓it t |
| det=bed | in=DET | fut=1SG.CnCl | sleep t |
| ‘a bed in which I will sleep’ |

Headless relative clauses realize only the initial determiner. The LINK marker and the second determiner are not pronounced (shown by strikethrough in 5):

(5)  
| ?ése-x̣ək-st-Ø-éne=xeʔ | t=[np [np O] [cp [dp t] ] | qʷc-iyx | u=[ƛ̓q̓əm̓cin t] |
| STAT-know-TR-3o-1SG.S=DEM | det= | LINK | det leave-AUT to=DET=Lytton t |
| ‘I know the one that went to Lytton.’ |

2 It is important to observe that the 2CL-position in NLEʔKEPMXCIN is the position after the first word. As a result, we find (strings of) 2CL-elements inside complex nominal constituents.
3 Free foci

This section shows that Nłeʔkepmxcin employs a purely predicative focus marking strategy (Kroeber 1997, Koch 2008a; Davis 2007 for Stát’ímcets, Benner 2006 for Sencóthen): the focus constituent, or the focus exponent, form (part of) the syntactic predicate in sentence-initial position. Parallel to three syntactic types of focus constituents (V(P)-predicate/sentence, bare NP, or DP-argument), three different syntactic focus structures emerge: (i.a) V(P) initial; (i.b) Nominal Predicate Construction (NPC); and (ii.) DP-argument cleft.

Before we go into the data, observe that syntactic focus marking in Nłeʔkepmxcin seems to be primarily triggered by the need to indicate the question under discussion (Roberts 1996, Beaver & Clark 2008), and not contrastivity as such. Thus, all examples of focus marking in this section come from discourse exchanges between participants; contrastive focus within a speaker’s discourse turn is not necessarily marked (see 39b-d).

All instances of predication focus (V-, VP-, Tense/Aspect/Mood, verum-focus) as well as CP-focus on the extended verbal projection are realized with the verbal predicate in default sentence-initial position (for reasons of space, wh-questions are just given in English):

\[(6)\] a. A: What’s going on? [CP focus]
      IMPF=DEM=DEM STAT=stand-AUT DET=Patricia
      ‘Patricia is standing there.’
   b. A: What are you doing? [VP focus]
      IMPF=DEM STAT=look.at-tr-3O-1SG,S DET=what=3CnCl=EVID
      ‘I’m looking at something.’
   c. A: Does your grandmother like cherries? [verum focus]
   B: heʔáy, y̓ecín-m-∅-s=xeʔ e=n-kžé e=céris.
      yes, like-tr-3O-3S=DEM DET=1SG.POSS-grandmother DET=cherry
      ‘Yes, my grandmother likes cherries.’

For focus on a bare NP, a Nominal Predicate construction is employed. The nominal predicate is realized in sentence-initial position (Davis et al. 2004). This is a subcase of predication focus.

\[(7)\] a. A: What is Betsy going to put in her soup? [O-focus]
   B: [kálec]FOC=xeʔ=néʔ? [e=xʷúy] mèÁ-e-∅-s]BACKGROUND.
      carrot=DEM=DEM COMP=FUT mix-TRANS-3OBJ-3SUBJ
      ‘[What she’s going to put in]BACKGROUND is [carrots]FOC.’
   b. A: What appeared now? [S-focus]
   B: [nčesqáx]áFOC=neʔ? [e=wʔáz cʔéyl]BACKGROUND.
      horse=there COMP=appear now
      ‘[What appeared now]BACKGROUND is [a horse]FOC.’

Finally, focus on DP-arguments is marked by means of a cleft-structure in which the focused DP is base-generated after the cleft-marker če or ?e in sentence-initial position. The background (cleft remnant) is realized as an argument clause: this is introduced by a complementizer e or k, and contains a gap t, marked by subordinating morphology on the
verb (Kroeber 1997, 1999, Koch 2008a, 2008b; Davis et al. 2004 on St’át’imcets Salish). The gap is coreferent with the clefted focus.

(8) a. A: *I heard that it was Fred who painted it.*    
    B: *Łékí [Ross]FOC [e pint-t-Ø-mus t=BACKGROUND.]

    ‘It was [Ross]FOC [that t= painted it]BACKGROUND.’

b. A: *What do you see there?*    
    B: *ʔé=xeʔ=neʔ [e=kréps]FOC [e=wik-t-Ø-ne t=BACKGROUND.

    CLEFT=DEM=there DET=grape COMP=see-TR-3o-1SG.S t= BACKGROUND.

    ‘It’s [grapes]FOC [that I see t= BACKGROUND.’

Syntactically, the cleft predicate takes the cleft-DP and a cleft-remnant CP as arguments (9a). Thus, clefts conform to the general constraint that focus is always initial and (part of) the predicate. Semantically, the cleft marker denotes a 2place-function that takes an individual (�性格 [cleft-DP]) and a property (属性格 [cleft-remnant]) as arguments (9b). For detailed argumentation, see Kroeber (1997, 1999), Koch (2008a, 2008b) and Davis et al. (2004).

(9) a. DP-CP analysis of clefts:    
    b. denotation of cleft predicate: 

Two kinds of evidence for the structure in (9a) are: (i.) The cleft predicate cée behaves like other verbal predicates in taking particular morphology under embedding (e.g. nominalization and possessive morphology in 10); (ii.) the cleft-remnant must be introduced by complementizing elements that are independently attested on complement clauses (e in 8bB, k in 11), but it cannot be introduced by the determiner ł (11), which is found in free relative DPs, such as (5) above.

(10) a. Embedded verb with nominalizer and possessive morphology s=...=s on V:    
    b. Embedded cleft with nominalizer and possessive morphology s=...=s on cée:  

(11) cée=ńeʃ=xeʔ    


(12) A: *Łékí xeʔ?  e=káh e=tx-úp=s  e=Pátrick.

    ‘Patrick bought a car.’ (more literally: ‘It was a car that Patrick bought.’)
Secondly, Nleggkepmxcin clefts come without a uniqueness or exhaustivity effect: they
are felicitous even if the cleft-denotation does not exhaust the domain of individuals
satisfying the backgrounded predicate (13).

(13) [Context: There are 6 people in a picture. Several of them are carrying apples.]  
A: Who is carrying apples?  
B: cē̩xeʔ e=Bétsy e=ʔes-k’ak*-m t=e=pèyeʔ,  
CLEFT=DEM DET=Betsy COMP=STAT-carry-MDL OBL=DET=one,  
?et cē̩xeʔ e=Jón.  
and CLEFT=DEM DET=Jon.  
‘Betsy is carrying one, and so is John.’  
(literally: ‘It is Betsy that is carrying one (basket), and it is John.’) (≠ only Betsy)

Since Nleggkepmxcin clefts are semantically not exhaustive, additive particles should be
able to associate with the focused cleft-DP. We show that this prediction is borne out in §4.2.

4 Exclusive ‘only’, additive ‘also’, and scalar readings

4.1 Expression of the exclusive reading ⇐ only

Exclusive readings are obligatorily expressed by means of the 2CL ſʔuʔ. ſʔuʔ must associate
with a syntactically-marked focus. Completely parallel to the three syntactic focusing
strategies observed in section 3, this focus is either the initial verbal or nominal predicate
(14ab), or a clefted DP (14c). When the 2CL ſʔuʔ associates with a clefted DP-focus, the
default predicative cleft marker cē̩ or ʔe is replaced by the exclusive cleft marker cukʷ
(14c).

(14) a. 2CL ſʔuʔ in a verb-initial clause associates with VP focus (also V, CP focus):
   nʔųqʷ-ə́m=kn=řʔuʔ=neʔ?  
   boil-MDL=1SG.InCl=řʔuʔ=DEM OBL=DET=egg
   ‘I only [boiled an egg]FOC.’ / ‘I only [boiled]FOC an egg.’
   (NOT: * ‘Only [I]FOC boiled an egg.’ / * ‘I boiled only [an egg]FOC.’)

b. 2CL ſʔuʔ with initial nominal predicates associates with bare NP-focus:
   tiy=us=řʔuʔ=neʔ?  
   tea=3CONJ=řʔuʔ=DEM COMP=IMPF=2SG.PoCl=NM=drink
   ‘You should only drink [tea]FOC.’
   (NOT: *‘Only [you]FOC should drink tea.’ / *‘You should only [drink]FOC tea.’)

c. 2CL ſʔuʔ preceded by exclusive cleft marker cukʷ and associated with clefted DP:
   cukʷ=řʔuʔ=weʔ?  
   [dp e=kę̱yx]FOC [cp e=wik-t-O-ne]BG
   CLEFT_POS=řʔuʔ=DEM DET=hand COMP=TRANS-3OBJ-1SG.SUBJ
   ‘I only see [a hand]FOC there.’ (literally ‘It’s only [a hand]FOC that I see.’)
   (NOT: * ‘Only [I]FOC see a hand there.’ / * ‘I only [see]FOC a hand there.’)
The negative judgements in (14) show that the 2CL ƛ̓uʔ must associate with the syntactically-marked foci (in situ or clefted). In the absence of overt cleft-structure, ƛ̓uʔ must associate with the sentence-initial verbal (14a) or nominal predicate (14b). With DP-argument clefts, 2CL ƛ̓uʔ must associate with the clefted focus DP (14c).

The exclusive meaning component of the 2CL ƛ̓uʔ is truth conditional, like English only, since it can be targeted by negation (15), and is not cancellable (16).

(15) Exclusiveness can be targeted by negation (= only):

\[
teté \ k=s=cúk*=s=ƛ̓uʔ \ e=Ŝám \ k=k*=\text{not} \ \text{nomin} \ \text{get}=\text{salmon} \\
\text{‘Not only Sam caught a fish.’}
\]

The exclusive meaning component of the 2CL ƛ̓uʔ is truth conditional, like English only, since it can be targeted by negation (15), and is not cancellable (16).

(16) Exclusive meaning is not cancellable (= only):

\[
cúk*=ƛ̓uʔ \ e=Jánet \ e=\text{pick}\text{-mushroom} \ t=e=\text{find}=
\text{dim}=	ext{3poCl} \\
\text{‘Only Janet picked mushrooms.’}
\]

4.2 Expression of the additive reading ≈ also, too

Additive readings are expressed by means of the expression ?etƛ̓uʔ, which is also typically realized as a 2CL (but see §6). Again parallel to the basic focusing strategies outlined in section 3, ?etƛ̓uʔ can associate with sentence-initial verbal (17a) or nominal predicates (17b). In cleft-structures, it associates with the clefted DP-argument (17c). Unlike the exclusive ƛ̓uʔ, when the 2CL ?etƛ̓uʔ associates with a clefted DP-focus, it co-occurs with the default predicative cleft marker če or ?e in initial position.

(17) a. 2CL ?etƛ̓uʔ in a verb-initial clause, associating with VP focus (also V, CP):

\[
\text{?et} \ [k^*=\text{kn}=?etƛ̓uʔ=x?e \ t=\text{dusk}=\text{3poCl}]_{\text{FOC}}. \\
\text{‘And I also cooked supper.’}
\]

b. 2CL ?etƛ̓uʔ associating with a bare NP predicate that is narrowly focused:

\[
\text{[NP n̓uy̓t̓n]_{\text{FOC}}=?etƛ̓uʔ=x?e \ [CP e=s=pûl̓n=s]_{\text{background}},} \\
\text{‘[What he also found was]_{background} [a bed]_{FOC}.’}
\]

c. 2CL ?etƛ̓uʔ associated with a clefted DP:

\[
\text{če}=?etƛ̓uʔ \ [\text{dp} \ e=\text{Sue}]_{\text{FOC}} \ [CP \ e=\text{čq}-\text{p}-\text{q}n]_{\text{bg}}, \\
\text{‘It was also [Sue]_{FOC} [that got hit in the head by an apple]_{bg}.’}
\]

However, in section 6 we will see that the syntactic distribution and the association behaviour of additive ?etƛ̓uʔ are more flexible compared to exclusive ƛ̓uʔ: ?etƛ̓uʔ can also occur in sentence-final adverb position, and can associate freely with the focus. This raises
the question: do exclusive and additive particles really belong in the same class of focus-sensitive expressions, as Beaver and Clark (2008) suggest?

Finally, the use of ?elƛ̓uʔ induces an additive existential presupposition (unlike plain clefts). Discourse-initial uses of ?elƛ̓uʔ are often judged infelicitous by speakers (18).

(18) # če=ʔelƛ̓uʔ?=xeʔ e=Monik e=nés u=t=ɪnaʔxanséytn. cleft=ʔelƛ̓uʔ?=DEM DET=Monique comp=go to=DET=restaurant
     ‘It was also Monique that went to a restaurant.’
     [Consultant comment: You should say that somebody else went before she did.]

While speakers’ reactions to out-of-the-blue utterances of ‘also’ are quite strong, it is unclear whether these consultant responses constitute instances of ‘Hey, wait a minute!’ responses (von Fintel 2004). If so, then at least some Salish languages may have some English-style presuppositions a la Stalnaker 1974 (contra Matthewson 2006). However, if these are metalinguistic comments relating only to the speaker’s perspective, then they may be compatible with a language-wide lack of presuppositional content for the hearer (Matthewson 2006, who adopts Gauker 1998). We set this issue aside for future work.

4.3 Expression of the scalar reading ≈ even

Unlike in European languages, scalarity is not lexically coded in Nłeʔkepmxcin by means of a separate lexical item (though it is in the Lower dialect of St’át’imcets (Davis 2007, p.c.) and Klallam Salish (Montler 2003)). Instead, the additive particle ?elƛ̓uʔ can get a scalar interpretation depending on context. The expression of the additive ‘also’- and scalar ‘even’-reading in (19) is not distinguished by prosody either, and must be contextually resolved.

(19) context I: Bill yelled at all the pets in the house and …
        context II: The boss was angry. He yelled at the workers and …
        če=ʔelƛ̓uʔ? e=pis, e=ɪxʷ-0-0-es. cleft=ʔelƛ̓uʔ? det=cat comp=yell-trans-3obj-3subj
     i. ‘He also yelled at [the cat]FOC.’ (in context I)
     ii. ‘He even yelled at [the cat]FOC.’ (in context II)

In some languages, use of the additive marker plus grammatical focus marking yields a scalar interpretation (e.g. Hindi – Lahiri 1998, Vietnamese – Hole 2008). However, in Nłeʔkepmxcin, scalarity is a pragmatically induced special instance of additivity in need of contextual resolution. There is no structural position and no syntactic focus realization that would force the particle ?elƛ̓uʔ to get only an additive or a scalar interpretation.

4.4 Summary of empirical observations

We have shown that focus-sensitive exclusive and additive readings are expressed by the obligatory presence of the 2CLs Łuʔ and ?etŁuʔ. When Łuʔ and ?etŁuʔ associate with clefted DP-foci, they co-occur with the special exclusive cleft marker cukʷ and the default cleft marker če / če, respectively. There is no separate lexical marker of scalarity. Finally, the meaning contribution of the exclusive and additive particles Łuʔ and ?etŁuʔ is parallel to that of their English counterparts only and also: the exclusive interpretation with Łuʔ is
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truth-conditional, while the additive interpretation with ?ełƛ̓uʔ is presuppositional. Since plain DP-clefts do not come with uniqueness presuppositions, the additional occurrence of exclusive ƛ̓uʔ is not redundant, nor is the co-occurrence of additive ?ełƛ̓uʔ incompatible.

5 Analysis: Focus-Sensitive Expressions in Thompson

5.1 The general picture

We propose that the exclusive and additive meaning components are coded in the 2CL elements, since only the 2CL are mandatory for all 3 focus-marking strategies (V-initial, NP-initial, DP-cleft). Under our account, the 2CLs ƛ̓uʔ and ?ełƛ̓uʔ are adverbial elements in a high functional projection FP, where they take proposition-denoting expressions (= clauses) as their arguments. This is parallel to recent accounts of 2CL modal and evidential markers in Salish (e.g. Matthewson et al. 2007).

\[
\begin{align*}
\text{(20) a. } & \quad \text{FP} \\
& \quad 2\text{CL} \quad \Lambda u? \\
& \quad ?e\Lambda u? \\
& \quad \text{TP} \quad \text{V(P)}_{\text{FOC}} \ldots \\
& \quad \text{NP}_{\text{FOC}} \ldots \\
\text{b. } & \quad \text{FP} \\
& \quad 2\text{CL} \quad ?e\Lambda u? \\
& \quad \text{TP} \quad \text{ce-}\text{DP}_{\text{FOC}} \quad \text{CP}_{\text{BG}} \\
& \quad \text{cuk}-\text{DP}_{\text{FOC}} \\
\end{align*}
\]

On our analysis, the cleft predicates če / ?e and cukʷ do not form part of complex focus-sensitive operators: če / ?e in additive clefts is simply the ordinary cleft-marker found in plain DP-clefts, while we treat cukʷ in exclusive clefts as a semantically vacuous focus-agreement cleft marker; see below.

5.2 The analysis of exclusive readings ≈ only

We assign the adverbial 2CL ƛ̓uʔ the same meaning as its adverbial proposition-taking counterpart only in English, on the analysis in Rooth (1996):

\[
\text{(21) } \llbracket \Lambda u? \rrbracket = \lambda p. p(w) \land \forall q \in \llbracket p \rrbracket ^\downarrow : [ q(w) \rightarrow q = \llbracket p \rrbracket ^0 ] \quad \text{(Rooth 1996)}
\]

Relevant alternative propositions are computed off the surface structure, where the focus constituent is (part of) the sentence-initial predicate:

\[
\begin{align*}
\text{(22) a. } & \quad 2\text{CL} \quad (\text{V(P)}_{\text{FOC}}X) \quad \text{(predication focus)} \\
\text{b. } & \quad 2\text{CL} \quad ([\text{NP}_{\text{FOC}}][\text{e-CP}]_{\text{BG}}) \quad \text{(bare NP-focus)} \\
\text{c. } & \quad 2\text{CL} \quad ([\text{cuk}^- \text{DP}_{\text{FOC}}][\text{e-CP} \ldots ]_{\text{BG}}) \quad \text{(DP-argument focus)}
\end{align*}
\]

The 2CL ƛ̓uʔ is focus-functional (strictly f-sensitive in the sense of Beaver and Clark 2003, 2008), in that it can only associate with the focus-marked predicative constituent (or its extended projection) in sentence-initial position. Sample derivations are given below:

\[
\begin{align*}
\text{(23) a. } & \quad \llbracket (14a) \rrbracket = \lambda p. p(w) \land \forall q \in \llbracket p \rrbracket ^\downarrow : [ q(w) \rightarrow q = \llbracket p \rrbracket ^0 ] \quad (= 'I only [boiled an egg]_{\text{FOC}.}') \\
\text{b. } & \quad \llbracket \Lambda u? \rrbracket ([\text{NP}_{\text{FOC}}][\text{e-CP}]_{\text{BG}}) \quad \text{([nǐʔqʷ-ə́ m=kn=neʔ t=čeʔuʔeʔúse]\text{FOC})} \\
\text{c. } & \quad = \lambda p. p(w) \land \forall q \in \llbracket p \rrbracket ^\downarrow : [ q(w) \rightarrow q = \llbracket p \rrbracket ^0 ] \quad (\lambda w. \text{I boiled an egg in } w)
\end{align*}
\]
d. $= 1$ iff I boiled an egg in $w$ and for all focus-alternative propositions $q$ in the set \{$\lambda w. I$ boiled an egg in $w$, $\lambda w. I$ peeled a carrot in $w$, …\}: If $q$ is true in $w$ it is the proposition that I boiled an egg.

\[(24)\]
a. $\llbracket (14c) \rrbracket = \llbracket \text{‘It’s only [a hand]$_{FOC}$ that I see there.’} \rrbracket$

b. $\llbracket \Lambda u? \rrbracket = \llbracket [\llbracket cuk^w = w e? [c = k\text{é}k\text{y}x]_{FOC} \rrbracket c e = w i w t-0-1 e n \llbracket 16g \rrbracket] \rrbracket$

c. $\lambda p. (p(w) \land \forall q \in \llbracket p \rrbracket \mid q(w) \rightarrow q = \llbracket p \rrbracket^{0}) (\lambda w. I see a hand there)$

d. $= 1$ iff I see a hand there in $w$ and for all focus-alternative propositions $q$ in the set \{$\lambda w. I$ see a hand there in $w$, $\lambda w. I$ see a foot there in $w$, …\}: If $q$ is true in $w$ it is the proposition that I see a hand there in $w$.

The cleft-marker $cuk^w$ derives from the homonymous lexical verb $cuk^w$ ‘to stop/finish.’

\[(25)\]  
$cuk^w = \lambda \text{h}=\text{x}=\text{e}\quad \text{finish} = \text{PERF} = \text{DEM} \quad \text{COMP} = 1 \text{SG. PoCl} = \text{NOM} = \text{babysit} \quad 1 \text{SG. EMPH}$

‘I stopped babysitting, myself.’ (more lit. ‘Finished that my babysitting myself.’)

However, since $cuk^w$ is absent in cases of V- and NP-initial focus (14ab), we contend that it does not form part of a syntactically complex exclusive focus operator. Rather, following Hole’s (2008) analysis of adnominal focus-agreement markers in Mandarin and Vietnamese (26), we analyze it as a semantically empty (as far as exclusive content goes) marker of focus agreement. Thus, $cuk^w$ is a lexically specified cleft predicate that has undergone semantic bleaching and is restricted to occur in the scope of the adverbial exclusive operator $\Lambda u?$.  

\[(26)\]  
Nam chǐ [VP ān mōi [thịt bò]$_{FOC}$ thôi].

Nam only eat PRT$_{FOConly}$ meat beef PRT.

‘Nam ate only [beef]$_{FOC}$.’

5.3 The analysis of additive readings ≈ also, too

The cleft marker $\ce$ with DP-clefts under the additive operator $\text{ʔełƛ̓u?}$ is the default cleft found in plain DP-clefts and carries no additive semantic load. Because plain clefts do not come with any existential presupposition or uniqueness effect, $\ce$ is compatible with additive $\text{ʔełƛ̓u?}$, which introduces an existential presupposition. In a first approximation, we have the additive operator $\text{ʔełƛ̓u?}$ denote the identity function on propositions and add a presupposition to the effect that a contextually relevant alternative proposition is true in addition to the proposition expressed (but see §6 for observations to the effect that things are not quite as simple):

\[(27)\]  
(first approximation): $\llbracket \text{ʔełƛ̓u?} \rrbracket^* = \lambda p: \exists q \in \llbracket p \rrbracket \mid q \neq p \mid q(w) \cdot p$

presupposition

5.4 Evidence for the (head-like) adverbial nature of focus-sensitive 2CLs

In this section, we go over several further correct predictions of the analysis. First, if the exclusive 2CL $\Lambda u?\text{ is adverbial in nature, its scope should be clause-bounded by analogy to the behaviour of adverbial only in English (28a) (Taglicht 1984). The scope of adnominal only, by contrast, is not clause-bounded, as illustrated in (28bii). On standard accounts (e.g.
von Stechow 1991), this follows from the fact that adnominal instances of only can undergo QR and thus take wide scope (29).

(28)  

(a) They were advised [to only learn Spanish]  
The advice was: Learn Spanish and nothing else.’

(b) They were advised [to learn only Spanish]  
i. ‘The advice was: Learn Spanish and nothing else.’ (=26a)  
ii. ‘Spanish is the only language such that they were advised to learn it (but they were free to learn other languages in addition).’

(29)  

LF for (28bii): only-DP advise […]

(30) shows that inverse scope construals are available in Nłeʔkepmxcin, in principle, as the universal QNP tek̓m ‘all’ can take inverse scope over the higher negation predicate, possibly after QR (see Davis 2005 on negation in Salish):

(30) tetéʔ k=s=ʔupi-t-Ø-iyxs tékm e=scmeʔmiʔt e=sʔwén-s.  
NEG COMP=NOM=eat-TR-3O-3PL.S all DET=children D=dry.salmon-3POSS  
‘All the kids did not eat their dried salmon.’ [all > not]

However, as expected on our analysis, exclusive 2CLƛ̓uʔ cannot take inverse scope over the negation predicate tetéʔ in (31a). The semantic scope of ƛ̓uʔ always corresponds to its surface position: In order to take wide scope, cukʷ ƛ̓uʔ must be the leftmost matrix predicate, while negation tetéʔ is embedded in the cleft-remnant (31b):

(31)  

(a) tetéʔ [k=s=cukʷ=s=ƛ̓uʔ] e=Šám k=kʷən-nwēn t=k=sqyétn].  
NEG COMP=NOM=cukʷ=3PoCl=ƛ̓uʔ D=Šam c=get-NCM OBL=IRL=salmon  
‘Not only Sam caught a fish.’ [not > only (*only > not)]

(b) cukʷ=ƛ̓uʔ e=Šám [tetéʔ k=s=kʷən-nwēn=s t=k=sqyétn.]  
cukʷ=ƛ̓uʔ DET=Sam COMP=NOM=get-NCM=3PoCl OBL=IRL=salmon  
‘Only Sam didn’t catch any fish.’ [only > not (*not > only)]

Nor can 2CLƛ̓uʔ scope over other verbal predicates (‘forget’ in 32). Again, to take wide scope, cukʷ ƛ̓uʔ must be the matrix predicate (33), while the verbal predicate is embedded in the cleft-remnant CP (‘remember’ in 33).

(32)  

CONTEXT: my mother tells me to only buy potatoes. But I forget and I come home with a whole bag full of groceries: forget > only; only embedded.  
ľep-Ø-Ø-ne=xeʔ [k=s=cukʷ=s=ƛ̓uʔ]  
FORGET-TRANS-3OBJ-1SG.SUBJ=DEM COMP=NOM=CLEFT OBJ=3PoCl=ƛ̓uʔ  
e=štqolš xʷúy̓ e=n=s=kʷn-əm].  
DET=potato FUT COMP=1SG.PoCl=NOM=get-MLD  
‘I forgot that it was only potatoes that I was supposed to get.’  
(NOT: * It was only potatoes that I forgot to get.)

(33)  

CONTEXT: I went grocery shopping. And I forgot everything that I was supposed to buy. I remembered to buy only potatoes: only > remember, verb embedded.  
cukʷ=ƛ̓uʔ e=štqolš [e=ləʔkʷ-šin-Ø-ne  
cLEFT=ƛ̓uʔ DET=potato COMP=remember-TRANS-3OBL-1SG.SUBJ  
k=xʷúy̓ n=s=kʷn-əm].  
COMP=FUT 1SG.PoCl=NOM=get-MLD  
‘I remembered to buy only potatoes: only > remember, verb embedded.’
‘Only potatoes did I remember that I had to get.’

(Nota: * ‘I forgot to buy only potatoes, I bought more than just potatoes.’)

Thus, the semantic scope of 2CL ƛ̓uʔ is clause-bounded, consistent with adverbial status.

The second prediction of the adverbial analysis is that 2CL focus particles are not possible in left-extraposed contrastive topics. Since left-extraposed topics are not propositional in nature, they are incompatible with adverbial focus-sensitive operators and have no left-peripheral position to host these clitics:

(34) a. Intended: * ‘Only [Bill]FOC, he’s wearing only [shorts]FOC.’
   \*[e=Bill]FOC=ƛ̓uʔ, CLEFT\*[e=skətkətwéyus]FOC e=ʔes-łūm-st-0-s.  
   DET=Bill=ƛ̓uʔ  CLEFT\*[cúk*=ƛ̓uʔ  DET=cut.off.pants COMP=STAT-wear-tr-3o-3s
   Intended: ‘[Their cat]FOC too, it’s also [smiling]FOC.’
   \*[e pus-iks]FOC=ʔetƛ̓uʔ, \*ex=ʔetƛ̓uʔ=xE=ncʔ  \*[ʔes-ƛ̓uʔ]FOC.  
   DET=cat=ʔetƛ̓uʔ, IMPF=ʔetƛ̓uʔ=DEM=DEM  STAT-smile

The third prediction is the absence of multiple occurrences of 2CL focus particles in a single clause. Since there is only one structural position for focus-sensitive 2CLs and only one structural focus position (sentence-initial predicate), we expect to find no more than one focus-sensitive particle per clause. Again, this prediction is borne out, as second occurrence focus (35iv).

(35) Intended: ‘Only [Bill]FOC is wearing only [shorts]SOF.’
   \*[cúk*=ƛ̓uʔ \*e=Bill]FOC ...
   CLEFT\*[e=s-łūm-st-0-mus (cúk*)=ƛ̓uʔ \*e=skətkətwéyus]SOF.
   C=STAT-wear-tr-3o-SUBJ,GAP (CLEFT\*[cúk*=ƛ̓uʔ  DET=cut.off.pants)
   Intended: ‘... that is wearing only [shorts]SOF.’
   \*[e=skətkətwéyus]SOF(=c)=ƛ̓uʔ \*e=ʔes-łūm-st-0-s.  
   COMP=cut.off.pants(=3PoCl)=ƛ̓uʔ  COMP=STAT-wear-tr-3oBu-3SUBJ
   Intended: ‘... that what he’s wearing is only [shorts]SOF.’
   \*[e=s-cúk*=ƛ̓uʔ \*e=skətkətwéyus]SOF e=ʔes-łūm-st-0-s.  
   COMP=NOM=cúk*=3PoCl=ƛ̓uʔ  DET=cut.off.pants  C=STAT-wear-tr-3o-3s
   Intended: ‘... that it is only [shorts]SOF that he is wearing.’
   \*[e=s-łūm-st-0-mus e=skətkətwéyus.  
   COMP=STAT-wear-tr-3o-SUBJ,GAP DET=cut.off.pants
   ‘... that is wearing shorts.’

(36) \*ê=ekʷuʔ=ʔetƛ̓uʔ \*e=Tóm]FOC k=ƛ̓ək-s-t-0-ěmus
   CLEFT=EVID=ʔetƛ̓uʔ  DET=Tom  COMP=know-caus-tr-3o-SUBJ,GAP
   \*[k=s-cúk*=s=ƛ̓uʔ \*e=sqyéytn]SOF
   COMP=NOM=CLEFTonly=3PoCl=ƛ̓uʔ  DET=Salmon
   k=ex=ʔuíp-0-o-s=xʔe= ꟟ e=Monik.
   COMP=IMPF=eat-tr-3o-3s=DEM DET=Monique

‘Even [Tom]FOC knows that Monique eats only [fish]SOF.’

(literally: ‘It is even Tom that knows that it is only fish that Monique eats.’)
Finally, if focus-sensitive 2CLs are proposition-taking operators, then they should behave like other proposition-taking operators, such as modal evidential markers. This appears to be the case. Modal evidentials are also realized as 2CLs (1b, 1d), and operate at the propositional level in Salish (Matthewson et al. 2007). The scope of modal/evidential markers is also clause-bounded, except for when they double the matrix verb of saying/hearing (Matthewson et al. 2007, Davis p.c.):

(37) qeʔni-m-O-ne=xeʔ k=s=x“ūy̓”s=ekʷu ʔəm̓i-n̓m̓í
  hear-tr-3O-1SG.s=DEM comp=NOM=fut=3PoCl=evid rodfish-MDL
t̓əkm̓=us e=séytkmn̓x.
all=3CnCl det=people

‘I heard that [reportative] everyone was going to go fishing.’

Thus, Nłeʔkepmxcin surface structure mirrors the semantic relations between operator and propositional complement in a fully transparent way. This is unlike English, where the semantic relations of operator and complement are not visible at surface structure (on some analyses). For such cases, LF-movement of the focus particle to a high left-peripheral position is typically assumed (e.g. Rooth 1996).

6 Exclusives ≠ Additives: Two kinds of focus-sensitivity?

In this final section, we take up recent work by Beaver and Clark (2008), who suggest that exclusive, scalar AND additive particles belong to a natural class of focus-functional items that conventionally associate with focus. This contrasts with freely associating Q-adverbials like always. We show that, in Nłeʔkepmxcin, only exclusive 2CLƛuʔ requires syntactic focus-marking, whereas the additive/scalar particleʔełƛuʔ is more flexible in its syntactic distribution and its association behaviour, on a par with the Q-adverbialƛ̓eʔkm̓íx ‘always.’

Beaver and Clark primarily show the focus-functional nature of exclusive particles in Germanic, but suggest that their account should extend to scalar and additive particles. Under their Conventionalized Association with Focus, the focus particles only and even are anaphoric on the current question under discussion (QUD). The particles mark assertions as weaker (only) or stronger (even) than the expected answer to the current QUD. In Germanic, the current QUD is indicated by focus accent. Thus, focus-functional particles require a focus-marked constituent to associate with.

In Nłeʔkepmxcin, we saw that the QUD is marked by a syntactic strategy rather than by focus accent (Koch 2008a, to appear). We saw in (14) that the exclusive 2CLƛuʔ can only associate with a syntactically marked focus, in line with Beaver and Clark’s (2008) account of English only. While the data that we have seen so far for additiveʔełƛuʔ (17) are also consistent with a conventional focus association account, additional data show that, in fact, additiveʔełƛuʔ patterns with the Q-adverbialƛ̓eʔkm̓íx ‘always,’ and associates freely.

(38) i. exclusiveƛuʔ: conventional association + FOC-marking
  ii. additiveʔełƛuʔ & Q-adverbials: free association

Syntactically, exclusiveƛuʔ must be realized as a 2CL, whereas additiveʔełƛuʔ can also occur in the sentence-final adverbial position (the canonical adjunct position) (39a), sharing this property with the Q-adverbialƛ̓eʔkm̓íx ‘always’ (39b).
In terms of association behaviour, we saw that exclusive 2CL ƛ̓uʔ must associate with the sentence-initial focus constituent under all three focus-marking strategies (14, 40a). In contrast, both the additive 2CL/adverbial ʔełƛ̓uʔ and the Q-adverbial ƛ̓eʔkm̓íx can freely associate with in situ arguments (in the absence of clefted DP-foci) (40b-e). Note that (40b-e) come from within the speaker’s discourse turn, rather than a conversational exchange; thus, there is no explicit QUD and the contrastive DP focus is not obligatorily marked via clefting (compare to the data in §3).

Finally, observe that, even in the absence of an explicit QUD, exclusive ƛ̓uʔ requires syntactic focus marking of the DP-argument that it associates with (41). In contrast, with additive ʔełƛ̓uʔ, no DP-clefting is required (40b-d), even when the associate of ʔełƛ̓uʔ does not match the QUD (i.e. is not a syntactically marked focus) (42). In (42), the syntactically marked focus is the initial verb (matching the QUD), while ʔełƛ̓uʔ associates with in situ John (shown by the numerical index).
(42) A: Betsy is hollering. What about John?
B: [qəxní-m]_{FOC}ʔełƛ̓uʔ?_{1}=xe? [c=Jóhn]_{FOC:1}.
holler-MDL=ʔełƛ̓uʔ?_{DEM} det=John
‘[John]_{FOC:1} is [hollering]_{FOC too}.’
QUD: What is John doing? [VP wide-focus, marked as V-initial]
Associate of ʔełƛ̓uʔ?: John [in situ DP, not focus-marked, ≠ QUD]

To conclude, exclusive 2CL ʔuʔ and the additive particle ʔełƛ̓uʔ differ syntactically and semantically, and, in Nłeʔkepmxcin, do not belong to the same class of focus-sensitive items. Exclusive 2CL ʔuʔ is focus-functional in the sense of Beaver and Clark (2008), since it must associate with a syntactically marked focus; it is therefore possible to analyse the exclusive particle as directly relating to the current QUD (Beaver and Clark 2008: ch.10). On the other hand, additive ʔełƛ̓uʔ patterns like the Q-adverbial ƛ̓eʔkmíx ‘always:’ both show free association behaviour and should not make direct reference to the focus value in their lexical semantics. As a result, the strong reading for additive ʔełƛ̓uʔ in (27) should be weakened to the Q-adverbial reading in (43), according to which ʔełƛ̓uʔ expresses the fact that there is at least one event satisfying a comparable (=) proposition to p, where comparability is governed by syntactic focus marking.

(43) [ʔełƛ̓uʔ]_{p} = λp: ∃q∃e [q(e) ∧ q ≠ p ∧ q ≈ p]: q(e) . p

7 Conclusion: Towards a typology of focus markers

In Nłeʔkepmxcin, focus particles are adverbial (corresponding to the general predicative focus marking strategy). Exclusives rely on syntactic focus marking, and hence are (like in English) anaphoric on the QUD. Q-adverbials do not rely on syntactic focus marking (again like English), but neither do additive particles, with both showing free association behaviour. Finally, scalar ‘even’ readings are expressed through the use of the additive particle, and are not explicitly coded in the grammatical system.

Cross-linguistically, then, we suggest the following possible dimensions of variation for focus particles.

First, in terms of syntactic status, focus markers may be strictly adverbial in some languages, as we have suggested for Salish (arguably also for German, Jacobs 1983, Büring and Hartmann 2001). This corresponds nicely to the more general predicative/verbal focus marking strategy observed in this language (and as noted by Davis 2007 for St’át’imcets Salish, Benner 2006 for Sencóthen Salish). On the other hand, languages with a nominal focus marking strategy may employ strictly adnominal focus particles. This has been observed for the West Chadic languages Tangale, Bole, Guruntum, and Hausa, and for Bura (Central Chadic), in Hartmann and Zimmermann (2007a, 2007b, 2008, 2009). Finally, mixed languages like English (Rooth 1985) and arguably German (Reis 2005), may have both adverbial and adnominal focus markers, possibly correlating with a flexible prosodic focus marking system via pitch accent.

Second, we have seen variation in the degree of focus association by different focus particles, and in different languages. Exclusives seem to display the most stability cross-linguistically, associating with focus conventionally (Nłeʔkepmxcin, English, Hausa (Zimmermann 2006), Tangale (Hartmann and Zimmermann 2007b) Bura (Hartmann and
In contrast, additive markers may be a less uniform class, cross-linguistically. The additive marker in Nłeʔḵepmxcin shows free association. While Beaver and Clark (2008) suggest that English additives associate conventionally with focus, stressed additives in English/German (Krifka 1999) and Bura (Hartmann and Zimmermann 2008) have been argued to associate with contrastive topics instead. This would leave only unstressed additives in English as conventionally associating with focus, though this conclusion certainly merits further work.

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Comparing to What is Possible

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Abstract

A novel pragmatic account of Heim (2001) and Rullmann (1995) ambiguities in comparatives with possibility modals is proposed and compared to a structural approach. The new analysis builds on a proposal in Fox and Hackl (2006) to treat strong readings of possibility statements with ‘before’ clauses as a result of strengthening their literary meanings by a free choice implicature.

1 Introduction

This paper is concerned with ambiguous comparative sentences featuring possibility modals. There are three types of such comparatives whose interpretation calls for an explanation. The first type is a ‘less’ comparative with a modal in the main clause. Consider the following example from Heim (2001).

(1) (The draft is ten pages.) The paper is allowed to be less long than that.

One reading of (1) says that the paper is not allowed to be as long as the draft. The other reading says that it is possible for the paper to be shorter than the draft, leaving it open whether it is allowed to be as long as the draft.

The second kind of ambiguity, also pointed out in Heim (2001), is observed in differential comparative like (2) below. (2) normally receives a rather weak interpretation conveying that it is allowed for the paper to be 15 pages long. However, it may additionally imply that the paper is not allowed to be longer than 15 pages. In the following I shall refer to the ambiguities in (1) and (2) as Heim ambiguities.

(2) (The draft is ten pages long.) The paper is allowed to be exactly five pages longer than that.

The third phenomenon to be considered is known as Rullmann ambiguity. The following sentence from Rullmann (1995) is a paradigmatic example. It can either be understood conveying that the altitude of the helicopter was below the maximal altitude
of a plane or that it was below the minimal one. Rullmann ambiguity arguably surfaces only in negative polar comparatives.

(3) The helicopter was flying less high than a plane can fly.

I shall defend the view that the weaker readings of the first two constructions are the basic ones and the stronger readings result from a pragmatic enrichment known as a free choice implicature. The same kind of enrichment is at work in Rullmann ambiguity examples. I call the pragmatically enriched meanings ‘extreme’ readings (ExR). In (1) and (2) the extreme is the maximally allowed length of the paper. In (3) the extreme is set either to the maximal or the minimal altitude of a plane.

The paper is structured as follows. In section 2 I shall summarise the arguments against treating the three kinds of ambiguities as structural ones and motivate a new non-structural approach. In section 3 I shall implement a pragmatic approach to the ambiguities along the lines suggested by Fox and Hackl (2006). In the remaining part I shall address two problems that such an approach faces. The first problem is the apparent dependence of Rullmann ambiguity on negative polarity. The second concern is the difference in the strength of ExR of Heim’s ‘less’ comparatives as predicted by a structural approach versus by a pragmatic approach.

2 Against Structural Ambiguity

The mainstream approaches to the ambiguities under discussion are structural, cf. Heim (2001), Büring (2007), Heim (2007), Oda (2008). Their central claim is that each of the three kinds of comparatives mentioned above can be assigned two LF's differing in the position of the comparative morpheme relative some other element in the structure. For the sake of concreteness, let me present the gist of Heim’s (2007) theory which, unlike other analyses, has a virtue of being general enough to account for all cases of ambiguity. In the second part of this subsection I shall list the main challenges to a structural ambiguity approach.

2.1 Heim (2007)

In Heim’s approach the ambiguity in sentences with ‘less’ results from the mobility of ‘less’ and the availability of two landing sites for it in the presence of intensional predicates. ‘Less’ spells out the comparative morpheme and the negative element ‘little’. Being a degree negation, cf. the lexical entry in (4), ‘little’ scopally interacts with possibility modals.

(4) \[ \text{[little]} = \lambda d \lambda P . \neg P(d) \]

For example, sentence (1) is assigned two LF's corresponding to a wide and a narrow scope of ‘little’ relative to ‘be allowed’, given in (5-a) and (5-b), respectively.
(5) a. \([-\text{er than 10pp}] \ [\lambda_2 \ [\text{little 2}] \ [\lambda_1 \ \text{allowed} \ [\text{the paper 1 long}]]]\]
b. \([-\text{er than 10pp}] \ [\lambda_2 \ [\text{little 2}] \ [\lambda_1 \ [\text{the paper 1 long}]]]\]

Two remarks on the underlying assumptions are in order before we consider the resulting interpretations. First, the comparative is treated here as a degree quantifier restricted by the comparative complement, cf. (6-a). It QRs from its base position in the ‘little’ phrase to the edge of the clause. Second, gradable adjectives are analyzed as relations between degrees and individuals, monotone in their degree arguments, cf. (6-b).

(6) a. \([\text{-er}] = \lambda P \lambda Q P \subset Q\]
b. \([\text{long}] = \lambda w \lambda d \lambda x \ \text{LENGTH}_w(x) \geq d\]

If the modal is in the scope of negation, as in (5-a), the scope of -er is a set of lengths greater or equal to the maximally allowed length of the paper, see (7-a). After the application of -er, set (7-a) is said to include the set of lengths greater than or equal to ten pages, which amounts to the claim that the length of the draft exceeds the maximally allowed length of the paper. If negation operates below the modal, as in (5-b), -er compares the set left-bounded by the length of the draft to the set in (7-b). The latter defines a set of degrees that are greater than the minimally allowed length of the paper. The LF in (5-b) therefore corresponds to the claim that a length under ten pages is permitted.

(7) a. \(\lambda d \forall w' \in \text{Acc}_w : \text{LENGTH}_{w'}(\text{paper}) < d\]
b. \(\lambda d \exists w' \in \text{Acc}_w : \text{LENGTH}_{w'}(\text{paper}) < d\]

Rullmann ambiguity in (3) is tackled analogously. The only difference is that in (3) QR of the reconstructed ‘little’ phrase inside the comparative complement is responsible for two readings. The option with a long movement leads to a comparison with the maximal altitude of a plane, while a short movement results in a comparison with the minimal altitude of a plane.

If there is no degree negation, as in comparatives with ‘exactly’ differentials, structural ambiguity is derived by assigning -er wide or narrow scope relative to the modal. This is a prediction that Heim (2007) inherits from Heim (2001). For example, the two readings of (2) are represented as a wide scope and a narrow scope of the comparative, given (8-a) and (8-b), respectively.

(8) a. \(\text{max}(\lambda d \exists w' \in \text{Acc}_w : \text{LENGTH}_{w'}(\text{paper}) \geq d) = 15\text{pp}\)
   ‘The maximally allowed length of the paper is 15 pages.’
b. \(\exists w' \in \text{Acc}_w : \text{max}(\lambda d \text{LENGTH}_{w'}(\text{paper}) \geq d) = 15\text{pp}\)
   ‘It is possible for the paper to be 15 pages long.’

Heim’s approach is thus capable of accounting for all three cases of ambiguity. Another advantage is that it uncovers the apparent link between negative polarity and the
availability of two readings in Rullmann ambiguity examples. Indeed, the variant of (3) with a positive polar ‘higher’ in place of ‘less high’, given in (9), is judged unambiguous. It can only compare the altitude of the helicopter with the maximal altitude of a plane.

(9) The helicopter was flying higher than a plane can fly.

2.2 Challenges to a Scope Approach

A scope analysis, like Heim’s, faces a number of challenges. I shall list five of them here. First, it appears that Heim ambiguity obtains outside comparatives as well. Depending on what kind of information is relevant to the addressee each of the following sentences has two different interpretations.

(10) a. You are allowed to arrive at 10 p.m.
    b. You are allowed to arrive earlier than 10 p.m.
    c. You are allowed to arrive before 10 p.m.

When answering the question “When are we allowed to arrive?” the sentences in (10) report on the latest permissible time of arrival: it is 10 p.m. in (10-a) and a time before 10 p.m. in (10-b) and (10-c). In a context of an alternative question they make a weaker claim. In the latter case (10-a) means that 10 p.m. is a permissible time of arrival leaving it open whether arriving before or after 10 p.m. would violate the regulations. By analogy, sentences (10-b) and (10-c) simply communicate that arriving before 10 p.m. is compliant with the regulations. While the two readings of (10-b) receive a straightforward account in Heim (2007), neither (10-a) nor (10-b) can be handled as proposed by Heim, despite the obvious relatedness of the available interpretations. Neither of them contains a comparative whose scope can be manipulated.

Rullmann ambiguity is not restricted to comparatives either. For example, the comparative clause of (11-a), when occurring unembedded as in (11-b), has two readings. 60 km/h may refer to the maximal speed limit as well as to the minimal one. These readings pattern with a less-than-maximum and a less-than-minimum reading of (11-a).

(11) a. Michael is driving less fast than allowed on this race track.
    b. It is allowed to drive 60 km/h on this race track.

The common feature of examples (10) – (11) is the presence of a degree-denoting expression under a certain type of possibility modals. Notably, not any possibility modal gives rise to an ambiguity. This raises a second problem for a scope analysis, already touched upon in Heim (2001) and Heim (2007). The variants of (10) with the epistemic ‘might’ in place of the deontic ‘be allowed’, given below, are not ambiguous.

(12) a. You might arrive at 10 p.m.
    b. You might arrive earlier than 10 p.m.
    c. You might arrive before 10 p.m.
Neither of the examples in (12) can convey the latest time at which the addressee will possibly arrive in view of the information available to the speaker. Accounting for the discrepancy between (10) and (12) within a scope approach would most likely amount to formulating a restriction on the narrow scope of ‘might’ with respect to ‘-er’, as Heim suggests. ‘Might’ is notorious for its pervasive high scope behaviour. This would leave us with a set of readings which correspond to the wide scope of ‘might’ relative to the comparative, i.e. the weaker readings. However, where exactly such a restriction stems from remains an open issue so far.

The third challenge to a scope analysis is the fact that ExRs in Heim ambiguity examples are unanimously judged less natural than weak readings. Uttered in a context favouring ExR, e.g. preceded by a wh-question, (13-a) is judged degraded by most speakers. It is, however, reported to improve if the modal is preceded by ‘only’ as in (13-b). The role of ‘only’ remains a mystery under a scope approach, and so does the strong preference for the weak interpretation when (13-a) is uttered out of the blue.

(13)  
\[a. \] You are allowed to arrive earlier than 10 p.m.
\[b. \] You are only allowed to arrive earlier than 10 p.m.

The fourth challenge faced by a scope approach is ambiguity in comparatives with true negative adjectives, like (14). Similar to (3), sentence (14) has a less-than-minimum and a less-than-maximum reading. Since the locus of ambiguity in a scope approach is the position of ‘little’ in the embedded clause, its proponents are forced to extract a component with the meaning of ‘little’ from ‘lower’, see Heim (2007), Heim (2008), Büring (2007). The discussion of a decompositional treatment of negative antonyms in Heim (2008) makes it clear that this creates as many puzzles as it solves problems.

(14)  
The helicopter was flying lower than a plane can fly.

The fifth challenge, which is related to the treatment of Rullmann ambiguity, is the availability of empirical evidence showing that this kind of ambiguity does not depend on negative polarity. The assumption that Rullmann ambiguity is restricted to comparatives with negative polar predicates is questioned in Meier (2002). While Meier’s examples contain deontic modals, comparatives with counterfactual possibility modals present somewhat more convincing evidence for the availability of ambiguity with positive polar adjectives. For example, (15) is undoubtably ambiguous. The context in (15-a) highlights a more-than-minimum interpretation, while (15-b) suggests a more-than-maximum reading.

(15)  
\[a. \] Mary made more mistakes than Bill could have.
\[b. \] . . . if he had done his best.
\[b. \] . . . if he had made no effort at all.

To sum up, a scope approach to Heim and Rullmann ambiguities fails to explain why this kind of ambiguity is possible outside of comparatives and only with a certain
class of modals. It has nothing to say on the preference for the weaker reading and the role of ‘only’ in promoting ExR, i.e. the stronger reading. It commits its proponents to a decompositional analysis of negative polar adjectives. Finally, its prediction that the ambiguity is polarity sensitive is questionable.

3 Fox and Hackl’s Solution

One alternative to a structural analysis in the spirit of Heim is informally discussed in Fox and Hackl (2006). Fox and Hackl consider (16) as addressed to a person who is staying at a Youth Hostel that is locked up over night. In the given context (16) is a way to convey the time at which the doors are locked. So one can use this sentence to communicate that the latest time at which one can enter the building precedes 10 p.m. This reading corresponds to the wide scope reading of ‘less’ comparatives with ‘be allowed’, viz. (1).

(16) You are allowed to arrive before 10 p.m.

Fox and Hackl suggest that there are two pragmatic mechanisms responsible for the strong reading of (16). The first one produces the so called free choice implicature, which turns the plain assertion that you can arrive at a time $t$ before 10 p.m. to the stronger statement that you can arrive at any time $t$ before 10 p.m. The second pragmatic enrichment component is a strengthening by a scalar implicature which is possible due to the existence of the free choice interpretation. The fact that you are allowed to arrive any time before 10 p.m. is inferred to be the most informative true possibility among alternative assertions of the kind ‘you are allowed to arrive any time before $t$’. If the plain meaning of (16) is strengthened by these implicatures the addressee gets informed about the latest time before which she is allowed to arrive.

In the following I shall follow in the footsteps of Fox and Hackl and show that their approach generalizes to all cases of ambiguity discussed here.

3.1 Implementing Fox and Hackl (2006)

In this subsection I shall apply Fox and Hackl’s analysis to Heim ‘less’ comparatives. The task is to explain why (1), repeated in (17) for convenience, can implicate that the paper is not allowed to be ten pages or longer. For this purpose, I shall make use of the procedure for deriving scalar implicatures developed in Fox (2007).

(17) (The draft is ten pages.) The paper is allowed to be less long than that.

Under a widely accepted assumption that ‘be allowed’ existentially quantifies over worlds compliant with whatever laws are in force in the actual world, we derive the following truth condition for (17).
(18) \( \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) < 10\text{pp} \)

(18) corresponds to the weaker reading of (17): it is met iff there is an admissible state of affairs in which the length of the paper is less than ten pages. Following the line of reasoning in Fox (2007), (18) may generate the ignorance inference that the speaker does not know what length under ten pages the paper is allowed to have. If this appears implausible to the addressee, they may choose to strengthen the original meaning. Fox suggests that in that case the hearer opts for an alternative structure by embedding the original one under the covert exhaustivity operator \( \text{exh} \) with the semantics similar to ‘only’. \( \text{exh} \) can be applied recursively as long as it contributes to the meaning in a nontrivial way, that is, as long as it removes undesirable ignorance inferences. \( \text{exh} \) is essentially an exclusive operator restricted by a set of propositional alternatives to its prejacent. It projects the truth of the prejacent and attempts to exclude as many alternatives from its restriction set as possible with the aim of returning a consistent statement. Fox calls alternatives that can be excluded in that way innocently excludable. The set of innocently excludable alternatives (I-E) is formed by intersecting all maximal sets of propositions in the alternatives set (A) such that their exclusion is consistent with the prejacent. This is reflected in the following definition of \( \text{exh} \).

\[
[\text{exh}](A)(p) = \lambda w \ p(w) \land \forall q \in I-E(p, A): \neg q(w),
\]
where \( I-E(p, A) = \bigcap \{ A' \subseteq A | A' \text{ is a maximal set in } A, \text{ s.t. } \{ \neg r : r \in A' \} \cup \{ p \} \text{ is consistent} \} \)

Assume that to get rid of the undesirable inference that the speaker does not know the acceptable length of the paper the addressee of (17) chooses the following parse for that sentence.

(20) \( [\text{exh}](A)(\exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) < 10pp) \)

The prejacent of \( \text{exh} \) in (20) can be represented as a disjunction of alternative lengths under possibility, as shown in (21-a). Following the common practice, the alternative set is formed by replacing disjunction with each separate disjunct, see (21-b).

(21) a. \( \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 1p \lor \ldots \lor \text{LENGTH}_{w'}(\text{paper}) = 9pp \)

b. \( A = \{ \lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 1p, \ldots, \lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 9pp \} \)

The reader can verify that none of the alternatives in A different from the prejacent can be excluded innocently. However, the presence of the ignorance inference licenses another level of exhaustification. The parse in (22) is another attempt by the addressee to make most out of the literal meaning.

(22) \( [\text{exh}](A')( [\text{exh}](A)(\exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) < 10pp)) \)
This time the alternatives $A'$ are formed by applying $exh$ to the elements of $A$, see (23-a). The prejacent remains unchanged, each other alternative $q$ can be strengthened by excluding all alternatives different from $q$ and the prejacent, as exemplified in (23-b).

\[(23)\]
\[
a. \quad A' = \{exh(A)(p) : p \in A\}
\]
\[
b. \quad \lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 1p, \ldots \quad \neg \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 9pp
\]

Each of the strengthened alternatives in the resulting $A'$ can be innocently excluded. The reader may verify that this turns the possibility of a disjunction of lengths expressed by the prejacent into the conjunction of the possibilities of separate disjuncts, as shown in (24). (24) denotes a set of worlds in which the paper is allowed to have any length under ten pages. This is the so called free choice interpretation of (17).

\[(24)\]
\[
\lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 1p \land \ldots \land \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = 9pp
\]
\[
= \forall d < 10pp \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = d
\]

Evidently, the free choice interpretation is still not maximally exhaustive. From it the addressee may infer by means of a scalar implicature that ten pages is the maximal length the paper is allowed to be under, resulting in the ExR in (25).

\[(25)\]
\[
\forall d < 10pp \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = d
\]
\[
\forall d \geq 10pp \neg \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) = d
\]

Treating ExR as a result of a free choice effect has a welcome prediction for sentences with epistemic modals like (12-b). The use of ‘might’ indicates the speaker’s uncertainty about the truth of the embedded proposition. The speaker obviously lacks the relevant evidence. In such a situation an inference about the ignorance of the speaker cannot appear plausible to the hearer and lead to a strengthening of the meaning. On the contrary, such an inference is a natural result of the use of ‘might’. This explains the lack of Heim ambiguity in epistemic possibility statements.

### 3.2 Numerals under Possibility

It is widely accepted in the literature on the interpretation of numerals that the ‘exactly’ interpretation of a numeral can sometimes give way to the ‘at least’ or ‘at most’ reading in an appropriate context. We need not delve into the ongoing debate about the source of ‘exactly’, ‘at least’ and ‘at most’ readings. Suppose we are free to select any option if it results in the strengthening of the overall meaning.

\[(26)\]
\[
\text{Mary could have spent } €100.
\]
\[
a. \quad \ldots \quad \text{She did away with a rather modest sum.}
\]
\[
b. \quad \ldots \quad \text{She didn’t have to be that extravagant.}
\]
Depending on the context, €100 in (26) can refer to the minimum or to the maximum Mary could have spent. Suppose (26) is uttered in a situation in which Mary was to organise a party and she was saving up money to buy a new laptop. Mary’s primary goal was to avoid spending too much for the party. Mary had €100 at her disposal. In that case, the maximum interpretation is prominent, as facilitated by the continuation in (26-a). On the other hand, (26) could have been uttered in a context in which Mary’s goal was to prepare a fabulous meal for her family whatever it might cost her. With the continuation in (26-b), the sentence receives the minimum interpretation.

How do these reading come about? I propose that the crucial step towards them is a shift from the basic ‘exactly’ reading of the numeral in (27-a) to the ‘at most’ or ‘at least’ reading in (27-b) and (27-c), respectively. Once we have made this step we can follow Fox and Hackl’s line of reasoning elucidated in the previous sections to derive a minimum or a maximum ExR of a possibility statement.

(27) a. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) = €100$
   b. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) \leq €100$
   c. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) \geq €100$

Two questions arise at this point. The first one is how the shift from ‘exactly’ to ‘at least’ and ‘at most’ can be implemented. It presents a broad and rather controversial issue which is outside the scope of this paper. To answer it one has decide on which interpretation is the basic one. A neo-Gricean approach along the lines of Fox (2007) would derive the ‘exactly’ reading of a numeral from the ‘at least’ reading by means of exhaustification. The ‘at most’ reading can be also obtained by excluding stronger propositional alternatives to the plain meaning, for a spelled-out analysis of overt ‘at most’ along these lines see Krifka (1999). An alternative, increasingly popular option is to treat the ‘exactly’ reading as the basic one and the ‘at least’ reading as a result of evaluating a sentence in a non-minimal situation, cf. Kratzer (2009). Whatever side one takes, the derivation of ExR pursued here does not hinge on the choice.

The second issue to be addressed is when which interpretation obtains. The move from (27-a) to (27-b) in the ‘party’ scenario mentioned above is possible because it supports the inference from “Mary spends $d$ much” to “Mary spends $d-n$ much”. If one saves up money by spending €100, it holds that one saves up money by spending less than €100, cf. (28-a). Crucially, the direction of the inference is inferred from the context and therefore the scale associated with the open proposition ‘Mary spends $d$ much’ is pragmatic. In the ‘fabulous meal’ scenario the direction of the inference is reversed. If Mary’s primary wish is to cook a fabulous meal then spending €100 is higher on a pragmatic scale than spending more than €100, cf. (28-b). This allows a shift from (27-a) to (27-c).

(28) a. Mary spends €100 and saves up money.
   → Mary spends €90 and saves up money.
   → Mary spends €200 and saves up money.
   b. Mary spends €100 and cooks a fabulous meal.
→ Mary spends €200 and cooks a fabulous meal.
→ Mary spends €90 and cooks a fabulous meal.

Rullmann (1995) contains an illuminating discussion on how pragmatics determines the direction of an inference in such cases. He compares the pair of sentences in (29). Given our world knowledge, the numeral in (29-a) receives an ‘at least’ reading, while that in (29-b) receives an ‘at most’ reading.

(29) a. A professor can live on €3000.
    b. A professor can spend €3000.

Given that we are technically equipped to derive this or that reading of a numeral, from the ‘at most’ reading in (27-b) and the ‘at least’ reading in (27-c) we can arrive at the free choice reading of (26). By successive double application of \( \text{exh} \), the statement ‘there is an accessible world in which Mary spends €100 or less’ is strengthened to the statement ‘for any sum \( d \) equal to or less than €100 there is an accessible world in which Mary spends \( d \) much.’ Finally, the resulting free choice interpretation is strengthened by the scalar implicature which excludes the possibility of Mary spending more than €100. The result is given in (30).

(30) For any sum \( d \) s.t. \( d \leq €100 \) there is a possible state of affairs in which Mary spends \( d \) much and for no \( d' \) such that \( d' > €100 \) there is a possible state of affairs in which Mary spends \( d' \) much. \[=(26-a)\]

This interpretation entails the weak meaning we set out with, viz. (27-a). The choice of the ‘at most’ interpretation of the numeral in the given context is justified by the fact that it leads to a more informative assertion. Similarly, we can derive the minimum ExR of (26) from the ‘at least’ sense of the numeral.

(31) For any sum \( d \) s.t. \( d \geq €100 \) there is a possible state of affairs in which Mary spends \( d \) much and for no \( d' \) such that \( d' < €100 \) there is a possible state of affairs in which Mary spends \( d' \) much. \[=(26-b)\]

If we adopt a localist approach for computing pragmatic implicatures advocated in (Fox, Chierchia and Spector, to appear), the strategy just described may be applied to the comparative complement of (32), which like (3) reveals Rullmann ambiguity.

(32) Mary spent more than she could have spent \( d \) much.
    a. . . . if she had been an economical housewife.
    b. . . . if she had had to organize a wedding party.

If we choose the ‘at least’ interpretation of the bound degree in the scope of ‘could’, after three rounds of exhaustification the embedded clause denotes a set of degrees \( d \) that satisfy two conditions: any sum greater or equal to \( d \) could have been spent by
Mary and any sum less than $d$ could not have been spent by Mary. This corresponds to the singleton set containing the minimum that Mary could have spent, cf. (33-a) ‘$\exists d$’ picks the unique element from (33-a) and compares it to Mary’s actual expense, which results in the minimum ExR, cf. (33-b).\(^1\)

$\{ \text{[\textit{than} clause]}(w) = \lambda d \exists d' \geq d : \exists w' \in Acc_w : \text{EXPENSE}_{w'}(\text{Mary}) = d' \land 
\neg \exists d'' < d : \exists w'' \in Acc_w : \text{EXPENSE}_{w''}(\text{Mary}) = d'' \}$

The truth conditions in (34-b), corresponding to the maximum ExR, result from the choice of the ‘at most’ interpretation of the numeral.

$\{ \text{[\textit{than} clause]}(w') = \lambda d \forall d' \leq d : \exists w'' \in Acc_{w'} : \text{LENGTH}_{w''}(\text{paper}) - 5pp = d' \land 
\neg \exists d'' > 10pp : \exists w''' \in Acc_{w'} : \text{LENGTH}_{w'''}(\text{paper}) - 5pp = d'' \}$

Thus, Rullmann ambiguity follows from the availability of two ways to apply the pragmatic reasoning that allows to derive a free choice interpretation of sentences with degree-denoting terms in the scope of a possibility modal and strengthen it by a scalar implicature. We may start out with the ‘at least’ interpretation of a degree term and derive an implicature that amounts to a comparison with the minimum; or we pick the ‘at most’ interpretation, which leads to a comparison with the maximum. The choice of the ‘at least’ or ‘at most’ reading of a numeral is pragmatically driven in the sense that it enriches the basic meaning of the whole clause and is therefore preferred over the choice of the ‘exactly’ reading in accordance with the strong meaning hypothesis.

Finally, I suggest that the same pragmatic mechanism is at work in comparatives with ‘exactly’ differentials. Take Heim’s example in (2), repeated in (35). In (35-a) I give the truth conditions for the the weak interpretation, which just entails that 15 pages is a permitted length of the paper. If we choose the ‘at most’ interpretation of the degree term under ‘than’, see (35-b), the maximum ExR, coveying that the paper is not allowed to be longer than 15 pages, can be inferred pragmatically, see (35-c).

$\{ \text{(The draft is ten pages long.) The paper is allowed to be exactly five pages longer than that.} \}$

a. $\exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) - 5pp = 10pp$

b. $\exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) - 5pp \leq 10pp$

c. $\forall d' \leq 10pp : \exists w' \in Acc_w : \text{LENGTH}_{w'}(\text{paper}) - 5pp = d' \land 
\neg \exists d'' > 10pp : \exists w'' \in Acc_w : \text{LENGTH}_{w''}(\text{paper}) - 5pp = d''$

To sum up, I claim that all three examples under discussion may be pragmatically strengthened in certain contexts, which accounts for their ambiguity. Thus, Heim and Rullmann ambiguities are not structural but result from the possibility to choose between plain assertions and pragmatically enriched meanings.

\(^1\)Alternatively, the comparative complement may be treated as a definite degree description.
4 Consequences of a Pragmatic Approach

In this subsection I want to address two consequences of a pragmatic approach to Rullmann and Heim ambiguities. First, in a pragmatic approach the availability of Rullmann ambiguity is not predicted to depend on the polarity of the gradable predicate involved. However, most existing approaches to Rullmann ambiguity take for granted that sentences with positive polar adjectives are not ambiguous, cf. Rullmann (1995), Heim (2007), Büring (2007). The second consequence is that an ExR derived in a pragmatic approach is logically stronger than an ExR derived in a structural ambiguity approach. There happen to be contexts in which the weaker meaning derived in Heim’s approach is more appropriate.²

4.1 Constraints on Rullmann ambiguity: Strong Meaning Hypothesis

I argued that Rullmann ambiguity is not restricted to comparatives with negative pole adjectives. However, it is worth while looking at the cases that are reported unambiguous. It turns out that the lack of ambiguity is not directly related to the polarity but resides in certain pragmatic restrictions on the use of this or that kind of comparative sentence. There are three factors the interplay of which is crucial for the availability of two readings. They are the modal flavour of the embedded possibility modal, the polarity of the gradable predicate and a preference for a maximum or minimum reading of degree-denoting terms outside of comparatives.

Let us first consider the case of deontic modals. A deontic modal in a comparative complement is generally not compatible with a more-than-minimum reading. This might be the reason the example in (36) from Meier (2002) is usually judged to lack that interpretation. One tends to compare Chuck’s actual speed with the upper speed limit even if the context does not support this type of comparison, e.g. in Meier’s context Chuck is a driver of a truck transporting a fragile load.

(36) Chuck is driving faster than he is allowed to drive.

The lack of the more-than-minimum interpretation suggests that one can only use (36) to convey that Chuck does not comply with the regulations. One cannot express the idea that Chuck is conform to the rules by comparing his speed to what is allowed. Comparatives with negative polar adjectives also reveal this pattern. Thus, for (37) the prominent interpretation is that Chuck is driving below the minimum speed.

(37) Chuck is driving slower than he is allowed to drive.

Put concretely, if we assume that the shaded area in the middle of the scale in (38) corresponds to how fast one is allowed to drive, a comparative sentence with a deontic possibility modal would normally set Chuck’s actual speed to X1 or X3 but hardly to

²I am very grateful to Maribel Romero for pointing out this problem to me and the audience at SuB 14 in Vienna for an inspiring discussion following her question.
X2. On reflection, it is not surprising that one does not use a comparative to state that Chuck’s speed falls within the compliance interval. A comparative can relate Chuck’s speed to one of the bounds of the admissible interval; it cannot refer to both bounds simultaneously. If Chuck is said to drive faster than the minimum or slower than the maximum this meaning appears too weak to ever surface. In both cases nothing can prevent the hearer from inferring that the speaker does not know if Chuck complies with the rules or not. I suggest that the strong meaning hypothesis determines the preference for a rule violation report and as a result blocks comparison with the minimum in positive comparatives and comparison with the maximum in negative ones.

(38) ——X1——///////////X2/////////—X3———>

A slight asymmetry between negative and positive polar cases remains unaccounted, though. To be more precise, occasional availability of a less-than-maximum reading calls for an explanation. My guess is that another factor at stake is the preferred interpretation of a degree term in a non-comparative environment. For instance, (39) normally conveys that 45mph is the maximum Chuck is allowed to drive. The prominence of a maximum interpretation undoes the effect of the strong meaning hypothesis and gives way to a less-than-maximum reading of a comparative with a negative polar adjective, e.g. (37). In a positive polar case, e.g. (36), there is no reason a more-than-minimum interpretation could surface. A reference to the minimum is not prominent under the comparative, nor can that reading express a violation of a rule.

(39) Chuck is allowed to drive 45mph fast on this highway.

Comparatives with non-deontic modals are not subject to the pragmatic constraints discussed above. However, they must be conform to a different kind of usage rules. For example, the more-than-minimum reading of (32), repeated in (40-a), is the prominent one for many speakers. If Mary is understood to be the agent of the same kind of event in the counterfactual worlds as she is in the actual one, the more-than-maximum interpretation makes this statement inconsistent. The span covering Mary’s expenses in counterfactual worlds cannot be exceeded by Mary’s expense in the actual world without producing a contradiction. Why should that be so? Counterfactual modals belong to a class of root modals. Root modality is a handy term covering those kinds of modal interpretations that are sensitive to the facts in the world of evaluation, i.e. requiring realistic conversational backgrounds. Thus, what Mary could have spent should be compatible with the actual circumstances. Mary’s actual expense therefore cannot exceed what is possible in view of the facts. The strong meaning hypothesis can again be appealed to to block the inconsistent more-than-maximum reading. The same reasoning can be used to explain why (40-b) is reported to express only a comparison with the maximum.

(40) a. Mary spent more than she could have.
   b. Mary spent less than she could have.
Note that if the events of the main and the embedded clause are explicitly made distinct, cf. (32-b), or if the subjects of the main and the embedded clause do not co-refer, cf. (41), the inconsistency effect is immediately lifted.\textsuperscript{3} (41) certainly has a more-than-minimum reading. It is prominent in a context of Mary and Peter spending money for the same purpose, to be more precise, if Mary and Peter are considered the agents of the same event associated with the same circumstances. If Mary and Peter are understood to be the agents of different events, say, Mary organising a party and Peter buying a laptop, a more-than-maximum interpretation becomes possible.

(41) Mary spent more than Peter could have spent.

To sum up, the lack of Rullmann ambiguity should not be directly linked to the positive polarity of the gradable predicate involved. I argued that the apparent dependence of Rullmann ambiguity on the negative polarity is not semantic but pragmatic – it varies with the kind of modal flavour and is sensitive to which interpretation of the degree term embedded under the modal is prominent.

4.2 Cancellation

The truth conditions corresponding to the ExR of (1) derived by Heim (2007) and by a pragmatic approach defended here are not equal. Heim (2007) predicts that (1) is true on its ExR iff the maximum length the paper is allowed to have is below the length of the draft, cf. (7). According to (25), derived by pragmatic strengthening, any length under ten pages is compliant with the rules. Therefore the maximum lies just below ten pages. This may seem too strict a requirement judging by the consistency of the discourse in (42). Heim’s truth conditions in (7) are compatible with the continuation in (42) and therefore prima facie appear more adequate than the meaning in (25).

(42) The draft is ten pages long. The paper is allowed to be less long than that. But I don’t know what length exactly it is allowed to have.

On a closer examination though, the fact that (42) is consistent is not a knock-down argument for a pragmatic theory, but is actually predicted by it. The last sentence of (42) contradicts the free choice interpretation of the ‘less’ comparative, i.e. the claim that the paper is allowed to have any length under ten pages. Since the free choice interpretation has a status of an implicature, it is expected that it can be cancelled if the context makes clear that the speaker is not opinionated enough for the implicature to arise. I submit that this is what is happening in (42). The first conjunct of (25) is replaced by the basic meaning of (1), which results in the following truth conditions.

\[
\exists w' \in Acc_w: \text{LENGTH}_{w'}(\text{paper}) < 10pp \land \\
\forall d \geq 10pp \neg \exists w' \in Acc_w: \text{LENGTH}_{w'}(\text{paper}) = d
\]

\textsuperscript{3}I thank Daniel Büring for drawing my attention to this issue and Vera Hohaus for an extremely enlightening discussion.
This raises an important question. How is it possible to cancel the free choice implicature without cancelling the scalar implicature that lives on it? To give a satisfactory answer to this question one would have to develop a theory of implicature cancellation, which hasn’t been done so far. I therefore have to confine myself to a couple of informal remarks. In a localist approach to pragmatic implicatures, which I relied upon in this work, cancellation amounts to backtracking and replacing a parse with an exhaustification operator by a corresponding parse without, cf. Fox, Chierchia and Spector (to appear). This produces an incorrect result for the case at hand, since the computation of the scalar implicature, i.e. the second conjunct in (43), depends on the presence of the two $exh$ operators responsible for the free choice interpretation. To solve the problem, one needs a dynamic framework for computing and cancelling scalar implicatures which enables one to store the original strengthened meaning and intersect it with the meaning computed in a backtracking step. This would allow to cancel what is contradictory and preserve what is consistent with the following discourse.

In a global neo-Gricean approach to implicatures no grammatical mechanism is introduced to account for strengthening effects. Scalar implicatures are added at the top level after the semantic meaning has been computed. Therefore cancellation targets only the components of a strengthened meaning that produce contradiction. This approach seems better suited to account for the cancellation effect discussed in this section. I leave it open whether a global approach could generate the strengthening effects discussed here, including strengthening at the level of a comparative complement.

5 Conclusion

A pragmatic approach to Heim and Rullmann ambiguities meets the challenges of the structural ambiguity analysis in Heim (2007). It offers a unified account of ambiguity in comparatives, possibility statements with numerals and sentences with temporal prepositions. The lack of ambiguity in comparatives with epistemic modals falls out from the status of ExR as a pragmatically strengthened meaning: epistemic possibility modals are associated with ignorance inferences and therefore do not give rise to pragmatic implicatures. Since a pragmatic approach does not predict a dependence between the availability of ExR and the polarity of the gradable predicate, it makes more adequate empirical predictions on the distribution of ambiguities. Finally, it uncovers the role of ‘only’ in facilitating ExR. ExR results from a scalar implicature that can be realised as part of the literally meaning by inserting an overt ‘only’.

Pursuing a pragmatic approach instead of a scope one has important consequences for the theory of comparatives. First, it refutes crucial semantic arguments for the degree operator analysis of the comparative morpheme: under a pragmatic account Heim and Rullmann ambiguities do not provide an evidence for the LF mobility of ‘-er’. Another important claim is that the ambiguity in comparatives with embedded modals is not anchored in the semantics of antonyms, in particular, it does not motivate the decomposition of negative polar adjectives into a negation and a positive polar counterpart.
References


Universal Quantification and NPI Licensing

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Abstract

In this paper, I try to reduce the NPI licensors every, no, only and conditionals to universal quantification \( \forall x(Px \rightarrow Qx) \) that licenses NPIs in the restrictor \( P \), which is downward entailing or more exactly, anti-additive. For the uniform analysis, I also advocate two more constraints to guarantee the licensing: one, the restrictor \( P \) and the scope \( Q \) should be in an essential relation \( \forall x(Px \rightarrow \text{essential } Qx) \), i.e. not only if \( Px \), then \( Qx \), but also \( Qx \) in virtue of \( Px \). Second, NPIs should occur in the focus within the restrictor, i.e. \( \ldots \lbrack \ldots \text{NPI} \ldots \rbrack \ldots \) in \( Px \).

1 Introduction

It is claimed in Ladusaw (1980), the most influential work on negative polarity items (NPIs), that the key property of NPI licensing contexts is downward entailing (DE). Along these lines, the restrictor of universal quantifiers licenses NPIs because the position is DE, as illustrated in (1).

\[
\text{(1) A function } f \text{ is downward entailing iff for all } x, y \text{ such that } (x \subseteq y) \Rightarrow (f(y) \subseteq f(x)) \\
\text{Every [student of mathematics] attended the lecture.} \Rightarrow \\
\text{Every [student of applied mathematics] attended the lecture.}
\]

The focus of the paper are NPI licensors, including universal quantifiers, no, only and conditionals, as shown in the examples extracted from the internet in (2)\(^1\).

(2) a. \textbf{Every} family that had ever lived there had gone broke or died or gone crazy, or all of the above, in multiple orders.

b. \textbf{No} man or woman who ever ran for national office, ever acted so inappropriately in any debate, interview or speech.

c. \textbf{Only} those who were in the middle of any battle can ever fully understand it.

\(^1\)In all examples, NPIs are underlined and NPI licensors are boldfaced.
d. If you lift a finger, we will destroy every last one of you.

I attempt to reduce all these contexts to universal quantification that licenses NPIs in the restrictor. This proposal, though attractive, has to face a range of challenges. Out of these licensors, no is the most harmless one to handle. If we believe that every licenses NPIs in the restrictor because the position is DE, no does so for the same reason. In addition, no licenses NPIs in the scope as well, which is also a DE position. Only is much trickier, as it licenses NPIs both in the restrictor and in the scope while neither position is straightforwardly DE. Conditionals are also problematic for at least two reasons: first, whether / how they can be analyzed as being implicitly prefixed by a universal quantifier; second, either the antecedent licenses NPIs not due to the DEness or the DEness is not a sufficient condition, as Heim’s (1984) data in (3) illustrate:

(3) If he has told a lie, he must go to confession. ∉
    If he has told a lie and shot himself right after, he must go to confession.

The uniform analysis of these contexts in terms of NPI licensing that I aim for covers only the positions of these NPI licensors that correspond to the restrictor of universal quantifiers. That is, although the scope of no and that of only (as generalized quantifiers) will be addressed, they are not relevant for the main proposal of the paper, as is stated below:

(4) PROPOSAL:
Every, no, only and conditionals as NPI licensors can be analyzed uniformly by reducing them all to universal quantification that licenses NPIs in the restrictor (an anti-additive position) with two requirements satisfied:

a. the restrictor stays in an essential (Dayal 1995) relation with the scope, i.e. " ∀x( Px → essential Qx );

b. within the restrictor, the position where NPIs occur must be prominently asserted, that is, the focus of the restrictor, i.e. . . . [ . . . NPI . . . ] F . . . in Px.

To keep things simple, I will use frequently discussed NPIs throughout such as any, ever and lift a finger without going into the issue of the strength of NPIs. The paper is organized as follows. Section 2 presents the logical resemblance of no, only and conditionals to every, which is in line with the fact that they all license NPIs at structurally similar positions. Section 3 argues that universal quantification (in the uniform analysis for all the NPI licensors addressed here) does not license NPIs by its DEness sufficiently, but that the restrictor and the scope need be in an essential (Dayal 1995) relation. Section 4 discusses the other constraint beyond the logical properties of these quantifiers in terms of NPI licensing, as is stated in (4-b). The last section concludes the paper.
2 Logical equivalence

The logic of no, only and conditionals is closely related to that of every. I will discuss first the other three NPI-licensing contexts briefly and then the most intriguing case of only.

2.1 Every

Note that semantically, every is actually anti-additive (AA), that is, stronger than DE functions in its negativity.

(5) A function \( f \) is anti-additive iff for all \( x, y \) such that \( f(x \cup y) = f(x) \cap f(y) \)

\[ \text{Every} \text{ [student of mathematics or linguistics] attended the lecture.} \]

\[ \text{Every} \text{ [student of mathematics] and every [student of linguistics] attended the lecture.} \]

2.2 No

\( \text{No}(P, Q) \) is the right internal negation (de Mey 1991) of every, i.e. \( \forall x (P x \to \neg Q x) \).

Both its restrictor and its scope license NPIs.

(6) a. **Nobody**\(_{i,j}\) who ever\(_i\) ran for national office ever\(_j\) acted inappropriately.

b. **Everyone**\(_i\), who ever\(_i\), ran for national office didn’t\(_j\) ever\(_j\), act inappropriately.

(6-a) and (6-b) are semantically equivalent, except that the second occurrence of the NPI ever is licensed by no in (6-a) while it is licensed by the sentence negation not in (6-b), as the indices indicate\(^2\).

2.3 Conditionals

In first-order predicate logic, while existential quantification contains a logical conjunction, universal quantification contains a logical conditional. Conditionals are universal quantifiers if we take their semantics to be \( \forall w (P w \to Q w) \).

Attributing the observation to Partee, von Fintel (1993: 135) notes that “If the if-clauses restricts a non-universal quantifier, where it is uncontroversial that there is no downward monotonicity, NPIs are not allowed”, as the example shows:

(7) \( \exists \) Sometimes, if a man feeds a dog any bones, it bites him.

\(^2\)I will use such kinds of indices to mark an NPI and its corresponding licensor when it is not clear in an example.
A more detailed discussion on the domain constancy concerning the antecedent of conditionals and downward inference is also contained in von Fintel (1999). I will leave this issue for others or another occasion, but concentrate on the case of only here.

2.4 Only

Only $P \& Q$ is logically more complex to define. One of the greatest puzzles in the theories of NPI licensing is why it can license NPIs in its scope $Q$ - taking only $PN/CN$ (proper name / common noun) as a generalized quantifier, while it is not, at least not straightforwardly, a DE position. The restrictor, also an NPI licensing position, receives much less attention in comparison. In this section, I will discuss both the restrictor and the scope to give a general picture of only as an NPI licensor.

2.4.1 The scope

As de Mey (1991) indicates, only $P \& Q$ is the left and right internal negation of every, i.e. $\forall x (\neg Px \rightarrow \neg Qx)$, therefore the converse of every i.e. $\forall x (Qx \rightarrow Px)$. The data in (8) seem to favor $\forall x (\neg Px \rightarrow \neg Qx)$ (see Linebarger 1987), although it is logically equivalent to $\forall x (Qx \rightarrow Px)$, as the latter cannot explain why only licenses NPIs in the $P$ position while the former can\(^3\).

(8) a. **Only** Peter lifted a finger to help.
    b. **Only** the students who have ever read anything about phrenology attended the lectures. (Ladusaw 1980)

That is, only resembles no rather than every, as both only and no license NPIs at the restrictor and at the scope, while every does so only at the restrictor. However, no is plausibly AA at the scope while only is not even DE at that position. As (9-b) shows: Broccoli makes a subset of vegetables but the reserved inference (DEness) does not hold between the sentences.

(9) a. **Nobody** smokes and **nobody** drinks. $\Leftrightarrow$ **Nobody** smokes or drinks.
    b. **Only** John [ate vegetables]. $\neq$ **Only** John [ate broccoli].

\(^3\)For example, although $\neg \exists x Qx$ and $\forall x \neg Qx$ are logically equivalent, the contrast between the following sentences confirms that NPIs should be in the syntactic and semantic scope of negation in order to be licensed. In other words, the logical property of a potential NPI licensor only counts when it stays in the right scope relation with the NPI to be licensed, i.e. when it c-commands the NPI (Baker 1970).

(i) a. John didn’t eat any vegetable.
    b. *Any vegetable, John didn’t eat.
Atlas (1996) suggests that only plus proper names is non-monotonic but pseudo-antiadditive. An operator is ‘pseudo-antiadditive’ if it meets the De Morgen conditions of “closure under finite unions, without being downwards monotonic” (Atlas 1996: 283), illustrated below:

\[(10) \quad \text{A function } f \text{ is pseudo-AA iff for all } x, y \text{ such that } f(x) \cap f(y) \Rightarrow f(x \cup y), \text{ while } f(x \cup y) \not\Rightarrow f(x) \cap f(y)\]

a. Only John smokes and only John drinks. ⇒ Only John smokes or drinks.

b. Only John smokes or drinks. ≠ Only John smokes and only John drinks.

This proposal is problematic, as pseudo-anti-additive NPIs such as some students, every student or at least three students do not license NPIs in the scope (von Fintel 1999). With this as one of the arguments against the symmetricalist view on only, von Fintel (1999) advances an asymmetric semantics for only, i.e. only licenses NPIs in its scope due to the Strawson-DEness of the position, as is defined and illustrated below.

\[(11) \quad \text{Strawson-DE: A function } f \text{ of type } <\sigma, \tau> \text{ is Strawson-DE iff for all } x, y \text{ of type } \sigma \text{ such that } x \Rightarrow y \text{ and } f(x) \text{ is defined: } f(y) \Rightarrow f(x)\]

a. Only John ate vegetables for breakfast.

John ate broccoli for breakfast. (Presupposition of the conclusion)

\[\models \text{ Only John ate broccoli for breakfast.}\]

What is true about this proposal is that only licenses NPs and only is Strawson-DE, but I am not convinced that only licenses NPIs due to its Strawson-DEness. In fact, I would rather drop the affix ‘Strawson’ (although it is an important point by itself) and stay with the DEness, as it seems unnecessary to make the “presupposition” DE, as von Fintel does (by putting the presupposition of the conclusion into the premises so that both contents, i.e. the presupposition and the assertion, turn DE). The fact that only licenses NPIs in its scope has nothing to do with the “presupposition”, but only with the content labeled as “assertion”. Strawson-DEness is therefore not an account but a consequence of the fact that only is actually conjunctive semantically and it licenses NPIs in the negative proposition.

These accounts fail due to the general assumption of a one-propositional semantics for only and forced attempts at accounting for its NPI licensing behaviour in its entire meaning. Horn (2002) correctly treats only as semantically conjunctive. But he distinguishes the two entailments (pragmatically) by their assertoric prominence and proposes that it is not the DEness, but downward assertion that is the key word for NPI licensing. Following him, the sentence in (8-a) is semantically an exponible but only (12-a) is asserted whereas (12-b) is ‘inertly’ asserted.

---

4 Atlas takes only plus common nouns (CN) as DE/AA, as his examples below show:

(i) Only women smoke or drink. ⇔ Only women smoke and only women drink.

5 “Semantically entailed material that is outside the scope of the asserted, and hence potentially controversial, aspect of utterance meaning counts as ASSERTORICALLY INERT and hence as
Only Peter lifted a finger to help. (=8-a)

(a) Among the relevant people, nobody other than Peter lifted a finger to help. (antiadditive)
(b) Peter helped. (non-DE)

In a similar spirit, I propose in Liu (2009) that only, unlike other quantifiers at issue here, is double-propositional, that is, it expresses two propositions that contrast with each other in polarity, as illustrated in (12). I called (12-b) the explicature and (12-a) the (negative) implicature (negative in the sense that it has reversed polarity at the restrictor and the scope positions in relation to the explicature). However, both are part of the conventional meaning, that is, truth-conditional contents of the sentence. The difference of logical properties between the two propositions is the cause of all the complications that arise with only in terms of NPI licensing.

Based on this reasoning, I would rather advocate a decompositional analysis for only. My proposal, though, does not have to turn to (but is not incompatible with) Horn’s (2002) assertion/assertion inert distinction, but a more straightforward trick, namely, to the composition of the entire sentence. It is plausible that whatever the contribution by the NPI lifted a finger is, this contribution is not made to the proposition in (12-b). The domain widening function (Kadmon and Landman 1993) of minimizer NPIs such as any, ever, lift a finger that occur with only only apply to updating the truth conditions of the negative proposition e.g. (12-a) in (12). Correspondingly, it is at this proposition effectively transparent to NPI-licensing and related diagnostics of scalar orientation (Horn 2002: 62).

The explicature (NOT in the relevance-theorectic sense) of Only S is usually S, but I will argue in a minute that if NPIs are present in S, the explicature of the sentence needs some slight revision for both grammatical and truth-conditional reasons.

The assumption is that a sentence with minimizer NPIs is truth-conditionally not equivalent to one without. As the examples below show, the presence of any and ever widens the domain of what counts as breakfast and that of the interval of reference time respectively.

(i) a. George didn’t have breakfast today, but drank a glass of orange juice.
   b. George didn’t have any breakfast today, but drank a glass of orange juice.

(ii) a. Kim hasn’t had soup for breakfast, but only once in Korea ages ago.
    b. Kim hasn’t ever had soup for breakfast, but *only once in Korea ages ago.

Such mechanism is similar to that of denials (or metalinguistic negation): in (i-b), the predicate be bald does not perform function application to The king of France, which only contributes its truth-conditional meaning compositionally to a presupposed or preceding utterance such as (i-a).

(i) a. The king of France is bald.
   b. The king of France is NOT bald, as there is no king in France.

I discuss in Liu (2009) also the cases of the AA operator no N failing to anti-license positive polarity items (PPIs) due to the positive implicature (pragmatically licensing PPIs), which differs from the case of only in that this positive implicature is conversational rather than conventional, as it can be cancelled. Take the PPI would rather as an example, the implicature that $\exists x (\neg P(x) \land Q(x))$ is positive at the Q position where the PPI is licensed. Correspondingly, would rather actually takes Boys rather than girl in e.g. (ii-b) as its semantic argument.

(ii) a. No [girl]$_F$ would rather stay at home.
that these NPIs are licensed. Let me elaborate the idea a little bit further:

(13) Only John ate any vegetables.
    a. * <John ate any vegetables; Nobody other than John ate vegetables.>
    b. * <John ate any vegetables; Nobody other than John ate any vegetables.>
    c. ? <John ate vegetables; Nobody other than John ate vegetables.>
    d. √ <John ate vegetables; Nobody other than John ate any vegetables.>

(13-a) or (13-b) simply cannot be the truth conditions of (13). (13-c) is not entirely wrong but is rather the truth conditions of Only John ate vegetables. (13-d) are the right truth conditions of the sentence. The negativity of the implicature gets lost if negation intervenes, as shown below: the NPI any is licensed at the explicature and correspondingly contributes its meaning, i.e. the domain widening function to the set of vegetables, to this proposition.

(14) Only John didn’t eat any vegetables.
    a. * <John didn’t eat vegetables; Everybody other than John ate any vegetables.>
    b. * <John didn’t eat any vegetables; Everybody other than John ate any vegetables.>
    c. ? <John didn’t eat vegetables; Everybody other than John ate vegetables.>
    d. √ <John didn’t eat any vegetables; Everybody other than John ate vegetables.>

To turn an only sentence straightforwardly DE, we need two negations to succeed so that both propositions the sentence expresses are DE per se. However, then, the NPI is not licensed by only but by the sentential negation, as is in (15-a). Correspondingly, Not only John ate vegetables does not license NPIs, as both propositions it expresses are positive in the scope, as shown in (16).10

(15) a. Not only John didn’t eat (any) vegetables.
    <John didn’t eat (any) vegetables; Someone other than John didn’t eat (any) vegetables.>
    b. (15-a) ⇒ Not only John didn’t eat broccoli.

Some people might criticize that my arguments here are circular, but such a criticism would be due to a certain assumption about the nature of licensing between NPIs and their licensors, which is not yet entirely clear to me. But if we admit the truth-conditional contribution of minimizer NPIs that I have been talking about, we can know - logically - where an NPI is licensed by checking at which proposition its domain-widening function applies.

10In fact, not only is an additive operator, i.e. it does not make a negative context.

(i) A function \( f \) is additive iff for all \( x, y \) such that \( f(x \cap y) = f(x) \cap f(y) \).
(16) Not only John ate vegetables.
<John ate vegetables; someone other than John ate vegetables>

To sum up, I follow Horn’s (2002) view that only is semantically conjunctive and non-DE. The two conjuncts are both entailments of the sentence. My double-propositional approach and Horn’s double-entailment approach differ only in that the latter distinguishes these two contents by their assertoric prominence, i.e. in a pragmatic asymmetry. Although Horn’s assertion/inert assertion distinction seems more explanatory for cases such as (17-a) and many others (indeed), where the negative assertoric tone with only (of the assertion) licenses NPIs, I would rather adopt only the two-propositional claim without distinguishing the two propositions by assertoric prominence, based on examples such as (17-b), in which I see no reason for such a distinction. Therefore, the inference failure in (17-a) arises not because Peter helped is not asserted or only inertly asserted (as it can be asserted, shown in (17-b)) per se, but because the matrix predicate only takes the negative content as its semantic argument. In my decompositional approach to only, only the (negative) implicature is in the semantic scope of the adversative predicate.

(17)  a. I was disappointed that only Peter lifted a finger to help. ≠
I was disappointed that Peter helped and nobody else under consideration lifted a finger to help.

b. I got to know that only Peter lifted a finger to help. ⇒
I got to know that Peter helped and nobody else under consideration lifted a finger to help.

With the assumption that NPIs contribute truth-conditional meaning by what Kadmon and Landman (1993) call domain widening, it is then natural to claim that in an only sentence, NPIs are licensed at the negative implicatum, and it is to this content that they contribute their domain widening function and therefore update the truth conditions of the entire sentence. The next question is whether the same applies to the scope position of only.

2.4.2 The restrictor

The restrictor of only PN/CN is logically as hard to define as the scope. As only is an exclusive operator, sentences like (18-b) and (19-b) are self-contradictory, if we keep the domain of people in contrast constant\(^\text{11}\), and as (18)-(19) show, this position is not AA.

\(^\text{11}\) If Bill and Kate are among two different domains of people in contrast, the sentence (18-b) turns fine. So does (19-b).

(i)  a. Among the boys, only Bill smokes, and among the girls, only Kate smokes.
b. Among the female, only (adult) women smoke, and among the male, only (adult) men smoke.
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(18)  a. **Only** Bill or Kate smokes. $\neq / \neq$
       b. **Only** Bill smokes and **only** Kate smokes.

(19)  a. **Only** women or men smoke. $\neq / \neq$
       b. **Only** women smoke and **only** men smoke.

The restrictor of *only PN* is less interesting for us now, as there is no place to plug in an NPI there. Neither *only a CN nor only CNs* is even (straightforwardly) DE.

(20)  a. **Only** a woman smokes. $\neq$ **Only** a career woman smokes.
       b. **Only** women smoke. $\neq$ **Only** career women smoke.

To ‘maintain’ the DEness thesis, we could try to test whether *only* is Strawson-DE in its scope. With *only a CN* in (21), the inference seems only to work when the indefinite NP is used specifically, but then this is not about the DEness, as in this case a *career woman* is not a subset of a *woman*, but they denote the same person. In the generic reading, the inference does not work, neither in (21) nor in (22): it could work only if we not only put the presupposition of the conclusion into the premises but also keep the cardinality of all the NPs in the premises and the conclusion constant. But then it is not about the DEness anymore because *a woman* and a *career woman*, or, *women* and *career women* are not in a set-subset relation but denote the same set.

(21)    **Only** a woman smokes.
        A career woman smokes. (Presupposition of the conclusion)
        $\neq$ **Only** a career woman smokes.

(22)    **Only** women smokes.
        Career women smokes. (Presupposition of the conclusion)
        $\neq$ **Only** career women smokes.

Now that it is certain that Strawson-DEness is not what we can even start with here, we can go back to the explicature/implicature distinction that I’ve advocated above:

(23)    **Only** a career woman smokes.
        a. Explicature: A career woman smokes.
        b. CI: No non-career woman smokes. (All non-career women don’t smoke.)

(24)    **Only** career women smoke.
        a. Explicature: Career women smoke.
        b. CI: No non-career women smoke. (All non-career women don’t smoke.)

Interestingly, if we put the conventional implicature of the conclusion in the premises, the DEness follows. Consider:
Based on this, we can conclude that the scope of only PN/CN is Strawson-DE, or taking the double-propositional view, it is non-DE at the explicature and DE at the CI content. In the same double-propositional view, the restrictor position of only is DE both at the explicature\(^{12}\) and the CI content, as is shown above. All in all, only is not straightforwardly DE, but at the conventional implicature, it is DE/AA both at the restrictor and at the scope.

2.4.3 Summary

For simplicity, I assume that (23) (in the non-specific reading) and (24) have the same meaning and that only PN is Q and Only Ps are Q have the same semantics and pragmatics, except that only induces a set of individuals as the set of the alternatives in the former, and a set of sets (properties) as the alternative set in the latter. I used Karttunen and Peters’ (1979) two-dimensional notation (designed for conventional implicatures) to present the entire meaning of an only sentence as \(< \phi_e, \phi_i >\): \(\phi_e\) is the explicature, i.e. the \(a\) sentences in the above examples and \(\phi_i\) is the conventional implicature, i.e. the \(b\) sentences above. This is summarized below:

\[
\begin{align*}
(27) \quad & \text{Meaning of the (contrastive) focus operator only:} \\
& [[\text{Only Ps are Q}]] = < \forall x (P x \rightarrow Q x), \forall x (\neg P x \rightarrow \neg Q x) >
\end{align*}
\]

Only \(P\) Q expresses two propositions that contrast with each other at both the \(P\) and the \(Q\) positions. The extensions of \(P\) and \(\neg P\) form together the entire target domain of foci; the contrast at the \(Q\) position is one of polarity. Only is therefore only and always halfway negative (and halfway positive) - if no extra negation intervenes.

2.5 Summary of the section

Whether it is possible to reduce the NPI-licensing positions of these quantifiers to one with the same or at least similar logical property has the following consequence: if yes, this will be evidence for the logical approach to the phenomenon of negative polarity; if not, we have to rethink the nature of NPI licensing and consider that the (dominant) logical approaches are, probably, problematic. This section proves that Every \(P\) Q, No \(P\) Q, Only \(P\) Q and If \(P\), Q with \(P\) as a NPI licensing position can all be reduced

\(^{12}\)It is not DE if we have a PN, different from those cases where we have a CN or CNs. As the explicature of Only Bill smokes, i.e. Bill smokes is obviously non-monotonic at the subject position.
to universal quantification $\forall x(Px \rightarrow Qx)$ that licenses NPIs in the restrictor position $P$ and $P$ is a DE/AA position. The question is whether this is a sufficient condition. In the following sections, I discuss two possible constraints that guarantee the NPI licensing in these contexts, namely, first, we need $\forall x(Px \rightarrow \text{essential } Qx)$ instead of plain universal quantification and second, where NPIs are licensed should be in the focus within the restrictor. The satisfaction of the two constraints should facilitate an uniform analysis for these four NPI licensors.

3 The essentialness

Dayal (1995) makes the distinction between an essential/accidental reading for *every* as in (28). This distinction seems to also capture the fact that it is the essential reading of the universal quantifier that is capable of licensing NPIs, or in other words, when the restrictor and the scope are inherently related (Heim 1984). Sailer (2009) notes that this is an issue of the strength of NPIs: strong NPIs e.g. *so much as* in (29) (Heim 1984) require that the sentence have a law-like, i.e. non-presuppositional rather than episodic reading, but weak ones like *ever* do not.

(28) *Every* student who is in Mary’s class is working on polarity items.
   a. *Every* student in Mary’s class, by virtue of being in her class, is working on polarity items. (essential)
   b. It happens to be true of *every* student in Mary’s class that s/he is working on polarity items. (accidental)

(29) a. *Every* restaurant that charges *so much as* a dime for iceberg lettuce ought to be closed down. (law-like/essential)
   b. ??*Every* restaurant that charges *so much as* a dime for iceberg actually has four stars in the handbook. (episodic/accidental)

Remember that *every* is actually AA in its scope. In the logico-semantic approaches to NPI licensing such as van der Wouden (1997), NPIs are classified by strength according to the negativity of their licensors. Other AA functions are, for example, *never*, *no N*, *nothing*. If *no N* can license the NPI *as much as* in its scope, there is no reason why *every N* should fail in its restrictor due to the strength of the NPI, since both positions are AA.

(30) *Nobody* there did *so much as* take notice of him.

Putting the issue of strength aside, with reference to (28)-(30), one can argue that although *every* is semantically DE/AA, this might not be the necessary condition for NPI licensing. At least certain NPIs are licensed in the restrictor only if $\forall x(Px \rightarrow \text{essential } Qx)$. Universally quantified NPs are controversially argued to be presuppositional, that is, *every student* presupposes the quantification domain to be a nonempty set, in this case, a set of students. However, universal quantifiers licensing NPIs in the restrictor seem to lack such an existential import.
to understand this, we can take the implication as a two-place predicate such as $R(P, Q)$. The operator $→_{\text{essential}}$ signals that this relation is essential in the sense not only that if $P$, then $Q$, but that $Q$ will be true by virtue of $P$. This is similar to the case of but, which, besides being a logical conjunctor, also occasionally indicates a contrast between its conjuncts.\footnote{Bach (1999) takes the semantics of but as propositional rather than simply as that of a truth-functional connective. Analogously, we can take the truth-functional connective $\text{if} \ldots \text{then}$ to be propositional, then it would be possible to modify it with the essential operator. In the case of but, this would roughly correspond to the following two cases in contrast: in sentence (i-a), with use of but the speaker expresses a contrast between the two propositions $\text{Mark is fat}$ and $\text{Mark is agile}$. This does not hold naturally between $\text{Mark is fat}$ and $\text{Mark is very smart}$ in sentence (i-b).}

Conditionals show similar requirements as every in terms of NPI licensing, namely, they can license NPIs in the restrictor only when the restrictor is essential to the scope. Consider: in (31-b), the lack of an essential relation between the antecedent and the consequent makes the presence of the NPI unacceptable, while (31-a) licenses the NPI as $\forall w (Pw →_{\text{essential}} Qw)$. This shows that the NPI licensing conditionals cannot be the material implication $P \rightarrow Q$ and nor can the plain universal quantification $\forall w (Pw \rightarrow Qw)$ do.

\begin{enumerate}
\item a. If you \textit{ever} date my daughter, I will kill you. (If you date my daughter, I will kill you for that.)
\item b. If you \textit{*ever} come to my office, we can have tea together. (*If you come to my office, we can have tea together because of that.)
\end{enumerate}

This proposal has received the following criticisms from anonymous reviewers.

An anonymous reviewer, referred to (32) as counterexamples to (29). His or her arguments are that in (32-a), the scope is not true in virtue of the restrictor but dependent on other contextual propositions. The sentence (29-b) is odd not due to the presence of the NPI but to the fact that the restrictor and the scope are not inherently related by themselves, as even if the NPI is absent e.g. in (32-b), the sentence is still odd.

\begin{enumerate}
\item a. \textbf{Every} person that so much as glances at this book should take its lessons to heart.
\item b. ??\textbf{Every} restaurant that charges more than $.20 for iceberg lettuce actually has fours stars in the handbook.
\end{enumerate}

Another anonymous reviewer questions the validity of the essentialness of the conditional relation in the case of no, as s/he thinks that the essentialness is not necessary in sentences like (33-a). However, (33-a) is logically equivalent to (33-b) and both of them conversationally strongly implicate (33-c).
(33)  

a. **No** child with any money left sat in the classroom.  
b. **Every** child with any money left did not sit in the classroom.  
c. Every child, if with any money left, did not sit in the classroom, by virtue of having any money left.

Though, in some cases, s/he is right. Suppose that a child gang who is used to robbing money from other children utters (33-a). The utterance does not have the meaning in (33-c).

The same reviewer also points out the following sentences as counterexamples to the essentialness between the restrictor and the scope as a necessary licensing requirement.

(34)  

a. If you ever become president, we can turn it into a museum and charge admission.  
b. If you had ever come to my office, we could have had tea together.

I don’t know how to answer these questions. Maybe the essentialness should not be put in the logical form, but be taken as a generalized conversational implicature that is available in most examples including the two from (2).

(35)  

a. **No** man or woman who ever ran for national office, ever acted so inappropriately in any debate, interview or speech, they all acted appropriately because they ran for national office before.  
b. **Only** those who were in the middle of any battle can ever fully understand it - they can fully understand it because they were in the middle of some battle and those who cannot fully understand it cannot because they were not in the middle of any battle.

Anyway, one thing that I want to advocate here with Dayal’s notion of essentialness is that these NPI licensors do not license NPIs only due to their logical properties, be it DE or AA. Rather, there are other requirements to be satisfied to guarantee the licensing. If the DEness is only necessary but not sufficient, it is at least important to see that (in many cases) the essentialness is sufficient, although it might not be necessary. In the section below, I will put forward another requirement that needs observing in addition to an NPI licensor with the right logical property.

4  NPIs in the restrictor

The examples below are intended to show that if the focus of the restrictor is restricted to the N head (in a-c) or switched to other constituents (in c-d), NPIs that were licensed in (2) turn odd. This is compatible with the fact that universal quantifiers do not take appositive relative clauses, which would make the position not DE anymore.
a. **Every** [family]$_F$, which had **ever** lived there, had gone broke or died or gone crazy, or all of the above, in multiple orders.

b. **No** [man or woman]$_F$, who **ever** ran for national office, **ever** acted so inappropriately in any debate, interview or speech.

c. **Only** [those]$_F$ who were in the middle of **any** battle can **ever** fully understand it.

d. If [you]$_F$ **lift a finger**, we will destroy every last one of you.

Coming back to (28)-(29), it is also to note that the content by the relative clause where NPIs are licensed is prominent at the NP node. For example, although (29-a) has the LF, for simplicity, $\forall x((Nx \land RCx) \rightarrow_{\text{essential}} Qx)$ ($N$ for restaurant, $RC$ for the relative clause, and $Q$ for the scope), it is the $RCx$ content that decisively makes the essential relation of the restrictor to the scope $Q$ hold. To elaborate, if we zoom in the restrictor, $Nx$ is only inertly asserted while $RCx$ is asserted, in Horn’s (2002) terms. Correspondingly, it is the RC content that licenses NPIs. Similarly, in (31), the antecedent in (31-a) is asserted whereas it is only ‘inertly’ asserted in (31-b) or even a conventional implicature in Potts’s (2005) sense, as the whole utterance is at issue in the former whereas the consequent in the latter, i.e. *we can have tea together* seems to suffice as the major message from the speaker. Although the theories on NPI licensing in the literature are predominantly semantic, all these data seem to support the insights that the phenomenon of NPIs cannot be a purely semantic one. Look at more googled examples:

(37) a. **If** you purchase DLC and **ever** get rid of xbox live, don’t plan on having DLC anymore.

b. 20-something (or even younger) will and do go after your man **if** he is decent looking and has **any** money/status/power.

c. **If** a boy fails to re-register at re-chartering time and has **any** money remaining in his account after the re-charter date, the money in his account will revert back to the troop.

d. WILLIAMS: An’t please your majesty, a rascal that swaggered with me last night; who, **if** alive and **ever** dare to challenge this glove, I have sworn to take him a box o’ th’ ear: or if I can see my glove in his cap, which he swore, as he was a soldier, he would wear if alive, I will strike it out soundly. (King Henry V., Shakespeare)

Take (37-a) for example, the replacement of the NPI **ever** would cause confusion or deviation from the original meaning.

(38) a. *If** you **ever** purchase DLC and get rid of xbox live, don’t plan on having DLC anymore.

b. *If** you **ever** purchase DLC, don’t plan on having DLC anymore.
5 Conclusion

I took efforts above to show that the NPI licensors every, no, only and conditionals are logically closely related to each other, that is, they can all be reduced to universal quantification that licenses NPIs in the restrictor position.

(39) a. Every $P$ $Q : \forall x(Px \rightarrow Qx)$
b. No $P$ $Q : \forall x(Px \rightarrow \neg Qx)$
c. If $P$, $Q : \forall x(Px \rightarrow Qx)$
d. Only $P$ $Q : <\forall x(Px \rightarrow Qx), \forall x(\neg Px \rightarrow \neg Qx)>$

Since the focus of the paper is on the relation between the restrictor of universal quantification and NPI licensing, I will not go into details about the other NPI-licensing positions in their logic as the formulae above exhibit. An important question for future research is why universal quantification matters: for example the NPI licensor before seems also to have a semantics of universal quantification over times (the contexts I’ve discussed above involve a semantics of universal quantification over individuals or worlds). The reductionist view in this paper is therefore probably more general than is presented here.

However nice and desirable the generalisation that every, no, only and conditionals license NPIs due to the universal quantification in their logic is, empirical data pose challenges, that is, the logical property of the restrictor of universal quantification might not be the sufficient condition for it to license NPIs. The two constraints that I elaborated so far, even if being sufficient but sometimes not necessary, are maybe just another starting point to look at this old but still entangling issue.

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References


Quoted imperatives

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Abstract

I show how, contrary to recent claims, so-called embedded imperatives are better analyzed in terms of mixed quotation. To this end I extend the presuppositional analysis of mixed quotation to include quotations of constructions.

1 Embedded imperatives

To report an imperative command in indirect speech we cannot simply re-use the imperative form in the complement clause, as shown in (1-a) (cf. e.g. Sadock and Zwicky, 1985; Palmer, 1986). Instead, we need to paraphrase the original command, for instance by means of a deontic modal, (1-b), or a suitable control construction, (1-c).

(1) Mary: “Call my mother!”
   a. *Mary {said/demanded/told me} that call her mother
   b. Mary {said/demanded} that I should call her mother
   c. Mary {said/told me} to call her mother

However, some authors have argued that imperatives can occur embedded in indirect report complements. Consider the Japanese report in (2).

(2) ashita made ni sono shigoto-o yare to jooshi-ni iwaremashita
    tomorrow until that work-Acc do-Imp Comp boss-by was told-Polite
    ‘I was told by the boss to finish that work by tomorrow’ [Maier 2009]

The first thing to note is that, unlike English, Japanese has dedicated imperative forms, so yare (‘do.Imp’) really is an imperative embedded in a report complement. However, since Japanese does not always distinguish direct and indirect speech syntactically (say, by word-order or special complementizer) we still have to exclude the possibility that this is direct speech semantically. In this particular case, the context is one where what the boss literally said was Finish this work in two days!. In other words, the adjustment of the temporal and demonstrative indexicals to the reporting
situation serves to establish indirect speech. What we’re dealing with here is therefore a so-called indirect imperative.\(^1\)

A similar story can be told for the German report in (3). \textit{Ruf... an} is an unambiguously imperative form, and the possessive pronoun refers to the actual speaker which rules out direct discourse:

(3) Hans hat dir doch gestern schon gesagt, ruf meinen Vater an
   ‘Hans told you yesterday already to call my father’ \[Schwager 2006\]

Finally, Crnic and Trinh (2008) argue that even English has indirect imperatives. If, as they argue, \textit{call} in (4) is indeed an imperative and \textit{his} refers back to \textit{John}, then (4) is yet another example of an indirect imperative:

(4) John said call his mom

Note however that the argumentation for English requires an extra step, as \textit{call} could also be an infinitive. To exclude this possibility Crnic and Trinh (2008) point out that infinitive complements differ from indirect imperative in allowing \textit{wh}-movement (an interesting data point that I’ll briefly return to at the end of section 4):

(5) a. Who did John say to call at 3PM
    b. *Who did John say call at 3PM

Additional explanations are needed for the restrictions on the matrix verb (only \textit{say}), and for the lack of overt complementizers (in both German and English), but these will not concern us here.

A more fundamental challenge for the indirect imperatives view is that it leads to the introduction of monstrous operators. Imperatives are usually considered to be semantically as well as morphologically second person, i.e. the actual addressee is ordered to do something. In addition, the source of the command is the actual speaker, so a simple imperative actually contains two indexical parameters somewhere in the syntax and/or semantics: \textit{do the work!} \(\approx\) \textit{I command you to do the work}. In (30) we see that these indexical parameters are \textit{shifted} when the imperative is embedded in a third person report: it’s my boss who (reportedly) told me to do the work, rather than me commanding you. Indexical shifting in indirect discourse means that there’s a context shifting operator (a ‘monster’ in Kaplan’s (1989) terminology) at work. For some languages there is independent evidence for monsters in indirect speech. In Amharic (Schlenker, 2003; Anand, 2006) or Zazaki (Anand and Nevins, 2004), for instance, person indexicals consistently allow shifted interpretations in speech reports. But in Japanese, German and English, person indexicals are generally well-behaved, i.e. \textit{My boss said that I commanded you to do this work} cannot mean that my boss told me to do

\(^1\)Schwager (2006) and Oshima (2006) present additional evidence for the thesis that some embedded Japanese imperatives are embedded in indirect rather than direct speech complements.
do it. In fact, proponents of the indirect imperative view often presuppose the non-
onmonstrous behavior of these languages in their argumentation to exclude direct speech in the first place.\textsuperscript{2} The introduction of monsters at this point thus creates a very real problem of circularity.

In this paper I propose an alternative analysis of the ‘indirect imperative’ data, in terms of covert mixed quotation. My account sticks with the original intuition expressed at the beginning of the paper that there are no indirect imperatives. Instead of introducing \textit{ad hoc} monsters, I rely on a number of independently motivated mechanisms, such as a presuppositional account of mixed quotation and interjection. I thereby return to a rather traditional view of the Japanese data as ‘blended quasi-direct discourse’ (Kuno, 1988), i.e. as a mix of direct and indirect speech.

The focus of this paper lies in discussing the extensions to the current theory of mixed quotation that are needed to be able to represent the types of examples in (30)–(4) as some kind of quotations. What I will offer is more a proof of concept than a fully worked out analysis of the cross-linguistic variety of restrictions on indirect embedding of imperatives.

2 Mixed quotation

Mixed quotation consists of an indirect speech report in which a part is quoted verbatim, as in Davidson’s 1979 \textit{Quine said that quotation “has a certain anomalous feature”}. Crucially, the quoted part in such examples is used and mentioned at the same time Davidson (1979). In this section I provide the formal apparatus needed to substantiate this idea. To properly account for quotations of discontinuous constituents in section 3 below, the presentation here will have to be more precise than earlier versions of the presuppositional analysis (e.g. Geurts and Maier, 2005; Maier, 2009). In particular, the current formalization will borrow more heavily from Potts (2007).

Section 2.1 lays the foundation by introducing the syntax and semantics of direct and indirect speech in a grammar inspired by the work of Potts. Section 2.2 adds presuppositions and DRT to arrive at a proper analysis of mixed quotation.

2.1 Indirect discourse, pure quotation, and direct discourse

Our grammar formalism will treat linguistic expressions as triples containing a surface representation, a logical representation, and a type. The written sentence \textit{I’m a fool}, for instance, is represented as the following triple:

(6) \langle \text{I’m a fool}, \text{fool}(i), t \rangle

In other words, the grammar has the following structure:

\textsuperscript{2}In particular, Crnic and Trinh, who cannot rely on the other main diagnostic for indirect speech, viz. wh-movement.
(7) \[ G \subseteq A^* \times \mathcal{L} \times \text{Type} \]
   a. \( A^* \) = set of finite strings over alphabet \( A \) (\( \cap \) denotes string concatenation)
   b. \( \mathcal{L} \) = formal language
   c. \( \text{Type} \) = set of types

For concreteness, let’s take \( A \) to be the roman alphabet, \( \mathcal{L} \) the language of intensional, typed lambda calculus, and \( \text{Type} \) the set of functional types generated by the basic types \( e \) (entities) and \( t \) (propositions).

From two basic or complex elements in \( G \) we can make a new one, if the types allow it, in the usual manner:

(8) \[
\langle \sigma_1 \cap \sigma_2, (\varphi_1(\varphi_2)), \tau_1 \rangle
\]
\[
\langle \sigma_1, \varphi_1, \tau_2, \tau_1 \rangle, \langle \sigma_2, \varphi_2, \tau_2 \rangle
\]

Note that we allow a lot of overgeneration by letting composition be entirely type-driven. For a more restrictive system, we could start by following Potts in adding a categorial grammar component into the terms of \( G \).

To illustrate this perhaps somewhat unusual presentation of a rather familiar system, we’ll consider the derivation of a normal English indirect speech report. Let’s construct a tree in \( G \) whose top-node contains the sentence Otto says that I am a fool as it’s first component. If we do it right, the third component will be a type \( t \), and the second will represent the intuitive truth conditions of the report in a familiar logical language. Strictly speaking we first have to agree on a set of terminal nodes, i.e. lexical items. To keep matters simple let’s say Otto and I are type \( e \), say is \( tet \), that is logically vacuous, and am a fool consists of two vacuous operators prefixed to an \( et \) predicate. This gives lexical triples like \( \langle Otto, o, e \rangle \) and \( \langle say, say, tet \rangle \), which we can combine into the following tree:

(9) \[ \langle \text{Otto says that I am a fool}, \langle \text{say(fool(i))}, o \rangle, t \rangle \]
The grammatical trees we can derive in $G$ come with a representation of truth conditions. Assuming that our formal language $L$ already has a sound truth definition, it suffices to say that the interpretation of a triple in $G$ is given by interpreting its second component:

$$(10) \quad \llbracket \langle \sigma, \varphi, \tau \rangle \rrbracket^c = \llbracket \varphi \rrbracket^c \in D^r$$

To deal with the semantic context dependence of indexicals we relatize semantic interpretation to a context parameter $c$. Thus, we can use Kaplan’s (1989) logic of demonstratives to interpret $I$ and indirect speech $say$:

$$(11) \quad \begin{array}{l}
\llbracket I \rrbracket^c := \text{the speaker of } c \\
\llbracket (\text{say}(\varphi))(\alpha) \rrbracket^c := \text{the proposition that } [\alpha]^c \text{ utters some sentence that in her utterance context } c' \text{ expresses proposition } [\varphi]^c
\end{array}$$

So, to finish our example: $\llbracket (\text{Otto says that I am a fool}, (\text{say}(\text{fool}(i)))(o), t) \rrbracket^c = \llbracket (\text{say}(\text{fool}(i)))(o) \rrbracket^c$ is the proposition that Otto utters something that expresses that I’m a fool.

With indirect discourse taken care of, we turn to quotation. Our goal is a semantics of mixed quotation, but we start with more basic forms: direct discourse and pure quotation. Pure quotation is the use of quotation marks to refer to the linguistic material enclosed within those quotation marks:

$$(12) \quad \text{‘fool’ rhymes with ‘tool’}$$

I’m following the so-called disquotational theory of pure quotation, by which an expression enclosed in quotation marks refers to that enclosed expression: $\text{fool}$, a predicate of type $et$, refers to the set of fools, but ‘$\text{fool}$’, the same expression flanked by quotation marks, refers to a word, viz. the word $\text{fool}$. To formalize the disquotational semantics of pure quotation, we first need to extend our semantic domains to include linguistic material, i.e. we need to add a new type $u$ for expressions that refer not to objects or properties in the world, but to linguistic entities. Expressions flanked by quotation marks will be represented in $G$ as type $u$ terms, referring to the linguistic expressions inside the quotation marks. To capture the fact that these linguistic expressions referred to can themselves be interpretable linguistic expressions, I take the domain of interpretation associated with type $u$ to be $G$, our grammatical triples.

How does this translate to our grammar? We make terms of type $u$ by adding quotation marks ‘...’ at the surface,某种 in $L$) around a term in $G$. That is, we add the following composition rule (Potts, 2007):

$$(13) \quad \frac{\langle \sigma^\cap; \sigma, \varphi, \tau \rangle^\cap, u}{\langle \sigma, \varphi, \tau \rangle}$$
To clarify what’s going on in the second component we have to look at the semantics. We have a new type $u$ with $D_u = G$. The interpretation of a type $u$ term is the interpretation of its second component, which is given by (14):

\[
\llbracket \langle \sigma, \varphi, \tau \rangle \rrbracket^c = \langle \sigma, \varphi, \tau \rangle
\]

This captures the self-reference that is the hallmark of the disquotational theory. It is also what prompted us to construe the second component of a type $u$ term in $G$ as containing the whole triple representing the quoted expression.

We can naturally extend this analysis of pure quotation to direct discourse. A direct discourse report like (15) asserts a relation between Otto and a particular sentence, i.e. a grammatical triple of type $t$.

(15) Otto says, ‘I am a fool’

The simple proposal is that the direct quotation marks in (15) are simply pure quotation marks, turning the reported phrase into a term of type $u$. All we need then is a separate lexical item for direct discourse saying: $\langle \text{say}, \text{say}^d, \text{uet} \rangle$

Let me illustrate the theory of pure quotation and direct discourse by generating the tree for (15), the direct discourse counterpart of (9):

(16) $\langle \text{Otto says, ‘I am a fool’}, (\text{say}^d(\langle \text{I’m a fool}, \text{fool}(i), t \rangle))(o), t \rangle$

\[
\langle \text{Otto…} \rangle
\]

\[
\langle \text{says, say}^d, \text{uet} \rangle \quad (\text{I’m a fool}, (\langle \text{I’m a fool}, \text{fool}(i), t \rangle), u) \quad \langle \text{I’m a fool, fool}(i), t \rangle \quad \langle \text{I…} \rangle
\]

\[
\langle \text{am a fool…} \rangle
\]

Semantically: $\llbracket (16) \rrbracket^c = \llbracket (\text{say}^d(\langle \text{I’m a fool}, \text{fool}(i), t \rangle))(o) \rrbracket^c = 1$ iff Otto stands in the say-relation to $\langle \text{I’m a fool, fool}(i), t \rangle$

2.2 The presuppositional analysis of mixed quotation

Consider the following case of mixed quotation (based on a newspaper example from Recanati (2001:680), involving an indexical to show off one of the main selling points of the presuppositional analysis).
(17) John said that this is “news to me”

An important difference between mixed and pure quotation is that a mixed quoted term (“news to me”) is not a self-referential term of type $u$, but rather a syntactically integrated constituent of the report complement, in this case a VP of type $et$. In other words a mixed quoted VP is itself a VP, referring to a property. But what property? Certainly not the same property that the VP without the quotation marks expresses, because, for one, the intended referent of the mixed quoted first person $me$ in (17) is John, not me. As Geurts and Maier (2005) put it, the mixed quotation marks induce a meaning shift, from the actual meaning of the words to the meaning that the reported speaker associates with those words. In short: (17) $\approx$ John said that this has the property he refers to as ‘news to me’.

To account for the context-dependence of what someone means with his words we analyze the shifted meaning part as a presupposition (unlike Potts, who analyzes it as a kind of conventional implicature in a separate dimension).

(18) a. presupposition: John used the expression ‘news to me’ to express some property $P$
   b. assertion: John said that this has property $P$

The formalization of these ideas takes place in Discourse Representation Theory (Kamp, 1981) with the theory of Presupposition as Anaphora (van der Sandt, 1992), henceforth DRT+PA. There are two stages of interpretation. In the construction stage, the grammar couples sentences with Preliminary DRS’s (PrelDRS). In terms of our $G$: $L =$ the compositional PrelDRS language (with types, lambdas, and (unsolved/in situ) presuppositions marked as dashed boxes). Then there is a resolution stage, where the context DRS, a representation of the common ground, is merged with the PrelDRS and all presuppositions are resolved.

Representing the presuppositional content described in (18) requires one final ingredient: a ternary relation express, relating an individual and a piece of linguistic material ($\in G$) to the semantic objects ($\in D$) that that individual associates with that linguistic object:

(19) \[ \text{express}(x, \langle \text{news to me}, \text{news.to(i)}, \text{et} \rangle, X) \approx x \text{ uses } \langle \text{news to me}, \ldots \rangle \text{ to refer to } X \]

In DRT+PA we can now represent the $X$ such that he uses ‘news to me’ to refer to $X$ as any other definite description, viz. as a presupposition. In fact, the mixed quote presupposition contains an anaphoric element itself, the $he$ representing the source of the quotation in the above paraphrase. The following composition rule which completes the analysis of mixed quotation:\footnote{Here, double quotes denote mixed quotation, single quotes denote pure quotation, dashed boxes denote unresolved presupposition complexes in which each discourse referent represents a presupposition.}
\[ \langle \omega \setminus \sigma \rangle^\omega, \begin{bmatrix} X \\ \bar{X} \\ y \\ \bar{X} y \\ \text{express}(y, \langle \sigma, \varphi, \tau \rangle, X) \end{bmatrix}, \tau \rangle \]

(20) 

For example, in the construction stage we construct the following tree:

---

\[^4\text{G-triples now represented vertically, with round instead of angled brackets}\]

---
The top-node contains the PrelDRS for our sentence. It contains a double presupposition triggered by the mixed quotation rule. In the resolution stage we take this PrelDRS, merge it with the representation of our common ground, which we assume will minimally contain some representation of a salient John (j) and some salient bit of ‘news’ (t). We then proceed to match the presuppositions with suitable antecedents where possible. The source presupposition y will look for someone who can be said to be expressing something and therefore find a match in the matrix subject John. But unless the context specifies explicitly that John tends to use the term news to me to denote this or that specific property, we will have to accommodate the main presupposition X of the mixed quotation, as shown below.

After this process of contextual merging, binding y, and accommodating X, our final output reads: there is a John, some info, and a property; John uses the term news to me to refer to the property; John says that the info has that property. In English: John says that this has a property he refers to as news to me.\(^5\)

### 2.3 Some problematic predictions

Although the presuppositional analysis is quite flexible and can deal with a range of quotational shift phenomena, it is not quite powerful enough to deal with all the cases we’d like to apply it, including the indirect imperatives of section 1.

First of all, to analyze indirect imperatives as mixed quotation we have to assume that the quotational meaning shift can be applied covertly. This is relatively unproblematic as there are clear cases of unmarked pure quotation (e.g. My name is Emar) and direct discourse (e.g. in colloquial English or Japanese).

A more serious limitation of our base system is the prediction that only grammatical constituents can be mixed quoted. Although we can extend G with un-lexical (⟨misunderestimate,∅,eet⟩) and even typeless (⟨sdd6Gte,∅,∅⟩) strings, the application of the mixed quotation composition rule requires that we know at least the type of the quoted expression. However, in real-life we find mixed quotations that standard syntactic theories will not assign any category/type to:

\[
\text{(21) David said that he had donated ‘largish sums, to several benign institutions’} \quad \text{[Abbott 2005]}
\]

\(^5\)If context allows, we can strengthen this pragmatically by assuming that John speaks English like the rest of us, i.e. he uses the same grammar G, and hence uses news to me to refer to the fact that something is new to him, John.
Finally, we predict that mixed quoted indexicals always shift. Although this is usually correct, it too is not universally true:

(22) And I even pissed off the youngest one so much that he told me to “stick a lamp up my ass” [Maier 2006]

In the next section I reconstruct Shan’s (2007) analysis of quotation interjection, which solves the remaining two problems above, and will finally allow us to model indirect imperatives as well.

3 Interjection

In newspaper and scientific articles, square brackets are frequently used to indicate editorial adjustments (shortening, indexical adjustment, clarification) inside a quote:

(23) The politician admitted that she “lied [her] way into [her job]” [Shan 2007]

To account for this phenomenon of quotation interjection I will incorporate Shan’s (2007) notion of constructions. The idea is as follows: lied ... way into ... is not a grammatical term in \( G \) as we know it, rather it is a binary construction. A construction is not itself an expression but a function from expressions to expressions. Feed the binary construction above with an expression of type \((et) e\) and one of type \( e\) and you get an expression of type \( et \). So, even though lied ... way into ... is not an expression it does contribute predictably to the truth conditions of the sentences that contain it. In fact, at the semantic level it behaves rather like a wellformed expression of type \(((et) e) eet\). Since constructions are typed and interpretable, they are mixed quotable. The square brackets are merely a typographic device to separate unquoted arguments from a mixed quoted construction: ...she “lied [her] way into [her job]” abbreviates ...she “lied ... way into ...”(her)(her job). As Shan already noted, the assumption of covert interjection brackets will provide an elegant analysis of non-constituent quotation, (24-a). I propose to further generalize this procedure to capture the occasional unshifted indexical, (24-b), and imperative argument, (24-c):

(24) a. ...said that he had “[donated] largish sums, to several benign institutions”
   b. ...told me to “stick a lamp up [my] ass”
   c. ...hat dir gesagt, “ruf [meinen] Vater an!”

Formally, we need a special kind of ‘two-dimensional variables’, triples in \( G \) consisting of a metalinguistic variable over \( A^* \) paired with a regular, typed variable over \( D \):

(25) for every \( \tau \in Type: \langle x, \overline{x}, \tau \rangle \) is a variable in \( G \)

Then we add ‘two-dimensional’ lambda abstraction:
According to our very first binary composition rule in section 2.1, combining expressions involves concatenation of the alphabetic surface representations and function application of the semantic components. Now that we have meta-variables and abstraction over alphabetic representations we can redefine composition in the surface dimension as function application as well. This means that simple lexical items like fool should be considered as (primitive) constructions, like $(\lambda x. x \cap \text{fool}, \text{fool}, \text{et})$. The new more general binary branching composition rule is:

$$(\gamma(\sigma), \varphi_1(\varphi_2), \tau_1)$$

$$(\gamma, \varphi_1, \tau_2 \tau_1) \quad \langle \sigma, \varphi_2, \tau_2 \rangle$$

Let’s see how we the enhanced grammar derives a proper representation for (24-b). I’ll briefly describe the derivation bottom up. We can assume that the lexicon contains a construction stick . . . up . . . In the bottom of the tree we combine that lexical construction with an underspecified x’s ass and a lamp to get the property stick a lamp up x’s ass. Binding the free variable with a lambda, we get a complex construction: stick a lamp up . . . ass. Applying mixed quotation gives the semantic object that w refers to as ‘stick a lamp up . . . ass’. This semantic object, represented by the presuppositional $X$ below, is indeed of the right type to take a possessive like my.$^6$

$^6$The fact that this quotation external argument is represented in brackets inside the quotation is but a typographic accident that can be captured by a special composition rule:

$$(\omega \cap \gamma([\cap \sigma \cap])^{\cap}, \varphi_1(\varphi_2), \tau_1)$$

$$(\omega \cap \gamma, \varphi_1, \tau_2 \tau_1) \quad (\sigma, \varphi_2, \tau_2)$$
"stick a lamp up [my] ass"

\[
\text{my} \quad \lambda x \, \text{stick a lamp up} \, x \, \text{ass} \\
(\ldots) \\
\text{express}(\ldots) \\
\text{et}
\]

\[
\lambda x \, \text{stick a lamp up} \, x \, \text{ass} \\
(\text{stick.up}(x(\text{ass}))(\text{lamp})) \\
((\text{et})\text{et})
\]

\[
\lambda \left( \begin{array}{c}
 x \\
 X \\
 (\text{et})\text{et}
\end{array} \right) \\
\text{stick a lamp up} \, x \, \text{ass} \\
(\text{stick.up}(X(\text{ass}))(\text{lamp})) \\
\text{et}
\]

\[
\text{a lamp} \\
\lambda z \, \text{stick up} \, z \, \text{ass} \\
\text{stick.up}(X(\text{ass})) \\
\text{et}
\]

4 Imperatives

With all the quotational machinery in place we return to imperatives. The idea is simple: instead of making imperatives shiftable by say, we let imperatives keep their regular semantics but allow them to be mixed quoted in an indirect discourse. As a first approximation, the Japanese example might be analyzed as something like: I was told by the boss that “finish!” that work by tomorrow.

The first problem is a familiar one: to mixed quote something it must be semantically interpretable, or at least have a definite semantic type. So what, if anything, is the type of \textit{finish}? To answer this question we have to adopt some kind of semantic analysis of imperative mood. Let’s take Schwager’s (2006) modal approach. Take a simple command like \textit{go!}. The starting point of this analysis is that \textit{go!} means \textit{you must go}. Formally, the ingredients are a deontic modal operator \textit{IMP}; a silent subject, by default equivalent to \textit{you}; and a some presuppositions meant to restrict the proper contexts of use of the \textit{IMP} operator to those where the speaker is qualified to perform a proper speech act of ordering (e.g. \textit{IMP}\varphi pressupposes I am an authority wrt the content of}
\( \varphi \) and \( I \text{ do not already know that } \varphi \text{ is true} \). Ignoring for now the performativity presuppositions, imperatives are handled as follows in \( G \):

\[
\begin{aligned}
(26) & \quad \text{a. syntax:} \\
& \quad \langle \text{go!}, \text{IMP}(\text{go}(j)), t \rangle \\
& \quad \langle !, \text{IMP}, tt \rangle \\
& \quad \langle \emptyset, j, e \rangle \\
& \quad \langle \text{go, go}, et \rangle
\end{aligned}
\]

\[
\begin{aligned}
(26) & \quad \text{b. semantics:} \\
& \quad (i) \quad [j]^c := \text{addressee}_c \\
& \quad (ii) \quad [\text{IMP} \varphi]^c := \text{the proposition that in all worlds compatible with speaker}_c \text{'s demands } [\varphi]^c \text{ is true}
\end{aligned}
\]

Imperatives now express propositions, type \( t \), and hence can be mixed quoted without problem. Note that to represent the crucial examples of section 1 (with unshifted indexical arguments) we will have to rely heavily on our interjection brackets:

\[
\begin{aligned}
(27) & \quad \text{a. } \text{“[ashita] made ni [sono] shigoto-o yare” to } \text{jooshi-ni tomorrow until that work-Acc do-Imp Comp boss-by iwaremashita was told-Polite} \\
& \quad \text{‘I was told by the boss to “finish [that] work by [tomorrow]”’ } \quad \text{[cf. (2)]} \\
& \quad \text{b. Hans hat dir doch gestern schon gesagt, “ruf [meinen] Vater an!” } \quad \text{[cf. (3)]} \\
& \quad \text{c. John said “call [his] mom!” } \quad \text{[cf. (4)]}
\end{aligned}
\]

The derivations of the structures in (27) are all rather similar to that of the \textit{stick a lamp up [my] ass} example, but let’s zoom in on (27-b). From the lexical construction \textit{ruf... an} of type \( et \), a 2D variable of type \( (et) \), and the \( et \) predicate \textit{Vater} we generate the property \( \text{ruf} \times \text{Vater an} \). Following (26), we add a silent addressee indexical as the subject, and then an imperative operator to get the command \( \text{Ruf} \times \text{Vater an!} \). Abstracting the previously introduced variable we get the construction we have been denoting as \( \text{ruf... Vater an} \). Mix quoting yields the semantic object that \( y \) refers to as \( \text{‘Ruf... Vater an!’} \). Finally, this presupposition trigger combines with \textit{meinen} to complete the complement clause.

To evaluate my mixed quotation approach to indirect imperatives, let’s compare it with the alternative Oshima-Schwager-Crnick-Trinh-treatment in terms of fully indirect discourse (cf. section 1). Although my analysis is still rather sketchy (cf. section 5 below), there are already two areas where it shows a marked advantage.

First and foremost is the automatic shifting of indexical parameters under quotation. In section 1 I pointed out that a truly indirect analysis of the Japanese example requires the introduction of a monster to shift the two indexical parameters inherent in the logical form of an imperative command. To recap, \textit{shigoto-o yare!} as a main clause imperative means that the actual speaker commands the actual addressee to do the work, but embedded in a report like (2) it means that the reported speaker (boss)
commanded the reported addressee (me) to do it. The current analysis already predicts this behavior. As illustrated in 2.2, the general mixed quotational meaning shift from $X$ to *what the reported speaker referred to as ‘$X$’* shifts the reference of indexicals to the reporting context. In non-pathological contexts the effect is rather similar to that of a monster, but it falls out of the much more general mechanism for capturing quotation.

A second, more tentative advantage of a quotational analysis is the blocking of wh-movement with indirect imperatives, as illustrated in (5) repeated below:

(28) *Who did John say call at 3PM

A crucial step in the argumentation that a report complement is semantically indirect rather than direct, is showing that it allows wh-movement: indirect speech allows it, direct speech blocks it (e.g. Schlenker, 2003; Anand and Nevins, 2004):

(29) a. What did Otto say I am
   b. *What did Otto say, “I am”?

Strictly speaking our semantics blocks movement out of a mixed quoted phrase as well, which would explain the infelicity of (28). This cannot be the whole story though, because there are Japanese examples of indirect imperatives with *wh-in-situ* question formation, which should likewise be blocked in direct and mixed quotation:

(30) Taro-wa yatu-i-no uti-ni nanzi-ni ko-i to itta no ka?
    Taro-Top to.his.house at.what.time come-Imp Comp said?
    ‘What time did Taro say to come to his house?’

Technically, the current system generates well-formed representations for both, and hence ultimately fails to explain the infelicity of (28):

(31) a. Who did John say “call [ t$_1$ ] at 3PM!”
   b. Taro-wa “[yatu$_1$]-no uti-ni [nanzi]-ni ko-i” to itta no ka?
    Taro-Top “to.[his].house at.[what.time] come-Imp” Comp said?

However, all is not lost. In the absence of further data, I hypothesize that the infelicity of (31-a) is of a pragmatic nature, perhaps due to a constraint that penalizes interjection of mere traces, or a more general constraint that restricts the application of covert interjection to a certain class of expressions, including (in situ) wh-phrases, pronouns and standard indexicals. Note that to avoid massive overgeneration, some pretty severe restrictions on covert mixed quotation and interjection are required in any case, but this will have to be left for future research.

In the presuppositional view, the reference of mixed quoted expression is ultimately a matter of pragmatics. Hence, pathological cases are contexts where a reported speaker is known to misuse *I* to refer to the color blue, and *go home!* as a name for his dog. Mixed quoting these terms will shift them to the reported speaker’s intended referents rather than just shifting *I* to the speaker of the reported context.
5 Conclusions

My central claim is that embedded imperatives are mixed quoted. To substantiate this claim I’ve brought together three independently motivated semantic theories, viz. presuppositional mixed quotation from Geurts and Maier (2005), propositional imperatives from Schwager (2006), and interjection as quoted constructions from Shan (2007). According to my proposal, an embedded imperative like Hans hat dir doch gestern schon gesagt, ruf meinen Vater an has the logical form Hans hat dir doch gestern schon gesagt, “ruf [meinen] Vater an!” A specific benefit of the analysis is that it takes care of the observed shifting of indexical imperative parameters without resorting to monsters.

A number of loose ends remain. Most importantly: how to restrict the overgeneration from the covert application of the two powerful and opposing mechanisms of quotation and interjection? In future work I intend to explore the possibility of a set of pragmatic constraints, with principles like avoid shifting perspective (to encode a preference for simple indirect speech, and prevent “[‘[go!]’]”) and use mixed quote if relevant features would get lost in indirect paraphrase. It remains to be seen if the system will then be able to offer some insights into the more subtle language specific restrictions on apparent imperative embedding and shifting.

References


Not Too Strong!
Generalizing the Scope Economy Condition

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Abstract
Fox (1995, 2000) argued that covert scope shifting operations (CSSOs) such as QR or reconstruction are subject to a semantic economy condition: they are not licensed if they are semantically vacuous. In this paper, we argue for a generalization of this condition according to which a CSSO is ruled out not only if it is vacuous, but also if it leads to a reading that is strictly stronger than the surface-scope reading.

1 The Generalized Scope Economy Condition
Fox (1995, 2000) argues that covert scope shifting operations (CSSO) such as QR and reconstruction (or quantifier lowering) are constrained by economy considerations. More specifically, according to Fox’s Economy Condition, a CSSO can take place only if it is not semantically vacuous:

(1) *Economy condition on scope shifting (Scope Economy)*

*OP* can apply only if it affects semantic interpretation (i.e., only if inverse-scope and surface-scope are semantically distinct) (*where OP stands for CSSO; M&ES*)

(Fox 2000:21)

Fox’s claim has far-reaching consequences for the architecture of the grammar, as it implies that some syntactic operations have access to certain semantic properties of logical forms. In the present paper, we discuss data that suggest that the principle of Scope Economy in (1) must be generalized. Our Generalized Scope Economy Condition is stated in (2).

(2) *Generalized Scope Economy condition*

A CSSO cannot apply if the meaning of the resulting reading is equivalent to or stronger than (i.e. entails) the meaning that would have resulted without it.
GSEC incorporates the cases subsumed under Fox’s Scope Economy condition, but moreover disallows CSSOs whose output structures have a reading which asymmetrically entails that of the input structure. In other words, we claim that a CSSO is ruled out not only when it is semantically vacuous, but also when it is semantically strengthening.

In section 2, we will show that (2) explains various complicated facts about the relative scopes of various operators. In section 3 we discuss a potential methodological counterargument to our claim and provide additional evidence for the GSEC. In section 4 we will discuss two systematic apparent exceptions to our theory, and we will argue that these exceptions support the GSEC under closer scrutiny.

2 Complicated scope facts

In this section, we discuss two sets of cases where certain scope ambiguities are missing and show that the GSEC correctly predicts the absence of the relevant readings.

2.1 Interaction between quantifiers and negation

Consider the pair of sentences in (3). (3a) is ambiguous between a reading equivalent to “no student of mine showed up on time” (the surface-scope reading, where the universal subject scopes over negation) and a weaker reading equivalent to “it is not the case that every student of mine showed up on time” (the inverse-scope reading, which we assume involves reconstruction of the universal quantifier to a VP-internal position, lower than negation). (3b), on the other hand, is not ambiguous (Beghelli and Stowell 1997). The universal quantifier cannot take scope over negation. The only difference with (3a) is that we have changed the surface-scope of the scope-bearing elements involved, but crucially the type of elements involved are the same.

(3) a. Every student of mine didn’t show up on time (∀ > ¬) (¬ > ∀)
   b. John didn’t meet every student of mine on time (∼ > ∀) *(∀ > ∼)

Beghelli and Stowell (1997) also observe that a narrow scope reading with respect to negation for an indefinite subject is difficult to obtain, as illustrated by (4). (4) differs minimally from (3a): the universal subject has been replaced by an indefinite. Reconstruction seems impossible in this case.

(4) A/One student of mine didn’t show up on time (∃ > ¬) ?!(¬ > ∃)

These facts are puzzling, and, as far as we know, they have not been accounted for so far in a principled way.¹ It turns out that the unavailable interpretations for (3b)

¹Beghelli and Stowell (1997) provide a syntactic account of these differences between quantifiers: they posit that QR operations move various quantifiers to various designated syntactic positions, but they do not explain why these positions are ordered the way they are. Büning (1997) provides a
and (4) are ruled out by the GSEC, provided we assume that universal quantifiers are *aristotelian*, i.e. presuppose that their restrictor is non-empty.\(^2\)

First consider (3a) and (3b). Both involve negation and a universal quantifier. Now, note that the following generally holds:

\[(5) \text{ If the extension of a predicate } P \text{ is presupposed not to be empty, then, for any contingent predicate } Q, \text{ the formula } \forall x(P(x) \rightarrow \neg Q(x)) \text{ a-symmetrically entails (‘a-entails’ for short) the formula } \neg \forall x(P(x) \rightarrow Q(x)).\]

In the case of (3a), the ‘surface-scope’ reading (\(\forall > \neg\)) is thus the one that a-entails the inverse-scope reading (\(\neg > \forall\)). Hence the inverse-scope reading does not entail the surface-scope reading. As a result, the inverse-scope reading is not ruled out by the GSEC, a correct result. In the case of (3b), on the contrary, the inverse-scope reading (\(\forall > \neg\)) entails the surface-scope reading (\(\neg > \forall\)), and therefore it is ruled out by the GSEC – a correct result again.

Next consider (4). With an existential quantifier instead of a universal quantifier, the logical relationships between the various putative readings are reversed. Namely, it is now the reading where negation takes wide scope which is the strongest. In other terms:

\[(6) \text{ If the extension of a predicate } P \text{ is presupposed not to be empty, then, for any contingent predicate } Q, \text{ the formula } \neg \exists x(P(x) \land Q(x)) \text{ a-entails the formula } \exists x(P(x) \land \neg Q(x)).\]

Hence, in the case of (4), the inverse-scope reading (\(\neg > \exists\)) entails the surface-scope reading, and is thus correctly ruled out by the GSEC. These well-known data lend first circumstantial support to the GSEC, which correctly predicts that the sentences in (3b) and (4) should be perceived as unambiguous.\(^3\)

### 2.2 Contrasts between UE-indefinites and DE-indefinites

In the preceding subsection we have seen that quantifiers show differing behavior in their ability to scope below or above negation, in a way that the GSEC manages to

---

2 If one does not want to commit oneself to the view that universal quantifiers presuppose their restrictor to be non-empty, one can as well stipulate that the GSEC involves a non-standard notion of entailment, whereby \(\phi\) is said to entail \(\psi\) whenever every model of \(\phi\) in which the relevant restrictors are not empty is also a model of \(\psi\).

3 Unless more is said, the GSEC also predicts that a wide-scope reading for the indefinite is impossible in (i), contrary to fact. But note that bare indefinites are known to be able to take ‘exceptional wide scope’, and it is widely assumed that the mechanism whereby they achieve wide-scope is not syntactic movement. Thus we do not expect this mechanism to be subject to the GSEC, a conclusion already reached by Fox in the context of his original proposal. See Heim (1982), Abusch (1994), Reinhart (1997), Winter (1997), Chierchia (2001), among others.
predict. In this section we turn to the interactions between indefinites and universal operators (universal quantifiers over individuals, times, or worlds – necessity modals). We argue for the following generalization:

(7) An indefinite which c-commands a universal operator in overt syntax can take scope below it if it is upward-entailing and cannot if it is downward-entailing.

The pairs in (8), (9) and (10) illustrate this generalization. The (a)-examples have an UE-indefinite in subject position which c-commands a universal quantifier. The (b)-examples differ minimally in that the UE-indefinite is replaced by a DE-one. The (a)-examples allow for an inverse-scope reading, whereas the (b)-examples do not.

(8) a. Many windows are always open in this building (i.e. it is always the case that few are closed) (many > always) (always > many)
   b. Few windows are always open in this building (#i.e, it’s always the case that most are closed) (few > always) *(always > few)

(9) a. More than three students are certain to pass, (i.e., it’s certain that at least four pass) (more than 3 > certain) (certain > more than 3)
   b. Fewer than three students are certain to pass, (#i.e., it’s certain that at most two pass) (fewer than 3 > certain) *(certain > fewer than 3)

(10) a. A boy heard every girl sing (∃ > ∀) (∀ > ∃)
   b. Few boys heard every girl sing (few > ∀) *(∀ > few)

The generalization in (7) follows from the GSEC. Let us for instance concentrate on the pair in (8). The inverse-scope reading of (8a) says that at any given moment, one can find many open windows in the building. This, of course, does not entail that a single, specific window is open permanently. Hence it does not entail the surface-scope reading, which says that there are many specific windows which are permanently open. Since the inverse-scope reading in this case does not entail the surface-scope reading, the inverse-scope reading is licensed by the GSEC. Consider now (8b). The inverse-scope reading for (8b) says that at any given moment, the number of open windows, call it k, is low. Now, note that the number of windows that are permanently open, call it k′, is necessarily smaller than or equal to k. Hence if k counts as low, then so does k′. In other words, if the inverse-scope reading is true, then there are few windows that are permanently open, i.e., the surface-scope reading is true as well. Therefore the inverse-scope reading entails the surface-scope reading, and it is thus ruled out by the GSEC. A completely parallel line of reasoning accounts for the cases in (9) and (10).

To predict the generalization in (7) in full generality, let us first remark that a UE-indefinite can be assimilated to an existential quantifier ranging over its so-called ‘witness-sets’ (cf. Barwise and Cooper 1981). Hence the relevant ambiguity in all the (a)-examples is reducible to an ambiguity in the relative scope of a universal quantifier and an existential quantifier. Given that the reading where the universal quantifier scopes over the existential quantifier is the weaker reading, it is not ruled out by the
GSEC, i.e., inverse-scope is predicted to be possible. In contrast with this, a DE-
indefinite is equivalent to the negation of a UE-indefinite. That is, the relevant readings
in cases involving a DE-indefinite can be schematically represented as follows:

\[(11) \begin{align*}
    & a. \text{Surface scope: } \neg \exists x \forall y P(x, y) \\
    & b. \text{Inverse scope: } \forall y \neg \exists x P(x, y)
\end{align*}\]

Now, (11b) entails (11a), and therefore the inverse-scope reading is ruled out by the
GSEC.

3 Further Evidence

3.1 A potential objection: Truth Dominance

In a recent paper, Meyer and Sauerland (2009) argue that if a sentence is ambiguous
between two readings \(R_1\) and \(R_2\), where \(R_1\) entails \(R_2\) and \(R_2\) is ‘the most accessible
reading’, then \(R_1\) is not detectable by mere inspection of speakers’ truth-conditional
intuitions, due to a principle they call Truth Dominance.

Now, if one assume that inverse-scope readings are never as ‘accessible’ as surface-
scope readings, then Truth Dominance predicts that an inverse-scope reading will be
undetectable when it entails the surface-scope reading. Hence Truth Dominance is able
to account for the facts we have discussed so far. Crucially, Truth Dominance and
the GSEC are genuinely distinct hypotheses: the GSEC says that the grammar rules
out certain LF representations, while Truth Dominance does not. In fact, Meyer and
Sauerland’s (2009) general argument for Truth Dominance is that one can provide in-
dependent evidence for the availability of certain LFs which happen to be undetectable
by purely truth-conditional means.

We agree that it is possible that some ambiguities cannot be detected due to a
principle along the lines of Truth Dominance. We thus need to provide additional
arguments for the GSEC. To this we now turn.

3.2 The parallelism condition on VP-ellipsis

Notice that if we grant that inverse-scope readings that are not licensed by the GSEC
could not be detected anyway by consulting our truth-conditional intuitions, we find
ourselves in the same situation as Fox did when he argued for his original Economy
Condition. Trivially, Fox’s ban on vacuous CSSOs has no observable effect on truth-
conditions. Fox argued for his Economy Condition by using certain constratins on
VP-ellipsis as diagnostic tools, and we will follow him in this respect.

Fox adduced data such as the ones in (12) originally discussed by Sag (1976) and
Williams (1977) to give support to Scope Economy. (12a) shows a scope ambiguity as
expected. But the very same sentence becomes sometimes unambiguous when followed
by a sentence involving VP-ellipsis, as in (12b) (Fox 2000:30).

(12) a. A boy admires every teacher. (∃ > ∀) (∀ > ∃)
   b. A boy admires every teacher. Mary does, too. (∃ > ∀) *(∀ > ∃)

Fox’s account for the lack of ambiguity in (12b) is based on two principles, namely the ‘parallelism constraint on ellipsis’, stated in (13) below, and his Scope Economy Principle.4

(13) **Parallelism**

If a CSSO has applied in a given sentence A, and A is followed by a sentence B in which the VP is elided, then a parallel CSSO must have applied in B.

Here is how (13) and Scope Economy conspire to make (12b) above unambiguous. First, we notice that QR of the (elided) universal quantifier over Mary would be vacuous and is thus ruled out by Scope Economy. Second, given parallelism (cf. (13)), the parallel CSSO in the antecedent sentence is blocked as well. As a result, (12b) is unambiguous.

Fox’s account makes the further prediction that (14) should exhibit scopal ambiguity, as it indeed does. Why? The inverse-scope interpretation of the ellipsis sentence is different from the surface-scope interpretation, i.e., Scope Economy allows the required CSSO. Parallelism entails that either both or neither of the two sentences will be interpreted under the inverse-scope reading, a correct prediction which provides independent evidence for parallelism.

(14) A boy admires every teacher. A girl does, too. (∃ > ∀) (∀ > ∃)

We can replicate Fox’s arguments in order to test whether our GSEC, which is strictly stronger than Fox’s original Scope Economy condition, is a real grammatical principle. Imagine a VP-ellipsis discourse where the antecedent sentence shows a scope ambiguity when it appears on its own, just like in (12a) above. Now, if the inverse-scope reading in the ellipsis sentence is ruled out by the GSEC (i.e., if it entails the surface-scope reading), then the CSSO in the antecedent should be blocked by the parallelism constraint. This means that the antecedent sentence should appear to be unambiguous. Such examples would thus provide crucial support for the GSEC, as the relevant facts cannot be predicted by Truth Dominance.

With this in mind, consider the examples in (15). We notice that under the given context (15a) sounds fine, whereas (15b) is odd.

(15) **Context:** Preprints of several new books are sent to both male and female reviewers. No male reviewer received every book.

a. More than five men read every book. And more than five women did, too.

---

4Notice that the formulation in (13) is stronger than one might initially expect. In particular, it requires that the scopal relations for the complete sentences are parallel and not just the ones in the VPs. We return to this issue below.
\[
\#(\text{more than } 5 > \forall) \ (\forall > \text{more than } 5)
\]

b. \#More than five men read every book. However, fewer than five women did.
\[
\#(\text{more than } 5 > \forall) \ *(\forall > \text{more than } 5)
\]

In the specified context, the surface-scope reading is pragmatically odd for the antecedent sentences in (15a)-(15b), because this reading implies that there are men who read every book. So only the inverse-scope reading (which states that every book was read by more than five men) is compatible with the context. We can thus interpret these facts as showing that the inverse-scope reading is available for the first sentence in (15a) but not in (15b) (even though it is the very same sentence in both cases).

Now consider the ellipsis sentences. The one in (15a) contains an UE-indefinite in subject position. As discussed in section 2.2, in such a case the GSEC licenses an inverse-scope reading. Hence the parallel inverse-scope reading in the first sentence is licensed as well (and in fact forced by parallelism if the relevant CSSO occurs in the ellipsis sentence). In (15b), however, the subject in the ellipsis sentence is DE. As we have seen, in such a case QR of the universal quantifier is ruled out by the GSEC. By parallelism, the parallel CSSO is ruled out in the antecedent sentence, which makes the inverse-scope reading unavailable for the first sentence. But since only this reading is compatible with the context, (15b) is correctly predicted to sound odd.

(16) is a similar example.\(^5\) The context makes sure that no person could have possibly watched every film shown at the festival. It follows that the surface-scope reading of the antecedent sentence in both (16a) and (16b) should be infelicitous, because it would say that many critics are such that they watched every movie. The inverse-scope reading, on the other hand, is licensed by the context, which allows every movie to be such that many critics watched it. But as in the previous example, we see that the overall discourse is odd when the ellipsis sentence contains a DE-indefinite subject, as in (16b), and not when it contains a UE-indefinite subject, as in (16a). This again is predicted by the combination of the GSEC and parallelism (as we have just explained).

(16)

\textbf{Context:} A film festival has parallel sessions. No one was able to watch every movie.

a. Still, many critics watched every movie. And a few ordinary people did, as well. \#(many > \forall) \ (\forall > \text{many})

b. \#Still, many critics watched every movie. However, very few ordinary people did. \#(many > \forall) \ *(\forall > \text{many})

A parallel account can be given for the oddness of (17). The surface-scope interpretation of the antecedent sentence is false, because it is not true that no Californian lives in LA. Thus the inverse-scope interpretation should be forced. The ellipsis sentence contains an indefinite and a negation. Applying reconstruction to the indefinite below negation results in an interpretation that is stronger than the surface reading. This interpretation is blocked by the GSEC. But then, in order to meet the parallelism constraint, the first

\(^5\)Thanks to Danny Fox (p.c.) for help with the construction of the example.
sentence must be interpreted under its surface-scope reading, which is incompatible with world knowledge.

(17) #Every Californian doesn’t live in LA, and a New Yorker doesn’t either
#(∀ > ¬) *(¬ > ∀)

(18) below differs minimally. Here the ellipsis sentence contains a universal quantifier. Applying reconstruction does not violate the GSEC. Hence the GSEC licenses inverse-scope in the second sentence, and as a result inverse-scope is licensed as well in the antecedent (given parallelism). No oddness is thus predicted, a correct result again.⁶

(18) Every Californian doesn’t live in LA, and every New Yorker doesn’t either
#(∀ > ¬) (¬ > ∀)

To summarize, the conclusions that Fox reached in the case of vacuous CSSOs on the basis of discourses involving ellipsis can be generalized to ‘strengthening’ CSSOs. This is predicted by the GSEC, but not by Truth Dominance.

3.3 Pragmatic deviance

Truth Dominance can certainly not be assumed to be an absolute principle. Sometimes an ambiguous sentence is disambiguated in favor of its stronger reading, because the weaker reading cannot be assumed to be what the speaker meant (for instance, because it is so weak that it expresses a tautology).⁷ Hence, let us consider a case where only the inverse-scope reading is a plausible reading. If this reading exists, it should be the most salient reading, even if it is stronger than the surface-scope reading. If the sentence instead sounds odd, this provides evidence that the inverse-scope reading is not generated by the grammar. With this in mind, consider the acceptable (19a) and the infelicitous (19b) under the context given in (19).

⁶Note that for (17) and (18) the argument rests on the assumption that it is the whole sentences that matter for parallelism, as stated in (13), i.e., it is not the scopal relations in the VPs alone that matter. We follow Rooth (1992a,b), Tancredi (1992), Fox (2000) in this assumption. Also note that the difference in acceptability between (17) and (18) itself provides support for the particular formulation of parallelism in (13).

⁷For instance, (i) below strongly favors the reading where the than-clause (‘than he has’) is interpreted de re, i.e., is taken to refer to the number of children that Jack has in the actual world (paraphrased in (ia)), rather than the reading where the than-clause is interpreted de dicto (paraphrased in (ib)), which happens to be a tautology.

(i) Jack could not have had more children than he has.
   a. De re: there is no accessible world w such that the number of children that Jack has in w is more than the number of children that Jack has in the actual world.
   b. De dicto: there is no accessible world w such that the number of children that Jack has in w is more than the number of children that Jack has in w.
(19)  \textit{Context: in some particular driving school, on every day, many people from many different states take a driving exam}

a. More than three people from New York State always pass
   \#(\text{more than 3 > always}) (\text{always > more than 3})

b. Fewer than three people from New York State always pass
   \#(\text{fewer than 3 > always}) *(\text{always > fewer than 3})

First, consider (19a). The surface-scope interpretation, which can be paraphrased as in (20a) below, is pragmatically odd due to general knowledge of driving exams. The inverse-scope reading, on the other hand, can be paraphrased as in (20b) below, which fits our assumptions about driving exams. Since the inverse-scope reading in (20b) is asymmetrically entailed by the surface-scope reading in (20a), hence is weaker than it, the GSEC predicts that the necessary CSSO can apply. That is, the only appropriate reading for (19a) is the inverse-scope one, and it is predicted to be available by the GSEC.

(20)  a. ‘There are more than three people from New York who take the exam repeatedly and always pass.’

       b. ‘It is always the case that more than three people from New York pass the exam.’

Why is (19b) infelicitous? Again, the surface-scope reading for (19b), paraphrased in (21a) below, is pragmatically odd (it is basically a tautology, given our general knowledge about driving exams). It follows that Truth Dominance is obviated in this context: even though the inverse-scope reading given in (21b) asymmetrically entails the surface-scope reading, if the former reading is available at all, it should be detected in this context. In contrast with this, the GSEC predicts reconstruction to be impossible in (19b), hence rules out the only sensible interpretation. It thus correctly predicts that (19b) should sound pragmatically odd.

(21)  a. ‘There are fewer than three people from New York who take the exam repeatedly and always pass.’

       b. ‘It is always the case that fewer than three people from New York pass the exam.’

4  Two classes of systematic exceptions

In the present section we will look at two classes of apparent exceptions to the GSEC and discuss how they can be reconciled with our proposal.

4.1  Quantifiers at the right edge

Recall that (3a), repeated below as (22), does not have an inverse-scope reading.

(22)  John didn’t meet every guest on time (\neg > \forall) *(\forall > \neg)
In contrast with this, however, in the case of (23) the inverse-scope reading is available, under a particular intonation.\textsuperscript{8} At first sight this is completely unexpected. The quantifiers involved in (23) are the same as in (22), and the GSEC rules out the inverse-scope reading in both cases.

\begin{equation}
\text{(23) The student couldn’t answer every question that was marked with a star.} \\
(\neg \forall) (\forall > \neg)
\end{equation}

We will now suggest an explanation for this pattern: we contend that these apparent counterexamples to the GSEC are only found when the relevant operator is positioned at the right edge of the sentence. We will claim that in such cases the operator can undergo an\textit{overt} but string-vacuous movement operation to the right, which a) gives it wide-scope, and b) is not subject to the GSEC (since it is overt).

According to us, what distinguishes (22) from (23) is that in the latter case, but not in the former, it is possible that the universal quantifier underwent Heavy NP Shift (HNPS) – that is, string-vacuous movement to the right – to scope over negation, but not in (22), because in the latter case the QNP is not phonologically heavy enough.\textsuperscript{9} This means that (22) has (24) as its underlying structure under the inverse-scope construal.

\begin{equation}
\text{(24) [The student [couldn’t answer t\textsubscript{1}] [every question that was marked with a star]}.}
\end{equation}

This approach makes certain predictions. For instance, the availability of the inverse-scope reading in (23) should disappear once we make sure that the universal quantifier cannot undergo string-vacuous HNPS. So if we place some material $X$ that needs to be in the scope of negation to the right of the universal quantifier, the latter should not be able to move overtly but string-vacuously high enough to take scope over negation: this is so because in order for it to scope over negation, it should also scope over $X$, hence should move to the right of $X$. A CSSO would be called for, but this would violate the GSEC.

This prediction is borne out. Consider the scopally ambiguous (25) and the unambiguous (26). Both examples use NPI\textit{yet}, which must be in the scope of negation to be licensed. In (25) the universal precedes the NPI. In order for it to take scope over negation itself, it has to undergo movement. Covert movement is blocked by the GSEC. Overt movement to the right would not be high enough if it is string-vacuous, because in order to take scope over negation the universal would have to move past the NPI, which is trapped under negation. Therefore the lack of ambiguity is expected.

\begin{equation}
\text{(25) I haven’t solved every problem that was marked with a star yet.} \\
(\neg > \neg) (\forall > \neg > \neg)
\end{equation}

\textsuperscript{8}We thank an anonymous reviewer for SuB 14 for pointing out data like (23).

\textsuperscript{9}Furthermore, for HNPS in (22) to be string-vacuous, it would have been necessary that the phrase ‘on time’ itself had moved to the right as well.
(26) differs from (25) in having the universal follow the NPI. This can be plausibly attributed to the fact that the universal underwent HNPS (indeed, if the universal is replaced with a ‘light’ DP, the sentence becomes ungrammatical). What is important is that the landing site of the HNPS is not forced to be under the scope of negation. Therefore the scope ambiguity in (26) is again explained by appeal to overt movement, which is not subject to the GSEC.\(^{10}\)

\[
\text{(26) I haven’t solved yet every problem that was marked with a star}\]
\[
(\neg > yet > \forall) (\forall > \neg > yet)
\]

Similarly, the account relying on overt movement to the right predicts that the ECM-marked universal quantifier in (27) cannot take scope over negation. It is not on the right edge. Therefore covert movement is the only way wide-scope could be achieved. But, again, this movement is blocked by the GSEC.\(^{11}\)

\[
\text{(27) Context: These students usually don’t solve any problem whatsoever.}\]
\[
(\neg > \forall) *(\forall > \neg)
\]

The same observation applies to subjects embedded by perception verbs, as in (28)

\[
\text{(28) a. I didn’t see every building collapse.} (\neg > \forall) *(\forall > \neg)
\]
\[
\text{b. I didn’t see every girl laugh.} (\neg > \forall) *(\forall > \neg)
\]

The fact that the linear position of certain quantifiers matters for their scope taking abilities has thus been shown to actually lend support to the GSEC. Apparent exceptions to the GSEC involve quantifiers on the right edge and can thus be analyzed in terms of overt but string-vacuous movement to the right. We saw independent evidence for such an analysis.

### 4.2 Modals\(^{12}\)

A second class of apparent exceptions involves certain modals. In section 2.2, we saw that the GSEC predicts that DE-indefinites in subject positions, unlike UE-indefinites,

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\(^{10}\)Kayne (1998) made similar observations in cases that do not involve a violation of the SGEC. He noticed that quantifiers at the right edge can violate the clause-boundedness of QR (May 1985) and assumed that overt rightward movement was responsible for this (despite the fact that rightward movement is usually taken to be clause-bound as well – a constraint known as the right roof constraint – Ross 1967). Kayne (1998) proposes a system where QR is reduced to overt rightward movement. This is incompatible with our own approach, which is based on a distinction between covert movement and string-vacuous overt movement.

\(^{11}\) (i) shows that ECM-marked subjects can take scope over the matrix subject (cf. May 1985:44), i.e. covert movement to the matrix level is not blocked in general.

\(^{12}\) Some of the judgments reported in this section are not very stable, and require further investigation.
are not able to reconstruct below a universal operator, and, in particular a necessity modal (cf. (9b)). Things are nevertheless more complicated. For there are other cases where a UE-indefinite can clearly reconstruct below a universal modal, as in (29) (which, given the specified context, favors the reading where the subject takes scope below ‘must’. See however footnote 13).

(29) Context: A dinner party is to take place, but the host hopes that there will not be too many people attending, for otherwise it could be a disaster. The host thus thinks . . .
Fewer than five people must come for the dinner to be pleasant.

a. Surface-Scope: #(fewer than 5 > □) There are fewer than five people x such that x must come for the dinner to be pleasant.
b. Inverse-Scope: (□ > fewer than 5) It must be the case that fewer than five people come for the dinner to be pleasant.13

Now, note first that this fact is problematic for the GSEC only if we ignore the fine details of the semantics of modal constructions. For the inverse-scope reading entails the surface-scope reading only on the assumption that the extension of the predicat e people is the same in the actual world and in the worlds quantified over by the necessity modal. That is, the entailment goes through only if the noun people is interpreted de re in the case of the inverse-scope reading. This could be a sufficient answer to the puzzle, but then of course we should remove modals entirely from the set of data which we can consider as evidence or counterevidence for the GSEC. Whether we want to adopt this answer depends on what we take to be the notion of entailment relevant to the GSEC. For we could also take the view that the GSEC, because it operates on very impoverished Logical Forms, 14 fails to see that the entailment-relation is broken under a de-dicto reading, in which case another answer is called for.

While we will not provide such an answer in this paper, we would like to suggest that the violation of the GSEC that we have just observed correlates with another property: the modal ‘must’, when adjacent to negation, licenses an interpretation in which negation applies to the verb embedded under ‘must’ rather than to ‘must’ itself. Let us call modals and predicates which behave like ‘must’ in this respect ‘neg-raising’. Now, not all necessity modals are neg-raising. Must is, but have to is not. Let us thus contrast (29), repeated below as (30a), with a minimally different sentence where ‘must’ has been replaced with ‘have to’, as in (30b). For many speakers, the inverse-scope reading is at best marginal in (30b), which makes it somewhat odd, because the surface-scope reading is pragmatically deviant.15

13 Note that (29) has an additional interpretation, which we ignore here due to lack of space, and which can be paraphrased as ‘the number n such that it must be the case that n people come and it is not necessary that more than n people come for the dinner to be pleasant is smaller than 5’. 14 Following Fox’s original proposal, and for entirely similar reasons (cf. Fox 2000:70), we assume that the GSEC operates in a ‘modular way’, to the effect that it does not ‘see’ all the details of the syntactic structure: the notion of entailment relevant to the GSEC would thus not be fully equivalent to the standard notion, as it is computed on the basis of impoverished representations. 15 Some speakers do not seem to get a strong contrast. For a reason unknown to us, the analogous contrasts in French are much stronger than in English. We ignore a potential complication alluded to
(30)   a. Fewer than five people must come for the dinner to be pleasant
#(fewer than 5 > □) (□ > fewer than 5)
b. #Fewer than five people have to come for the dinner to be pleasant
#(fewer than 5 > □) *(□ > fewer than 5)

It must be noted that have to does not disallow reconstruction in general. As (31) shows, UE-indefinites can reconstruct below have to.

(31)   More than five people have to come for the dinner to be pleasant
#(more than 5 > □) (□ > more than 5)

Have to is thus well behaved with respect to the GSEC, contrary to must.

Further evidence for the claim that the predicates that are not ‘well-behaved’ are the neg-raising predicates comes from the difference between the doxastic predicates be believed to and be supposed to on the one hand, and be known to on the other hand. Only the former are neg-raising predicates but not the latter, as shown by the paraphrases for (32a), (32b), (32c), respectively.

(32)   a. John is not believed to be home
    ‘John is believed not to be home
b. John is not supposed to be home
    ‘John is supposed not to be home
c. John is not known to be home
    ‘It is not known that John is home

On the assumption that all these attitude predicates are universal operators of some sorts, the GSEC predicts that a DE-indefinite subject, unlike a UE-indefinite subject, cannot reconstruct below them. Now, on the one hand, the neg-raising predicates be believed to and be supposed to license a violation of the GSEC, as illustrated in (33), where an inverse-scope interpretation is available, in contradiction with the GSEC:

(33)   a. Fewer than 1000 Americans are believed to have been been hit by the swine flu (fewer than 1000 > believe) (believe > fewer than 1000)
b. Fewer than 1000 Americans are supposed to have been been hit by the swine flu (fewer than 1000 > suppose) (suppose > fewer than 1000)

On the other hand, the predicate be known to does not license the inverse-scope interpretation, as shown in (34).

(34)   Fewer than 1000 Americans are known to have been been hit by the swine flu (fewer than 1000 > know) *(know > fewer than 1000)

in footnote 13: (30b), just like (30a), has another reading, saying that the minimal required number of guests (for the party to be a success) is smaller than 5. This reading is not pragmatically deviant.
Again, note that be known to does not block inverse-scope in general – that is, reconstruction of UE-quantifiers is allowed under the same configuration, as (35) shows.

(35) More than 1000 Americans are known to have been hit by the swine flu 
    (fewer than 1000 > know) (know > fewer than 1000)

So the contrast between be supposed to and be believed to, on the one hand, and be known to provides support for the view that all the exceptions to the GSEC do indeed involve neg-raising predicates. Further investigation is needed in order to show that this is a correct generalization. But if it proves correct, it suggests a research strategy where these apparent exceptions are to be explained in terms of the specific properties of neg-raising predicates, rather than by giving up the GSEC.

5 Is the GSEC a local or a global constraint?

Our current formulation of the GSEC makes a clearly incorrect prediction: it predicts that for some sentences $S$ which license an inverse-scope reading, embedding $S$ in a downward-entailing context will eliminate the relevant inverse-scope reading. This prediction is made because downward-entailing contexts are, by definition, contexts that reverse entailment patterns. Consider for concreteness the following sentence:

(36) Whenever a girl dances with every boy, everybody is happy.
    a. Surface-scope: Whenever there is a girl who dances with every boy, everybody is happy.
    b. Inverse-scope: Whenever for every boy, there is a girl that dances with him, everybody is happy.

Contrary to what happens when A girl dances with every boy is not embedded, the inverse-scope reading for (36) happens to entail the surface-scope reading, and thus should be ruled out by the GSEC. But we observe that the inverse-scope reading is in fact clearly available. A natural way of solving this problem is to conceive of the GSEC as a local constraint, rather than a global constraint, in the following sense: what would count for the GSEC is not (necessarily) the global reading of the full sentence, but rather the semantic value of a specific syntactic constituent, minimally the one that contains both the pre-movement position and the landing site of the moved operator. If so, the inverse-scope reading remains licensed in (36), because the GSEC is met for the constituent [a girl dances with every boy].

Before determining how exactly this ‘local’ version of the GSEC should be formulated, let us note a second prediction that is made when GSEC is viewed as a global constraint. It is predicted that new scope possibilities arise when a sentence is embedded in a DE-context. For suppose that the GSEC does not license the inverse-scope

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16 The fact that the inverse-scope reading is clearly perceived provides additional evidence against an account based only on Truth Dominance.
reading for a certain sentence $S$. This means that the inverse-scope reading entails the surface-scope reading. But then when $S$ is embedded in a DE-context, entailment relations are reversed, and therefore the inverse-scope reading will generally not entail anymore the surface-scope reading, and should thus be licensed. Consider (37a) in this light. As shown in subsection 2.1, the GSEC blocks the inverse-scope reading (equivalent to ‘No guest showed up’). But when (37a) is embedded in a DE-environment as in (37b), the inverse-scope interpretation becomes available (Spector 2004), i.e. (37) can be interpreted as ‘If no guest had shown up, the party would have been a disaster.’

(37) a. A guest didn’t show up ($\exists > \neg$) ??($\neg > \exists$)
    b. If a guest had not shown up, the party would have been a disaster
       ($\exists > \neg$) ($\neg > \exists$)

Now, as we have just discussed, this fact is predicted by the GSEC viewed as a global constraint. This might indicate that the GSEC, contrary to what was suggested in the previous paragraph, should not be formulated as a purely local constraint. It is in fact possible to characterize the GSEC as a constraint that can be met either locally or globally. Our final version of the GSEC is thus the following:

(38) A CSSO is licensed in a sentence $S$ only if there exists a constituent $C$ of $S$ (possibly $S$ itself) such that the CSSO does not make the semantic value of $C$ stronger than or equivalent to what it would be without the CSSO.

6 Conclusion

In this paper, we provided several arguments for the following generalization of Fox’s economy condition on covert scope shifting operations: a CSSO is ruled out not only if it is vacuous, but also if it leads to a reading that is strictly stronger than the surface-scope reading. We suggested various strategies in order to deal with some apparent counterexamples, and we argued that our generalized condition has to be formulated as a constraint that can be met either locally or globally. Further investigation is needed in order to explore the theoretical and empirical ramifications of our proposal.

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References


Abstract

Sets of Hamblin alternatives are often used side by side syntactic movement and variable binding. Shan (2004) shows that previous attempts at defining a Predicate Abstraction rule for variable binding while using sets of alternatives face serious problems: they overgenerate alternatives and/or are incapable of handling binding into a wh-phrase. This paper provides a solution by assuming Poesio’s (1996) general type $\langle\langle x, \tau, t \rangle \rangle$ and by borrowing and extending Rullmann and Beck’s (1997) treatment of wh-phrases as definites.

1 Introduction

Hamblin (1973) introduced sets of alternatives into Montague Grammar to treat wh-phrases in questions. Sets of alternatives have been later used by Rooth (1985) to model focus. Hagstrom (1998) and Shimoyama (2006) use alternatives for quantified expressions in Japanese. Kratzer and Shimoyama (2002) account for German free choice indefinites using Hamblin alternatives, and their approach has been adopted for further languages. In all these analyses, alternatives are employed as a kind of scoping mechanism carried out purely in the semantics.

By introducing sets of alternatives into the grammar, it is generally assumed that Hamblin alternatives operate side by side other scoping devices, such as syntactic movement with subsequent variable binding of movement traces and pronouns. Despite this, the literature dealing with sets of alternatives has struggled to make variables and alternatives work together. The difficulty encountered was to formulate an adequate Predicate Abstraction rule (PA) able to bind variables inside the set of alternatives. Solutions to this problem have been proposed by Poesio (1996), Hagstrom (1998) and Kratzer and Shimoyama (2002). However, Shan (2004) shows that all these solutions are inadequate to deal with sets of alternatives. Hagstrom’s (1998) and Kratzer and Shimoyama’s (2002) PA-rule generate unwanted readings, while the PA-rule provided by Poesio (1996) is not able to deal with cases where the binder of the variables is intuitively outside the set of alternatives. Shan concludes that it is not possible to formulate an adequate PA-rule for variable binding with alternatives. His proposal is to abandon variables altogether by using Variable Free Semantics (Jacobson, 1999) instead. The goal of the present paper is to present a way to circumvent Shan’s problems and thus make sets of alternatives compatible with syntactic movement and variable binding.
2 Two Ways of Scope Taking and their Empirical Motivation

A scoping technique standardly assumed in the syntactic and formal semantic literature (Montague, 1974; May, 1985; Heim and Kratzer, 1998) is overt / covert syntactic movement, by which a constituent is displaced to a higher position in the tree leaving a co-indexed trace in the original position. This is exemplified in (1) for overt wh-movement and in (2) for covert Quantifier Raising (QR) at LF. Crucially, the relation between a displaced constituent and its trace is subject to locality constrains (Ross, 1967): wh-phrases, for example, cannot overtly move outside syntactic islands such as complex Noun Phrases (NPs) and adjunct clauses, witness (3)-(4):

(1) What did Sue eat t_i?  (3) *Who did Taro eat the rice cakes that t_i bought?
(2) a. Alice saw nobody.  (4) *Who did Taro leave because t_i came?
    b. LF: Nobody Alice saw t_i.

A second scoping mechanism seems to be at play in Japanese. In this language, interrogative and quantifier phrases are built using indeterminate phrases like (5) and associating them with particles such as -ka or -mo. Depending on which particle is associated, a different interpretation is derived: -mo gives rise to a universal reading of the indeterminate phrase and -ka produces an interrogative or existential interpretation.

(5) a. dare ‘who’   c. dore ‘which (one)’
    b. nani ‘what’   d. dono ‘which’ (Det)

The particle can associate with the indeterminate phrase non-locally. Interestingly, this non-local association can cross an island boundary, as the grammaticality of (6)-(7) shows. But non-local association fails if another ‘ka’/- ‘mo’ particle intervenes, as shown by the unavailability of reading (8-c) (Shimoyama, 2001). The conditions on non-local association are summarized in (9-b).

(6) Taro-wa [[dare-ga katta] mochi]-o tabemasita ka?
    Taro-Top who-NOM bought rice cake-ACC ate Q
    ‘Who did Taro eat rice cakes that x bought?’

(7) Taro-wa [[dare-ga kita-kara] kaerimasita ka?
    Taro-TOP who-NOM came-because left Q
    ‘Who did Taro leave because x came?’

(8) a. Yoko-wa [[Taro-ga nan-nen-ni nani-nituite kaita ronbun]-mo yuu-datta ka]
    Yoko-Top [[Taro-Nom what-year-in what-about wrote paper]-MO A-was Q]
    siritagatteiru.
    want to know
b. Available reading: ‘Yoko wonders whether for every topic x, every year y, the paper that Taro wrote on x in y got an A.’
c. Impossible reading: ‘Yoko wonders for which year y, for every topic x, the paper that Taro wrote on x in y got an A.’
Kratzer and Shimoyama (2002) and Shimoyama (2006) develop an approach to deal with the Japanese facts. They claim that the association between the indeterminate phrase and its operator is not of syntactic nature, as it is less constrained. They use Hamblin alternatives as a scope taking device instead: indeterminate pronouns induce Hamblin alternatives, which then are passed up the tree until they meet a -ka/-mo operator. From this point on, all the alternatives are “bound” and a scopal effect is achieved. This scope taking device does not rely on any syntactic movement, as there are no indexed chains involved, and it is therefore not subject to syntactic constraints. This is sketched in (10). However, the alternatives arising from different indeterminate phrases are passed up together and become all “bound” when they encounter the closest c-commanding operator. This gives rise to a new locality condition that prohibits any other -ka/-mo operator to intervene: (11).

Thus, (at least) two empirical patterns of scope taking can be found: one is sensitive to syntactic islands\(^1\), whereas the other is immune to them but cannot skip a “binder”. The first pattern is usually modeled using syntactic movement and variable binding of the trace; the second is straightforwardly accounted for using Hamblin alternatives. Other constructions for which sets of alternatives have been used as scoping device are in situ wh-phrases in English, focus (Rooth, 1985) and free choice indefinites (Kratzer and Shimoyama, 2002). As the two scoping patterns can co-exist in the same language (e.g. QR and focus alternatives in English), the question arises, how the two mechanisms can be combined.

In the rest of the paper, we will use English sentences for semantic derivations, assuming for simplicity that the relevant items are interpreted using the two scoping mechanisms. If some of these assumptions are questionable for English (e.g. a given wh-phrase is analysed in situ using alternatives rather than as undergoing syntactic movement, as in (16) below), the reader should feel free to map the structure to some other language and draw the same conclusions. The point of the paper, which is a formal one, remains.

### 3 Semantics of Quantifier Raising and Hamblin Alternatives

#### 3.1 The semantics of syntactic movement: Quantifier Raising

As we saw, in QR, the quantificational DP is moved into the higher specifier position where it can take proper scope, leaving behind a trace and having its own index of movement rebracketed as \(\lambda\).

---

\(^1\)See Richards (1997) for wh-movement and islands crosslinguistically.
(12) a. Alice saw nobody b. Nobody λ_i saw Alice t_i

On the semantic side, the trace will be interpreted as a pronoun. The denotation of the trace \([t_i]^{MS}\) is \(g(i)\), as usual: (14-a). The two other expressions Alice and saw in this sentence are not dependent on the assignment \(g\) and are interpreted as in (14-b)-(14-c). The denotation of saw is then combined with that of the trace and of Alice via function application, giving us (14-d). The PA-rule (13) interpretes the numerical λ-abstract and binds the variable, as in (14-e). Finally, the quantifier applies: (14-f).

(13) Predicate-Abstraction Rule:
\[
\lambda x. \left[ \beta \right]^{\tau_\times} :: \langle \sigma, \tau \rangle
\]

\[
\lambda_i \left[ \beta \right]^{\tau} :: \tau
\]

(14) a. \([t_i]^{MS} = g(i)\) b. \([saw]^{MS} = \lambda x.\lambda y. y \text{ saw } x\) c. \([Alice]^{MS} = \text{Alice}\) d. \([Alice \text{ saw } t_i]^{MS} = 1 \iff \text{Alice saw } g(i)\)

e. \([\lambda_i \text{ Alice saw } t_i]^{MS} = \lambda x. \text{ Alice saw } g^{\prime} (i)\)
f. \([\text{Alice saw nobody}]^{MS} = 1 \iff \neg \exists x [\text{Alice saw } x]\)

3.2 Hamblin Alternatives

In Hamblin (1973), \(wh\)-expressions denote sets of alternatives. Non-\(wh\)-words also denote sets, but only singleton sets. So, consequently, proper names now denote sets of individuals, predicates denote sets of relations and sentences denote sets of propositions. This means, following Hamblin’s (1973), that every former denotation is enriched to a set of denotations of that type. From a type theoretical point of view, an expression of an arbitrary type \(\tau\) is enriched to \(\langle \tau, t \rangle\).

Additionally, the Functional Application (FA) rule is modified in order to be able to deal with sets. When using Hamblin alternatives, a predicate does not only encounter a single argument, but a set of arguments. The new FA-rule (15) makes every predicate in one set apply to every argument in the other set.

(15) Hamblin Functional Application:
\[
\left\{ f(x) : f \in \left[ \beta \right]^{MS} \land x \in \left[ \gamma \right]^{MS} \right\}
\]

\[
\langle \tau, t \rangle
\]

\[
\left[ \beta \right]^{MS} \left[ \gamma \right]^{MS} \langle \sigma, \tau \rangle, \langle \sigma, t \rangle
\]

The bottom-up computation of (16) (with the \(wh\)-phrase interpreted in situ) looks as follows:

(16) a. LF: Alice visited whom in−situ
b. \{Alice visited Xavier, Alice visited Yves, Alice visited Zack\}

\[
\text{Alice visited whom :: } \langle t, t \rangle
\]

\[
\{\text{Alice}\} \quad \{\lambda y. \text{visited Xavier}, \lambda y. \text{visited Yves}, \lambda y. \text{visited Zack}\}
\]

\[
\text{Alice :: } \langle e, t \rangle \\
\text{visited whom :: } \langle \langle e, t \rangle, t \rangle
\]

\[
\{\lambda x. \lambda y. \text{visited x}\} \quad \{\text{Xavier, Yves, Zack}\}
\]

\[
\text{visited :: } \langle \langle e, (e, t) \rangle, t \rangle \\
\text{whom :: } \langle e, t \rangle
\]

### 4 Shan’s Puzzle: Combining Sets of Alternatives with Variables

Shan (2004) claims that we end up with a problem as soon as we combine movement and variable binding with sets of alternatives. He argues that it is not possible to provide a PA-rule that is able to deal adequately with sets of alternatives. To localize the problem, it is decidedly the best to demonstrate what happens just up to the point where we need to formulate the PA-rule.

Consider (17), with the \textit{wh}-phrase in base position and \textit{nobody} moved by QR. In the semantics, since we are dealing here with sets of alternatives, every expression of an arbitrary type \(\tau\) is enriched to the type \(\langle \tau, t \rangle\), as shown in (18). The bottom-up composition up to the \(\lambda\)-abstract proceeds as in (19):

(17) a. Who saw nobody

b. LF: nobody \(\lambda_i [\text{who\text{-in-situ saw } t_i}]\)

\[
\begin{array}{c}
\lambda_i \text{ who saw } t_i :: ??? \quad QR \\
\lambda \quad \text{ who saw } t_i :: \langle t, t \rangle \\
\text{who :: } \langle e, t \rangle \\
\text{ saw } t_i :: \langle e, (e, t) \rangle \\
\text{saw :: } \langle \langle e, (e, t) \rangle, t \rangle \\
\end{array}
\]

(18)

(19) a. \([t_i]_{M_S} = \{g(i)\}\)

b. \([\text{saw}]_{M_S} = \{\lambda x. \lambda y. \text{saw } x\}\)

c. \([\text{saw } t_i]_{M_S} = \{\lambda y. \text{saw } g(i)\}\)

d. \([\text{who}]_{M_S} = \{\text{Alice, Barbara, Caroll}\}\)

e. \([\text{who saw } t_i]_{M_S} = \{\text{Alice saw } g(i), \text{Barbara saw } g(i), \text{Caroll saw } g(i)\}\)

f. \([\lambda_i \text{ who saw } t_i]_{M_S} = ???\)

The task now is to formulate a PA-rule which takes the set (19-e) of open propositions – due to unbound \(i\)-variables – and returns an object after the \(i\)-variables are bound.

A first, naive attempt would be to formulate a PA-rule by abstracting over the set of alternatives. Basically, this PA-rule takes the set of propositions and applies the \(\lambda\)-operator in front of it:
(20) The First Try: A Naive PA-Rule
\[ \lambda x. [\beta]^{M_g}_{\tau,i} \\langle e, \langle \tau, t \rangle \rangle \]
\[ \lambda_i [\beta]^{M_g} _\tau \langle \tau, t \rangle \]

By applying just the \( \lambda \)-operator in front, we end up with a function into sets, with type \( \langle e \rangle \langle \tau \rangle \), as in (21). But this is, of course, the wrong type. In order for the quantifier \( \langle e \rangle \langle \tau \rangle \) to properly combine via Hamblin Functional Application (15), its sister should be a set of \( \langle e, t \rangle \)-properties. This means that the correct PA-rule should apply the \( \lambda \)-operation to each member of the set of alternatives and produce a set of functions, type \( \langle \langle e \rangle \langle \tau \rangle, t \rangle \), as in (23).

(21) \( \lambda x. \{ \text{Alice saw } g^{\langle i \rangle}, \text{Barbara saw } g^{\langle i \rangle}, \text{Caroll saw } g^{\langle i \rangle} \} \)

(22) \[ [\text{nobody}]^{M_g} = \{ \lambda Q(e, t). \neg \exists x[Q(x)] \} \]

(23) \( \{ \lambda x. \text{Alice saw } g^{\langle i \rangle}, \lambda x. \text{Barbara saw } g^{\langle i \rangle}, \lambda x. \text{Caroll saw } g^{\langle i \rangle} \} \)

Hence, we end up with a type clash, as the different types do not fit. In such a situation, a natural solution is to apply a type-shifting rule from type \( \langle e \rangle \langle \tau \rangle \) into type \( \langle \langle e \rangle \langle \tau \rangle, t \rangle \). Such an operation means that we transpose from a function into sets (type \( \langle e \rangle \langle \tau \rangle \)) into a set of functions (type \( \langle \langle e \rangle \langle \tau \rangle, t \rangle \)). Such a type-shifting rule can be defined, witness (24), but one needs to bear the following caveat in mind. As Shan notes, a function into sets carries less information with respect to ordering compared to a set of functions. As the reader can verify for herself, if we transpose from a function into sets into a set of functions via (24), the resulting set will contain uniform \( \langle e, t \rangle \)-functions like “to be seen by Alice”, “to be seen by Barbara” and “to be seen by Carol” in (25), but also non-uniform \( \langle e, t \rangle \)-functions like the ones in (26), which have different values for the subject:

(24) \[ \lambda Q_{\langle e \rangle \langle \tau \rangle}, \{ f_{\langle e \rangle \langle \tau \rangle} : \forall x. f(x) \in Q(x) \} \]

(25) Uniform properties:
\[ \{ x_1 \mapsto \text{Alice saw } x_1, x_2 \mapsto \text{Barbara saw } x_2, x_3 \mapsto \text{Caroll saw } x_3 \} \]

(26) Non-uniform properties:
\[ \{ x_1 \mapsto \text{Alice saw } x_1, x_2 \mapsto \text{Barbara saw } x_2, x_3 \mapsto \text{Caroll saw } x_3 \} \]

4.1 Hagstrom and Kratzer & Shimoyama

In the literature, a PA-rule where transposing is included can be found in Hagstrom (1998) and Kratzer and Shimoyama (2002):
This rule is able to apply the \( \lambda \)-operator to each member of the set of alternatives and, as the reader can verify, it produces a set containing uniform functions as well as non-uniform functions. Shan (2004) shows that including non-uniform functions leads to an empirical problem, which we will call Problem 1: non-uniform functions generate unwanted FF and pair-list readings. Consider, for example, (28). If Alice is \( x_1 \)'s mother, Caroll is \( x_2 \)'s mother and Barbara is \( x_3 \)'s mother, then the leftmost function depicted in (26) would predict the functional answer (28-a) to be acceptable, contrary to fact. Similarly, if \( x_1 \) is Xavier, \( x_2 \) is Yves and \( x_3 \) is Zack, then that same function would predict the pair-list answer in (28-b) to be felicitous, contrary to fact.\(^2\)

(28) Who saw nobody\( _i \)?

a. #His\( _i \) mother saw nobody\( _i \) / Nobody\( _i \) was seen by his\( _i \) mother.
b. #Alice didn’t see Xavier, Caroll didn’t see Yves, and Barbara didn’t see Zack.

4.2 Poesio’s Approach

So far we have treated the variable assignment \( g \) as a parameter on the interpretation function \([\_\_]\)\( ^{M,g} \). It is also possible to treat the assignment as part of the denotation (Groenendijk and Stokhof, 1991; Heim, 1982). Here the denotation of an expression is a function from assignments to the original denotation, so that an expression of type \( \tau \) when evaluated under \( g \) is now treated as \( \langle a, \tau \rangle \), where \( a \) is the type of variable assignments. A trace \( t \) denotes the function of type \( \langle a, e \rangle \) mapping each assignment \( g \) to the individual \( g(i) \): (29). A constituent with no unbound index, like the verb \emph{saw} in (30), denotes a constant function.

(29) \( t_i :: \langle a, e \rangle \)

\[
\begin{align*}
g_1 & \mapsto g_1(i) \\
g_2 & \mapsto g_2(i) \\
g_3 & \mapsto g_3(i)
\end{align*}
\]

(30) \( \text{saw} :: \langle a, \langle e, \langle e, t \rangle \rangle \rangle \)

\[
\begin{align*}
g_1 & \mapsto \lambda x. \lambda y. y \text{ saw } x \\
g_2 & \mapsto \lambda x. \lambda y. y \text{ saw } x \\
g_3 & \mapsto \lambda x. \lambda y. y \text{ saw } x
\end{align*}
\]

Poesio (1996) proposes that, when using set of alternatives, we use assignment-sensitive denotations like the ones above. This way, it is possible to make assignments part of each element of the set of alternatives. That is, it is possible to have the general type \( \langle (a, \tau), t \rangle \) with the set layer as the outermost and the assignment layer inside. With this general type template, the Functional Application rule (31) is used and the PA-rule (32) can be defined:

\(^2\)Kratzer & Shimoyama (2002) are aware that their PA-rule produces a larger set of alternatives than expected, but they do not realize that this problematic.
nobody $\lambda_x \text{ who\textunderscore in\textunderscore situ saw } t_i$

a. $[\textit{saw}]^M = \{ \lambda g. \lambda x. \lambda y. y \text{ saw } x\}$

b. $[t_i]^M = \{\lambda g. g(i)\}$

c. $[\textit{saw } t_i]^M = \{\lambda g. \lambda y. \text{ saw } g(i)\}$

d. $[\textit{who}]^M = \{\lambda g. \lambda x : x \in D_i\} = \{\lambda g. \lambda x. \lambda y. \text{ Barbara saw } g(i), \lambda g. \text{ Caroll saw } g(i)\}$

e. $[\textit{who saw } t_i]^M = \{\lambda g. \lambda x. \lambda y. \text{ Barbara saw } g(i), \lambda g. \text{ Caroll saw } g(i)\}$

f. $[\lambda i \textit{ who saw } t_i]^M = \{\lambda g. \lambda x. \lambda y. \text{ Barbara saw } g^{x/y}(i), \lambda g. \text{ Caroll saw } x\}$

g. $[\textit{no\textunderscore body}]^M = \{\lambda g. \lambda Q. \neg \exists x[Q(x)]\}$

h. $[\textit{no\textunderscore body } \lambda i \textit{ who saw } t_i]^M = \{\lambda g. \neg \exists x[\text{ Alice saw } x], \lambda g. \neg \exists x[\text{ Barbara saw } x], \lambda g. \neg \exists x[\text{ Caroll saw } x]\}$

While Poesio’s (1996) PA-rule circumvents Problem 1, Shan (2004) points out a second problem for Kratzer and Shimoyama’s PA-rule which also applies to Poesio’s. The problem, which we will call Problem 2, arises when we need to bind a variable that sits inside a \textit{wh}-phrase:

(34) a. Which man$_i$ sold which of his$_j$ paintings?

In this example, for each man, the set of his paintings is different. So, for instance, Picasso’s paintings are “Guernica” and “Three Musicians” and Velázquez’ paintings are “The Surrender of Breda” and “Las Meninas”. This means that, intuitively, the \textit{wh}-phrase has to denote the set of paintings \{“Guernica”, “Three Musicians”\} when his$_i$ is interpreted as Picasso and the set \{“The Surrender of Breda”, “Las Meninas”\} when his$_i$ is interpreted as Velázquez. More specifically, it seems that the denotation of the constituent headed by the $\lambda$-abstract in (35-a) should assign to Picasso the set of propositions \{Picasso sold “Guernica”, Picasso sold “Three Musicians”\} and to Velázquez the set of propositions \{Velázquez sold “The Surrender of Breda”, Velázquez sold “Las Meninas”\}. But this is the function (35-b), which has the problematic type $\langle e \langle \tau, t \rangle \rangle$ again.

(35) a. Which man [ $\lambda_i t_i$ sold which of his$_i$ paintings ]

b. $\lambda x. \{x \text{ sold } y : y \text{ is a painting of } x\}$

Additionally, binding into the \textit{wh}-phrase and QRing an NP can take place in the same sentence, as in (36). This means that the type $\langle e \langle \tau, t \rangle \rangle$ needed for QR and the problematic type $\langle e \langle \tau, t \rangle \rangle$ needed for binding into the \textit{wh}-phrase would have to be interleaved, as sketched in (36):
Unfortunately it is not possible with Poesio’s (1996) approach to deal with these cases, as his approach tries deliberately to avoid the problematic type \langle e, \langle \tau, t \rangle \rangle. To sum up so far, we need an alternative-friendly Predicate Abstraction rule that will generate a set of functions: type \langle \langle e, \tau \rangle, t \rangle. The naive approach produces the wrong type. The PA-rule by Hagstrom and by Kratzer and Shimoyama produces the correct type but overgenerates alternatives and produces ungrammatical readings (Problem 1). The PA-rule by Poesio produces the correct type and avoids Problem 1, but it is not able to deal with examples where the \lambda-abstract binds into a \wh-phrase (Problem 2).

In the next section, we develop a solution to Problem 2 within Poesio’s approach by treating \wh-phrases as definite descriptions.

5 Proposal: \wh-phrases as definites

Rullmann and Beck (1997) note that \wh-phrases project existence presuppositions the way definite descriptions do. Consider the definite NP the unicorn, which triggers the presupposition that a unicorn exists, and the examples in (37). When the NP the unicorn is embedded under a presupposition hole like know, as in (37-a), the NP’s existence presupposition is projected up. As a result, (37-a) presupposes that a unicorn exists. When the NP is embedded under a presupposition filter like think, the presupposition projects up but modified in a particular way: (37-b) presupposes that Bill believes that a unicorn exists. Rullmann and Beck (1997) note that the same pattern is found in \wh-phrases: (38-a) presupposes that a unicorn exists and (38-b) presupposes that Bill believes that a unicorn exists.³

³Treating \wh-phrases as definites in base position also allows to generate Groenendijk and Stokhof’s (1984) dicto reading and solves Reinhart’s (1992) “Donald Duck” problem. Note that Rullmann & Beck’s presuppositionality of \wh-phrases is different from the partitive presupposition in D-linked \wh-phrases (e.g. which unicorn as “which unicorn out of a salient set of unicorns”), and, thus, it can in principle be extended to \what-phrases.
Our proposal is to combine the general type \(\langle a, t \rangle\) and the PA-rule in Poesio’s (1996) approach with Rullmann and Beck’s (1997) insight on wh-phrases. Instead of denoting a set of assignment-sensitive name-like denotations, as in (41), we propose that a wh-phrase denotes a set of assignment-sensitive definite description-like denotations, as in (42).

\[
\text{(41) } \left[\text{who}\right]^M = \{ \lambda g. x : x \in D_e \} \equiv_{e.g.} \{ \lambda g. Alice, \lambda g. Barbara, \lambda g. Caroll \}
\]

\[
\text{(42) } \left[\text{who}\right]^M = \{ \lambda g.tlx[ \text{person}(x) \land x = v] : v \in D_e \}
\equiv_{e.g.} \{ \lambda g.tlx[ \text{person}(x) \land x = Alice], \lambda g.tlx[ \text{person}(x) \land x = Barbara], \\
\lambda g.tlx[ \text{person}(x) \land x = Caroll] \}
\]

This move will ensure that, when the wh-phrase contains a pronoun bound from the outside, the \(\langle a, e\rangle\)-functions in the set of alternatives will be partial functions. Consider the denotation of \textit{which of his} paintings defined in (43-a) and exemplified in (43-b). Assume, furthermore, that A is the painting “Guernica” and B is the painting “Las Meninas”. Then, the \(\langle a, e\rangle\)-function depicted on the left in (43-b) will map an assignment \(g\) to “Guernica” if \(g(i) =\) Picasso, and it will be undefined otherwise. Similarly, the \(\langle a, e\rangle\)-function on the right will map an assignment \(g\) to “Las Meninas” if \(g(i) =Velázquez, and it will be undefined otherwise. In other words, the Hamblin set will contain as many \(\langle a, e\rangle\)-functions as there are individuals in \(D_e\). But those functions will be partial and they will output an individual only when that individual is a painting of \(g(i)'s.\)

\[
\text{(43) } \left[\text{which of his} \right]_i \text{paintings}^M
\equiv_{e.g.} \begin{cases}
\{ \lambda g.tv[ \text{paint-of}(v, g(i)) \land v = z] : z \in D_e \} \\
\left\{ g_1 \mapsto tv[ \text{paint-of}(v, g_1(i)) \land v = A] , g_2 \mapsto tv[ \text{paint-of}(v, g_2(i)) \land v = A] , g_3 \mapsto tv[ \text{paint-of}(v, g_3(i)) \land v = A] \right\}
\end{cases}
\]

The semantic computation of (34) is spelled out below. The last step shows that all Hamblin alternatives arising from \textit{which of his} paintings are combined with all Hamblin alternatives arising from \textit{which man}. But, since the final assignment-sensitive propositions are partial functions, the combinations where a painter is not paired with one of his own paintings yields a presupposition failure (marked as \#). That is, only answers to (34) that link a painter with one of his own paintings are felicitous (and, hence, true or false). This way, we capture the intuition discussed by Shan that, for a given painter, we can only felicitously choose among that painter’s paintings.

\[
\text{(44) Which man } \lambda_i \, t_i \, \text{sold which of his} \, i \, \text{paintings?}
\]
(45) a. \([V]^M = \begin{cases} g_1 \mapsto \lambda x, \lambda y. y \text{ sold } x \\ g_2 \mapsto \lambda x, \lambda y. y \text{ sold } x \\ g_3 \mapsto \lambda x, \lambda y. x \text{ sold } y \end{cases}\)

b. \([V']^M = \begin{cases} g_1 \mapsto \lambda y. y \text{ sold } t v \text{ paint-of } (v, g_1(i)) \wedge v = A \\ g_2 \mapsto \lambda y. y \text{ sold } t v \text{ paint-of } (v, g_2(i)) \wedge v = A \\ g_3 \mapsto \lambda y. y \text{ sold } t v \text{ paint-of } (v, g_3(i)) \wedge v = A \end{cases}\)

c. \([t]^M = \begin{cases} g_1 \mapsto g_1(i) \\ g_2 \mapsto g_2(i) \\ g_3 \mapsto g_3(i) \end{cases}\)

d. \([VP]^M = \begin{cases} g_1 \mapsto \lambda x. g_1^{V_1}(i) \text{ sold } t v \text{ paint-of } (v, g_1(i)) \wedge v = A \\ g_2 \mapsto \lambda x. g_2^{V_2}(i) \text{ sold } t v \text{ paint-of } (v, g_2(i)) \wedge v = A \\ g_3 \mapsto \lambda x. g_3^{V_3}(i) \text{ sold } t v \text{ paint-of } (v, g_3(i)) \wedge v = A \end{cases}\)

e. \([\lambda x [VP]]^M = \begin{cases} g_1 \mapsto \lambda x. g_1^{V_1}(i) \text{ sold } t v \text{ paint-of } (v, g_1^{V_1}(i)) \wedge v = A \\ g_2 \mapsto \lambda x. g_2^{V_2}(i) \text{ sold } t v \text{ paint-of } (v, g_2^{V_2}(i)) \wedge v = A \\ g_3 \mapsto \lambda x. g_3^{V_3}(i) \text{ sold } t v \text{ paint-of } (v, g_3^{V_3}(i)) \wedge v = A \end{cases}\)

That is: \(g_1 \mapsto \lambda x. x \text{ sold } t v \text{ paint-of } (v, x) \wedge v = A\)

g. \([WHP]^M = \begin{cases} g_1 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Picasso}) \wedge v = A) \\ g_2 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Velázquez}) \wedge v = A) \\ g_3 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Velázquez}) \wedge v = A) \end{cases}\)

g. \([CP]^M = \begin{cases} g_1 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Picasso}) \wedge v = A) \\ g_2 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Velázquez}) \wedge v = A) \\ g_3 \mapsto (\exists z. (\text{man}(z) \wedge z = \text{Velázquez}) \wedge v = A) \end{cases}\)

This move also allows us to compute the cases like (36) that Shan (2004) intuitively diagnosed as interleaving types. Poesio’s (1996) general type \(\langle (a, \tau), t \rangle\) is kept throughout the derivation (47), and both \(\lambda\)-abstracts \(\lambda_j\) under \textit{nobody} and \(\lambda_i\) under \textit{which man} give rise to denotations of type \(\langle (a, \langle e, t \rangle), t \rangle\). We do not need the problematic type \(\langle e, (\tau, t) \rangle\) and types are not interleaved.
(46) Which man, told nobody, about which of his, paintings?

(47) a. \[ [[t_j] \text{ tell } t_j \text{ about which of his, paintings}]^M \]
    \[ = \{ \lambda g.g(i) \text{ tells } g(j) \text{ about } t_x \text{ paint-of}(x, g(i)) \land x = v : v \in D_e \} \]

b. \[ [[\lambda_j, t_j] \text{ tell } t_j \text{ about which of his, paintings}]^M \]
    \[ = \{ \lambda g, \lambda u. g^{u/j}(j) \text{ tells } g^{u/j}(i) \text{ about } t_x \text{ paint-of}(x, g^{u/j}(i)) \land x = v : v \in D_e \} \]

c. \[ [[[\text{nobody}] M} = \{ \lambda g, \lambda Q. \neg \exists z Q(u) \} \]

d. \[ [[[\text{nobody}] j \text{ nobody } \lambda_j, t_j] \text{ tell } t_j \text{ about which of his, paintings}]^M \]
    \[ = \{ \lambda g, \lambda w.e. \neg \exists u [g^{w/j}(i) \text{ tells } u \text{ about } t_x \text{ paint-of}(x, g^{w/j}(i)) \land x = v] : v \in D_e \} \]

e. \[ [[[\text{which man}] M} = \{ \lambda g, \lambda y. \text{mang}(y) \land y = z : z \in D_e \} \]

f. \[ [[[\text{which man}] j \text{ nobody } \lambda_j, t_j] \text{ tell } t_j \text{ about which of his, paintings}]^M \]
    \[ = \{ \lambda g, \lambda w.e. \neg \exists u [w \text{ tells } u \text{ about } t_x \text{ paint-of}(x, w) \land x = v] : v \in D_e \} \]

g. \[ [[[\text{which man}] \lambda_j, \text{nobody } \lambda_j, t_j] \text{ tell } t_j \text{ about which of his, paintings}]^M \]
    \[ = \{ \lambda g, \lambda y. \text{mang}(y) \land y = z \text{ tells } u \text{ about } t_x \text{ paint-of}(x, y) \text{mang}(y) \land y = z) \land x = v] : v \in D_e \land z \in D_e \} \]

In sum, using the Poesio’s (1996) general type \( \langle a, \tau, t \rangle \) (as opposed to Shan’s (2004) type \( \langle a, \langle \tau, t \rangle \rangle \)), we can use an alternative-friendly PA-rule that generates the correct set of alternatives. No spurious functional or pair-list readings are produced, hence circumventing Problem 1.

To this, we add Rullmann and Beck’s (1997) treatment of wh-phrases as underlying definites. This allows us to bind into a wh-phrase while keeping the same general type throughout the derivation, thus avoiding Problem 2.

6 Extensions: Free Choice and Focus

As mentioned above, Hamblin sets of alternatives have been also used to model the behaviour of free choice indefinites and focus. In this section, we briefly consider how the analysis pursued in the present paper applies to these two phenomena.

Kratzer and Shimoyama (2002) propose that free choice NPs like German irgendeinen Studenten in (48) are interpreted as introducing a (widened) set of students, as in (49). The semantic computation proceeds as usual until the relevant operator is encountered, e.g. the modal Kann

\footnote{For genuine functional and pair-list readings, see the appendix.}
‘can’ in (48). We note that there exist examples where we need to bind into a free choice indefinite, that is, examples with the problematic configuration described in Problem 2: e.g., in (50), the set of professors intuitively varies with the students. To circumvent the problem, one would need to treat free choice indefinites as underlying definites, as in (51).

(48) Hans kann irgendeinen Studenten besuchen.
Hans can anyone student visit.
‘Hans can visit any student.’

(49) \[ \{ x : x \text{ is a student in } w \} \]

(50) a. John can introduce any student, to any professor of his, John introduces ti to any professor of his, 

b. LF: Can [ any student λj John introduces t, to any professor of his, ]

(51) \[ \{ y : y \text{ is a student of } v \} \]

As for focus, Rooth (1985) proposes that a focused element (marked in capitals) of type τ has as its focus semantic value the set Dτ, as exemplified in (52)-(53). Can we find examples of binding into a focused XP? Jacobson (2004) gives examples like (54) and argues that, intuitively, they seem to involve functions into sets of alternatives, i.e. the problematic type \( \langle e, \langle \tau, t \rangle \rangle \).

(52) John only introduced MARY to Sue.

(53) \[ \{ x : x \in D_e \} \]

(54) a. Every third grade boy loves Mary, her, and every FOURTH grade boy loves himSELF

b. Every third grade boy loves himself and every FOURTH grade boy loves HIMself.

These examples can be captured in the approach pursued in the present paper without resorting to the problematic type. Consider first (54-a). To capture the intended contrast between Mary / her, and himSELF, we propose the LF in (55), with focus on the entire pronoun including its index. This would give us the ordinary semantic value in (56-a) and the focus semantic value in (56-b). A member of this focus semantic value is the proposition expressed by the first conjunct Every third grade boy loves her. Thus, Rooth’s (1985) focus felicity condition is satisfied.

(55) LF: \ldots [ every FOURTH grade boy λj t, loves [himSELFj]Focus ].

(56) a. \( \lambda g. \forall x [ 4 \text{-gr-boy}(x) \rightarrow [[t_i]]^M(g^{x/i}) \text{ loves } [[t_i]]^M(g^{x/i})] \)

b. \( \lambda g. \forall x [ 4 \text{-gr-boy}(x) \rightarrow [[t_i]]^M(g^{x/i}) \text{ loves } h(g^{x/i}) : h \in D_{(a,e)} \]

E.g. : \( \lambda g. \forall x [ 4 \text{-gr-boy}(x) \rightarrow [[t_i]]^M(g^{x/i}) \text{ loves } \lambda g' g'(i)(g^{x/i})] \), 
\( \lambda g. \forall x [ 4 \text{-gr-boy}(x) \rightarrow [[t_i]]^M(g^{x/i}) \text{ loves } \lambda g' g'(j)(g^{x/i})] \), 
\( \lambda g. \forall x [ 4 \text{-gr-boy}(x) \rightarrow [[t_i]]^M(g^{x/i}) \text{ loves } \lambda g' g'(k)(g^{x/i})] \)

As for (54-b), Sauerland (2000) analyzes HIMself underlyingly as a definite description with focus on part of the descriptive content, as in (57). In the framework used in the present paper, this would give us the focus semantic value in (58), one of whose members is the proposition expressed by the first conjunct Every third grade boy loves himself.
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(57) LF: ... [ every FOURTH grade boy \( \lambda_i t \), loves the \([\text{FOURTH}]_{\text{Focus}} \text{year grade boy} \) pro_{1} ]

(58) \( \{ \lambda g. \forall x [\text{4-gr-boy}(x) \rightarrow x \text{loves the } [\text{Adj year grade}] \text{ boy } x] : \text{Adj} \in D_{\langle g, \langle e, \tau \rangle \rangle} \} \)

E.g. \( \{ \lambda g. \forall x [\text{4-gr-boy}(x) \rightarrow x \text{loves the } [\text{third year grade}] \text{ boy } x], \lambda g. \forall x [\text{4-gr-boy}(x) \rightarrow x \text{loves the } [\text{fourth year grade}] \text{ boy } x], \lambda g. \forall x [\text{4-gr-boy}(x) \rightarrow x \text{loves the } [\text{fifth year grade}] \text{ boy } x], \ldots \} \)

In sum, Hamblin alternatives arising from free choice indefinites and focus which (appear to) bind into the set of alternatives can be handled in the present account without resource to the problematic type \( \langle e, \langle \tau, t \rangle \rangle \).

7 Conclusion

We have seen that it is not trivial to combine syntactic movement and variable binding with Hamblin alternatives. A naive Predicate Abstraction (PA) rule produces the wrong type \( \langle a, \langle \tau, t \rangle \rangle \). Hagstrom’s (1998) and Kratzer and Shimoyama’s (2002) PA-rule deliver the correct type but at the expense of overgenerating alternatives (Problem 1 from Shan (2004)). And Poesio’s (1996) PA-rule cannot handle cases where a pronoun inside the wh-phrase needs to be bound from the outside (Problem 2 from Shan (2004)).

To circumvent the first problem, we follow Poesio (1996) and use the general type \( \langle \langle a, \tau \rangle, t \rangle \) throughout the derivation, as opposed to Shan’s (2004) type \( \langle a, \langle \tau, t \rangle \rangle \). The new PA-rule outputs the correct type \( \langle \langle a, \langle e, \tau \rangle \rangle, t \rangle \) without overgenerating alternatives. To solve the second problem, we borrow an insight from Rullmann and Beck’s (1997) and treat wh-phrases, free choice indefinites and potentially other constructions giving rise to Hamblin alternatives as underlying definite descriptions. This allows us to maintain Poesio’s (1996) general type while producing sets of alternatives whose felicity is relativized to the binder.

Thus, if we commit ourselves to combining movement and variable binding with Hamblin alternatives, we can do it, but we need to do it with caution.

A Genuine functional and pair-list readings

For functional readings like (59-a), we incorporate Engdahl’s (1986) skolem functions into our analysis below and assume Chierchia’s (1993) constraints. For pair-list readings like (59-b), we assume that an absorption mechanism turns the functional reading into a pair-list reading in the appropriate configurations (Chierchia, 1993), but we will not spell it out in this paper.

(59) Which relative of his does everybody like the best?
   a. Functional answer: His mother.
   b. Pair-list answer: Johnny likes his aunt Lilly the best, Paul likes his father Martin the best and Timmy likes his cousin Matt the best.

With Engdahl (1986), we make the following assumptions. First, a predicate like relative of his can be applied to a skolem function \( f_{\langle e, e \rangle} \) using the semantic rule (60). Second, next to the trace left by a moved functional wh-phrase, a second index is fed as the argument of the
function. In our case, since we interpret \(wh\)-phrases in base position, the extra index is the sister of the entire \(wh\)-phase, as in (61). The abridged semantic computation is given in (62).

(60) Functional N' rule: 
\[
\text{relative of his}_2 \ 2\ M_g(f)(w)=1 \\
\text{iff } \forall x \in \text{Dom}(f) \ [\text{relative of his}_2 \ 2\ M_g \ (f(x))(w) = 1 \\
\text{iff } \forall x \in \text{Dom}(f) [f(x) \text{ is a relative of } x \text{ in } w]
\]

(61) 
```
  \[
  \begin{array}{c}
    \text{IP}
    \\
    \text{NP} \ \\
    \text{everybody}
    \\
    \lambda_j
    \\
    \text{VP}
    \\
    \text{likes}
    \\
    \text{WhP}
    \\
    \text{pro}_i
    \\
    \text{which relative of his}_j
  \end{array}
\]
```

(62) a. 
\[
\text{[which relative of his}_j]_j [M]_j
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{mother}} (g(i))] \\
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{father}} (g(i))] \\
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{aunt}} (g(i))] \}
\]
b. 
\[
\text{[pro}_j]_j [M]_j = \{ \lambda_g.g(i) \}
\]
c. 
\[
\text{[which relative of his}_j]\text{[pro}_j]_j [M]_j
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{mother}} (g(i))] \\
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{father}} (g(i))] \\
= \{ \lambda_g.t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{aunt}} (g(i))] \}
\]
d. 
\[
\text{[t]}_j [M]_j = \{ \lambda_g.g(i) \}
\]
e. 
\[
\text{[which relative of his}_j]\text{[pro}_j]_j [M]_j
= \{ \lambda_g.g(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{mother}} (g(i))] \\
= \{ \lambda_g.g(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{father}} (g(i))] \\
= \{ \lambda_g.g(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{aunt}} (g(i))] \}
\]
f. 
\[
\text{[\lambda_i t]}_j [M]_j
= \{ \lambda_g.\lambda_{u,c}.g^{u/c}(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{mother}} (g^{u/c}(i))] \\
= \{ \lambda_g.\lambda_{u,c}.g^{u/c}(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{father}} (g^{u/c}(i))] \\
= \{ \lambda_g.\lambda_{u,c}.g^{u/c}(i) \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{aunt}} (g^{u/c}(i))] \}
\]
g. 
\[
\text{[everybody]}_j [M]_j = \{ \lambda_g.\lambda_Q.\forall u [Q(u)] \}
\]
h. 
\[
\text{[everybody} \lambda_i t]\text{[which relative of his}_j]\text{[pro}_j]_j [M]_j
= \{ \lambda_g.\forall u \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{mother}} (u)] \\
= \{ \lambda_g.\forall u \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{father}} (u)] \\
= \{ \lambda_g.\forall u \text{ likes } t[f/\forall x \in \text{Dom}(f)] [f(x) \text{ is a relative of } x \land f = h_{\text{aunt}} (u)] \}
\]
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On the Typology of Donkeys: Two Types of Anaphora Resolution

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Abstract

This paper argues that there are two types of donkey pronouns cross-linguistically: donkey pronouns that require an overt NP antecedent and donkey pronouns that do not require such an antecedent. We argue (in section 2) that English donkey pronouns do not categorically require an overt NP antecedent; in contrast, they are subject to licensing conditions very much like referential pronouns. On the other hand, languages with richer pronominal systems, such as German and Kutchi Gujarati, have both donkey pronouns that require an overt NP antecedent and donkey pronouns without such a requirement (section 3). We propose that the difference is structural: donkey pronouns that require an overt NP antecedent contain an empty NP site that needs to be licensed, whereas pronouns without this requirement do not contain such a site (section 4).

1 Overview

Anaphora is a phenomenon where the meaning of one expression (e.g. an anaphoric pronoun) depends on the preceding context and cannot be construed context-independently. Typically (but as we will see not necessarily) anaphoric pronouns have an explicit linguistic antecedent, which together with the context determines their meaning. It is generally assumed that anaphoric pronouns can be categorized into (syntactically) bound pronouns, as in (1a), referential pronouns (or anaphoric referring expressions), as in (1b), and certain other types that classify as neither, such as so-called “donkey pronouns” (Geach 1962), as in (1c). (We mark anaphors and their antecedents in bold type where applicable.)

(1)  a. No male lawyer believes that he is stupid.
    b. John came to the party. He believes that the host is an idiot.
    c. Every linguist who owns a donkey thinks that it is intelligent.

Donkey pronouns (cf. Geach 1962, Evans 1977, Heim 1982) are pronouns (like it in (1c)) that co-vary with a quantifier (a donkey in (1c)) without being syntactically bound.

1 See King (2009) for the most recent entry on anaphora in the Stanford Encyclopedia of Philosophy.
Therefore, if the quantifier *every linguist* in (1c) quantifies over the set of *Bill, John* and *Mary*, the sentence means that Bill thinks that his own (Bill’s) donkey is intelligent, John thinks that his own (John’s) donkey is intelligent and Mary thinks that her own (Mary’s) donkey is intelligent.

This paper is concerned with the analysis of such donkey pronouns and with the restrictions that an explanatory analysis should account for. Specifically, it investigates the empirical claim that referential pronouns (as in (1b)) and donkey pronouns (as in (1c)) require an overt NP antecedent, which cannot be sub-part of a word\(^2\), i.e. that such pronouns have to be syntactically licensed by their antecedent. This claim is discussed in the literature on *anaphoric islands* (focusing on referential pronouns, see Postal 1969, Ward, Sproat & McKoon 1991, Ward 1997), and in the literature on the *formal link* (focusing on donkey pronouns, see Evans 1977, Kadmon 1987, Heim 1990, Chierchia 1992 and Elbourne 2001). The two research traditions are not fully integrated. Our paper aims at unifying these research traditions by arguing that English donkey pronouns are not subject to a *strict formal link condition* (which posits that donkey pronouns without overt NP antecedent are categorically ill-formed), but rather to the type of licensing conditions that we see with referential anaphoric pronouns.

The paper is structured as follows. Section 2 shows that English donkey pronouns do not uniformly require an overt NP antecedent (2.1), and argues that they are subject to the same conditions as referential anaphoric pronouns (2.2). Having thus argued, section 3 shows that cross-linguistically we do, however, find donkey pronouns that are subject to a strict formal link condition. Specifically, we find them in languages that have at least two different pronominal paradigms, such as demonstrative versus personal pronouns in German, and overt versus null pronouns in Kutchi Gujarati. In either language, one set of pronouns (German demonstrative pronouns and Kutchi Gujarati overt pronouns) respects a strict formal link condition, whereas the other (German personal pronouns and Kutchi Gujarati null pronouns) doesn’t. We propose an analysis for such languages in section 4 and conclude in section 5.

2 Against syntactic licensing of all donkey pronouns

2.1 Donkey Pronouns Do Not Uniformly Require Antecedents

Postal (1969) observed (focusing on referential anaphoric pronouns) that an anaphoric pronoun must have an overt NP antecedent, and this antecedent cannot be a (morphological) sub-part of a word (see also Ward, Sproat & McKoon 1991, Ward 1997). He coined the term *anaphoric island*\(^3\) for words that contain potential antecedents (e.g. *McCarthyites* in (2b)) or merely imply them (e.g. *orphan* in (3b), which loosely means *somebody who has lost his/her parents*, and thus implies *parents* as a potential referent).

\(^2\) For simplicity, we generally write *donkey pronouns without overt NP antecedent* to mean ‘donkey pronouns that either do not have an overt antecedent or have an overt antecedent that is a sub-part of a word’. This abbreviation glosses over the possibility that sub-parts of words are NPs.

\(^3\) Anaporic islandhood was later linked to the idea of lexical integrity (cf. Levi 1978, Pesetsky 1979, Kiparsky 1982, Simpson 1983, Mohanan 1986).
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(2)  
  a. Followers of McCarthy are now puzzled by his intentions.  
  b. # McCarthyites are now puzzled by his intentions.  
  (Postal 1969:213)

(3)  
  a. Max’s parents are dead and he deeply misses them.  
  b. # Max is an orphan and he deeply misses them.  
  (orphan = ‘a child whose parents have died’)  
  (Postal 1969:206)

In the literature on donkey pronouns, a similar constraint was postulated, usually referred to as the formal link constraint. Almost identical to the definition of the anaphoric island constraint, it states that a donkey pronoun must have an overt NP antecedent, and this antecedent cannot be a sub-part of a word (see Evans 1977, Kadmon 1987, Heim 1990, Chierchia 1992 and Elbourne 2001, among others). In (4b), donkey is not a suitable antecedent, as it is a sub-part of donkey-owner, whereas in (5b), wife is not suitable, as it is merely implied.

(4)  
  a. [Every man [who owns a donkey]] loves it.  
  b. # [Every donkey-owner] loves it.

(5)  
  a. [Every man [who had a wife]] hugged her.  
  b. # [Every married man] hugged her.  
  (married = ‘to have a wife’)

Starting the discussion of these constraints with the more general literature on anaphoric islandhood (which aims to cover all anaphoric pronouns), Anderson (1971) was the first to observe that anaphoric islandhood is gradient and not categorical, casting doubt on its status as a grammatical constraint4. One of the first counter-examples to anaphoric islandhood is quoted in (6), where the antecedent for it (i.e. vomit) is only implied by the verb throw up.

(6)  
  When Little Johnny threw up, was there any pencil-eraser in it?  
  (throw up = ‘to emit vomit’)  
  (Anderson 1971:46)

Further counter-examples to a strict anaphoric island constraint were presented by Ward, Sproat & McKoon (1991:451-452), two of which are quoted in (7) together with the original source. Crucially, Kal Kan in (7a) and Schachter in (7b) are taken to be sub-parts of the compounds Kal Kan cat and Schachter paper, respectively.

(7)  
  a. Patty is a definite Kal Kan cat. Every day she waits for it.  
  (Television advertisement for Kal Kan; January 28, 1987)  
  b. I refer you to the Schachter paper; he’s very proud of it …  
  (Mark Baker in response to a question at NELS; November 12, 1988)

While there is little integration between the literature on the anaphoric island constraint and the literature on donkey pronouns, Ward (1997), in a paper on anaphoric islands, gives three examples of donkey pronouns where the intended antecedent is a sub-part of a word, which he claims to be fully grammatical and acceptable.

4 Others confirmed this gradienty (e.g. Lakoff & Ross 1972, Corum 1973, Browne 1974, Watt 1975).
(8)  a.  [Every academy award winner] treasures it for the rest of his life.
    b.  [Every pet owner in our building] takes extremely good care of it.
    c.  [Every sadistic donkey owner I know] beats it for no apparent reason.
    (Ward 1997:203)

Other counter-examples to a strict and grammatically encoded formal link are given in Jacobson (2001) and Riley (2007).

(9)  a.  [Every Siberian husky owner] needs to give it lots of exercise.
    (Jacobson 2001)
    b.  If a man owns a horse, he races it; if he owns a mule, he harnesses it up; but
    [every donkey owner] beats it.
    (Riley 2007)

A quick online search reveals further, naturally occurring counter-examples to the formal link condition, which are judged well-formed by native speakers, illustrated in (10)5.

(10)  a.  Of course [every iphone owner] uses it for browsing.
    b.  Studies show that [an average 30’ sports fishing boat owner] uses it 10-20
    days a year.
    (http://www.gladiatorcharters.com/fractional.htm)
    c.  As a small business owner, I can tell you for a fact that [not every small
    business owner] aspires to sell it out to a big company.
    (http://www.stltoday.com/blogzone/political-fix/political-
    fix/2007/12/initiative-against-trash-hauling-districts-to-start-jan-7/)
    d.  [Each website owner] will only see its own members.
    (http://www datingsitebuilder.com/how-to-start-your-own-dating-site.asp)
    e.  At $525, [no gold owner] will use it to buy oil.
    (http://www.gold-eagle.com/editorials_05/weber010506.html)

These counter-examples indicate that there are cases of donkey pronouns without overt NP antecedent that are well-formed, contradicting an understanding of the formal link condition under which donkey pronouns without overt NP antecedent are completely ungrammatical (in the sense in which strong island violations cause ungrammaticality). In recent experiments, Patel et al. (2009) also show that donkey pronouns without an overt NP antecedent are not rated uniformly on a 7-point naturalness scale, but exhibit systematic variation: some cases (such as (11a)) receive higher ratings than others (such as (11b)). The relevant factor that is responsible for the difference between (11a) and (11b) seems to be that fatherless is likely to make father salient as a potential antecedent for him, whereas friendless fails to make friend salient in the same sense. Patel et al. (2009) conjecture that this might be due to the world knowledge that everyone tends to have one father but typically tends to have more than one friend.

(11)a.  (?) [Every man who was fatherless] had lost him in the war.
    b.  ?? [Every man who was friendless] had lost him in the war.
    (Patel et al. 2009)

5 These websites were last accessed for the purpose of this paper on March 25, 2010.
The conclusion that we can draw from the empirical observations in (8)-(11) is that constructions that violate the formal link conditions are not uniformly bad, but vary in their acceptability. This is exactly what has been observed for anaphoric island violations since Anderson (1971), thus motivating a uniform treatment of donkey pronouns and other types of anaphoric pronouns with respect to the necessity of an overt NP antecedent. Section 2.2 investigates factors that determine the well-formedness of anaphoric expressions without overt antecedents, showing more parallels between donkey pronouns and referential anaphoric pronouns.

### 2.2 Certain Donkey Pronouns are Contextually Resolved

In section 2.1, we have seen that donkey pronouns, on a par with referential anaphoric pronouns, are sometimes licensed without an overt NP antecedent. In this section, we argue that English donkey pronouns are not subject to a strict formal link condition. In contrast, they are subject to constraints on accessibility/saliency of a contextually construed antecedent, as previously posited by Ward, Sproat & McKoon (1991). These constraints are currently poorly understood, but Ward, Sproat & McKoon (1991) argue that the acceptability of referential anaphoric pronouns is affected by at least the following three factors that determine the accessibility/saliency of a possible antecedent in the discourse context: (i) semantic transparency of a word that contains the antecedent, (ii) information-structural status of the intended antecedent, and (iii) syntactic position of a word that contains or implies the antecedent. We will discuss and illustrate these constraints in turn and argue that the same factors are at play in constructions that contain donkey pronouns without overt NP antecedents.

First consider semantic transparency; this notion refers to the decomposability of complex words, i.e. the degree of semantic transparency of a complex word corresponds to the degree to which it is semantically decomposed into its parts. To exemplify this idea, the noun *cow-owner* can be decomposed into ‘someone who owns cows’, whereas *cowboy* does not have an analogous decomposition. In this sense, *cow-owner* is more semantically transparent than *cowboy* and *cowboy* is more semantically opaque than *cow-owner*. In recent research, Hay (2001) shows that dictionary definitions of complex words can be used as a simple measure of semantic transparency; she argues that a derived word is more semantically transparent if its base is mentioned in dictionary definitions. She also argues that more semantically transparent words have a lower number of definitions listed in dictionaries. For our present purposes it suffices to point out that *cowboy* has two definitions in Webster's Revised Unabridged Dictionary (1913), none of which contains the word *cow*.

(12) **cowboy**
1. A cattle herder, a drover; specifically, one of an adventurous class of herders and drovers on the plains of the Western and Southwestern United States.
2. One of the marauders who, in the Revolutionary War infested the neutral ground between the American and British lines, and committed depredations on the Americans.

In this sense, Ward, Sproat & McKoon (1991) argue that their example in (13a) is well-formed, because *cocaine use* is semantically decomposed (both the predicate *use* and the argument *cocaine* are lexically accessed), making *cocaine* contextually salient and thus
accessible as a possible antecedent for it. In contrast, (13b) is ill-formed, as cowboy is semantically opaque and not decomposed into cow and boy; therefore, cow(s) is not accessible as an antecedent for they.

(13)  a. Although casual cocaine use is down, the number of people using it routinely has increased.  
(WCBS 11 O’clock News; December 20, 1990)  

b. Fritz is a cowboy. He says they can be difficult to look after.  
(Ward, Sproat & McKoon 1991)

This contrast can be reproduced for donkey pronouns, as shown in the judgments for (14a) and (15a) versus (14b) and (15b). While native speakers might judge (14a) and (15a) to be slightly odd, (14b) and (15b) are significantly worse.

(14)  a. (??) [Many men who were cow-owners] sold them during the financial crisis.  

b. (??) [Many men who were cowboys] sold them during the financial crisis.

(15)  a. (??) [Everybody who’s a cow-owner] knows they can be difficult to look after.  

b. (??) [Everybody who’s a cowboy] knows they can be difficult to look after.

On a more subtle level, it is commonly assumed that compounds (e.g. N-owner compounds) are more semantically transparent than words formed by means of derivational affixes such as -less. This is illustrated by the (weaker) contrast in (16a) and (16b).

(16)  a. (??) [Every researcher that was a computer-owner] had to shut it down during the thunderstorm.  

b. (??) [Many graduate students that arrived computerless] had forgotten it at home in a hurry.

The fact that semantic transparency of the antecedent-containing word correlates with acceptability of the donkey sentence can be taken as a first argument for the following conclusion: If donkey pronouns without overt NP antecedents are felicitous, they are contextually resolved, in the same sense in which referential pronouns are contextually resolved.

A second factor that Ward, Sproat & McKoon (1991) explore is the discourse functional status of intended antecedents for an anaphoric pronoun. They argue that discourse entities are more accessible (and thus make better antecedents) when they are in contrastive opposition to other discourse entities. They assume that (17a) and (17b) can be successfully resolved, because syntax and business are contrastively stressed. (Examples in (17) are quoted from Ward, Sproat & McKoon 1991.)

(17)  a. For a Syntax slot I’d rather see someone with more extensive coursework in it.  
(Judith Levi discussing various subdisciplines of linguistics; January 18, 1987)

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6 Thanks to Alec Marantz for pointing this out to us.
7 To illustrate the relatively low semantic transparency of complex words derived by -less, consider semantically opaque words, such as listless. In Webster’s Revised Unabridged Dictionary (1913) listless is defined as “having no desire or inclination; indifferent; heedless; spiritless” and thus does not seem to have any semantic relationship to list, as opposed to the compound list-owner.
b. Cliff Barnes: Well, to what do I owe this pleasure?
Ms Cryder: Actually, this is a BUSINESS call, and I’d like to get right down to it.

(‘Dallas’, 1987)

They also report on an experimental study, which shows that the text in (18) has lower reading times if the topic of conversation has been on activities such as hunting, shooting and fishing, rather than if it has been on skiing or mountain climbing. They attribute this to the idea that the intended antecedent deer is more easily accessible if it is already implicitly present in the discourse (i.e. “topical” in Ward, Sproat & McKoon’s terminology).

(18) Lately he’s taken up deer hunting. And he thinks that they are really exciting to track.

(Ward, Sproat & McKoon 1991:457)

Evidence that such information-structural properties of intended antecedents also matter for donkey sentences stems from Riley (2007), who contrasts the well-formed (19a) with the (classical) deviant example in (19b), which is strictly speaking a sub-part of (19a).

(19) a. If a man owns a horse, he races it; if he owns a mule, he harnesses it up; but every donkey owner beats it!
(Riley 2007)

b. # Every donkey owner beats it.
(Heim 1982, Chierchia 1992)

The observation that information-structural status of an intended antecedent matters for the resolution of donkey pronouns can be taken as another argument that felicitous donkey pronouns without overt NP antecedents are contextually resolved.

Finally, Ward, Sproat & McKoon (1991) propose that the syntactic position of an antecedent-containing element might matter for the accessibility of the antecedent\(^9\). They argue for such a constraint based on unpublished work by McKoon et al. (1990) which indicates that pronominal (attributive) adjectives (intolerable in (20a) and hostile in (20b)) are less accessible in subsequent memory tests than postnominal (predicative) adjectives (hostile in (20a) and intolerable in (20b)).

(20) a. His intolerable aunt is hostile.

b. His hostile aunt is intolerable.

(Ward, Sproat & McKoon 1991:455)

While Ward, Sproat & McKoon (1991) contrast phrases such as the VP hunting deer and the compound deer hunting, which introduces confounding factors that are not controlled for, our own experimental research (currently in progress) indicates that this constraint on accessibility/saliency affects the acceptability of donkey sentences as predicted: The relevant finding is that native speakers rate (21b) as significantly worse than (21a)\(^9\).

(21) a. (?) [Every man who was fatherless] had lost him in the war.

b. ?? [Every fatherless man] had lost him in the war.

---

\(^8\) They attribute this observation to Wilson & Sperber (1979).

\(^9\) Thanks to Sabine Iatridou for being the first one to point out this contrast.
In analogy, even an implied antecedent seems to be more accessible if the NP that implies it is in a predicative position than if it is in a modifier position.

(22)  

a. (?) [Many men who were married] needed years to find out what her favorite breakfast was.
b. ?? [Many married men] needed years to find out what her favorite breakfast was.

We conclude that the modifier/predicate distinction is indeed linked to the acceptability of donkey sentences without overt NP antecedent. We argue that such an asymmetry also follows from the fact that donkey pronouns without overt NP antecedent must be contextually resolved.

In sum, we have argued that the acceptability of donkey pronouns without overt NP antecedent is linked to a variety of factors that determine the saliency/accessibility of an intended antecedent, namely: semantic transparency of a word that contains the intended antecedent (examples (14)-(16)), information-structural status of an intended antecedent (example (19)) and syntactic position of a word that contains or implies the intended antecedent (examples (21)-(22)). We conclude that donkey pronouns that are felicitous without an overt NP antecedent retrieve their meaning from the context, in the same way in which a referential anaphoric pronoun (e.g. (23)) has its meaning contextually assigned.

(23)  

John gave a bottle of red wine to Mary. He thought she didn’t like white wine.

Note that our claim that donkey sentences without overt NP antecedent can be well-formed does not entail that such sentences must be well-formed. As we have demonstrated above, there are various reasons for which such sentences might still end up being ill-formed (mainly because no suitable antecedent can be made salient/accessible). Our proposal also does not entail that the presence or absence of an overt NP antecedent is completely irrelevant for the acceptability of sentences with donkey pronouns. Au contraire, there are good reasons to believe that an explicitly expressed overt NP is automatically much more accessible/salient than a possible antecedent that is either on the sub-word level or merely implied (see also Ward, Sproat & McKoon 1991). We therefore predict that sentences containing donkey pronouns are generally more acceptable if they do contain an overt NP antecedent than if they do not.

3 A case for syntactic licensing of some donkey pronouns

In section 2, we discussed English data, arguing that donkey pronouns without overt NP antecedents are not uniformly bad, but rather subject to constraints on accessibility/saliency of an intended antecedent. We thus argued for a uniform analysis of referential anaphoric pronouns (cf. (24a), repeated from (6)) and donkey pronouns (cf. (24b), repeated from (9a)), which are both subject to this type of constraint.

(24)  

a. When Little Johnny threw up, was there any pencil-eraser in it?
   (throw up = ‘to emit vomit’)
   (Anderson 1971:46)
b. [Every Siberian husky owner] needs to give it lots of exercise.
   (Jacobson 2001)
However, there is evidence that a strict formal link condition does exist in languages with richer pronominal systems. While English does not make an explicit distinction between different types of pronouns, such a distinction can be observed in other languages. Specifically, German distinguishes between demonstrative pronouns (or \(d\)-type pronouns, see Wiltschko 1998) and personal pronouns; and other languages, like Kutchi Gujarati, distinguish between overt pronouns and null pronouns. For these two languages, the two pronominal pairs can be shown to be equivalent, at least on the surface, based on the following three data points.

First, when unbound, German personal pronouns and Kutchi Gujarati null pronouns in subject position prefer to refer to topical elements, such as the subject of the preceding sentence (the hash mark in parentheses, ‘(#)’, indicates ‘dispreferred’ in the following examples, whereas the hash mark, ‘#’, indicates ‘unavailable reading’).

\[
\begin{align*}
\text{(25) a.} & \quad \text{Hans}\_{3} \text{ wollte mit Paul}\_{7} \text{ joggen, aber } \text{er}\_{3(#)}\_{7} \text{ war krank.} \\
& \quad \text{H. wanted with P. jog but he (= Hans) was sick.} \\
& \quad \text{'Hans wanted to go jogging with Paul, but he (= Hans) was sick.' (adapted from Bosch et al. 2003)} \\
\text{b.} & \quad \text{John}\_{3} \text{-ne Paul}\_{7} \text{ saathedhorva javu thu, pun}\_i\text{\text{pro}3(#)}\_{7} \text{ thandithi aavi thi} \\
& \quad \text{J.-dat P. with run.inf go aux but 3.sg.nom cold came aux} \\
& \quad \text{'John wanted to go running with Paul, but he (= John) had a cold.'}
\end{align*}
\]

On the other hand, German demonstrative pronouns and Kutchi Gujarati overt pronouns cannot refer to topical elements.

\[
\begin{align*}
\text{(26) a.} & \quad \text{Hans}\_{3} \text{ wollte mit Paul}\_{7} \text{ joggen, aber } \text{der}\_{7(#)}\_{3} \text{ war krank.} \\
& \quad \text{H. wanted with P. jog but that.one was sick} \\
& \quad \text{'Hans wanted to go jogging with Paul, but he (= Paul) was sick.' (adapted from Bosch et al. 2003)} \\
\text{b.} & \quad \text{John}\_{3} \text{-ne Paul}\_{7} \text{ saathedhorva javu thu, pun}\_i\text{pro3(#)}\_{7} \text{ thandithi aavi thi} \\
& \quad \text{J.-dat P. with run.inf go aux but 3.sg.nom cold came aux} \\
& \quad \text{'John wanted to go running with Paul, but he (= Paul) had a cold.'}
\end{align*}
\]

It also seems that German demonstrative pronouns and Kutchi Gujarati overt pronouns cannot be syntactically bound by a quantifier in subject position.

\[
\begin{align*}
\text{(26) a.} & \quad \text{Jeder Mann behauptet, dass } \text{er} / *\text{der} \text{ intelligent ist.} \\
& \quad \text{every man claims that he that.one intelligent is} \\
& \quad \text{'Every man claims that he is intelligent.' (cf. Wiltschko 1998 for similar examples)} \\
\text{b.} & \quad \text{Batha manas kidhu ke } \text{pro} / *\text{i} \text{ hosiyar che.} \\
& \quad \text{every man says that 3.sg.nom 3.sg.nom intelligent is} \\
& \quad \text{'Every man said that he was intelligent.'}
\end{align*}
\]

We can thus conclude that German demonstrative pronouns and Kutchi Gujarati overt pronouns form one category (which we will call “strong pronouns”), whereas German personal pronouns and Kutchi Gujarati null pronouns form another category (which we will call “weak pronouns”). We can treat the binary contrasts between demonstrative pronoun

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10 The idea that weak pronouns have a different structure and semantics from strong pronouns was also explored in Cardinaletti & Starke (1999) with a different empirical scope.
and personal pronoun and between overt (personal) pronoun and null pronoun as sub-parts of a scale, as shown in (28). Note that German does not have null pronouns and Kutchi Gujarati does not have demonstrative pronouns of the German type.

(28) null pronoun < (overt) personal pronoun < demonstrative pronoun

Weakest Strongest

In the remainder of this section, we show that there is a crucial asymmetry between the two types of pronouns with respect to their requirement for an overt NP antecedent. Specifically, the strong pronouns exhibit a strict formal link condition.

Consider first German, which has three paradigms of strong (demonstrative) pronouns (der, dieser and jener), one of which (the der paradigm) corresponds to the definite determiner der ‘the’. All German demonstrative pronouns can be used anaphorically, as donkey pronouns in donkey sentences, as shown in (29) (see also Wiltschko 1998).

(29) Jede Linguistin, die einen Esel hat, libet **ihn** / **den** / **diesen** / **jenen**.

‘Every linguist who owns a donkey loves it / that donkey.’

However, demonstrative pronouns can only serve as donkey pronouns if there is an overt NP antecedent, whereas personal pronouns are not restricted in this way. While the personal pronoun **ihn** ‘him’ is somewhat marked in (30), due to the absence of an overt antecedent, the demonstrative pronouns **den** ‘the’, **diesen** ‘this’ and **jenen** ‘that’ are drastically worse.

(30) Jede Linguistin, die eine Eselbesitzerin ist, füttert (**ihn** / **den** / **diesen** / **jenen** meistens erst spät am Abend.

‘Every linguist who’s a donkey-owner usually feeds it late at night.’

German thus seems to make a case for a strict formal link condition with strong donkey pronouns. This observation also holds for cases where the antecedent is not even a sub-part of a word, but merely implied, as in example (31), from Roelofsen (2008).

(31) Some men have been married for more than twenty years and still don’t know what her favorite breakfast is.

(married = ‘to have a wife’)

(Roelofsen 2008:122)

Again, this is possible with a German personal pronoun, but not with a demonstrative pronoun, as shown in (32).

(32) Manche Männer sind schon für mehr als zwanzig Jahre verheiratet, und some men are already for more than twenty years married and wissen noch immer nicht, was **ihre** / **ihrer** Lieblingsfrühstück ist.

‘Some men have been married for more than twenty years and still don’t know what her favorite breakfast is.’
This contrasts with example (33), where the presence of an overt antecedent licenses the genitive-marked demonstrative pronoun *deren*.

(33) Manche Männer haben schon für mehr als zwanzig Jahre eine **Frau**, und wissen noch immer nicht, was *ihr* / *deren* Lieblingsfrühstück ist.  
   ‘Some men have had a wife for more than twenty years and still don’t know what her favorite breakfast is.’

We can conclude that there is a categorical difference between German demonstrative pronouns and German personal pronouns with respect to the need for an overt NP antecedent. Personal pronouns can be licensed without such an antecedent, whereas demonstrative pronouns do require it.

The same contrast can be observed between Kutchi Gujarati overt pronouns and Kutchi Gujarati null pronouns: The overt (“strong”) pronoun can occur in a donkey sentence with overt NP antecedent, and is in fact preferred over a weak (null) pronoun.  

(34) ji manas jena passe **pathni** che, gare aave, tho **pro**  
   ene / ?**pro** bak bharave.  
   3.sg.acc 3.sg.acc hug makes  
   ‘If any man who has a wife comes home, he hugs her.’

Like the personal pronoun in German, the null donkey pronoun is possible in a donkey sentence that lacks an overt NP antecedent, whereas the overt pronoun *ene* ‘him/her’ cannot occur, on a par with the German demonstrative pronoun.  

(35) ji penelo manas gare aave, tho i **pro** / *ene**  
   bak bharave.  
   hug makes  
   ‘If any married man comes home, he hugs [his wife].’

In the spirit of integrating the literature on donkey pronouns and the literature on anaphoric islands, it can be shown that referential anaphoric pronouns also exhibit the same pattern. Weak pronouns (illustrated for German personal pronouns) are licensed without an overt antecedent, whereas strong pronouns (illustrated for German demonstrative pronouns) are impossible.

(36) a. Wenn ich schwanger werde, werde ich **es** / ***das** / ***dieses** auf  
   if I pregnant become will I it it this in  
   jeden Fall behalten.  
   any case keep  
   ‘If I get pregnant, I’ll definitely keep it.’  
   (pregnant = ‘to be having a **baby**’)  
   (based on Roelofsen 2008:92)

---

11 We are glossing over the fact that Kutchi Gujarati generally seems to require subject and object pronouns to not be both overt or both null. Note also that it was not possible to construct minimal pairs for comparing German and Kutchi Gujarati, due to independent reasons.
b. Hans hat so sehr geblutet, dass es / *das / *dieses durch den Verband gedrungen ist und sein Hemd verschmutzt hat. ‘Hans bled so much it soaked through his bandages and stained his shirt.’ (bleed = ‘to emit blood’) 

We can conclude from the data in (29)-(36) that strong pronouns must be syntactically licensed by an overt NP antecedent, whereas weak pronouns are not subject to such a strict licensing requirement. As we have seen, this is the case for donkey pronouns (examples (29)-(35)) and for referential anaphoric pronouns (example (36)) alike. This contrast between weak and strong pronouns is reminiscent of the distinction between (pragmatically controlled) deep anaphora like *do it* and (syntactically licensed) surface anaphora like *do so*, cf. Sag & Hankamer (1984).

4 Analysis: Two types of anaphora resolution

To account for the facts in German and Kutchi Gujarati, we propose that strong pronouns and weak pronouns have a different structure; our analysis is based on Wiltschko (1998), who assumes that German personal pronouns have less structure than demonstrative pronouns, as sketched in (37). We adopt her proposal and assume that strong pronouns (i.e. German demonstratives and Kutchi Gujarati overt pronouns) contain an empty NP site, whereas weak pronouns (i.e. German personal pronouns and Kutchi Gujarati null pronouns) do not.

\[\text{German demonstrative pronoun: } [\text{DP } d- [\varphi P \text{er } [\text{NP } \emptyset]]] \]

\[\text{German personal pronoun: } [\varphi P \text{er}] \]

We assume that the empty NP site of demonstrative pronouns must be licensed in the syntax by an overt NP antecedent, shown in (38) and (39). Our analysis of strong donkey pronouns is thus a syntactic analysis in the spirit of Parsons (1978), Heim (1990) and Elbourne (2001).

\[\text{Jede Linguistin, die einen Esel hat, liebt den. Every linguist who owns a donkey owns loves that donkey.} \]

\[\text{LF: Jede Linguistin, die einen Esel hat, liebt } [\text{DP d- [\varphi P en } [\text{NP Esel}]]]. \]

\[\text{licensing of NP-deletion} \]

\[\text{Jede Linguistin, die eine Eselbesitzerin ist, liebt den. Every linguist who is a donkey-owner.} \]

\[\text{LF: Jede Linguistin, die eine Eselbesitzerin ist, liebt } [\text{DP d- [\varphi P en } [\text{NP Esel}]]]. \]

\[\text{licensing of NP-deletion fails} \]

12 We use the label \(\varphi P\) from Déchaine & Wiltschko (2002) instead of Wiltschko’s (1998) AgrDP.
We assume an Elbourne (2001) style semantics for (38). Every minimal situation in which a female linguist owns a donkey can be expanded into a situation in which the unique linguist loves the unique donkey in that situation.

In contrast, given that their licensing requirements are less rigid, we propose that the meaning of personal pronouns is construed from the context, as illustrated in (40). This is in the spirit of pragmatic / contextual analyses, such as the definite description analysis of Cooper (1979), Heim & Kratzer (1998) and Buering (2005).

(40)  

a. Jede Linguistin, die eine Eselbesitzerin ist, liebt ihn.  
   ‘Every linguist who is a donkey-owner.’

b. LF: Jede Linguistin, die eine Eselbesitzerin ist, liebt [ap ihn].

c. if successfully resolved, the following meaning is construed for ihn:  
   \[ \phi P \text{ihn} \rightarrow \text{the donkey owned by x (s.t. x is bound by the universal quantifier)} \]

For concreteness sake, we implement this pragmatic resolution in terms of Chierchia’s (1992) functions of type \(<e,e>\)\(^{13,14}\).

(41)  

a. John doesn’t have a car anymore. He sold it last month.

b. LF: John doesn’t have a car anymore. He sold \(f(\text{John})\) last month.

\(f_{<e,e>}\): a function from people into the car they used to have

However, given the contrast between weak and strong pronouns discussed above, we do not share Chierchia’s assumption of a structural formal link between the donkey pronoun and an overt NP antecedent (which he implements in terms of a coindexation restriction on donkey pronouns that we do not assume, Chierchia 1992:159). In order to account for the matching in \(\phi\)-features between a donkey pronoun and its intended antecedent, e.g. gender and number as in (42), we assume that \(\phi\) features are syntactically represented in the \(\phi P\) and interpreted by the semantics as presupposition triggers (Cooper 1983, Heim 1991, Sauerland 2004, Kratzer 2009).

(42)  

a. Every man who was fatherless had lost [ap him] in the war.

b. LF: Every man who was fatherless had lost \([e_{sg} \text{[masc]}f(x_2)]\) in the war.

\(f_{<e,e>}\): a function from people into the father they used to have

c. truth conditions:  
   \[ ||(42b)|| \text{ is defined iff } ||f(x_2)|| \text{ is singular and masculine; if defined,} \]
   \[ ||(42b)|| \text{ is true iff every man who was fatherless had lost his father in the war} \]

Our analysis assumes that the relevant function \(f\) is purely construed from the linguistic and non-linguistic context, and the acceptability of weak donkey pronouns without overt antecedents depends on how easily and unambiguously the correct function \(f\) can be accessed. In section 3, we showed that the split between weak pronouns and strong pronouns applies equally to donkey pronouns and referential pronouns, motivating a unified analysis of weak donkey pronouns and weak referential pronouns. This indicates that the factors that

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13 Chierchia’s proposal is based on Cooper (1979) and Engdahl (1986), and also makes reference to Heim (1990) who rejects such a proposal.

14 Chierchia (1992) assumes a “mixed account for anaphora” much in the spirit of the current proposal. He assumes three types of semantically bound pronouns, (i) syntactically bound pronouns, (ii) dynamically bound pronouns, and (iii) donkey pronouns that are pragmatically resolved.
come into play when construing an <e,e> type function \( f \) for the interpretation of donkey pronouns are the same factors that determine whether a referential anaphoric pronoun can be interpreted.

The question at this stage is how English donkey pronouns fit into a system that covers the binary distribution of pronouns in German and Kutchi Gujarati. While English does not have a weak/strong distinction, it appears that English must have “weak” donkey pronouns, as there does not seem to be a strict formal link condition in English. An open question at this point is whether English donkey pronouns are always weak, or whether they are either ambiguous between strong and weak pronouns, or have a hybrid status.

5 Conclusion

In this paper, we argued that there are two types of donkey pronouns, which must receive two different analyses: There are “strong” donkey pronouns (like German demonstrative pronouns and Kutchi Gujarati overt pronouns) and “weak” donkey pronouns (like German personal pronouns and Kutchi Gujarati null pronouns). We have shown that only the strong ones are subject to a rigid requirement for an overt NP antecedent, whereas the weak pronouns are often felicitous without such an overt antecedent, depending on how salient/accessible a suitable (potentially unexpressed) antecedent is in the context. We proposed to analyze the two types of pronouns as having different syntactic structures. Specifically, strong pronouns contain an empty NP site, which must be structurally licensed, whereas weak pronouns do not involve NP deletion and are purely contextually resolved. In a sense, the distinction between strong pronouns and weak pronouns is reminiscent of the distinction between surface anaphora and deep anaphora.

It follows from our analysis that the formal link condition (‘donkey pronouns must have an overt NP antecedent’) is not a uniform phenomenon, but an epiphenomenon tied to different syntactic and semantic configurations. In the case of strong pronouns it reflects the syntactic licensing requirements on NP ellipsis, whereas in the case of weak pronouns it reflects salience/accessibility of an intended antecedent. This means that the formal link condition will always be a rigid constraint in the case of strong pronouns, but much less rigid in the case of weak pronouns. For the former, an overt NP antecedent is always obligatory. In contrast, for the latter, the presence of an overt NP antecedent might well be the best and most straightforward way of providing a suitable, contextually accessible/salient antecedent, but it is crucially not the only way of doing so.

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How to do comparison in a language without degrees: a semantics for the comparative in Fijian

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Abstract
Kennedy (2009) distinguishes between implicit and explicit comparison (IC/EC): IC is exemplified by ‘Compared to John, Mary is tall’, and EC is of form, ‘Mary is taller than John’. Kennedy goes on to ask whether there are IC-only languages. We show that Fijian is an example of one. Along the way, we demonstrate that not all of Kennedy’s diagnostics for IC can be reliably applied across languages, and offer some novel diagnostics of our own. We propose a semantics for Fijian comparatives that makes no appeal to degree arguments, and discuss possibilities source of the cross-linguistic variation.

1 Introduction
Kennedy (2009) raises the question of whether there are any languages which only have implicit comparison (IC), where IC is as defined in (1) and exemplified in (2a). (2a) might in turn be contrasted with (2b), which exemplifies explicit comparison (EC).

(1) Implicit comparison (Kennedy 2009)
Establish an ordering between objects $x$ and $y$ with respect to gradable property $g$ using the positive form by manipulating the context such that the positive form is true of $x$ and false of $y$.

(2) a. Compared to John, Mary is tall.
b. Mary is taller than John.

In some languages such as Motu, the so-called conjoined comparative is employed (3): the gradable property is predicated of the subject of one conjunct, and asserted not to hold of the subject of the other conjunct. Kennedy suggests that languages that use this strategy may be good candidates for IC-only languages. In the present work, we show that Fijian (Austronesian, Oceanic) is an implicit comparison-only language. Since Fijian employs the separative comparative\(^1\), we learn that implicit comparison is not limited to the conjoined comparative.

\(^1\) A comparative construction is separative if the morpheme introducing the standard of comparison is a preposition.
2 Some data

We begin with some examples of the comparative of superiority (4) and superlative (5)\(^2\).

\(\begin{align*}
(4) & \quad a. \quad e \ qase \ mai \ vei \ Meri \ ‘o \ Pita \\
& \quad 3SG \quad old \quad DIR \quad PRP \quad Mary \quad PERS.DET. \quad Peter \\
& \quad ‘Peter \ is \ older \ than \ Mary’.
\end{align*}\)

\(\begin{align*}
& \quad b. \quad e \ rua \ na \ teveli \ ka \ dua \ e \ lekaleka \\
& \quad 3SG \quad two \ ART \quad table \ CONJ \ one \ 3SG \quad short \\
& \quad ‘This \ table \ is \ shorter \ than \ that \ one’. \ (Lit:\ There \ are \ two \ tables \ and \ one \ is \ short.)
\end{align*}\)

\(\begin{align*}
(5) & \quad Pita \ e \ qase \ mai \ vei \ ira \\
& \quad Peter \ 3SG \quad old \ DIR \ PRP \ 3PL \\
& \quad ‘Peter \ is \ the \ oldest’.
\end{align*}\)

Here are some noteworthy properties of this brief data set. (i) There are no overt morphemes meaning more or most. (ii) The comparative of superiority and superlative are morphosyntactically identical. (iii) The comparative of superiority has two forms: one in which the standard of comparison is introduced by a directional marker mai and a preposition vei, and a conjoined comparative; we shall confine our attention to the first of these\(^4\).

3 Diagnosing implicit comparison

Let’s begin by expanding the range of data that we include under the label implicit comparison. To the compared to... construction exemplified in (2a), we will add another, (6), which as far as we know has not yet been discussed in the literature on implicit comparison.

\(\begin{align*}
(6) & \quad Of \ John \ and \ Mary, \ Mary \ is \ the \ tall \ one.
\end{align*}\)

Moreover, notice that (7a) and (7b) are minimally different from (2a) and (6) respectively.

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\(^2\) I confine my attention here to the comparative of superiority and superlative for reasons of space only. See Pearson (2009) for a semantics for the comparative of inferiority and equative that is compatible with everything I say here.

\(^3\) Abbreviations employed in this paper: ART = article; CONJ = conjunction; DIR = directional; LNK = linker; NMLZ = nominalizer; PERS.ART = personal article (used with proper names); PRP = preposition; TOP = topic.

\(^4\) Notice that the Fijian conjoined comparative differs from the Motu type. The construction is certainly worthy of further attention, but this is beyond the reach of the present paper.
(7) a. Compared to John, Mary is taller.
   b. Of John and Mary, Mary is the taller one/is taller.

We shall say that examples such as (7), where comparative morphology is used, instantiate weak implicit comparison (WIC), and that cases like (2a) and (6), where the positive form of the predicate is used, constitute strong implicit comparison (SIC). Kennedy’s interest is in SIC (for him, implicit comparison by definition employs the positive form), and hence the diagnostics that he proposes are diagnostic of SIC and not WIC. We are now in a position to make more precise the claim to be defended in this paper: Fijian is an SIC-only language, and hence it has no comparative morphology. Since we have already observed that Fijian has no overt comparative morphology, our task is to show that it also lacks covert comparative morphology.

Our suspicions that this may be the case are aroused by consideration of a diagnostic proposed by Beck, Oda and Sugisaki (2004). They observe that implicit comparison yields a felicitous response to A’s question in (8), but explicit comparison does not. Turning to Fijian, we find that the comparative sentence in (9) is a suitable answer to the same question; hence we have evidence that we are looking at implicit comparison, although we are yet to apply tests that are fine-grained enough to tease apart WIC and SIC.

(8) A: How does your son’s height compare to yours when you were his age?
   B: (i) ??He’s taller than me. EC
       (ii) ✓Compared to me, he’s taller. WIC
       (iii) ✓Compared to me, he’s tall. SIC

(9) E balavu sara mai vei au.
    3SG tall very DIR PRP 1SG

‘He’s taller than me’.

Let me offer three novel diagnostics which will enable us to discriminate between the two flavors of implicit comparison. The first exploits an exception to the generalization that for any gradable predicate $g$, the proposition that A is more $g$ than B can be expressed by a sentence of form, ‘Compared to B, A is $g$’. With certain predicates, the strong implicit comparison configuration turn out to have different truth conditions from its EC and WIC counterparts. One such predicate is surprising. Whereas (10a,b) assert that the maximal degree to which the length of the table is surprising is greater than that to which the height of the chair is surprising, (10c) says that in light of how tall the chair is, it is surprising how long the table is. The latter might be used to convey that the two pieces of furniture seem out of proportion; neither of (10a,b) can be used to make such a claim.

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5 We have two reasons for distinguishing between weak and strong IC: (i) Since English has both modes of comparison, it is worth asking whether there are languages that employ only WIC, and whether there are languages that employ only SIC. (ii) Kennedy shows that Japanese yori-comparatives fail his diagnostics for (what we call) SIC, and hence concludes that it has EC. The distinction that we have introduced leaves open the possibility that Japanese has WIC rather than EC. (See Beck (2009), Oda (2008) and Pearson (2009) for relevant discussion). Similarly, when we turn to Fijian we shall have to ensure that our diagnostics can discriminate between EC, WIC and SIC.

6 From now on we shall treat Kennedy’s diagnostics as diagnostics for SIC, assuming it to be understood that he describes them simply as diagnostics for implicit comparison.

7 The attentive reader will note that (10c) does not conform to Kennedy’s definition of implicit comparison. One might respond either by claiming that the definition is wrong, or by saying that (10c) is not an example of implicit comparison. If one takes the latter view, one might even question the legitimacy of diagnosing IC using a
HOW TO DO COMPARISON IN A LANGUAGE WITHOUT DEGREES

(10) a. The length of the table is more surprising than the height of the chair. EC  
    b. Compared to the length of the table, the height of the chair is more surprising. WIC  
    c. Compared to the length of the table, the height of the chair is surprising.  SIC

The Fijian comparative employing surprising (11) has the same meaning as (10c); it cannot express what (10a,b) say. This is our first piece of evidence that Fijian is an SIC language.

(11) Na balavu ni teveli e kurabuitaki mai na ceere ni dabedabe
    ART length LNK table 3SG surprising DIR ART height LNK chair
    ‘Compared to/given the height of the chair, the length of the table is surprising’. 

Another difference between EC/WIC and SIC is highlighted by the following triple.

(12) a. # John is a taller guy than Mary. EC  
    b. # Compared to Mary, John is a taller guy. WIC  
    c. Compared to Mary, John is a tall guy.  SIC

(12a,b) are infelicitous (they presuppose that Mary is a man); (12c) is considerably better. Since no presupposition failure arises in Fijian, we have more evidence that it is an SIC language.

(13) e goneyalewa qase ‘o Meri mai vei Jone.
    3SG girl old PERS.ART Meri DIR PRP John
    ‘Mary is older than John’. (Lit: ‘Mary is an old girl mai vei John’).

Finally, the interaction of focus with SIC is different from EC or WIC, at least in the variety of SIC that employs an of-phrase (14e).

(14) a. John only likes Peter more than Mary. EC  
    b. ??Compared to Mary, John only likes Peter more. WIC

construction that does not instantiate IC. I don’t think we need to be overly worried about this. We are interested in whether Fijian comparatives have more in common with ‘Compared to B, A is g’ than they do with ‘Compared to B, A is more g’, or ‘A is more g than B’. Cases where this appears to be the case will be taken as evidence that Fijian is an SIC-only language, regardless whether one thinks those cases instantiate SIC or some other, yet to be understood construction. Note incidentally that this approach is not the same as claiming that some morpheme in Fijian means the same thing as compared (to). The semantics that we will give for mai has both similarities to and differences from the semantics of compared (to). Thanks to Li Julie Jiang and an anonymous reviewer for pushing me to think further about these considerations.

Vera Hohaus (p.c.) points out that this test is only suitable for languages in which surprising is gradable. I do not know whether there are languages where this is not the case, but since the predicate can combine with sara (‘very’), as shown in (i), I take it that it is indeed gradable in Fijian.

(i) Na balavu ni teveli e kurabuitaki sara
    ART length LNK table 3SG surprising very
    ‘The length of the table is very surprising’.

For some speakers, (12c) also seems to presuppose that Mary is a man. I believe that this presupposition is at least less robust in (12c) than in (12a-b); the former appears to be more acceptable than the latter two for many speakers.

Some care is needed in applying this test. If Fijian had no adjectives, as has been argued for other Austronesian languages (eg Javanese, Vander Klok (to appear), apparent cases of adjectival modification would have to be analysed as reduced relative clauses. (13) would then mean, ‘Mary is a girl who is older than John’, and its felicity would have no bearing on the SIC/WIC/EC distinctions. For arguments that Fijian does indeed have adjectives, see Pearson (in preparation).
In (14e), focus associates with Peter, and the sentence is evaluated with respect to the alternatives \{John likes Peter, John likes Mary\}. This reading is not available with EC, WIC/SIC of the compared to... type, or WIC of the of-phrase type. We take the availabilty of this reading in Fijian (15) as further evidence that it as an SIC language.

(15) E talei-taki Pita ga ‘o Jone mai vei Meri
3SG likes Peter only PERS.ART John DIR PRP Mary
‘Of Peter and Mary, John only likes Peter’.

On the basis of our diagnostics, then, it seems that Fijian is an SIC language. How does it fare with respect to Kennedy’s tests for strong implicit comparison? Here the results are rather more mixed. For instance, Kennedy observes that SIC is infelicitous in what he calls ‘crisp judgment’ contexts – contexts in which the difference in the degree to which the individuals being compared possess the gradable property is small. This can be seen by considering how the sentences in (16) are judged in a context where Mary is just 2cm shorter than Peter.

(16) a. Mary is shorter than Peter. EC
b. Compared to Peter, Mary is shorter. WIC
c. # Compared to Peter, Mary is short. SIC

The prediction seems to be that the Fijian counterpart of (16) should be infelicitous in the same context. Yet (17) shows that this is not borne out. We shall return to this issue.

(17) E lekaleka ‘o Meri mai vei Pita.
3SG short PERS.ART Mary DIR PRP Peter
‘Mary is shorter than Peter’. (felicitous with a 2cm difference in height)

We also find mixed results when we consider the implicatures associated with SIC. Kennedy identifies one of these; however Sawada (2009) draws attention to an additional one. I shall call the tests involving implicatures the Kennedy-Sawada tests. Sawada observes that a sentence like (18c) implicates that the standard of comparison is tall, but (18a) and (18b) carry no such information. Likewise, my consultant reports that if she heard (19) out of the blue, she would conclude that the referent of na teveli oya were a tall table, although the sentence could also be uttered in a situation where both tables were short. However, Kennedy and Sawada both observe that (18c) also carries a negative implicature for the subject: in Sawada’s terms, that the subject is not definitely short. In fact, my consultant reports that (19) suggests that the subject is short. So, it seems we have another point in favor of an SIC analysis, and another against.

(18) a. This table is shorter than that table. EC
b. Compared to that table, this table is shorter WIC
c. Compared to that table, this table is short. SIC

(19) E lekaleka na i teveli oqo mai na teveli oya
3SG short ART NMLZ table this DIR ART table that
‘This table is shorter than that table’.
We are on firmer ground with Kennedy’s test involving minimum standard gradable adjectives like bent. He notes that in a context where a minimum standard property holds of both the comparee and the standard of comparison, SIC is infelicitous (20c). So too in Fijian (21).

**Context:** Pipe A and Pipe B are both bent; Pipe A more so than Pipe B.

(20) a. Pipe A is more bent than Pipe B. EC
   b. Compared to Pipe B, Pipe A is more bent. WIC
   c. # Compared to Pipe B, Pipe A is bent. SIC

(21) # E takelo na vaivo oqo mai na vaivo oya. 3SG curved ART pipe this DIR ART pipe that
    ‘This pipe is more bent than that pipe’.

The last of Kennedy’s tests for SIC is also the last that Fijian fails, and concerns the availability of differential measure phrases (MPs). Kennedy observes that these are impossible in SIC constructions (22). Yet we found that they are available in Fijian (23).

(22) a. Mary is one year older than Peter/older than Peter by one year. EC
   b. Compared to Peter, Mary is one year older/older by one year. WIC
   c. ??Compared to Peter, Mary is one year old/old by one year. SIC

(23) ‘o Meri e qase mai vei Pita e na dua PERS.ART Mary 3SG old DIR PRP Peter PRP ART one na yabaki. ART year
    ‘Mary is one year older than Peter’.

We find ourselves in a quandary. Our three novel diagnostics, along with one and a half of Kennedy’s four tests, suggest that Fijian is a strong implicit comparison language. Yet contrary to what Kennedy says one should expect of SIC, Fijian permits comparatives in crisp judgment contexts, lacks negative implicatures for the subject, and tolerates differential measure phrases. I see two possible responses to the data. The first is to treat Fijian as a mixed WIC/SIC language. One could say, for example, that the language has covert comparative morphology which only comes into play as a last resort, for example to compose with a differential MP. Alternatively, we might retain a pure SIC analysis by rejecting the premise that all of the properties exhibited by SIC in English – a language that also has EC and WIC at its disposal – will carry over to an SIC-only language. I think that the latter option is the more promising of the two, for the following reason: some of our tests for SIC not only teach us that Fijian has SIC, but also rule out the possibility that it has WIC. If there were an optional covert degree morpheme, we would need a story about why constructions involving surprising are not ambiguous between weak and strong implicit comparison readings, and we would be at a loss to explain why comparatives with minimum standard gradable adjectives cannot be rescued in the contexts Kennedy describes. We maintain, therefore, that the only type of comparison available in Fijian is SIC. In the following section, we provide a semantics for the Fijian comparative that captures this insight; once we have done this, we will be in a position to respond to the challenge provided by the diagnostics involving crisp judgments, implicatures and differential measure phrases.
4 A semantics for the Fijian comparative

Our claim that Fijian is a strong implicit comparison language encompasses a particular view about how the language goes about forming comparisons (roughly, that its comparatives have more in common with English ‘Compared to B, A is P’ or ‘Of A and B, A is P’, than they do with ‘A is more P than B is’). In addition, when we say that Fijian has no form of comparison other than SIC, we claim that it has no comparative morphology. A simple way to capture this second insight is to say that in Fijian, there are no lexical items that introduce degree arguments. Within the framework proposed by Beck et. al. (in press), this would amount to claiming that Fijian has the negative setting of the Degree Semantics Parameter (DSP), stated in (24).

(24) Degree Semantics Parameter (Beck et.al. (in press))
A language {does/does not} have gradable predicates (type <d,<e,t>> and related), i.e. lexical items that introduce degree arguments.

So how does one form comparisons in a language without degrees? A promising alternative is to adopt the semantics for gradable predicates proposed by Klein (1980, 1991). Let a gradable predicate \( g \) be interpreted relative to a comparison class \( X \) – a set that is salient in a context \( c \). If \( X \) is a suitable comparison class for \( g \) in \( c \), every element of \( X \) will be an element of either \{x: x counts as \( g \) in \( c \)\} or \{x: x counts as \( \neg g \) in \( c \)\}. (25) is a sample lexical entry for \( \text{balavu} \) (‘tall’).

(25) \[ \text{balavu}^c = \lambda X \lambda x \in X. x \text{ counts as tall in } c, \text{ with respect to } X \]^11

The idea is this: comparative readings are obtained by via the directional particle \( \text{mai} \)^12, whose role is to determine what, aside from the argument of the predicate, is in the comparison class. By providing information about which individuals fall on which side of the \( c \)-class’s threshold for, say, tallness, a Fijian comparative yields inferences about relative degrees of height\(^\text{13}\). In a moment we shall show how this works in more detail. But for now let us acknowledge that this view of the contribution of \( \text{mai} \) cannot be quite the whole story. We have seen sentences employing \( \text{mai} \) whose meaning is not comparative as such. This is true of our example with \textit{surprising} (11), and of the example that we used to investigate focus association induced by \textit{only} (15). We shall amend our claim slightly in order to give a unified semantics for \( \text{mai} \) that can account for both comparative and non-comparative readings: \( \text{mai} \)’s role is to fix, not the \( c \)-class, but the domain of discourse. Given a \( c \)-class variable introduced by a gradable predicate, the value of this variable may be, but need not be, identical with the domain of discourse.

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11 What it is to ‘count as tall’ is of course a context-dependent matter not wholly accounted for by merely invoking comparison classes. A complete semantics might also incorporate a threshold variable determining the cut-off for tallness within the \( c \)-class, whose value is contextually supplied. I set these matters aside for simplicity’s sake.

12 One might wonder about the contribution of \( \text{vei} \), which follows \( \text{mai} \) in many of the examples we have seen. \( \text{Ve} \) is employed only when its complement is a proper name; when it is a person-denoting common noun phrase \( \text{vua} \) is used; with common noun phrases denoting inanimates no preposition is pronounced. Hence it seems that the prepositions are not semantically contentful, but rather appear for case reasons (presumably noun phrases that do not occur with an overt preposition are complements of a null \( P \) head).

13 This is essentially what Kennedy (2009) says about the contribution of \textit{compared to...} in English IC.
The second point to be mindful of is that we need to capture not only the comparative of superiority, but also the superlative: we have seen that these are morphosyntactically identical. Given this, we would expect to find sentences that have both a comparative of superiority reading and a superlative reading. This is what we find with (26). The extraordinary thing is that (26) also tolerates a third reading, (iii). Our task, then, is to give a semantics for *mai* that admits of the three possible readings for (26). It is to this task that we now turn.

(26) e balavu ‘o Hazel mai vei ira na kai Sikoti
3SG tall PERS.ART Hazel DIR PRP3PL ART people Scots
(i) ‘Hazel is taller than the Scottish people’.
(ii) ‘Hazel is the tallest Scottish person’.
(iii) ‘Hazel is tall for a Scottish person’.

Here’s the idea: a sentence of form ‘A is P *mai* B’ presupposes that the domain of discourse consists only of A, B and any individuals mentioned in P\(^14\). This presupposition is introduced by ‘*mai* B’, a predicate modifier which contributes no further semantic content. Before stating the semantics for *mai*, some technical preliminaries: we assume that if use of an expression E in a context c involves mentioning an individual x, then x is presupposed to be an element of the domain of discourse for c, ‘U\(_c\)’; hence for any context c which satisfies the presuppositions of an expression E that mentions an individual x, x \(\in\) U\(_c\). Presuppositions will be stated using the fraction-style notation employed in Sauerland (2005), whereby presuppositions are given on the top line, and semantic values appear on the lower line. (27) is the entry for *mai*\(^15\).

\[
(27) \left[\text{mai}\right]_{\text{\text{\(\in\)}},\text{\text{\(\in\)}},\text{\text{\(\in\)}},\text{\text{\(\in\)}}} = \\
\lambda x \lambda y \lambda w \lambda c. U_c = \{x\} \cup \{z : \forall c' \left[\text{domain}(P(y)) \rightarrow z \in U_{c'}\right]\}
\]

\[\left[P(y)(w)\right]_c^e = 1\]

Since the resulting presupposition merely concerns the structure of the domain of discourse, and doesn’t require a consensus concerning extralinguistic facts, it is easy to accommodate. Where a gradable predicate *g* is involved, a comparison class variable is introduced which in the unmarked case takes as its value the set of individuals in the domain of discourse (U)\(^16\). That is provided of course that g(U) is defined. We therefore need some constraints on what may be a suitable comparison class argument for a given gradable predicate. These are stated in (28).

\[(28) \quad \text{For any gradable predicate } g, \text{ any set } X \text{ and any context } c, \text{ } g(X) \text{ is defined in } c \text{ only if:} \]
\[
\begin{align*}
(i) & \quad \forall x [x \in X \rightarrow x \text{ counts as } g \text{ in } c, \text{w.r.t. } X \lor x \text{ counts as } \neg g \text{ in } c, \text{w.r.t. } X] \\
(ii) & \quad \exists x [x \in X \& x \text{ counts as } g \text{ in } c, \text{ w.r.t. } X] \\
(iii) & \quad \exists x [x \in X \& x \text{ counts as } \neg g \text{ in } c, \text{ w.r.t. } X]^{17}
\end{align*}
\]

\(^14\) The third provision is intended to accommodate sentences involving transitive verbs, such as (15).

\(^15\) The invocation of intensional types may seem superfluous just now; the pay off will come in the next section.

\(^16\) Cf. Klein (1980: 13): ‘In many cases, the comparison class is just the set of things that the participants in a conversation happen to be talking about at a given time’.

\(^17\) Arguments for (ii) and (iii) can be found in Klein (1980). (i) depart from Klein in making the simplifying assumption that there is no extension gap; we would need to invoke extension gaps, however, if we were to attempt to handle vagueness phenomena, a task which is unfortunately beyond the limits of what can be achieved here.
Putting everything together, we can provide a bottom-up derivation of the meaning of ‘Mary is tall mai John’ (= ‘Mary is taller than John’).

\[(29) \quad \sem{\text{mai}} = \lambda x, \lambda P_{c, e, x} \in C. \{ z : \forall c' [c' \in \text{domain}(P(y)) \to z \in U_c]\} \]
\[\quad \sem{\text{mai} (John)} = \lambda y, \lambda w \in C. \{ z : \forall c' [c' \in \text{domain}(P(y)) \to z \in U_c]\} \]
\[\quad \sem{\text{mai} John (tall_X)} = \lambda w \in C. \{ z : \forall c' [c' \in \text{domain}(\text{tall}_X (y)) \to z \in U_c]\} \]
\[\quad \sem{\text{tall}_X \text{mai John} (Mary)} = \lambda w \in C. \{ z : \forall c' [c' \in \text{domain}(\text{tall}_X (Mary)) \to z \in U_c]\} \]

Mary counts as tall in \(c\), with respect to \(X\), at \(w\)

The result: ‘Mary is tall mai John’ presupposes that the domain of discourse is \{John, Mary\}, and asserts that Mary counts as tall with respect to her \(c\)-class. We have a little more work to do to show that the sentence conveys that Mary is taller than John. The first step is to supply the value of the \(c\)-class variable. Since the domain consists of only John and Mary, the plausible answer is that these two individuals, and no others, make up the \(c\)-class. Given that the \(c\)-class must be a suitable argument for \(\text{tall}\), and Mary counts as tall by virtue of the meaning of the sentence, we can infer that John does not count as tall, by (28iii). Hence Mary is taller than John.

So much for the basic case. The challenge now is to show how a sentence of form ‘\(A\) is \(P\) mai \(B\)’ could have three different interpretations – ‘\(A\) is more \(P\) than \(B\)’, ‘\(A\) is the most \(P\) of the \(B\)’s’, and ‘\(A\) is \(P\) for a \(B\)’, as we found to be the case with (27). We have already shown how the comparative of superiority works. Notice that here, the two individuals being compared are presupposed to have disjoint reference. With the superlative and the ‘\(A\) is \(P\) for a \(B\)’ construction, the denotation of the subject is presupposed to be included in the set to which it is being compared. Presumably this is the reason for the contrast between (30a) and (30b,c).

\[(30) \quad \begin{align*}
\text{a.} & \quad \# \text{Chomsky is smarter than a linguist}^{18}. \\
\text{b.} & \quad \text{Chomsky is the smartest linguist.} \\
\text{c.} & \quad \text{Chomsky is smart for a linguist.}
\end{align*} \]

We propose that which interpretation is assigned to a sentence of form ‘\(A\) is \(P\) mai \(B\)’ is (partially) determined by whether the context includes only those worlds in which \(\sem{A}\) is included in \(\sem{B}\), or whether their denotations are presupposed to be disjoint. The latter case yields the comparative of superiority, in the manner already exemplified in (29). In the former case, we get either the superlative or ‘\(A\) is \(P\) for a \(B\)’. We shall deal with the latter case first, taking (26) as our case study. The reader can verify that given our semantics, (26) presupposes that the domain of discourse is \{Hazel\} \cup \sem{\text{the Scots}}\), and asserts that Hazel

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18 I have in mind the generic interpretation of a linguist. If this expression is interpreted as a singular indefinite, (30a) is much improved.
counts as tall, with respect to her comparison class. Let’s say then that the comparison class is \{Hazel\} \cup \mathbb{⟦}\text{the Scots}\mathbb{⟧}; since the interpretation we are interested in arises only in contexts that entail that \{Hazel\} \subseteq \mathbb{⟦}\text{the Scots}\mathbb{⟧}, the c-class is simply \mathbb{⟦}\text{the Scots}\mathbb{⟧}. The sentence therefore communicates that Hazel is in the proper subset of Scots who are tall; that is, that she is tall for a Scot.

To derive the superlative reading, we shall maintain our assumption that Hazel is presupposed to be a Scot, but add a second presupposition: that the threshold for tallness is such that only one member of the c-class falls into the proper subset of individuals that count as tall. Since the sentence asserts that Hazel is tall, it follows that she must be the tallest Scot.

With the semantics in place, we are now in a position to address the challenge from those of Kennedy’s diagnostics for strong implicit comparison that Fijian fails.

5 The problem of differential measure phrases

We need to explain why it is that Fijian, an SIC language, tolerates differential measure phrases. The first step is to appreciate why it is surprising to encounter such expressions in an SIC language. We are used to thinking of differential measure phrases as arguments of the function denoted by comparative morphology. Hence differential MPs require comparative morphology in order to enter into the semantic composition in the appropriate way. Since SIC languages lack such morphology, we expect that they will lack differential measure phrases too.

One reply to this line of argument is to point out that it takes it for granted that the only strategy UG makes available for differential MPs involves treating them as arguments of comparative morphemes. It is conceivable that other languages may have other strategies, and that Fijian may be such a language. This is a point worth making, but in fact one need not even go that far: it turns out that English has other strategies too. To see this, consider (31).

(31) a. John failed the exam by 20 points.
   b. Peter missed the target by 2cm.
   c. Mary won the race by 59 seconds.

Observe that fail the exam, miss the target, and won the race are not gradable predicates.\(^{19,20}\) As such, no degree phrase is projected and there is no place for comparative morphology. Nonetheless, differential measure phrases combine quite happily with these expressions. If we can give a semantics for English by-phrases that permits them to combine with the predicates in (31), we may be able to apply the same semantics to differential measure phrases in Fijian.\(^{21}\)

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\(^{19}\) I take the inability of these predicates to combine with comparative morphology or degree modifiers such as very or extremely as evidence that they are not gradable.

\(^{20}\) I learned after presentation of this work that these predicates were independently discovered and discussed in Schwarzschild (2008) His semantics for by-phrases occurring with these predicates is different from that given below.

\(^{21}\) I leave it to future research to discover what determines whether an English non-gradable predicate may
Note that to the extent that any comparisons are involved in (31), they are between actual and counterfactual situations. For example, (31a) says that John failed the exam and would not have done so had he scored 20 points more than he actually scored. The semantics to be proposed for an expression like by 20 points will build on this insight. We will treat the by-phrase as a predicate modifier whose semantics involves quantification over counterfactual worlds. The first thing to do is to describe an accessibility relation R between worlds (32).

$\forall w \forall w': <w,w'> \in R$ iff \( w' \) is just like \( w \) except that the number of points John received in \( w \) ≠ the number of points John received in \( w' \).

The counterfactual worlds relevant to the meaning of (31a) are only those in which the number of points John received is different from the number of points he received in the evaluation world. (32) ensures that the accessibility relation is sufficiently constrained to capture this. Next, we need an operator that can supply the difference between the number of votes John actually received and the number received in a counterfactual world. Call it \( \text{DIFF} \).

It is defined in (33).

For any two numbers \( n_1 \) and \( n_2 \), \( \text{DIFF}(n_1, n_2) = n_1 - n_2 \) if \( n_1 > n_2 \), or \( n_2 - n_1 \) otherwise.

Since MPs involve taking the measure of abstract individuals in particular units (length in feet, age in years, etc.), we introduce a measure function, \( \mu \), defined in (34).

A measure function \( \mu \) relativized to a class of unit \( m \) takes an individual \( u \) and a world \( w \) and returns a number \( n \) representing the measure of \( u \) in terms of \( m \)'s in \( w \).

Suppose John received 100 points in the actual world @. Then in @, the result of applying \( \mu_{\text{points}} \) to the points John received, written \( \mu_{\text{points}}(\text{points John received})@ \), is 100. (35) is a first attempt at providing truth conditions for (31a).

\[
\begin{array}{c}
\exists w: R(\@, w) \ [\text{DIFF}(\mu_{\text{points}}(\text{points John received})w, \mu_{\text{points}}(\text{points John received})@) = 20 \\
\& \ \neg \text{John failed the exam in } w] \ \text{ and} \\
\forall w': R(\@, w') \ [\text{DIFF}(\mu_{\text{points}}(\text{points John received})w', \mu_{\text{points}}(\text{points John received})@) < 20 \to \text{John failed the exam in } w']
\end{array}
\]

Before developing a compositional semantics, let’s check that we have got the truth conditions right. (35) says that ‘John failed the exam by 20 points’ is true just in case (i) John failed the exam; (ii) there is an accessible world \( w \) such that the difference between the number of points John received in \( w \) and the number of points he actually received is 20, and John passed the exam in that world, and (iii) in every accessible world \( w \) such that the difference between the number of points John received in \( w \) and the number of points he actually received is less than 20, John failed the exam. Suppose John needed at least 100 points to pass the exam, and scored 80 points – a scenario on which our example sentence is true. (i) holds in such a situation. (ii) also holds, since the only accessible worlds satisfying the first conjunct of the condition statement of the existentially quantified sentence are \( w_1 \), in which John scored 100 points, and \( w_2 \) where he scored 60 points. \( w_1 \) also satisfies the second

combine with a by-phrase. This research will shed further light on the semantics of the by-phrase; amendments to the current proposal will doubtless be needed. The semantics I propose seems adequate for Fijian comparatives, however.
conjunct, hence the condition specified by the existentially quantified sentence is satisfied. (iii) also holds, since any number of points less than 20 would fail to make a difference to whether or not John passed. We seem to be on the right track. The next step is to provide a semantics for expressions of form, \textit{by n units}.

Notice that we merely helped ourselves to \textit{points John received} as a suitable argument for \(\mu\). We can certainly improve on that. First, let the class of units to which the measure function is relativized be determined by the class of units mentioned in the \textit{by}-phrase – points in the example we have been considering. Next, assume that the argument \(u\) of the measure function is a contextually salient individual with the properties described in (36). Under these assumptions, \textit{points John received} is a suitable candidate value for \(u\).

(iii) also holds, since any number of points less than 20 would fail to make a difference to whether or not John passed. We seem to be on the right track. The next step is to provide a semantics for expressions of form, \textit{by n units}.

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(36)  
i. \(\mu_u(u)\) is defined (\(u\) can be measured in \(m\)’s).
ii. There is a contextually salient relation \(R\) which holds between \(u\) and the subject of the predicate that the \textit{by}-phrase modifies.

While we’re at it, let’s also define the accessibility relation more precisely:

(37)  
\(\forall w \forall w': \langle w, w' \rangle \in R \iff \mu_m(u) w \neq \mu_m(u) w'\) where \(u\) is the contextually salient individual which meets the conditions in (36), and \(m\) identifies the units mentioned in the \textit{by}-phrase.

We are now in a position to give a semantics for the \textit{by}-phrase, (38), and to show how this semantics enables the correct truth conditions for (31a) to be derived (39).

(38)  
\[\text{[by n m’s]} \circ_{\text{by}, \text{af}, \text{af}} = \lambda P_{\text{by}, \text{af}, \lambda x, \lambda w \in c.} P(x)(w) = 1 \& \exists w': R(w, w') [\text{DIFF}(\mu_m(u)_w, \mu_m(u)_w) = n \& \neg(P(x)(w') = 1)] \& \forall w'': R(w, w'') [\text{DIFF}(\mu_m(u)_w, \mu_m(u)_w) < n \rightarrow P(x)(w'') = 1]\]

(39)  
\[\text{[by 20 points]} \circ_{\text{by}, \text{af}, \lambda x, \lambda w \in c.} P(x)(w) = 1 \& \exists w': R(w, w') [\text{DIFF}(\mu_{\text{points}}(u)_w, \mu_{\text{points}}(u)_w) = 20 \& \neg(P(x)(w') = 1)] \& \forall w'': R(w, w'') [\text{DIFF}(\mu_{\text{points}}(u)_w, \mu_{\text{points}}(u)_w) < 20 \rightarrow P(x)(w'') = 1]\]

The semantics applies straightforwardly to Fijian. Consider (23) again. We treat \textit{e na dua na yabaki} (‘by one year’) as a predicate modifier whose semantics fits the template of that
given for English by-phrases in (38). (40) is a bottom-up derivation of the truth conditions of (23).

(40) [[by one year]] = λP λx λw e c. P(x)(w) = 1 & ∃w': R(w,w') [DIFF(µ_year(u)w, µ_year(u)w) = 1 & P(x)(w') = 0] & ∀w'': R(w,w'') [DIFF(µ_year(u)w', µ_year(u)w) < 1 → P(x)(w'') = 1]

[[by one year (oldX mai Peter)]]
= λx λw e c. U_c = {x} \cup Peter
[[oldX mai Peter(x)(w)]] = 1 & ∃w': R(w,w') [DIFF(µ_year(u)w, µ_year(u)w) = 1 & ¬([[oldX mai Peter(x)(w)]] = 1)] & ∀w'': R(w,w'') [DIFF(µ_year(u)w', µ_year(u)w) < 1 → [[oldX mai Peter(x)(w'')]] = 1]

(23) is thus true just in case (i) Mary is older than Peter; (ii) if she were a year younger, she would not be older than Peter; and (iii) in every accessible world w' such that the difference between Mary’s age in w'' and her actual age is less than a year, Mary is older than Peter. We have provided a semantics for differential MPs which makes no appeal to degrees; unlike Kennedy, we think that tolerance of differential MPs is no evidence against an SIC analysis.

6 The problems of crisp judgment contexts and implicatures

The problem of Fijian comparatives being felicitous in crisp judgment contexts can be rather more quickly dispensed with. The strategy will be to identify the property of English adjectives that renders SIC impossible in these contexts, and to explain that since this property is lacking in Fijian, the same issues do not arise for that language. The first step is provided by Kennedy (2007a); the second step is a natural consequence of the analysis we have proposed.

According to Kennedy (2009), the infelicity of SIC in crisp judgment contexts is due to the adjective combining with an operator pos whenever it appears in its positive (non-comparative) form. Kennedy’s semantics for pos is reproduced as (41).
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(41) \[ |_{\text{deg pos}} | = \lambda g \lambda x. g(x) \geq s(g) \] (Kennedy 2007a)

‘where \( s \) is a context sensitive function that chooses a standard of comparison in such a way as to ensure that the objects that the positive form is true of ‘stand out’ in the context of utterance, relative to the kind of measurement that the adjective encodes’.

According to Kennedy, the failure of SIC in crisp judgment contexts is failure of the standard of comparison given by the complement of \( \text{to in compared to} \) to possess the relevant property to a sufficiently lesser degree from the subject so that the subject ‘stands out’. Given our analysis, it is no surprise that the constraints imposed by the \( \text{pos} \) operator are absent from Fijian: in that language, adjectives do not combine with degree morphology, of which \( \text{pos} \) is an instance. It is therefore a virtue, rather than a drawback of the theory that Fijian fails the crisp judgments test.

Another pleasing aspect of our proposal is that it predicts that Fijian should pass the implicature test that it does pass, and that it should fail the implicature test that it does fail. Recall that we found that Fijian comparatives give rise to negative implicatures concerning the standard of comparison, but do not produce negative implicatures for the subject. This is just as we should expect: by the lights of our analysis, a sentence of form ‘A is P mai B’ asserts that A is P and communicates (by virtue of the meaning of \( \text{mai} \) and general principles governing the nature of comparison classes) that B is not P. It seems we have discovered some differences between SIC in a language with comparative morphology, and SIC in an SIC-only language.

7 Conclusions

It seems that there are indeed strong implicit comparison-only languages – that is, languages that lack degree morphology. Moreover, SIC is not limited to the conjoined comparative, but can also occur as a separative comparative. We close by asking what makes an SIC language.

We have already seen the beginnings of an answer to this question: the Degree Semantics Parameter of Beck et. al. stated in (24). One question that Beck et. al. do not address is how the child determines the correct setting of this parameter. I take it that the properties of SIC discussed here, which mostly concern truth conditions and usage conditions, are not well suited to this purpose. Here is a way of approaching the problem. Suppose that degree arguments of gradable predicates, and quantifiers over (sets of) degrees (comparative morphology), are generated in the syntactic position labelled Deg. A language that has predicates that take degree arguments – that is, a language that has the positive setting of the DSP – will have syntactic material that occupies Deg. A language that has the negative setting of the DSP will not, which is just to say that Deg will not be projected. I take it that the presence of particular types of material constitutes a better basis on which to set a parameter than the absence of such material. Hence the default setting for the DSP will be the negative one. The parameter will be set positively just in case items occupying Deg (degree arguments or quantifiers over degrees) are encountered in the language. One prediction of this view is that any language that is not a strong implicit comparision language will have some overt material occupying Deg. If Japanese is a WIC language which employs a covert item meaning \( \text{more} \), we will have to search beyond the comparative of superiority to find such overt material. The superlative seems to be the place to look: Aihara (2009) gives
an analysis of the Japanese superlative based on the assumption that *ichiban* is the Japanese counterpart of *–est*. Encountering a superlative morpheme might then be what tells the child that she is learning Japanese and not Fijian.

Another issue raised by the DSP is that it commits us to the view that there is cross-linguistic variation in the type assigned to lexical items of the same syntactic category. This idea is not without precedent: Chierchia (1998) proposes that different languages have different options concerning the type(s) to which nouns are mapped. It is worth noting, however, that our analysis of Fijian is compatible with a more conservative view whereby the locus of variation is confined to the syntactic component. The relevant parameter is stated in (43).

(43) *Degree Head Parameter*

A language {does/does not} have the functional category Deg.

Locating the variation we find in the Degree Head Parameter would require a qualification of our proposal that gradable predicates in Fijian have a different type from that usually assigned to the corresponding English items in the semantic literature. Kennedy (2007b) provides a response to this challenge: gradable predicates are of the same type cross-linguistically, with no degree argument even for English. Degree arguments are introduced via type-shifting operations that come about as a consequence of the presence of degree morphology — items occupying Deg. Once again, the default setting of the parameter is negative; the child only sets the parameter positively if she encounters material occupying Deg. A correlation between the presence of Deg, the presence of degree morphology, and the availability of degree arguments in a given language is thereby maintained. We end then with a choice between locating variation in syntax and locating it in semantics. Since both possibilities seem to be compatible with the proposal described in this paper, I leave it to future research on a broader range of languages to determine the exact nature of the parameter responsible for cross-linguistic variation in the availability of comparative morphology.

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Toward a Structural Account of Conservativity

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Abstract

In this paper I propose a structural account of conservativity, which derives it as a byproduct of the syntax-semantics interface. In this approach, the reason for the absence of non-conservative determiners from natural languages is that in entering chain relations in the syntax, they would either lead to trivial meanings (in a sense to be made precise) or to quantificational clauses truth-conditionally equivalent to ones created by regular conservative determiners. In the latter case, I will argue that they do in fact exist but they are undetectable. As for the former case, I will argue that they are excluded because they lead to triviality, either formulated in terms of a constraint against ‘pointless’ lexical items, or with a notion of logical triviality which leads to ungrammaticality (Gajewski, 2002). Finally, I will explore two possible principles that should be coupled with either of the two: (1) DPs always move (2) DPs should always be moveable and will give some arguments for adopting the first principle in (1).

1 Introduction

A standard way of thinking about the meaning of natural language determiners is as functions from sets to generalized quantifiers, type \( \langle \langle e, t \rangle, \langle et, t \rangle \rangle \). Given the huge number of logically possible functions of this type (see discussion and proof in Keenan and Stavi (1986)), one of the aims in the semantics literature, since the introduction of Generalized Quantifier Theory in linguistics, has been defining precisely the range and the properties of those functions that can serve as possible semantic denotations for determiner expressions (Barwise and Cooper (1981), Keenan and Stavi (1986), Van Benthem (1983), Higginbotham and May (1981) among others\(^1\). Among the properties individuated, Conservativity is probably the most famous. Conservativity is a property of functions, which is intuitively based on the question of which individuals are relevant for truth conditions calculation. More precisely, the meaning of a determiner expression \( \text{dax} \) is conservative if and only if given two sets \( A, B \) as arguments, to check the truth conditions of \( \llbracket \text{dax} \rrbracket (A)(B) \), only the individuals in \( A \) are relevant\(^2\).

\(^1\)For Generalized Quantifier Theory see Mostowski (1957) and Lindstroem (1966).
\(^2\)In the following I will sometimes use ‘determiner’ to indicate the function which serves as the denotation of the determiner expression and sometimes to refer to the expression itself. Where confusion
Conservativity = def
A determiner $D$ is conservative iff for all $A, B \subseteq E$:
$D_E(A, B) \iff D_E(A, A \cap B)$

Sometimes an informal natural language version of the equivalence in (1) is given, as in (2-a) and (2-b).

(2) a. Every elephant is gray $\iff$ Every elephant is a gray elephant
   b. Most linguists are friendly $\iff$ Most linguists are friendly linguists.

The observation that all English determiners exhibit this property, has led Keenan and Stavi (1986) to the conjecture of the universal in (3)\(^3\).

(3) Conservativity Universal:
Extensional determiners in all languages are always interpreted by conservative functions.

(3) is a robust and accepted generalization, which has persisted through the years, despite putative counterexamples. To my knowledge, conservativity still does not have a satisfactory and complete explanation, though there are suggestions on how to derive it in the literature, to which I won’t be able to do justice here. Rather, in the following I will put forward a new proposal, based on the syntax-semantics interface. In this approach there is no direct ban on non-conservative determiners, in fact some of them are predicted to exist in natural language, though the claim is that we don’t see them because the meanings they give rise too are indistinguishable from others obtained by regular conservative determiners.

2 A New structural account of Conservativity

2.1 The idea in informal terms

In the structural account of conservativity that I will propose here (‘SC’ henceforth), conservativity is not a direct constraint on the lexicon, rather it is a byproduct of the syntax/semantics interface. This approach is suggested in footnotes in Chierchia (1995) could arise I will refer to the latter as ‘determiner expression’.

\(^3\)Barwise and Cooper (1981) have instead two stronger universals that entail this:

(i) NP-Quantifier Universal: Every natural language has syntactic constituents (called noun-phrases) whose semantic function is to express generalized quantifiers over the domain of discourse.

(ii) Determiner Universal: Every natural language contains basic expressions, (called determiners) whose semantic functions to assign to common count noun denotations (i.e., sets) A a quantifier that lives on A (Barwise and Cooper (1981:177))

See von Fintel and Matthewson (2008) for a discussion of these two universals.
and Fox (2002) and it is based on the assumption that there are contentful traces in the syntax. The gist of the idea is in (4), which I will call the Chierchia-Fox hypothesis:

\[(4) \text{ Chierchia-Fox hypothesis: If a non conservative determiner existed, it would always lead to a trivial meaning.}\]

Below I will discuss the notion of triviality as ungrammaticality and will also present some counterexamples to (4) and consequently propose a modification of it. But first let’s see the assumptions and some predictions of SC.

### 2.2 Some Assumptions on the interpretation of Chains

In the following I will assume a syntax semantics mapping that is based on a syntactic structure interpreted by the semantic component (Logical Form) where the (second) arguments and the scope of quantifiers can be determined by movement operations (see Heim and Kratzer (1998), Fox (2003) and Jacobson (2002) for discussions of the arguments and comparison with alternative approaches.). I will also crucially assume the Copy Theory of Movement (Chomsky (1993) and Chomsky (1995)) in which movement transformations are conceptualized just as a copying operation followed by phonological deletion. The copy theory has the advantages of eliminating traces and making movement a simpler operation (merge), but more importantly for us here, it opens new perspectives on how chains should be interpreted. In fact, in a framework with traces it was natural to interpret the trace of the moved item as a bare variable (Heim and Kratzer, 1998) and one could also stipulate that this is what happens to copies too, but there are more interesting options (see Fox (2003) for discussion).

For the sake of the discussion here, I will make some simplifications concerning the semantics for chains. So for a sentence like (5), I will not go into the internal composition of the VP and I will just assume the meaning for the entire VP as in (6).

\[(5) \text{ Polanski likes every movie.}\]

\[(6) \lambda z[\text{likes}(z, [1]^g) \land \text{movie}([1]^g)]\]

\[(7) \lambda x[\text{likes}(p, [1]^g[x/1]) \land \text{movie}([1]^g[x/1])]\]

So the meaning of the whole sentence would be ‘everything that is a movie is liked by
Polanski and it is a movie’. Which we can represent in predicate logic or in set notation as in (8-a) and (8-b) respectively.

(8) a. \( \forall x [\text{movie}(x) \rightarrow (\text{likes}(p, x) \land \text{movie}(x))] \)

b. \( \{x : x \text{ is a movie}\} \subseteq \{\{y : y \text{ is liked by Polanski}\} \cap \{z : z \text{ is a movie}\} \}

To be sure, SC is compatible with a class of semantics of chains, as long as somehow the NP part of the copies is interpreted at the tail and at the head of the chain. In Romoli (2009) I discuss different semantics of chains and their compatibility with SC, in particular, trace conversions (Fox (1999) and Fox (2003), Sauerland (2004)).

### 2.3 Predictions for non-conservative determiners

The Chierchia-Fox hypothesis is that if non conservative determiners existed, in entering chain relations, they would lead to trivial meanings. In order to test this prediction, consider some made-up non conservative determiners defined on the complement of the restrictors, let’s call them everynon, somenon and nonon, the denotations of which are given in (9), (10) and (11)\(^4\).\(^5\).

\[
(9) \quad [\text{everynon}] = \lambda P \lambda Q [P^{-} \subseteq Q] = \\
= \lambda P \lambda Q \forall x [\neg P(x) \rightarrow Q(x)]
\]

\[
(10) \quad [\text{somenon}] = \lambda P \lambda Q [(P^{-} \cap Q) \neq \emptyset] = \\
= \lambda P \lambda Q \exists x [\neg P(x) \land Q(x)]
\]

\[
(11) \quad [\text{nonon}] = \lambda P \lambda Q [(P^{-} \cap Q) = \emptyset] = \\
= \lambda P \lambda Q \neg \exists x [\neg P(x) \land Q(x)]
\]

To illustrate these possible determiners at work, consider a sentence like (12) and a

---

\(^4\)The former is used in Chierchia and McConnell-Ginet (2000), see also von Fintel (1994). Notice that these are not those cases of lexicalization gaps of the ‘south east corner’ of the square of oppositions for connectives and quantifiers as observed in Horn (1972) and Horn (1989). The case of the universal quantifier is usually called notall and has the definition in (i), which is perfectly conservative as shown by the equivalence in (ii):

\[
(i) \quad [\text{everynon}] = \lambda P \lambda Q \forall x [P(x) \rightarrow Q(x)] = \\
= \lambda P \lambda Q \forall x [P \cap Q^{-}] \neq \emptyset
\]

\[
(ii) \quad \{P \cap Q^{-}\} = \emptyset \iff P \cap \{P \cap Q^{-}\} = \emptyset
\]

For an explanation based on the notion of generalized scalar implicatures and markedness of negation see Horn’s work cited above (see also Levinson (2000)). For a recent different interesting proposal within a system where logical operators are based on min and max operators see Katzir and Singh (2008). It is not clear to me whether there is a relation between the absence of lexicalization of operators of this sort and non-conservative ones and I will leave this topic for future research.

\(^5\)For any set A, A\(^-\) is the complement of A, that is the domain \(D - A\). Also, whenever possible I will give the meaning of quantifiers in predicate logic.
possible LF of it in (13), where the DP [everynon movie] has moved from its object’s position.

(12) Polanski likes everynon movie

(13) [everynon movie] [\(\lambda_i [\text{Polanski} [\text{likes} [\text{the movie}], i]]\)]

As is evident from the informal paraphrases given below, if we apply these meanings to the sentence above, the result is contradictory. The same result is obtained if we replace everynon with somenon and we obtain a tautological meaning instead if we replace it with nonon.

(14) a. \(\forall x \neg \text{movie}(x) \rightarrow (\text{likes}(p, x) \land \text{movie}(x))\)
   b. \(\{x : x \text{ is not a movie}\} \subseteq \{\{y : \text{polanski likes } y\} \cap \{z : z \text{ is a movie}\}\}
   c. For everything \(x\) that is not a movie, Polanski like \(x\) and \(x\) is a movie.

(15) a. \(\exists x [\neg \text{movie}(x) \land (\text{likes}(p, x) \land \text{movie}(x))]\)
   b. \(\{x : x \text{ is not a movie}\} \cap \{\{y : \text{polanski likes } y\} \cap \{z : z \text{ is a movie}\}\} \neq \emptyset
   c. There exists an \(x\) that is not a movie and Polanski likes \(x\) and \(x\) is a movie.

(16) a. \(\neg \exists x [\neg \text{movie}(x) \land (\text{likes}(p, x) \land \text{movie}(x))]\)
   b. \(\{x : x \text{ is not a movie}\} \cap \{\{y : \text{polanski likes } y\} \cap \{z : z \text{ is a movie}\}\} = \emptyset
   c. It is not the case that there exists an \(x\) that is not a movie and Polanski likes \(x\) and \(x\) is a movie.

As we will see a similar result is obtained also for other made-up non conservative determiners. From now on, I will use a more schematic way to present the relevant cases, by inventing a symbol, the \(\leftrightarrow\), to mean something like ‘equivalent once interpreted with the syntactic-semantic regime of SC’. So for instance everynon would be presented as follows, where in (a) there is the lexical meaning of the determiner and in (b) the output given the syntax-semantics assumed here.

(17) a. \([\text{everynon}] = \lambda P \lambda Q [P^c \subseteq Q]\)
   b. \([\text{everynon}] (A, B) \equiv A^c \subseteq (A \cap B)\)

Similar cases of possible non-conservative determiners include the proper subset relation, which is non-conservative and which here would lead to quantificational clauses that are always false.

(18) a. \([\text{propsub}] = \lambda P \lambda Q [P \subset Q]\)
   b. \([\text{propsub}] (A, B) \equiv A \subset (A \cap B)\)

Also the (non-conservative) superset or equal relation leads to a trivial (always true) meaning.

(19) a. \([\text{superseteq}] = \lambda P \lambda Q [P \supseteq Q]\)
b. \([\text{superseteq}] (A, B) \equiv A \supseteq (A \cap B)\)

Notice that *Only* has been sometimes given the meaning of a non conservative *determiner* encoding the superset or equal relation as in (20) (see De Mey (1996) among others).

\[
(20) \quad [[\text{Only}] = \lambda P \lambda Q[P \supseteq Q] \\
\quad \lambda P \lambda Q \forall x [Q(x) \rightarrow P(x)]
\]

The case of *only* is too complicated to be discussed here, and in the literature there are various arguments against the idea of treating it as a determiner with the analysis in (20) (see von Fintel (1999) and Ippolito (2008) among others for some discussion) I just wanted to point out that regardless of the analysis of *only* the superset or equal relation is a potential non-conservative *determiners* and it is predicted to lead to a trivial meaning in SC.

Summing up, what we have seen so far are cases of non-conservative determiners, which create trivial meanings if put in a chain with copies interpreted with direct restriction as above. In the following I will turn to more detailed predictions and implications of SC and in particular to the issue of triviality, of which SC makes crucial use.

3 On triviality

3.1 Which notion of triviality?

A necessary step for SC is to assume that words that lead to trivial meanings are banned. A constraint that excludes trivial meanings and triviality as ungrammaticality have been adopted in different linguistic domains (see among others Barwise and Cooper (1981), Chierchia (1984), Gajewski (2002), Fox and Hackl (2007)). One general issue for these proposals is how to distinguish these trivial meanings from other (at least apparent) contradictions and tautologies that are grammatical, like (21) and (22) for instance.

\[
(21) \quad \text{War is war}
\]

\[
(22) \quad \text{He’s an idiot and he isn’t} \quad (\text{Fox and Hackl, 2007})
\]

Also, more relevant for the discussion here is whether a constraint against trivial sentences would be enough for ruling out cases of possible non-conservative determiners. As for the first issue, I think there are at least two options: one is based on the observation that natural language does not seem to lexicalize completely pointless words. Consider as an analogy a word like *dax* that would mean ‘it is both true and false’. It is reasonable to think that this is not attested crosslinguistically as a word, though it is conceivable that it could be lexicalized and it would be understood with no difficulties. So one idea would be that non-conservative determiners are pointless in the
same way, and one evidence in favor of this route is that one can introduce artificially
non-conservative determiners in the language, as I did already and I will do again
later below, and they seem understandable and usable in a different way than other
expressions that are more clearly ungrammatical. For the purposes here an intuitive
constraint against the lexicalization of pointless expressions might be enough.

A second option is to adopt a more technical notion of triviality, linked to ungram-
maticality (Gajewski, 2002). As mentioned above, the task for this kind of approach
is to define a relevant subset of the trivial sentences and link that subset to ungram-
maticality. Gajewski (2002) proposes to adopt an algorithm that takes LF structure
and transform them by substituting all the non-logical constants with variables with
different indices. The output obtained is checked by a semantic system in order to see
whether it is trivial. If this system can compute triviality at that level, then the sentence
is logically-trivial (always true/false only in virtue of its logical structure). The rele-
vant question here is whether trivial outputs of sentences containing non conservative
determiners are logically trivial in this sense.

(23) Polanski likes every non movies

(24) [every non movie] [λ1 [Polanski like [every non movie]1]]

The logical constants in this sentence is every non. Crucially, we have to add an
assumption about substitution of copies: I will assume that they are substituted in the
logical skeleton by the same variable.

(25) [every non NP1, e, t] [λi [DP2, e VP3, e, t] NP1, e, t]

In this case the sentence would be indeed L-trivial as under every assignment g, g(NP1, e, t)
will always be the same. That is the system would be able to detect the triviality from
the logical skeleton alone.

(26) ∀z[¬P1, e, t](z) → (R3, e, t)(x2, e, z) ∧ P1, e, t](z)]

So Gajewski (2002)’s account and the assumption that copies are substituted at the
logical skeleton by the same variable, would work for cases as above.

(27) L-trivial meanings are ungrammatical

Still, as we will see now, in order to indirectly exclude non-conservative determiners,
both (27) and the previous hypothesis, just ruling out pointless lexicalization, are not
efficient. In particular I can see two problems: one is DPs in subject positions and the
other is a more specific case that could arise, if we allow late merger of relative clauses.

6Thanks to Noam Chomsky(p.c.) and Ede Zimmermann(p.c.) for independently pointing out this
to me. Thanks to Noam Chomsky also for the example of ‘it is both true and false’.
3.2 Two problems

3.2.1 DPs in subject positions

The first problem is constituted by DPs in subject position, which are normally assumed to be interpreted in situ, at least in some cases, given that they are interpretable there. If this is the case, though, they would not create pointless or logically trivial meanings, as it is evident from the example below.

(28) a. Everynon student smokes
b. $\forall x[\neg \text{student}(x) \rightarrow \text{smoke}(x)]$

This is of course a consequence of the fact that the meanings of these non-conservative determiners are not trivial by themselves, but become trivial only under the particular transformation that the syntax-semantics assumed here leads to. In other words, if this transformation doesn’t occur, the meanings are perfectly contingent, hence we are back to the situation in which it is not obvious why the determiner expressions encoding them should be excluded.

3.2.2 Late merge and non-conservativity

Another problematic predictions is made under some particular assumptions that allow late merge after QR, like in the account for adjunct-extraposition from NP by Fox and Nissenbaum (1999) or the one of Antecedent Contain Deletion by Fox (2002). In fact, in theory, we could create a case, like (29), where we first QR the non conservative DP everynon movie and then we late merge the relative clause that is Italian.

(29) Polanski likes everynon movie that is Italian.

(30) a. [rightward QR]
In fact, if we run the semantic computation on the LF thereby created, the output turns out to be non-trivial (something that we could paraphrase as: ‘for every thing that is not an Italian movie, Polanski likes it and it is a movie’)

\(\forall x[\neg(movie(x) \land \text{italian}(x)) \rightarrow (\text{likes}(p, x) \land movie(x))]\)

There are at least two possible responses to these problems and I will outline them below.

4 Responses

4.1 DPs always move

The first hypothesis is simply stipulating that DPs have to move in all cases (i.e. QR is obligatory - even if very short). As the reader can immediately see, this entails that DPs in subject position would not be a problem anymore. As for late merge, one can adopt the system of Fox (2000)’s, in which the output of every scope shifting operation must be checked by the semantic component. So the output of QR before late merge is checked by the semantic component. Building on Fox (2002)’s licensing condition of late merge if we add to the conditions of scope economy that the output should not be logically trivial, then the first step in the derivation in (27) above would be blocked and this could account for this type of potential counterexamples.

4.2 DPs should always be moveable

The second possibility is that DPs should always be moveable, even if they don’t move in practice. The intuition behind this is that even if DPs are allowed not to move in some cases, they should always be ‘moveable’, because there are reasons for

\(^{7}\text{thanks to Danny Fox(p.c.) for pointing this out to me.}\)
allowing them to move at least in some cases from every position (i.e. scope ambiguities resolution, binding pronouns, Antecedent Contained Deletion...). Let’s state this with a principle along the following lines, (let’s call the relevant syntactic relation: ‘congruence’ relation):

(32) a. ban a structure $\Sigma$ if it is congruent with $\Sigma'$, such that $[\Sigma']$ is logically-trivial:
b. congruence: $\Sigma$ is congruent with $\Sigma'$ iff either (1) or (2):
   1. $\Sigma'$ is identical to $\Sigma$
   2. $\Sigma'$ can be derived by $\Sigma$ by a single (permissible) application of movement.

As long as the structure in which they are is syntactically ‘congruent’ with another, the interpretation of which is trivial, then it is excluded. Both subject DPs and late merge would not be a problem anymore. The former is self evident, the latter also if one considers that once the relative clause is late merge, the entire DP is in a position in which it should be moveable again, but this is not the case, because it would lead to triviality, as the reader can verify.

5 Some potential counterexamples

5.1 Contingent non-conservative determiners

Recall that the prediction of the Chierchia-Fox hypothesis for non-conservative determiners is that they should always lead to triviality. So what we don’t expect is to find cases of determiners that don’t lead to triviality and that are also non-conservative. But indeed we do find such cases, consider the relation of larger cardinality, call the corresponding potential non conservative determiner ‘Korgat’ (I will give them monster names).

(33) a. $[\text{Korgat}] = \lambda P \lambda Q [|P| > |Q|]$
b. $[\text{Korgat}] (A, B) \iff |A| > |A \cap B|$

It is straightforward to show that $[\text{Korgat}]$ is contingent:

1. if $A \subseteq B$
   (a) then $(A \cap B)$ become simply $A$ hence
   (b) $|A| > |A \cap B|$ becomes $|A| > |A|$ which is always false

2. if $A \nsubseteq B$:
   (a) then $(A \cap B)$ is either $\emptyset$ or some non-empty proper subset of $A$ itself.
   i. in the first case $|A| > |A \cap B|$ becomes $|A| > 0$ which is true, if we assume that
      non-emptiness of the domain of quantification is provided independently.
Toward a Structural Account of Conservativity

ii. in the second case $\lvert A \rvert > \lvert A \cap B \rvert$ becomes always true, given that in this last case $A \cap B$ can only be a subset of $A$.

3. Hence we have cases in which $[\text{Korgat}]$ is true and cases in which it is false, this it is contingent.

Also the identity relation, aka $[\text{Minulzur}]$ gives the same problem:

\begin{equation}
\begin{aligned}
(34) \quad &a. \quad [\text{Minulzur}] = \lambda P \lambda Q[\lvert P \rvert = \lvert Q \rvert] \\
&b. \quad [\text{Minulzur}](A, B) \iff \lvert A \rvert = \lvert (A \cap B) \rvert
\end{aligned}
\end{equation}

As shown below, $[\text{Minulzur}]$ is contingent:

1. if $A \subseteq B$
   
   (a) then $(A \cap B)$ become simply $A$ hence
   
   (b) $\lvert A \rvert = \lvert A \cap B \rvert$ becomes $\lvert A \rvert = \lvert A \rvert$ which is always true

2. if $A \nsubseteq B$
   
   (a) then $(A \cap B)$ is either $\emptyset$ or some non-empty proper subset of $A$ itself.
   
   (b) in both cases $\lvert A \rvert = \lvert A \cap B \rvert$, which is false, provided again an independent condition
   that prevents emptiness of the domain of quantification.

3. So, also for $[\text{Minuzur}]$ we have contingency

Consider $[\text{Zeesnook}]$, which relates two sets with identity directly, or $[\text{Sakalthor}]$, which is
the superset relation. As the reader can verify, they both lead to contingent meanings (the
latter for instance is always true, unless $A \subseteq B$, then $A \supset (A \cap B)$ becomes $A \supset A$).

\begin{equation}
\begin{aligned}
(35) \quad &a. \quad [\text{Zeesnook}] = \lambda P \lambda Q[\lvert P \rvert = \lvert Q \rvert] \\
&b. \quad [\text{Zeesnook}](A, B) \iff A = (A \cap B)
(36) \quad &a. \quad [\text{Sakalthor}] = \lambda P \lambda Q[\lvert P \rvert \supset \lvert Q \rvert] \\
&b. \quad [\text{Sakalthor}](A, B) = A \supset (A \cap B)
\end{aligned}
\end{equation}

Other minor variations, lead to contingency, like $[\text{Balkumagan}]$ expressing the the first set
is empty or $[\text{Glusterhap}]$ relating the two cardinalities of the arguments to the same number:

\begin{equation}
\begin{aligned}
(37) \quad &a. \quad [\text{Balkumagan}] = \lambda P \lambda Q[\lvert P \rvert \cup \lvert Q \rvert = \lvert Q \rvert] \\
&b. \quad [\text{Balkumagan}](A, B) \iff A \cup (A \cap B) = (A \cap B) \\
&A = (A \cap B)
(38) \quad &a. \quad [\text{Glusterhap}] = \lambda P \lambda Q[\lvert P \rvert = 3 \land \lvert Q \rvert = 3] \\
&b. \quad [\text{Glusterhap}](A, B) \iff \lvert A \rvert = 3 \land \lvert (A \cap B) \rvert = 3
\end{aligned}
\end{equation}

Summing up, there are cases of potential determiners that have non-conservative meanings but
that do not lead to trivial structure (in the sense above).
6 The response: they do exist!

If we look at the meanings above, it turns out that the truth-conditions of all of them correspond to the ones of existing determiners. In fact, \([\text{korgat}]\), once fed the appropriate argument, is equivalent to *not every*: always true, unless \(A \subseteq B\).

\[\[\text{korgat}\](A, B) \iff |A| > |A \cap B| = (A \not\subseteq B)\]

Similarly, the other cases either correspond to the meaning of sentences created by *every* or *not every* or some numeral.

\[\[\text{Minulzur}\](A, B) \iff |A| = |(A \cap B)| = (A \subseteq B)\]

For instance when is \([\text{Minulzur}]\)(A, B) true? only when \((A \cap B) = A\) and this is so when \(A \subseteq B\). The same goes for the others.

\[\[\text{Zeesnook}\](A, B) \iff A = (A \cap B) = (A \subseteq B)\]

\[\[\text{Sakalthor}\](A, B) = A \supset (A \cap B) = (A \not\subseteq B)\]

\[\[\text{Balkumagan}\] = \lambda P \lambda Q[P \cup Q = Q]\]

\[\[\text{Balkumagan}\](A, B) \iff A \cup (A \cap B) = (A \cap B) = (A \subseteq B)\]

As for the case of the identity related to a number, it ends up being identical to the meaning of the numeral.

\[\[\text{Glusterhap}\](A, B) \iff |A| = 3 \land |(A \cap B)| = 3 = (A \subseteq B \land |A| = 3)\]

The moral is that they should not be excluded after all. In fact, as far as we can tell, these could be the meaning of *every* or *not every* or a numeral determiner, or in other words we could not distinguish them from the meaning of *every* and *not every* and numerals.

\[\[\text{every}\] = \lambda P \lambda Q[P \subseteq Q]\]

The former do exist, while for the latter we can adopt a story along the lines of Horn (1989) that would account for his non-existence (see also Katzir and Singh (2008) and footnote 4 above). Summing up, it seems that the potential counterexamples could be explained away by showing that they are equivalent to the meaning of existing determiners. To put it differently, we could say that the Chierchia-Fox hypothesis was not completely correct, in fact it is not the case that if non-conservative determiners existed, they would always lead to triviality but rather it should be that if non-conservative determiners existed, they either lead to trivial meanings or to...
contingent meaning that are equivalent to the ones obtained by some conservative determiners.

6.1 But wait a minute! what if they don’t move?

A remaining issue, though, is with one the two choices above (DPs always move or DPs should always be moveable). In fact if we decide not to enforce QR always, then in the cases where the monsters above are in subject position they should ‘reveal their true nature’. That is to say, if they don’t move they retain their non-conservative meaning, whereas if they do they ‘become’ conservative.

\[
\frac{(46)}{[\text{Minulzur}([\text{students}]) [\text{smoke}])}
\]

\[
\begin{align*}
\text{(47) a. } |\{x : x \text{ is a student}\}| &= |\{y : y \text{ is a smoker}\}| \\
\text{b. } \{x : x \text{ is a student}\} &\subseteq \{y : y \text{ is a smoker}\}
\end{align*}
\]

\[
\begin{align*}
\text{(48) a. } &\text{the cardinality of the set of students equals the one of the smokers.} \\
\text{b. } &\text{every student smokes.}
\end{align*}
\]

The first option is of course excluded if we assume that QR is always obligatory. It seems then that we would have to assume that DPs always move after all. This would ensure that if non-conservative determiners existed, they would either lead to trivial meanings or to contingent one equivalent to ones obtained with conservative determiners.

Summing up: SC indirectly excludes non conservative determiners by a ban on structures mapped to logically-trivial meanings. It allows for a link between the constraint of ‘conservativity’ and the syntactic category of determiners, as it is crucially based on the syntax of DP movement. There are some counterexamples that can be solved if it is assumed that DPs always move. This route then requires finding some independent justification for triggering movement of DPs always.

7 Conclusion

In this paper I have developed and explored an account of conservativity based on the copy theory of movement following suggestions in Chierchia (1995), Fox (1999) and Fox (2002). The first idea, which I called the Chierchia-Fox hypothesis, is that non-conservative determiners do not exist because they would always lead to trivial meanings. I have also discussed the problems posed to such formulations by subject DPs and Late merge and I have proposed to either deal with them by saying that DPs always move or that DPs should always be moveable. Finally, I have discussed some potential counterexamples and shows that they can be dealt with if we choose the first option (QR is obligatory), in fact if they always move they become equivalent to meanings that are obtained with existent conservative determiners (namely every and not every). So SC is based on the idea that non-conservative determiners do not exist because in this syntactic-semantic system they would either always lead to trivial meanings or lead to contingent meanings that are equivalent to ones obtained by conservative existing determiners.

\footnote{Thanks to Rick Nouwen p.c. for suggesting to me this way of looking at the issue here.}
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Troubles at the Semantics/Syntax Interface:
Some thoughts about the modal approach to conditionals

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Abstract

Topic of the present paper is the modal approach to conditionals. We will distinguish two versions of the modal approach: a weak version which is the one that has been introduced by Kratzer (Kratzer (1977, 1979, 1981)) and a strong version that is the way the modal approach is presently used in many approaches to conditionals. In the second part of the paper we will present some arguments against the strong version of the modal approach. Aim of the paper is to stimulate a more critical and reflecting application of the modal approach.

1 Introduction

One of the most fundamental principles in the study of syntax and semantics of natural language is the principle of compositionality (Frege 1892; Partee 1984). This principle states that the meaning of a sentence directly follows from the meaning of its parts and the way they are combined. Applied to conditionals sentences, i.e. sentences of the form If ..., then ..., the principle of compositionality faces a number of very interesting challenges, concerning the interpretation of tense, aspect and modality (Comrie (1986); Crouch (1993); Fintel (2005); Iatridou (2000)). These problems have recently attracted a lot of attention among semanticists (Ippolito (2003, 2006); Kaufmann (2005); Schulz (2008); Stechow (2005); Stechow and Gronn. (2008)). Nearly all attempts made to answer these challenges build on a very popular interpretation principle for conditionals known as the modal approach. But people strongly differ in what they actually take the modal approach to be. This causes confusion in the discussion of the plausibility of the modal approach. The present paper attempts to clarify the landscape of modal approaches. In the first part I will argue that mainly two versions of the modal approach have to be distinguished: a weak version claiming that the if-clause of a conditional semantically functions as restrictor of one or more quantifiers, and a strong version claiming that the if-clause is at the level of Logical Form a direct argument of an obligatory quantifier in the consequent clause of the conditional. In the second part of the paper I will present a number of arguments against the strong version of the modal approach.

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approach. The main message is that though not impossible, the strong modal approach is not plausible, because from the perspective of the syntax/semantics interface it postulates a worst case scenario: (i) it introduces semantically crucial material into the logical form that is not visible in the surface structure, and (ii) it does not interpret a substantial part of the material that is visible in the surface structure.

2 Compositionality and logical form

To start with let us first clarify some basic issues about the notion of logical form. The aim is to provide the fundament for distinguishing two variants of this notion. The distinction to be made is certainly not new and has probably been part of the reader’s linguistic background knowledge since her first courses in linguistics. Nevertheless, it The purpose here is rather to remind us of this distinction and apply it to the case of the modal approach.

The notion of logical form is closely related to the principle of compositionality. As said in the introduction, the principle of compositionality states that the meaning of a complex expression is determined by the meaning of its parts and the way they are combined. Ideally, a compositional theory of meaning for some (sub-) would thus consists of a lexicon that annotates every primitive expression of L with its syntactic information and semantic value, a set of syntactic rules for how to combine simple expressions to complex expression, and a semantic annotation of these rules that tells us how the meaning of the simple expression has to be combined to the meaning of the complex expression. It is widely accepted among semanticists that compositionality cannot apply to the surface structure (SS) of sentences directly, but rather applies to an underlying representation. Still, requirements like learnability demand a systematic correspondence between what is expressed in the SS of a sentence and what can be assumed to be present at the level of LF. Consequently, the picture that emerges for the compositional theory looks rather as given in figure 1. Some natural language expression e is in a systematic, computable way that is described by the grammar of the language related to an expression e∗ that is called the Logical Form of the expression e. This Logical Form is then fed into the compositional semantics of the language, consisting of a semantically annotated lexicon and grammar for e∗ expressions. This compositional semantics produces as meaning of e∗ the meaning we observe for e. We will call the notion of Logical Form that emerges from this picture LF1, in order to distinguish it from a second notion LF2.

The essential difference between LF1 and LF2 that in case of LF 2 there does not have to be in a systematic grammatical relation between a natural language expression and its LF2 e+. e+ is just an expression in some formal language that is supposed to clarify the logical structure of the meaning of e. The relation between the two expression essentially comes down to the following two points: (i) e+ contains the primitive parts of e (according to some level of primitivity), and (ii) the meaning m_e+ assigned to e+ identical to the meaning observed for e. This means that, strictly speaking, an LF2 theory does not provide a compositional semantics for e, but only for e+. As far as e is
concerned, the theory only gives a general description for how the meaning of \( e \) depends on the meaning of its parts. It is possible that the way the meaning is computed for \( e^+ \) is totally out of question for \( e \) given its syntax.

To illustrate the distinction between LF1 and LF2 we can use a well-known example from the literature. In (1-b) and (1-c) two expressions in different formal languages (First Order Logic (FOL) and the language of Generalized Quantifiers L(GQ)) are given that both predict the same overall meaning for the English sentence (1-a) as function of the meanings of its parts.\(^1\)

\[
\begin{align*}
(1) &\quad \text{a. All linguists are bad mathematicians.} \\
&\quad \text{b. } \forall x (\text{Linguist}(x) \to \text{BadMathematician}(x)) \\
&\quad \text{c. } \text{ALL} (\text{Linguist}) \text{ BadMathematicians}
\end{align*}
\]

Though there was a time when people took (1-b) to represent the logical of (1-a), its is certainly not an LF1. The reason is that there is no general and systematic relation between English expressions of the form (1-a) and the FOL expression (1-b). Already changing in (1-a) all into some will mean that one has to use a completely different FOL expression to describe the meaning of the resulting sentence correctly. Other quantificational expressions like most completely miss a FOL translation. The expression in (1-c) is much more convincing as LF1, in this case a systematic relation to the form of English sentences exists.

In formal semantics we find both notions of LF applied, giving rise to two different types of semantic theories: LF1 theories and LF2 theories. Actually, the weaker LF2-type theories dominates the field. This is not very surprising, because in an LF2 theory semanticists only have to worry about the syntax of \( e^* \) expressions. These are normally expressions of some formal language for which a fully specified syntax is at hand. Of course, there is nothing wrong with a LF2 theory. It is a weaker type of a theory of meaning because it does semantics without syntax. But it still can

\(^1\)To simplify matters we assume that the atomic parts of the complex expression (1-a) are Linguist, BadMathematician and All.
clarify important points about lexical semantics and functional dependencies within the meaning of complex expressions. However, one can observe a tendency in compositional approaches to meaning to take successful LF2 theories as providing a description of the LF1 of natural language expressions. Though this can be an interesting working hypothesis it is a hypothesis with a weak foundation. As the example above shows LF2s are not uniquely defined. So the fact that you found some formula computing based on the atomic expressions the meaning of the complex does not imply that you have found a representation of the LF1 of the expression. Therefore, the step from an LF2 theory to an LF1 theory has to be done with care and should be accompanied with serious investments into providing a syntactic basis for this step.

In the next section we will argue that such a step from a LF2 theory to an LF1 theory has been taken in case of the modal approach and that in this case the step misses a sound foundation. We will base this conclusion on semantic arguments.

3 The modal approach

3.1 The original modal approach

The modal approach originated in the work Angelika Kratzer (Kratzer77, Kratzer79, Kratzer81a, Kratzer81b, Kratzer91b) and was inspired by an article by David Lewis (Lewis (1975)). Both, Kratzer and Lewis, observe that if-clauses in combination with quantifiers, i.e. structures like (2-a) and (2-b) below, obtain an interpretation according to which the antecedent of the conditional restricts the quantifier and the consequence forms the nucleus of the quantifier. Lewis makes this observation for adverbs of quantification and Kratzer mainly for modal quantifiers. In Fintel and Iatridou (2002) you find the same point illustrated for individual determiners.

(2) a. \[Quantifier\] \[if \ p\] \[q\]
   Always if Peter goes to the pub, he comes home drunk.
   b. \[if \ p\] \[Quantifier\] \[q\]
   If Peter comes home drunk, probably he went to the pub.

At this point, this is only an observation concerning functional dependencies within the meaning of complex expressions like (2-a) and (2-b). In a next step they consider the question of how to derive this meaning compositionally from the construction. How do quantifier and conditional combine in order to produce this overall meaning? They observe that neither (3-a) nor (3-b) give the intuitive correct results if one analyses \( p > \) as material implication. Thus, analyzing conditionals as material implication will not do the job.

(3) a. \( p > (Quantifier \ q) \)
   b. \( Quantifier(p > q) \)
Lewis (1975) goes further and argues that there is no way to interpret $>$ in a uniform manner such that (3-b) produces the correct meaning.\footnote{Though he is not explicit on this point, I take him to mean no interpretation of $>$ as binary truth-function on $p$ and $q$.} Lewis concludes "... that the if of our restrictive if-clauses should not be regarded as a sentential connective. It has no meaning apart from the adverb it restricts. ... It serves merely to mark an argument-place in a polyadic construction." [Lewis 1998, p.14] One might want to complain at this point: considering only binary truth-functions as meaning for $>$ is too restricted. But we also have the result of Gibbard showing that any conditional operator $p \Rightarrow s$ satisfying the following three principles reduces to material implication, and for material implication we already know that it works neither for (3-a) nor for (3-b) (Gibbard (1981)).

1. $p \Rightarrow (q \Rightarrow r)$ and $(p \land q) \Rightarrow r$ are logically equivalent.
2. $p \Rightarrow q$ implies the corresponding material conditional, that is, $p \Rightarrow q$ is false whenever $p$ is true and $q$ is false.
3. If $p$ logically implies $q$, then $p \Rightarrow q$ is a logical truth.

The conclusion Kratzer derives is that there is no such thing as a conditional construction: "The history of the conditional is the story of a syntactic mistake. There is no two-place if ... then connective in the logical forms of natural language. If-clauses are devices for restricting the domains of various operators." [Kratzer (1991)]. Notice the cross-linguistic nature of this claim. The alternative analysis Kratzer consequently proposes consists essentially of two claims.

1. An if-clause semantically functions as restrictor of one or more quantifiers.
2. If there is an if-clause, then there is also a quantifier in the main clause. Bare conditionals contain covert quantifiers.

Notice that the first claim is essentially an LF2-theory claim. It says something about the semantic function of the if-clause within the sentence, but does not explain how this function comes about. The second claim is a LF1-type claim: it puts restrictions on the LF1 form of conditional sentences: there has to be a quantifier in the LF1 of the main clause. Kratzer is aware of the status of the claims she makes. She openly admits that at this point the problem of a compositional account for the meaning of conditional sentences is not yet solved: “If we are serious about the syntax/semantics interface, our job is not done, however. We still have to show how plausible syntactic structures can provide the right input for a semantic interpretation component that derives truth conditions for conditionals in a fully compositional and general way for all cases where if-clauses restrict operators of any kind.” [Kratzer 2009, ch. 4, p. 12]. In particular, according to her there is no need to take the if-clause to be also on the level of Logical Form (LF1) an argument of the quantificational operator. Kratzer even cites argument against such an analysis. As possible alternative, she proposes as LF1
of conditionals \((\text{If } \ldots)(\text{modal } \ldots)\) and as interpretation principle for conditionals the following rule.

\[ \text{Conditional modality} \]
\[ \text{For any conversational backgrounds } f \text{ and } g \]
\[ [\text{If } \alpha \beta]^{f,g} = [\beta]^{f^*,g}, \text{ where for all } w \in W, f^*(w) = f(w) \cup [\alpha]^{f,g}. \]

Before concluding this section on the original form of the modal approach, let me stress the point that the main argument in favor of the modal approach that has been given in the discussion is negative: we can’t make things work with a conditional connective. This does, of course, not necessarily mean that we have to assume the modal approach instead. There are not many positive arguments for the approach given. In favor of the first claim we can say that it correctly describes the overall meaning of conditional sentences with quantifiers. This means that it is a correct LF2 analysis. For the second claim Kratzer gives essentially one argument: bare conditionals show the same context dependence as do sentences with overt modals Kratzer (2009, ch. 4, p. 23).

### 3.2 Stronger versions of the modal approach

The modal approach has gained an enormous popularity during the last 30 years. This popularity is well motivated by its elegance, flexibility and simplicity. The approach also relates well to the extensive body of philosophical literature on conditionals.

In recent applications of the modal approach a number of assumptions have been added to the two claims of Kratzer’s original proposal. Most importantly, one can often find interpretations of the modal approach according to which the first claim is strengthened from an LF2 claim to a claim about the LF1 of conditional sentences. In other words, it is assumed that the \textit{if}-clause is at the level of LF1 a direct argument of a quantifier in the consequent.

This stronger approach is often used as starting point to approach the interpretation of tense, mood, and aspect in conditionals of different languages. The LF1 of the English conditional (4) can then be proposed to look like given in figure 2 (see Ippolito (2003, 2006) and for a very similar line of approach Stechow (2005); Stechow and Gronn.
In this case it is assumed that the modal WOLL in English conditionals realizes the quantifier that according to the modal approach takes the if-clause as argument. This is combined with a standard analysis of the modal, according to which it does not only quantify over possible worlds, but also binds the evaluation time of its arguments. The tense- (and aspect-) morphology marked on the modal is interpreted on top of the modal and determines the evaluation time of the modal. This approach works very well for the VP governed by the modal expression would, because the latter does not contain any inflectional material on its own. But the verb of the antecedent is fully inflected. The general strategy adopted to deal with this problems is to claim that the markings are semantically void (sequence of tense, agreement). Another problem is that because the theory inserts the antecedent directly as argument of the modal, there is no semantic function left for if and then. In consequence, they are also claimed to be semantically void.

(4) If Hanna asked Simon nicely, he would help her.

The list below summarizes the main claims of the strong interpretation of the modal approach. The order follows roughly the motivational links between the different claims. Thus, a claim A that motivated the introduction of a claim B will show up higher in the order than the claim B. This also has the effect that the claims lower in the order are those that are more specific or stronger.

1. WOLL in the main clause of English conditionals is the obligatory modal quantifier that according to the weak modal approach is restricted by the if-clause of the conditional.
2. Bare conditionals are implicitly modalized.
3. The LF1 of conditionals is: MODAL[\(g(f(\text{if-clause } IP))\)\[\text{main-clause } V P\]], where \(g\) describes the contextually given ordering source and \(f\) the contextually given modal base.
4. WOLL binds the temporal and modal perspective of the if-clause.
5. The (tense) morphology in the if-clause is semantically void (sequence-of-tense, agreement).
6. If (and then) in conditionals is semantically void.

It has to be stressed that not all applications made of the modal approach clearly fall in one the two groups of modal approaches distinguished here, weak modal approach (claim 1 of Kratzer) or strong modal approach (claim 1 to 6 in the list above). There are also intermediate approaches that embrace some of the claims of the strong modal approach, but not all of them (see, for instance, Alonso-Ovalle (2009)). For the discussion at hand this is of no relevance.
4 Evaluating the modal approach

The present section presents some arguments against the strong modal approach. Most of the arguments are not new. It is also not the aim of this section to completely refute the modal approach. The goal is rather to argue that the strong modal approach is not plausible, because it involves very costly assumptions about the syntax/semantics interface. These costs do not show at first sight, because the strong modal approach is normally only applied to one particular language (English), and within this language one particular subclass of conditionals (subjunctive conditionals). Therefore the main strategy in the argumentation below will be to take a more general perspective and show that then the assumptions made by the strong modal approach are not convincing. In the following we will address each of the claims of the strong modal approach (see the list given in section 3.2) separately, starting at the bottom of the list.

4.1 Claim 6: If (and then) in conditionals is semantically void.

The sixth claim of the strong modal approach is that the expressions if and then in English conditionals are semantically void. It is an assumption easily made given claim 3, because if one assumes that the if-clause is a direct argument of the modal on the level of LF1, then one wants to have there just the proposition denoted by the antecedent. There is nothing left for if to do.

Of course, this is not the first time an element of the surface structure is claimed to have no semantic function. The problem for the specific case at hand is that the claim extends to lack to syntactic function as well. This idea is not convincing for it had to translate to a large group of languages that all use similar elements in the construction of their conditionals. Furthermore, If is a stable element of English conditionals since hundred of years. Why should a construction with a completely superfluous element be so stable across time and across languages? With regard to the second possibility, I’m not aware of any approach where if has no semantic, but does have a syntactic function.

Another problem with such a position is that it makes it very hard to explain why in English there is a whole class of sentences with apparently the same syntactic structure (adverbial clauses) only varying with respect to the element in the position of if but with clearly different meaning (see the examples in (5)).

(5) a. If Mary has left the building, we are in great danger.
   b. Because Mary has left the building, we are in great danger.
   c. When Mary has left the building, we are in great danger.
   d. Though Mary has left the building, we are in great danger.

3If one assumes that if nevertheless has a syntactic function, one could propose that it marks the presents of covert semantic material at a different position in the tree. For instance, one could propose that if marks the presence of a modal operator higher up in the tree, though I do not have any references for this position.
Of course, one could propose that *If* is the element that is semantically void, while the other elements still make a semantic contribution. But that would probably mean that one would have to propose a completely different semantics for these otherwise completely identical constructions. Thus, we conclude that claim 6 should not be part of a semantic theory of conditional sentences.

### 4.2 Claim 5: The (tense) morphology in the *if*-clause is semantically void

Let's turn to the fifth claim in the list, stating that the tense morphology in the *if*-clause is semantically void. The motivation for claim 5 is similar to that of claim 6. The inflectional markers on the modal in the consequent is taken to be interpreted on top of the modal. The modal is assumed, in turn, to pass by claim 4 this information (i.e. the evaluation time) to its arguments. That leaves basically nothing for the morphological material (tense) on the verb in the antecedent to do. This makes it very natural to assume that the antecedent just copies the markings from the main verb (sequence of tense, agreement).

The claim is in Ippolito (2003, 2006); Stechow and Gronn. (2008) made for English subjunctive conditionals. In this case it looks very convenient, because the inflectional markings on the verb in antecedent and consequent are arguably both Past Tense markers and the Past Tense morphology appears to have no effect (at least temporally). But notice that SOT is normally used to explain the existence of an additional reading that ignores the embedded Past Tense morphology. In the case of subjunctive conditionals there is no 'normal' reading that does interpret the Past Tense in the antecedent. Furthermore, there are (i) languages with normal functioning tense in antecedent and consequent of subjunctive conditionals, and (ii) languages marking their subjunctive or counterfactual conditional using a ‘non-functional’ past tense only in the antecedent. A theory that adopts claim 5 would not extend to these languages. For English, the problem is that the approach does not extend to indicative conditionals. In the antecedent of indicative conditionals the tense morphology cannot always be vacuous due to SOT, for one thing, because the main tense does not have to be past (see (6-a)), and secondly, even in case the tense of the main clause is Simple Past, the antecedent does not have to be marked for the Past Tense as well (see (6-b)). In fact, the tense in the antecedent of indicative conditionals appears to function pretty normal: it just localizes the eventuality described by the antecedent in the expected way relative to some temporal anchor point. So, any compositional account of the semantics of indicative conditionals has to allow for tense in the antecedent to be functional.

---

4A well-known particularity of the temporal interpretation of the antecedent of English conditionals is that the Present Tense freely allows for future interpretations relative to the utterance time. In contrast, future reference for the Simple Present of simple sentences is very restricted. Kaufmann (2005) and Schulz (2008) propose that the Simple Present in English in general allows for future reference, but that in normal sentences this possibility cannot be realized for conceptual reasons. If one adopts such an approach one can even claim that the tense in *if*-clauses is interpreted exactly as in plain sentences.
(6) a. If Peter found your letter, he will kill the postman.
   b. If Peter comes out smiling, the interview went well.

The reaction of approaches that embrace claim 5 probably will be that they really only want it to apply to subjunctive conditionals and that indicative conditionals just function differently. First, one has to say that the semantics of indicative and subjunctive conditionals is not that different. Examples like the classical Kennedy example from Adams do not prove that there is a fundamental difference between both types of conditionals. It is easy to find similar pairs of subjunctive and indicative conditionals that do not differ substantially in meaning, see (7).

(7) a. If yesterday there was a lot of rain up in the mountains, we will have a flood down here by tomorrow.
   b. If yesterday there has been a lot of rain up in the mountains, we would have had a flood down here by tomorrow.

A difference between indicative and subjunctive conditionals that would help an claim 5 approach does not have to be that fundamental, but it has to allow tense a normal interpretation in the if-clause of indicative clauses, while it completely excludes the same possibility for subjunctive conditionals. The question is how realistic such an approach is.

To summarize, claim 5 cannot hold for conditionals in general: SOT or agreement cannot in general explain away the morphological material on the verb in if-clauses. Any account of the meaning of English conditionals has to allow for interpretation of this material at least in indicative conditionals. Secondly, an SOT account for tense in subjunctive conditionals has to explain why an interpretation of the morphological material is completely impossible.

4.3 Claim 4: Woll binds the temporal and modal perspective of the if-clause.

The idea that modals like WOLL bind not only the modal parameter but also the evaluation time of their arguments has a long history in formal semantics. This assumption (that intensional operators bind the evaluation time of eventualities in their scope) has been proposed already by Montague and has been argued for at many occasions since then (see Abusch (1997); Condoravdi (2002)). These approaches agree that in order to get the temporal references right on has to assume the presence of a non-past operator (NPO) on top of the VP meaning in scope of the modal. This operator introduces the possibility for the eventuality described by the VP to take place at or in the future of the evaluation time of the modal.\footnote{This operation has been analyzed to be part of the semantic contribution of the modal (see Condoravdi (2002)) or to be an independent (tense-) operation at the level of Logical Form (Stechow (2005)). For arguments against an analysis as tense see Condoravdi (2002).}

An additional complication for the case of conditionals is that now also the temporal
interpretation of the antecedent has to be fixed relative to the evaluation time of the modal. If one assumes with claim 3 of the strong modal approach that the antecedent is an LF1-argument of the modal, then claim 4 follows: Woll binds the temporal and modal perspective of the if-clause. At this point one has to decide on how to interpret the tenses in the antecedent relative to the evaluation time of the modal. In approaches like Ippolito (2003, 2006); Stechow and Gronn. (2008) that embrace claim 5 for subjunctive conditionals, the authors assume an additional non-past operator on top of the semantically tense-less antecedent clause. For a sentence like (4) we obtain then the schematic meaning described in (8-a), and paraphrased in (8-b) (we additionally assume that the tense marked on the modal refers to the utterance time).

(4) If Hanna asked Simon nicely, he would help her.

(8) a. $\forall w' [w' \in Sim_{w_0}(\lambda w'.w' \in MB_{(w_0,t)} \land \exists t' \geq t_0 [if-\text{clause}](w')(t')) \rightarrow \exists t'' \geq t_0 [VP \text{ main-\text{clause}}](w')(t'')]$

b. For all worlds that are (i) in the relevant modal base evaluated at the utterance time $t_0$ in the evaluation world, (ii) make the antecedent true at some time at or in the future of $t_0$, and (ii) are maximally similar to the evaluation world holds that they also make the main clause VP true at some time in the future of $t_0$.

Given that at least in English indicative conditionals the tense marked in the if-clause appears to be interpreted in situ, we have to allow for this possibility in our semantic theory. According to claim 4 the tense in the antecedent should get a relative interpretation, relative to the evaluation time of the modal. Such an analysis would predict the following observations:

1. The tense marked on the modal is interpreted absolutely (relative to the utterance time).
2. The tense in the antecedent is interpreted relative to the evaluation time of the modal.
3. The temporal location of the eventuality denoted by the VP of the consequent is located relative to the evaluation time of the modal (at or in its future) but independent from the temporal location of the eventuality denoted by the VP of the antecedent.

Some support for the prediction described in 2 seems to come from observations concerning the interpretation of the Simple Present in the antecedent of conditionals (see footnote 4). But certainly prediction 3 and arguably also prediction 1 are problematic. Contra to what is predicted by a strong modal approach, we observe that the interpretation of tense marked in the consequent of English indicative conditionals depends on the temporal location of the eventuality described in the antecedent. Let's have a look, for instance, at example ((9-a)). This sentence has a reading according to which the interview mentioned takes place before John leaves smiling, but still in the future of the utterance time. Thus, apparently, the Simple Past in the consequent
is not anchored in the utterance time, but in the time denoted by the tense of the antecedent: the time of John’s leaving.\textsuperscript{6}

(9) a. If John comes out smiling, the interview went well.

The observation extends to the Simple Present. In its generic reading, example ((10-a)) cannot have an interpretation according to which the rising of the temperature takes place before the bending of the strip. One might argue that the alternative reading is excluded by world knowledge. But this reading is admissible if we express the same conditional relation as fact about the past ((10-b)).

(10) a. If the strip bends, the temperature rises.
    b. If the strip bent, the temperature rose.

So far, we have only discussed examples without modal verb in the consequent. But the observation can be made for explicitly modalized conditionals as well. This is somewhat less easy to observe, because, as discussed in more details below, the shift of the anchor to the denotation time in the antecedent is not obligatory. It is only obligatory given a particular reading of the conditional, or to use the terminology of Kratzer (1979, 1981), given the choice of the modal base. Consider, for instance, the conditionals in (5), reading the dependency between antecedent and consequent as causal dependence (he passed the examen because he practiced the night before). With this reading variant ((11-a)), without perfect, is marked and ((11-b)) should be used. The use of the perfect is necessary because the anchor for the temporal interpretation of the modal phrase is shifted to the future denotation time of the Simple Present in the antecedent.

(11) a. If tomorrow he passes the examen, he will practice all night.
    b. If tomorrow he passes the examen, he will have practiced all night.

The same optional shift of the anchor can be observed with subjunctive conditionals.\textsuperscript{7} Translating the indicative example ((9-a)) into the subjunctive, the perfect-free variant ((12-a)) is out and ((12-b)) has to be used. Again, the fact that you have to use the perfect shows that the evaluation time of the modal is shifted to the future denotation time of the Simple Present in the antecedent. The perfect is necessary to access a time in the future of the utterance time and in the past of the denotation time of the tense in the antecedent.

(12) a. ??If John came out smiling, the interview would go well.
    b. If John came out smiling, the interview would have gone well.

We conclude that claim 4 results in the wrong scopal dependencies for the interpretation

\textsuperscript{6}Notice that this is not a sequence of tense phenomenon. The Simple Past in the consequent is not semantically void, but still expresses pastness.

\textsuperscript{7}To my knowledge this has not been observed before.
of tenses in conditionals.

### 4.4 Claim 3: The LF1 of conditionals

The next claim we will address is the assumption that the logical form (LF2) of conditionals as proposed by the weak modal approach is an LF1, in particular, that the if-clause is on the level of Logical Form an argument of the obligatory modal in the consequent clause of the conditional. Semantically, this claim is not easily criticized, for the distinction between LF2 and LF1 is mainly one concerning form and not meaning. Therefore, arguments against this position are most easily found in syntax rather than semantics.

However, this paper is not concerned with syntactic, but with semantic argumentation. Potential semantic arguments against claim 3 have to concern semantic dependencies between the involved operators. In fact, Angelika Kratzer herself argues against the assumption that the modal approach concerns an LF1 representation and presents an argument concerning modal dependencies. Her argument is based on the observation that one and the same antecedent can serve to restrict a number of independent modal expressions in independent sentences (four subsequent modals in example (13)). This kind of data, concerning modal subordination, rather points to an analysis that takes the if-clause of conditionals to modify global parameters of interpretation that can freely be accessed from modals in discourse.

(13) If a wolf entered the house, he must have eaten grandma, since she was bedridden. He might have eaten the girl with the red cap, too. In fact, thats rather likely. The poor little thing wouldnt have been able to defend herself. (Kratzer, ch. 4, p. 13)

Another argument following the same line can be found in Fintel and Iatridou (2002). This paper discusses the application of the modal approach in case the if-clause appears in the context of nominal quantifiers. Against an analysis that takes the if-clause to be an argument of the quantifier they mention the observation that the existential presupposition that nominal quantifiers often carry does not extend to the if-clause (see (14), cited from Fintel and Iatridou (2002)).

(14) a. Many /A few of the students will succeed if they work hard.
    b. Many/A few of the students who work hard will succeed.

The semantic argument added by the present paper is the observation from subsection 4.3 against claim 4. Claim 4 is a consequence of claim 3: if you assume that the antecedent is a syntactic argument of the modal then the independently motivated assumption that modals (as intensional operators) bind the evaluation time in their scope leads to the acceptance of claim 4. Hence, the scoping problems concerning the interpretation of tense that we have discussed in subsection 4.3 attack claim 3 together with claim 4.
4.5 Claim 2: Bare conditionals are implicitly modalized.

Claim 2 is the only LF 1-theory claim made by Angelika Kratzer herself. To account for conditional sentences that contain no quantificational elements she proposes that in these cases the quantifier is covert. Furthermore, she suggests that the question which types of bare conditionals a particular language distinguishes depends on the inventory of covert operators of that language. For instance, English has according to Kratzer (2009) covert generic and epistemic universal quantifiers that result in two types of bare conditionals. The situation might be different in other languages.

How convincing this claim is depends a lot on the kind of independent evidence that can be brought forward for the existence of covert modals in a particular language. A covert modal that only exists in the context of bare conditionals would not be very convincing. It has often (and independently from the issue of conditionals) been argued that English has covert generic operators, but the claim about covert epistemic operators is much less supported.

Cross-linguistically, it is conspicuous that there appears to be no substantial variation in the meaning of bare conditionals. I am not aware of any language that has a covert possibility modal in conditional or any covert operator with a quantificational force different from the universal force. Also the type of modal base that has to be assumed as underlying the bare conditional reading appears to be considerably fixed to circumstantial/metaphysical or epistemic readings and generic readings. There has to be some cross-linguistic explanation for these restrictions. Without such an explanation, it appears much more convincing to look for an approach that does without covert elements that are in principle extremely flexible in their potential meaning.

Furthermore, one has to be careful with the type of covert element that is postulated here. In the spectrum of claims made about the existence of covert elements that have been proposed claim 2 is particularly strong. The difference with more standard covert elements like (negative) concord, pro-drop or e-pronouns is that claim 2 concerns a covert element that leaves no surface traces at all. It is not copying some meaning that is already expressed at some other place (as in the case of e-pronouns) or spelled out at some distance as is often claimed for inflection markers like tense and mood on verbs. There is simply nothing. This type of covert material puts rather heavy loads on the shoulders of the language learner or interpreter that has to detect them in the right places. Particularly simple sentences are problematic in this respect. Given that modal base and ordering source are supposed to be provided by the context, any bare sentence could in principle contain one or more covert modals of the relevant kind.

Given these conceptual problems a recourse to the kind of overt elements proposed by claim 2 should be a last resort, in case nothing else goes. But this means that we first should seriously try to do without claim 2.

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8It has been argued that generic operators are not truly universal, because they allow for exceptions. This might weaken my point here.
4.6 Claim 1: Woll as the modal of the modal approach.

Claim 1 is the weakest of all the claims in the list we have discussed. It is furthermore completely independent from the other claims. An example for an approach that embraces claim 1 but is at least neutral with respect to all other claims might be Alonso-Ovalle (2009). In particular, he does not assume that the antecedent is at the level of Logical Form an argument of the modal WOLL (claim 3) and he does assign as semantic function to If (claim 6). There is nothing substantial that I can put forward against this claim. The only problem I see is that by assuming claim 1 while dropping claim 2 gives an inhomogeneous semantics for conditionals. If we have to do without modals for bare conditionals, it looks much stronger if the semantics of bare conditionals would also apply to conditionals involving over quantificational elements.

In sum, we will not refute claim 1 in principle, but just note that dropping claim 1 together with the claims 2 to 6 will result in a more homogenous semantic theory.

5 Conclusions

What we hoped to achieve with the discussion in section 4 is not so much a refutation of the strong modal approach. Rather, the conclusion should be that this approach is not very plausible, because from the perspective of the syntax/semantics it assumes a worst case scenario for the semantics of conditionals: (i) it introduces material that is crucial for the semantics of conditionals (the modal) that is sometimes not visible at all in the surface structure, and (ii) it does not interpret a substantial part of the material (if and then) that is visible in the surface structure. Furthermore, as argued in section 4.4, the Logical Form of conditionals assumed by the strong approach leads to a number of problems concerning the scoping of semantic operators. There might be repair strategies for these problems, but they still have to be worked out.

This together should provide sufficient reason to motivate a general shift in attention towards alternatives to the strong modal approach. If the present paper has convinced the reader of this central point, then the paper has achieved all it was meant to do. Hopefully, we will see in the future more work done in this direction and generally a more critical stance towards the strong modal approach.

For many reasons experience is good in research; experience makes you a better researcher. But there is also a draw back: the more experienced you are, the more you tend to stick to the tools that have proven themselves in the past and the more difficult it becomes to approach something with a clean conscious. This does not only apply to a single individual, but also to a group of scientists as a whole. I think that’s what we need in the case of conditionals: a fresh look on the data, free from an European bias. Maybe, then we can find a solution to the problems discussed in the present paper.
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References


A Scope Theory of Non-presuppositional Noun Phrases

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Abstract
Musan (1995) observed that the temporal interpretation of a non-presuppositional noun phrase is obligatorily dependent on that of the main predicate. To account for this generalization, this paper proposes that the temporal interpretation of a non-presuppositional noun phrase is determined by virtue of being in the scope of an operator. Upon an investigation of the interpretation of non-presuppositional noun phrases in the plural form, the paper argues under this scope approach that the numeral part of a non-presuppositional noun phrase splits from the rest of the noun phrase and undergoes LF raising.

1 Introduction
Musan (1995) observed that the temporal interpretation of a non-presuppositional noun phrase is obligatorily dependent on that of the main predicate. In order to account for this generalization, this paper advocates a “scope” theory, that is, it proposes that the temporal interpretation of a non-presuppositional noun phrase is determined by virtue of being in the scope of an operator that simultaneously determines the temporal interpretation of the main predicate. The paper observes that Musan’s generalization gives rise to “distributed” temporally dependent interpretations of non-presuppositional noun phrases in the plural form and argues that this fact suggests under the scope theory that the numeral part of a non-presuppositional noun phrase be separated from the rest of the noun phrase and raised at LF. We also consider alternative theories to the scope theory and see that they are problematic on independent grounds. Finally, a novel approach to existential sentences (i.e., sentences that make an existential claim) is briefly introduced that exploits Lebesgue integration.

2 Musan’s Generalization
Since Enç’s (1981, 1986) work, it has been known that the evaluation time of a noun phrase in a sentence may be different from the evaluation time of the sentence’s main predicate. For instance, if the noun fugitive and the main predicate be in jail in Enç’s
example (1) were evaluated with respect to the same time, the sentence would be claiming that some individuals are simultaneously fugitives and in jail, a contradiction.

(1) Every fugitive is now in jail.

Instead, (1) should be understood as ‘every individual who was a fugitive is now in jail.’ The noun fugitive can thus be evaluated with respect to some past time, even though the main predicate is evaluated with respect to the present time.

Following Enç’s work, Musan (1995) made an interesting generalization that such temporally independent readings are available only for presuppositional noun phrases, which in turn means the following:

(2) The temporal interpretation of a non-presuppositional noun phrase is always dependent on that of the main predicate.

The relevant concept of (non-)presuppositionality is due to Diesing (1992). Noun phrases with a “strong” determiner (e.g. every rabbit, most rabbits, etc.) and partitive noun phrases (e.g. some of the rabbits, etc.) are presuppositional. On the other hand, noun phrases with a “weak” determiner (e.g. some rabbits, etc.) are ambiguous as to their presuppositionality, but their syntactic position or stress pattern may help disambiguate it in some cases. For instance, in Musan’s German data (3), the subject noun phrase in (3a) is presuppositional because the determiner, rather than the head noun, is stressed and it in effect means ‘some of the professors’, while the subject noun phrase in (3b) is non-presuppositional because the head noun is stressed.

(3) a. EINIGE Professoren waren in den sechziger Jahren glücklich.
   some professors were in the sixties happy
   ‘Sôme professors were happy in the sixties.’

b. Einige PROFESSOREN waren in den sechziger Jahren glücklich.
   some professors were in the sixties happy
   ‘Sm professors were happy in the sixties.’

Musan observes that while (3a) may be talking about current professors who were not necessarily professors in the sixties, (3b) only asserts the existence of people who were simultaneously professors and happy in the sixties. One can then see that Musan’s generalization holds here, as a temporally dependent interpretation of the subject noun phrase is forced in (3b), but not in (3a).

### 3 Sketching the Scope Theory

In this paper, I would like to put presuppositional noun phrases aside and focus on the fact that non-presuppositional noun phrases always receive temporally dependent readings. As an account for this obligatory temporal dependence, this paper advocates
what I call the scope theory, and this is sketched in the present section.

Unless we adopt Musan’s (1995) stage semantics approach (see Subsection 6.1), it is safe to assume that predicates such as nouns and verbs are interpreted with respect to an evaluation time interval for their temporal interpretation. The scope theory claims that the value of the evaluation time interval of a non-presuppositional noun phrase is determined by an operator that has the non-presuppositional noun phrase in its scope. If this operator simultaneously gives the evaluation time interval of the main predicate, a temporally dependent interpretation of the non-presuppositional noun phrase will automatically follow.

For illustration, let us consider the following sentence:

(4) Mary kissed a 20-year-old.

When (4) is uttered without an appropriate context so that 20-year-old is non-presuppositional, it claims the existence of an individual who got kissed by Mary when he or she was age 20, as predicted by Musan’s generalization. Let us assume that the the evaluation time interval of predicates is their first argument:

\[
\begin{align*}
(5) & \quad [20\text{-year-old}] = \lambda I \in D_i, \lambda x \in D_e. 20\text{-yr-old}(I)(x) \\
& \quad [\text{kiss}] = \lambda I \in D_i, \lambda x \in D_e, \lambda y \in D_e. \text{kiss}(I)(x)(y)
\end{align*}
\]

Assuming that time interval arguments are projected as variables in syntax (cf. Percus, 2000), the relevant operator can be taken to be a \( \lambda \) abstraction that simultaneously binds the evaluation time interval of the non-presuppositional noun phrase and that of the main verb. If we assume a generalized-quantifier meaning for \( a \) as in (6a), the non-presuppositional noun phrase in the object position needs QR’ing, but only below the temporal \( \lambda \) abstraction for the desired binding. We thus obtain the LF in (6b), whose denotation is computed to be what is given in (6c):

\[
\begin{align*}
(6) & \quad [a] = \lambda f \in D_{(e,t)}, \lambda g \in D_{(e,t)}. \exists x \in D_e [f(x) \land g(x)] \\
& \quad \lambda I \in D_i \rightarrow \\
& \quad \lambda x \in D_e \rightarrow \\
& \quad a \rightarrow \\
& \quad 20\text{-year-old} \rightarrow \\
& \quad I \rightarrow \\
& \quad \exists x \in D_e [20\text{-yr-old}(I)(x) \land \text{kiss}(I)(x)(\text{Mary})]
\end{align*}
\]

By existentially closing the open time interval variable in (6c), we expect to obtain the truth conditions for the observed temporally dependent reading.
In order to ensure temporal dependence, however, we need to clarify the exact interpretation of the predicates 20-yr-old and kiss. Suppose the following interpretations:

(7) a. $20\text{-yr-old}(I)(x)$ is true iff $x$ is of age 20 in some subinterval of $I$.
    b. $\text{kiss}(I)(x)(y)$ is true iff there is an event of $y$’s kissing $x$ and its running time interval is a subinterval of $I$.

With these, (6c) actually does not guarantee temporal dependence even though the two predicates are saturated with one and the same time interval. To see this, one need only consider models like the following:

(8) $I$

\begin{tabular}{|c|c|}
\hline
kissing Ann & Ann age 20 \\
\hline
\end{tabular}

In (8), a big time interval $I$ contains the running time interval of the kissing and the one-year period during which the kissee was 20, but they do not overlap. Mary thus kissed Ann before Ann turned 20 here. In order to guarantee temporal dependence, we should therefore accept either or both of (9a) and (9b):\footnote{For example, if we accept (9a), $20\text{-yr-old}(I)(\text{Ann})$ means that Ann is age 20 throughout $I$. Therefore, in this case, even if we do not accept (9b) and only adopt (7b) for the interpretation of kiss, kissing must have taken place while Ann was 20, as illustrated by the following model:}

(9) a. $20\text{-yr-old}(I)(x)$ is true iff $x$ is of age 20 throughout $I$.
    b. $\text{kiss}(I)(x)(y)$ is true iff $I$ is exactly the running time interval of an event of $y$’s kissing $x$.

4 A Scope Puzzle about Plural Noun Phrases

Having sketched the scope theory, we now examine the temporal interpretation of non-presuppositional noun phrases in the plural form and see that the scope theory seems to run into a scope paradox.

Consider (10):

(10) In the last five years, Mary kissed three 20-year-olds.

When (10) is uttered out of the blue and the plural object noun phrase three 20-year-olds is thus interpreted non-presuppositionally, it claims that Mary kissed three people and
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each of them was age 20 when Mary kissed him/her. Thus, three 20-year-olds receives a temporally dependent reading, as predicted by Musan’s generalization. Interestingly, however, it is required neither that these three have been simultaneously age 20 nor that they have simultaneously gotten kissed by Mary (cf. Szabó, 2006). For instance, if uttered at the end of the year 2008, (10) can truthfully describe the scenario depicted by following model:

(11)

\[
\begin{array}{c}
\text{last five years (2004-2008)} \\
I_1: \text{kiss Ann} \\
\text{Ann age 20} \\
I_2: \text{kiss Bill} \\
\text{Bill age 20} \\
I_3: \text{kiss Chris} \\
\text{Chris age 20}
\end{array}
\]

The question is whether this reading can be predicted by the the scope theory, which would assign the following LF to (10):

(12)

\[
\lambda I \in D_i. \exists X \in D_e. |X| = 3 \land [\ast \lambda x \in D_e. 20-yr-old(I)(x)](X) \land [\ast \lambda x \in D_e. \text{kiss}(I)(x)(\text{Mary})](X)
\]

In what follows, I consider two conceivable attempts at interpreting this LF and argue that neither can yield the desired truth conditions. This leads to a conclusion that (12) is not the correct LF for (10).

4.1 Attempt I: Simple Pluralization of the Individual Argument

The first attempt is to utilize Link’s (1983) * operator to pluralize the individual arguments of 20-year-old and kiss. This gives us the following denotation for LF (12):

(13)

\[
\lambda I \in D_i. \exists X \in D_e. |X| = 3 \land \forall x \in D_e. [x \text{ is atomic} \land x \subseteq \sigma X \rightarrow 20-yr-old(I)(x)] \\
\land \forall x \in D_e. [x \text{ is atomic} \land x \subseteq \sigma X \rightarrow \text{kiss}(I)(x)(\text{Mary})]
\]

\[|X|\] means the number of the atomic individuals constituting the plural individual X. Assuming that the unstarred predicates 20-yr-old and kiss are true only of atomic individuals, (13) can be rewritten without the * operator as in the following, where \(\subseteq \sigma\) is the partial order relation on a lattice of entities of type \(\sigma\).

(i) \[
\lambda I \in D_i. \exists X \in D_e [|X| = 3 \land \forall x \in D_e. [x \text{ is atomic} \land x \subseteq \sigma X \rightarrow 20-yr-old(I)(x)] \\
\land \forall x \in D_e. [x \text{ is atomic} \land x \subseteq \sigma X \rightarrow \text{kiss}(I)(x)(\text{Mary})]]
\]
By existential closure of the time interval variable, we obtain truth conditions that claim the existence of a single time interval. The reader may recall now that we should accept either (9a) or (9b). If we accept (9a), in order for sentence (10) to be true, there will have to be a single time interval in which all the three people were simultaneously age 20. On the other hand, if we accept (9b), it will be required that the three people have simultaneously gotten kissed by Mary. Thus, either way, we end up with too strong truth conditions for (10).

4.2 Attempt II: Cumulative Relation Formation

The second attempt utilizes the double * operator (Krifka, 1986, Sternefeld, 1998) to form a cumulative relation between individuals and time intervals. This gives us the following denotation for LF (12):

\[
\lambda I \in D_i \exists X \in D_e [ |X| = 3 \land [**\lambda x \in D_e. \lambda J \in D_i. 20-yr-old(J)(x)](X)(I) \land [**\lambda x \in D_e. \lambda J \in D_i. \text{kiss}(J)(x)(\text{Mary}))(X)(I)]
\]

Applying existential closure to (14), we obtain truth conditions that claim the existence of a plurality of time intervals and a plurality of individuals. Note now that the obtained truth conditions are satisfied under the following model, as \(I = J_1 \sqcup J_2 \sqcup J_3\) exemplifies the existentially quantified variable for a plurality of time intervals.

\[
\begin{array}{ccc}
J_1: \text{kiss Bill} & & J_2: \text{kiss Chris} & & J_3: \text{kiss Ann} \\
\text{Ann age 20} & & \text{Bill age 20} & & \text{Chris age 20}
\end{array}
\]

In this scenario, none of the three kissees was age 20 when he/she was kissed by Mary, hence no temporal dependence. The obtained truth conditions are therefore too weak to capture the correct meaning of (10).

4.3 What Goes Wrong

The truth conditions that correctly capture the meaning of (10) should look like (16), or equivalently, (17):

\[
\exists X \in D_e [ |X| = 3 \land [\lambda x \in D_e. \exists I \in D_i [20-yr-old(I)(x) \land \text{kiss}(I)(x)(\text{Mary})]](X)]
\]

\(\sqcup_{\sigma}\) represents the join operation on a lattice of entities of type \(\sigma\).
Thus, while 20-year-olds must be in the scope of the binder of its time interval argument for the temporally dependent reading, three ought to be interpreted above this binder, after 20-year-olds and kiss are combined and then some pluralization operation is applied. This is why no attempt at interpreting LF (12) seems to pan out. It then appears that the scope theory runs into a scope paradox here, because given the fact that three and 20-year-olds make a syntactic constituent, it looks as if this noun phrase should be in two distinct positions, below and above the binder of the time interval variables.

5 Proposal

In order to solve the puzzle illuminated above, I propose that the correct LF is obtained by separating the numeral part off from the rest of the non-presuppositional noun phrase and moving it to right above the binder of the time interval variables. Just like a usual QR operation, this LF movement creates a λ abstraction over individuals. The correct LF for (10) thus looks as follows:

\[
\exists I \in D_I \exists X \in D_e \left[ |X| = 3 \land [\ast \ast \lambda x \in D_e. \lambda I \in D_I. 20-\text{-old}(I)(x) \land \text{kiss}(I)(x)(\text{Mary})](X)(J) \right]
\]

Since the denotations of the head noun and the main predicate must be combined by set intersection, I posit the following new rule of semantic composition:

\[
\begin{array}{c}
\left[ \left[ \alpha \right] \right] = \lambda p \in D_{(e,t)}. \left[ \beta \right] (\left[ \alpha \right]) \land p(\left[ \alpha \right])
\end{array}
\]

The following, which is a partial LF of (18), shows how the new rule works:
Thus, as the denotation of the sister of the numeral three, we obtain the following relation $R$ holding between an individual and a time interval:

\[
R = \lambda x \in D_e. \lambda I \in D_I. 20\text{-yr-old}(I)(x) \wedge \text{kiss}(I)(x)(\text{Mary})
\]

$R$ is then “pluralized” with the double * operator, and the numeral three specifies the number of the atomic individuals in the plurality of individuals denoted by the pluralized individual variable to be 3. By existential closure, the following truth conditions can finally be obtained, which is exactly what we had in (17).

\[
\exists J \in D_I \exists X \in D_e [[X] = 3 \wedge **R(X)(J)]
\]

6 Alternative Lexical Theories and their Problems

The scope theory derives the temporally dependent reading from the syntactic configuration of scope. By contrast, one might alternatively argue that the temporal dependence is due to the lexical semantics of the numeral determiner. Let us call this the “lexical” approach. As we have seen above, under the scope theory, an LF split of the numeral part off non-presuppositional noun phrases seems to be required to solve an apparent scope paradox. If the lexical approach is actually on the right track and the scope theory is wrong, however, there can be no “scope” paradox to begin with, and straightforwards LF without fancy LF movement like (23) should suffice. This section therefore considers two conceivable implementations of the lexical approach. It is argued that these theories are untenable for independent reasons.

---

It is merely a simple exercise to spell out an appropriate lexical entry for three to go with LF (18). I omit doing this, since we end up having a special operator called CUM between the numeral and the $\lambda$ abstraction below it that is actually responsible for the pluralization job as discussed shortly.
6.1 Musan’s Stage-Semantics Approach and Bi-clausal Sentences

The first theory under the lexical approach that we consider is Musan’s (1995) stage-semantics approach. Musan has actually considered the scope approach and rejected it for reasons that I cannot discuss here due to space limitation. To account for her generalization, Musan instead proposes that noun phrases quantify over stages of individuals, which are pairs of an individual and a time interval. Predicates under this theory take stages of individuals as their arguments, and the temporally dependent reading of a non-presuppositional noun phrase arises as a result of one and the same stage of an individual being simultaneously predicated of by the noun and by the main predicate. Under Musan’s approach, (10) would be analyzed as follows:

\[(24)\]  
There are 3 maximal stages of individuals \(x_{st}\) situated in the last five years such that \([20-yr-old(x_{st}) \land \text{kiss}(x_{st})(\text{Mary})]\) holds.

(24) *per se* does not necessarily express temporal dependence, however. In order for this to work as desired, it is necessary to postulate a principle such as (25). With (25), the truth conditions in (24) correctly capture the “distributed” temporally dependent reading that we have been focusing on.

\[(25)\]  
For any predicate \(P\) and any stage of an individual \(x_{st}\), if \(x_{st}\) is an argument of \(P\), the event described by \(P\) occurs at the temporal extension of \(x_{st}\).

Inadequacies of Musan’s approach become evident, however, once we consider bi-clausal examples like the following:

\[(26)\]  
a. When he was young, John promised to marry three 20-year-olds on their 30th birthday.
b. When he was young, John wanted to marry three 20-year-olds on their 30th birthday.

---

6For details, see Musan (1995) and Shimada (2009).
7These truth conditions can be derived from LF (25), by defining an appropriate lexical entry for *three* and assuming that the index 1 in (23) is translated into a \(\lambda\) abstraction over stages of individuals.
8For a given individual, Musan proposes counting only the maximal stage of that individual that satisfies relevant properties. This way, one can avoid counting different stages of one and the same individual separately.
When these sentences are uttered out of the blue and *three 20-year-olds* is thus interpreted non-presuppositionally, its temporal interpretation obligatorily depends on the matrix predicate *promised/wanted*. For instance, (26a) is a true statement for the scenario depicted by the following model:

(27) **when John was young**

<table>
<thead>
<tr>
<th></th>
<th>J promises to marry Ann in approx. 10 yrs</th>
<th>J promises to marry Bill in app. 10 yrs</th>
<th>J promises to marry Chris in app. 10 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann age 20</td>
<td></td>
<td>Bill age 20</td>
<td>Chris age 20</td>
</tr>
</tbody>
</table>

Here, John made a promise to each person when he/she was age 20, and the content of the promise was that he would marry them in ten years. Note that *three 20-year-olds* clearly cannot depend on the embedded predicate *marry* for its temporal interpretation. If it did, a contradictory reading would arise as some people would have to be simultaneously age 20 and age 30 at some point.

What is important here is the fact that *three 20-year-olds* is an argument of the embedded predicate *marry* and not an argument of the matrix predicate *promised/wanted*. Given (25), however, one can see that Musan’s theory only predicts that *three 20-year-olds* is obligatorily dependent on the embedded predicate for its temporal interpretation, and not on the matrix predicate, contrary to the fact. Musan’s account is hence untenable.

By contrast, the scope theory should have no problem with bi-clausal examples as in (26). To explain (26a), for instance, one need only assume a λ abstraction simultaneously binding the time interval arguments of *20-year-olds* and *promise* and a movement of *three* to right above this binder as illustrated below:

(28)

\[
\lambda x \in D_e \lambda I \in D_t \lambda p \in D_{(e,t)} 20-\text{yr-old}(I)(x) \land p(x) \text{(by New Rule)}
\]

\[
\lambda y \in D_e \text{John promise at } I \text{ to marry } y \text{ on } y's 30\text{th birthday}
\]

\[
\lambda x \in D_e \text{John promise } I \text{ TP ... } y ...
\]
6.2 Lexical-Internal Binding of Time Interval Arguments and Scha’s Cumulative Reading

The second theory under the lexical approach that we consider agrees with the scope theory in assuming that predicates take separate arguments for individuals and time intervals. This theory therefore also derives the temporally dependence of a non-presuppositional noun phrase by having a single binder simultaneously bind the time interval arguments of the head noun and the main verb. However, the binder in question is now encoded in the lexical entry of the numeral, and not present in syntax.

Let us see how this “lexical-internal binding” theory works. So that LF (23) may produce the desired interpretation, we should first assume that the time interval argument of a predicate is generally the innermost argument:

(29) a. \[\text{[20-year-old]} = \lambda x \in D_e. \lambda I \in D_i. \text{20-yr-old}(I)(x)\]
    b. \[\text{[kiss]} = \lambda x \in D_e. \lambda y \in D_e. \lambda I \in D_i. \text{kiss}(I)(x)(y)\]

With the lexical entry in (30a) for the numeral three, the denotation of LF (23) becomes (30b), and by applying existential closure to (30b), we obtain (17), the desired truth conditions for (10).

(30) a. \[\text{[three]} = \lambda p \in D_{(e,\langle i,t \rangle)}. \lambda q \in D_{(e,\langle i,t \rangle)}. \lambda J \in D_i. \exists X \in D_e. [X] = 3 \land [**\lambda x \in D_e. \lambda I \in D_i. p(I)(x) \land q(I)(x)](X)(J)\]
    b. \[\lambda J \in D_i. \exists X \in D_e. [X] = 3 \land [**\lambda x \in D_e. \lambda I \in D_i. \text{20-yr-old}(I)(x) \land \text{kiss}(I)(x)(\text{Mary})](X)(J)\]

A problem of this theory is revealed when one considers sentences with more than one non-presuppositional noun phrase in the plural form like the following:

(31) Five 30-year-olds kissed three 20-year-olds.

As observed by Scha (1981), sentences like this have a cumulative reading, where none of the noun phrases takes scope over the other(s). Essentially, the cumulative reading of (31) can be paraphrased as ‘there were five 30-year-olds who kissed some 20-year-old or another, and there were three 20-year-olds who got kissed by some 30-year-old or another.’ What is interesting is that when (31) is uttered out of the blue so that neither noun phrase is presuppositional, Musan’s generalization gives rise to a reading according to which each kisser was age 30 when he/she did his/her kissing, and each kissee was age 20 when he/she was kissed.

On the lexical-internal binding theory, each numeral is responsible for the temporal dependence of the noun phrase it is part of by virtue of creating a simultaneous binding of the time interval arguments of the head noun and whatever predicate it takes as its second argument. This means that when there are more than one non-presuppositional noun phrase in a sentence, each one necessarily takes scope below or above the other(s) at LF. For instance, (32) is one of the two possible LFs for (10), and it yields the
denotation in (33):

\[ (32) \quad \lambda y \in D_e \quad \lambda x \in D_e \quad [y \text{ kiss } x]]\]

\[ (33) \quad \lambda K \in D_i \quad \exists Y \in D_e \quad [|Y| = 5 \land \lambda y \in D_e \quad \lambda J \in D_i \quad \lambda F \in D_i \quad 30-yr-\text{old}(J)(y) \land \exists X \in D_e \quad [|X| = 3 \land \lambda x \in D_e \quad \lambda I \in D_i \quad 20-yr-\text{old}(I)(x) \land \text{kiss}(I)(x)(y)[(X)(J)][(Y)(K)]\]

Obviously, this does not represent the scopeless, cumulative reading.\(^9\) The other possible LF for (10) only has the scopes of the two noun phrases reversed and thus does not work either.

Being a syntactic account, the scope theory can easily accommodate such cumulative readings. On the scope theory, the temporal dependence of multiple non-presuppositional noun phrases should be due to a \(\lambda\) abstraction that simultaneously binds the time interval arguments of the head nouns and the main predicate. In order to account for the scopeless reading of (31), one essentially needs to create a relevant 3-place relation between a time interval, an individual and another individual and “pluralize” that relation by the triple * operator. To that end, I propose that the numeral of each non-presuppositional noun phrase is raised to above this temporal \(\lambda\) abstraction in such a way that a later instance of movement always targets a position right above the \(\lambda\) abstraction created by the previous instance of movement as proposed in Beck & Sauerland (2000). Finally, a special operator which I call \(\text{CUM}^2\), is inserted right above the last-created, and thus the highest \(\lambda\) abstraction:

\[ (34) \quad \text{CUM}^2 \]

\(\text{CUM}^2\) has the following denotation and is responsible for (triple) pluralization:

\(^9(33)\) does not even correctly express a non-cumulative reading whose truth conditions are given by the following:

\[ (i) \quad \exists Y \in D_e \quad [|Y| = 5 \land \forall y \in D_e \quad y \text{ is atomic } \land y \subseteq Y \rightarrow \exists X \in D_e \quad [|X| = 3 \land \forall x \in D_e \quad x \text{ is atomic } \land x \subseteq X \rightarrow \exists I \in D_i \quad [30-yr-\text{old}(I)(y) \land 20-yr-\text{old}(I)(x) \land \text{kiss}(I)(x)(y)]]]]\]
Here, \( n \) is the semantic type of numbers. Since the role of pluralization has now been taken over by the \( \text{CUM}^2 \) operator, numerals simply denote numbers. For example, \([\text{three}] = 3 \in D_n\) and \([\text{five}] = 5 \in D_n\). The truth conditions for (34) are now computed as follows:

\[
([34]) = [\text{CUM}^2] (\lambda y. \lambda x. 20\text{-}yr\text{-}old(I)(x) \land \text{kiss}(I)(x)(y))(\text{[five]})(\text{[three]})
\]

where \( \exists X \in D_e \exists Y \in D_e \exists J \in D_i [\| X \| = 3 \land \| Y \| = 5 \land \ast \lambda y \in D_v. \lambda x \in D_v. 20\text{-}yr\text{-}old(I)(x) \land \text{kiss}(I)(x)(y)](X)(J) \)

The reader may verify that the intended cumulative reading is now correctly captured.

For cumulative readings with \( k \) non-presuppositional noun phrases, I define \( \text{CUM}^k \) as follows and propose that \( \text{CUM}^k \) is inserted in place of \( \text{CUM}^2 \):

\[
([34]) = [\text{CUM}^2] (\lambda y. \lambda x. \lambda i. \lambda I. 20\text{-}yr\text{-}old(I)(x) \land \text{kiss}(I)(x)(y))(\text{[five]})(\text{[three]})
\]

\[
= \exists X_1 \in D_e \exists X_2 \in D_e \ldots \exists X_k \in D_e \exists J \in D_i \left[ \left\| X_1 \right\| = n_1 \land \ldots \land \left\| X_k \right\| = n_k \land \ast \lambda X_1 \in D_v. \lambda X_2 \in D_v. \ldots \lambda X_k \in D_v. \lambda J \in D_v. 20\text{-}yr\text{-}old(I)(x) \land \text{kiss}(I)(x)(y) \right](X_1)(X_2)\ldots(X_k)(J)
\]

To recapitulate, the scope theory is capable of accounting for cumulative readings because a single binder in syntax is simultaneously responsible for the temporal dependence of all the non-presuppositional noun phrases.

## 7 Prelude to a Lebesgue Integral Approach for Event-related Readings

In my dissertation (Shimada, 2009), I developed a new theory of the semantics of sentences that claim the existence of certain entities, based on mathematical measure theory. On this new theory, the truth conditions of existential sentences are in general expressed by virtue of Lebesgue integration.\(^{10}\) I would like to introduce this new approach in this final section, albeit very cursorily.

Krifka (1990) observes that sentence (38) has two readings that can be paraphrased as in (39), and calls the reading in (39a) the object-related reading as it counts the number of the relevant objects (individuals), and the reading in (39b) the event-related reading as it counts the number of the relevant events:

\[
(38) \quad \text{Four thousand ships passed through the lock last year.}
\]

\(^{10}\)For measure theory and Lebesgue integration, the reader is referred to textbooks such as Halmos (1974), Rudin (1987) and Wheeden & Zygmund (1977).
(39)  

a. There are four thousand distinct individual ships that passed through the lock last year. (object-related reading)

b. There were four thousand events of a ship passing through the lock last year. (event-related reading)

If one simply employs existential quantification over ship-individuals and writes a formula like the following, the object-related reading may, but the event-related reading can never be captured.

\[
\exists x_1 \exists x_2 \ldots \exists x_{4000} \left[ x_1 \neq x_2 \land x_1 \neq x_3 \land \ldots x_{3999} \neq x_{4000} \land \text{ship}(x_1) \land \text{pass-through-the-lock}(x_1) \land \cdots \land \text{ship}(x_{4000}) \land \text{pass-through-the-lock}(x_{4000}) \right]
\]

Krifka constructs a special function or relation to account for the event-related reading.

What we should note is the fact that when (38) is uttered out of the blue, the subject noun phrase receives a temporally dependent reading. Since Krifka’s analysis does not even talk about the temporal interpretation of noun phrases, it cannot possibly account for the temporal dependence without modification.

Let us see, then, how we can account for the temporally-dependent event-related reading under the theory in Shimada (2009). For (38), we assume an LF raising of *four thousand* and obtain the relation between an individual and a time interval below in the same way as the relation in (21) was obtained for sentence (10):

\[
R_1 = \lambda x \in D_e. \lambda I \in D_i. \text{ship}(I)(x) \land \text{pass-through-the-lock}(I)(x)
\]

I showed in Shimada (2009) that the truth conditions of temporally-dependent event-related reading of (38) are then given by virtue of Lebesgue integration as follows:

\[
\int_{\{I \mid I \subseteq \text{last-year}\}} \lambda I \in D_i. \text{ATOM} \left( \bigcup_e \{x \mid R_1(I)(x)\} \right) \, d\mu \geq 4000
\]

Here, ATOM is a function that returns the number of atomic individuals in a given (plural) individual, and \( \mu \) is the counting measure (viz., the measure that gives the cardinality of a given set).

The Lebesgue integral approach also provides an elegant analysis for existential sentences that describe events of continuous production or consumption. I argued in Shimada (2009) that Lebesgue integration is indeed fundamentally required to account for such sentences. Consider the following example:

\[
\text{(43) } \text{Machine P produced forty-nine liters of Liquid XYZ yesterday.}
\]

In this case, in place of a pure numeral, the whole measure phrase *forty-nine liters* undergoes LF-raising, and we obtain the following relation:
(44) \( R_2 = \lambda x \in D_e. \lambda I \in D_i. XYZ(I)(x) \land \text{produce}(x)(I)(\text{Machine P}) \)

Using the Radon-Nikodým theorem from measure theory, I showed in Shimada (2009) that for almost all time point \( t \), the rate \( \rho(t) \) of Machine P’s production of XYZ per unit time at \( t \) is given by the following:

\[
(45) \quad \rho(t) = \lim_{h \to 0} \frac{1}{2h} \text{liter}(t) \left( \bigsqcup_{t' \in (t-h, t+h)} \bigsqcup_e \{x \mid R_2(x)([t', t'])\} \right)
\]

Here, \text{liter} is a function that returns the volume of a given individual measured at a given time point. The truth conditions of (43) are then given by integrating \( \rho \) as follows:

\[
(46) \quad \int_{\{t \mid t \in \text{yesterday}\}} \rho \, d\mu \geq 49
\]

Here, \( \mu \) is the Lebesgue measure.

8 Conclusion

This paper argued for a scope account of the obligatory temporally dependent reading of non-presuppositional noun phrases. As far as I can see, the lexical approach is the only viable alternative to the scope theory. As discussed in Section 6, however, the two conceivable implementations of the lexical approach both face independent problems. Therefore, unless one finds yet another alternative account of the temporally dependent reading of non-presuppositional noun phrases, the scope approach advanced in the current paper seems to be the only approach on the right track. However, as discussed in Section 4, the scope theory seems to run into a scope paradox, and it was proposed that the numeral splits and gets raised at LF to get around this problem. Finally, the paper introduced the new Lebesgue integral approach to existential sentences developed in Shimada (2009). The split of the numeral (or of the whole measure phrase) proposed in this paper might have appeared a little odd to the reader, but as cursorily suggested in the final section, it actually forms a basis for the Lebesgue integral theory of existential sentences. For more thorough treatment of the problems discussed in this paper, the reader is referred to Shimada (2009).

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References


Linking argumentativity and information structure in adversatives

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Abstract

This paper deals with the semantics of the adversative connective but. It argues for a unified description of the semantic opposition and denial of expectation uses of but. Our analysis is an attempt at reconciling approaches based on the focus-sensitivity of but and an argumentative description of its meaning. To show that both approaches are necessary, we rely on examples involving quantifiers. Throughout this work, we connect our account to works dealing with the derivation of scalar implicatures. We argue that our data are neutral towards the issue of the locality of these inferences, and that the semantics of but is not sensitive to the presence of scalar implicatures.

1 Introduction

A recurring problem in the description of the adversative but is the difference between its meaning in examples such as (1-a) (called semantic opposition or contrastive use, e.g. in (Lakoff, 1971)) and the one in (1-b) (called denial of expectation or argumentative use).

(1) a. Lemmy plays the bass, but Ritchie the guitar.
    b. Lemmy has been smoking for 40 years, but he’s in perfect health.

Semantic opposition is characterized by the fact that each conjunct contains two elements that have a corresponding contrastive element in the other conjunct; in other words the conjunction must involve two contrastive pairs. In (1-a), the pairs are \langle Lemmy, Ritchie \rangle and \langle bass, guitar \rangle. The interpretation of these examples is said to be symmetric: reverting the order of the conjuncts does not change the meaning of the whole, as shown in (2).

(2) Ritchie plays the guitar, but Lemmy the bass. \approx (1-a)
It is also often noted that *and* can replace *but* without deeply affecting the meaning of the utterance:

(3) Lemmy plays the bass and Ritchie the guitar. \(\approx\)(1-a)

Uses of *but* that signal a denial of expectation have different properties. There is no requirement of double contrastiveness, the conjunction is not symmetric (cf. (4-a)) and *but* cannot be closely paraphrased by *and* (cf. (4-b)).

(4) a. Lemmy is in perfect health, but he’s been smoking for 40 years. \(\not\approx\)(1-b)
   b. Lemmy has been smoking for 40 years, and he’s in perfect health. \(\not\approx\)(1-b)

The only apparent requirement on denials of expectation is that the two conjuncts must stand in an oppositive relation: given the information of the first conjunct one would tend to reject what is asserted in the second one. This property does not seem to extend to semantic opposition cases. To verify this, one can check that in denial of expectation contexts, *but* can easily be replaced by *yet* without an apparent shift in meaning, whereas it is not true for semantic opposition:

(5) a. Lemmy has been smoking for 40 years, yet he’s in perfect health. \(\approx\)(1-b)
   b. Lemmy plays the bass, yet Ritchie plays the guitar. \(\not\approx\)(1-a)

Besides these two uses, at least two others are often described:

- *Indirect Opposition* examples are sisters to denial of expectations. Instead of involving a direct clash between first and second conjunct, the opposition is indirect: the first conjunct evokes a certain conclusion and the second one evokes the opposite.

(6) This ring is nice but expensive (so we shouldn’t buy it).

In an argumentative framework as the one we’ll be using below (e.g. the one in Anscombe and Ducrot (1983)), these examples and the denial of expectations are treated on a par: the denial of expectation cases have the property that the conclusion evoked by the first conjunct is the negation of the second conjunct.

- *Correction* cases are marked by a negation in the first conjunct and a second conjunct that corrects an information in the first conjunct:

(7) It’s not a car, but a Volkswagen.

In many languages (Spanish, German, Romanian...) these constructions use a specific connective. These uses of *but* have been analyzed as involving metalinguistic negation by Horn (1989). We will not deal with such examples in this work, although it is our opinion that a complete account of *but* should cover them.
One can distinguish at least three approaches to the description of the meaning of *but*\(^1\):

- *Argumentation* based theories consider that the core meaning of *but* lies in its argumentative properties (e.g. (Anscombe and Ducrot, 1977), (Merin, 1999)) and that examples like (1-b) and (6) exhibit the central properties of *but*.

- Theories based on the notion of *semantic contrast* consider that denial of expectation and concessive interpretations are an over-interpretation of the contrastive meaning of *but* (e.g. (Umbach, 2005)). Rather, semantic opposition is what *but* is all about.

- Others claim that *but* is *ambiguous* and needs distinct descriptions for distinct uses (e.g. (Izutsu, 2008)).

We will argue that a single description is sufficient to account for both readings of *but* described above. To give a satisfactory account, we will borrow from both argumentation and semantic contrast based theories, and state an *argumentative strength* constraint which will rely on the information structure of each conjunct.

First, we study examples that show the interplay between information structure and strength in the felicitous licensing of *but*. Then, we formulate our proposition and show how it applies to some examples. Throughout the presentation we also look at alternative explanations and theories, especially the theory of local scalar implicature derivation and we show that it cannot account for our data.

## 2 Motivating Data

To motivate our account of *but* we will study (8) in detail.

(8) #Lemmy answered all the questions, but Ritchie some of them.

Out of the blue, (8) appear infelicitous which motivates our use of the # mark. However, we will show that the felicity of (8) depends on its information structure. Then, we will look at two different aspects of the quantifiers in (8). The first one is the *contrastiveness* of the quantifiers, the second is their relative *strengths* (in a sense to be made precise). Our claim is that the quantifiers form a proper contrastive pair, and that it is their strength that interferes with the meaning of *but* to yield infelicitousness.

### 2.1 Information Structure

We claim that the information structure of a coordination with *but* has an effect on its felicity (as already noted in Umbach (2005)). More specifically, for the case of (8) we claim that:

\(^1\)An approach that does not properly fit in these categories is the one proposed by Blakemore (2002) where she argues for an underspecified description of *but* that gets enriched in particular contexts. Although this approach has its merits, we leave a thorough discussion of it for the future.
If *some* is in the second conjunct and is an informational focus, the coordination is not felicitous$^2$.

If *some* is in the second conjunct and is not narrowly focussed (be it as a contrastive topic or if the whole conjunct is all-focus), then the coordination is felicitous.

To prove our claim, we rely on a number of tools that help us manipulate the informational structure of an utterance:

- Information Structure can be forced by an overt question.
- Prosody can indicate Information Structure$^3$.
- Clefts can identify Informational Focus.

### 2.1.1 Quantifiers as Informational Foci

The question in (9-a) marks Lemmy and Ritchie as contrastive topics, and is open regarding the number of questions they answered, i.e. the quantities of answers will be informational foci. As can be observed, (9-b) is not felicitous as an answer to (9-a).

(9)  
\begin{align*}
\text{a. } & \text{How many questions did Lemmy and Ritchie answer each?} \\
\text{b. } & \#[\text{Lemmy}]_{CT} \text{ answered } [\text{all the questions}]_F \text{ but } [\text{Ritchie}]_{CT} [\text{some of them}]_F.
\end{align*}

### 2.1.2 Quantifiers as Contrastive Topics

We use the question (10-a) to show that if the quantifiers in (8) are contrastive topics, then the utterance is felicitous. This question establishes that somebody answered all the questions and that someone else answered some of them.

(10)  
\begin{align*}
\text{a. } & \text{Who answered all the questions and who answered some of them?} \\
\text{b. } & [\text{Lemmy}]_F \text{ answered } [\text{all the questions}]_{CT} \text{ but } [\text{Ritchie}]_F [\text{some of them}]_{CT}.
\end{align*}

Example (10-b) sounds slightly better than (9-b). However, in order to sharpen our judgement, we propose to use (11) instead. There, each subject is clefted, which here means that the subjects are informational foci, just as they would be in (10-b). The resulting (11) shows that if the quantifiers are contrastive topics and not foci, then the sentence is indeed felicitous.

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$^2$Throughout this work, the notions of Informational Focus and Contrastive Topic are based on those found in Büring (2003). These notions are not prosodic in nature, although informational foci and contrastive topics do have prototypical prosodic realizations (e.g. the A and B accents in English).

$^3$We had no access to English speakers to test the effects of prosody on the felicity of (8). We ran a preliminary experiment on French *mais* (= *but*) which showed that prosodic information is not a very good indicator of information structure for (8) in French. Therefore, we will keep a detailed study of these effects for future work.
(11) It’s [Lemmy]$_F$ who answered [all the questions]$_{CT}$, but it’s [Ritchie]$_F$ who answered [some of them]$_{CT}$.

2.1.3 All Focus Conjuncts

A last configuration we need to look at is the case of quantifiers in all-focus utterances, as in (12-b).

(12) a. Tell me who fared well on the test?
   b. [Lemmy answered all the questions]$_F$ but [Ritchie some of them (too)]$_F$.

As we have claimed, (12-b) is felicitous, but it is worth noting that too facilitates its interpretation. In this case, some approaches even predict that too should be obligatory (see (Winterstein, 2010) for more details about the behaviour of too in such cases).

Nevertheless, whatever the effect of too in (12-b), it cannot be used to account for the infelicity of (9-b), as seen in (13-b). In this regard, (12-b) and (9-b) can be considered as a minimal pair for felicity.

(13) a. How many questions did Lemmy and Ritchie answer each?
   b. #[Lemmy]$_{CT}$ answered [all the questions]$_F$ but [Ritchie]$_{CT}$ [some of them]$_F$ too.

2.1.4 Summing-Up

The examples seen above show that our previous claim is correct: as long as the quantifiers in (8) are not narrowly focussed, (8) is felicitous.

2.2 The Contrastiveness of Quantifiers

In this section, we look at a potential explanation for the infelicity of (9-b). It can be argued that the quantifiers all and some do not form a proper contrastive pair because the former logically entails the latter. If we assume that but requires truly contrastive pairs, the infelicity of (9-b) would follow as a consequence. We argue that this explanation is inconclusive for several reasons.

First, we show that these quantifiers can be contrasted with connectives different from but. Second, we claim that in order to be contrasted with all, some needs to be exhaustified. We then show that nothing prevents this exhaustification in (9-b).

2.2.1 Romanian and And

If all and some did not form a contrastive pair, we would not expect them to appear in constructions requiring contrastiveness. Besides coordination with but, we present
two such constructions that require and allow a contrast between these quantifiers.

The first one is taken from Romanian and relies on the connective *iar*. The semantics of *iar* is often described as intermediate between that of *and* and *but* (for more details about *iar*, see (Bălbăie and Winterstein, forthcoming)). The characteristics that interest us are the following:

- A coordination with *iar* requires two pairs of contrastive items. Having just one pair as in (14) does not license the use of *iar*.

\[(14) \quad \text{*Inelul e frumos iar scump.} \]
\[
\quad \text{The ring is nice IAR expensive}
\]

- *Iar* does not allow non-contrastive elements in one pair:

\[(15) \quad \text{#Paul a mâncat un măr, iar Petre un fruct.} \]
\[
\quad \text{Paul ate an apple, IAR Peter a fruit}
\]

The pair ⟨apple, fruit⟩ is not contrastive because the first one is an hyperonym of the second. This prevents the use of *iar* in (15).

We can now check that *iar* can contrast the Romanian equivalents of *all* and *some*:

\[(16) \quad \text{Paul a răspuns la toate întrebările, iar Petre la câteva.} \]
\[
\quad \text{Paul answered all the questions, IAR Peter some of them}
\]

The example (16) is felicitous, and it must be noted that our informants told that its second conjunct strongly conveys that Peter did not answer all the questions.

A similar point can be made with the connective *and*, as in (17-b):

\[(17) \quad \begin{array}{a}
\text{a. How many questions did Lemmy and Ritchie answer each?} \\
\text{b. Lemmy answered all the questions, and Ritchie some of them.}
\end{array} \]

The answer (17-b) would typically be produced with contrastive accents on *all* and *some*. Here again, the favoured interpretation of *some* is an exhaustified one: Ritchie did not answer all the questions.

2.2.2 Exhaustification

We have seen that in (16) and (17-b) the preferred interpretation of *some* is an exhaustified one. Exhaustification is often assumed to be the mechanism yielding scalar inferences (e.g. Groenendijk and Stokhof (1984), van Rooij and Schulz (2004), Chierchia et al. (2008), . . .), i.e. that allows *some of the questions* to be interpreted as *some of, but not all, the questions.*
Therefore, we make the hypothesis that to form a contrastive pair with *all, some* must be exhaustified. The hypothesis makes sense since an exhaustified *some* is not linked by an entailment relation with *all* and the two are likely to form a proper contrastive pair (being thereby both similar and different).

To explain the infelicity of (9-b), one could then argue that since *but* blocks the exhaustification of its right conjunct (note that this presupposes that *but* requires contrastive pairs in its conjuncts, a fact we actually argue against later in favor of an analysis based on the strength of the items). But such an hypothesis would be rather *ad-hoc*, and counter-intuitive: if *but* requires a contrastive pair, it should not block the mechanism that would properly force the proper interpretation of the quantifiers. Furthermore, an exhaustive interpretation of *most* is accessible in (18), indicating that the exhaustification is not hampered in the second conjunct.

(18)  Lemmy answered some questions, but Ritchie most of them.

We conclude that the infelicity of (9-b) cannot be attributed to a blocking of the exhaustification mechanism of the right quantifier.

### 2.3 Strength

An immediate way to modify (9-b) into a felicitous utterance is to switch its conjuncts:

(19)  a. How many questions did Lemmy and Ritchie answer each?
     b. Lemmy answered some of the questions, but Ritchie all of them.

*Some* and *all* are often described as belonging to the same *scale*, be it an entailment based one (e.g. Horn (1989)) or a relevance based one (e.g. Merin (1999), van Rooij (2004)). Some scale examples are *(All, most, some, a bit)* and *(None, few, not all)* (these two scales are related by negation: the negation of each element of a scale belongs to the other, e.g. *not some=*none). The contrast between (19-b) and (9-b) thus shows that if the foci in the left and right conjuncts belong to the same scale, the stronger item must be placed in the right conjunct.

If each focus belongs to negated scale of the other, the constraint is more complex: the right focus must be stronger than the negation of the left focus. In (20-a) and (20-b), the right focus is the strongest on its scale, and the coordination with *but* is felicitous. In (20-c), the negation of the left focus is *None*, and it is stronger than the right focus: the utterance is not felicitous.

(20)  a. Lemmy answered a few questions, but Ritchie none of them.
     b. Lemmy answered some of the questions, but Ritchie none of them.
     c. #Lemmy answered some of the questions, but Ritchie not all of them.
If one admits that semantic opposition is one of the uses of but and constitutes a class of its own, then the examples (9-b) and (19-b) both have a structure of this kind, which, as stated above, is traditionally considered to be symmetric. However, the contrast between (9-b) and (19-b) shows that this cannot be a general property of semantic opposition. We take it to mean that but is intrinsically asymmetrical, in both its denial of expectations and semantic opposition uses. This will be our starting point for the formalization of its semantics.

2.4 Taking Stock

We sum-up the main observations we have made in this section:

- *But* is sensitive to information structure (as already noted by Umbach (2005))
- *But* is intrinsically asymmetrical: a scalar item in the focus of the second conjunct in a *but*-coordination must be stronger or opposed to its counterpart in the first conjunct:
  - It is not a contrastability issue.
  - It is not an exhaustification issue.

3 Proposed Solution

Our proposed analysis will borrow from two formalizations we already mentioned:

- the analysis by Umbach (2005) that relies on the sensitivity of but to information structure,
- the description of but given by Anscombre and Ducrot (1977) that is based on the theory of argumentation.

We briefly present the merits and flaws of each approach, and then take the best of both worlds to build our final proposal.

3.1 Umbach (2005)’s Analysis

The central claim of Umbach’s analysis is that but is sensitive to the information structure of its conjuncts. A simple way to observe this sensitivity is the intuitive difference between (21-a) and (21-b):

(21)  a. . . . but BILL has washed the dishes.
       b. . . . but Bill has washed the DISHES.
The continuation in (21-a) bears a stress on Bill that suggests that the whole conjunction is an answer to a question bearing on persons (e.g. Who prepared dinner and who washed the dishes?). On the other hand, (21-b) bears a stress on dishes suggesting a question such as What did Bob and Bill do?

To describe the semantics that Umbach gives to a coordination with but, we assume an utterance with the following information structure⁴: ⟨⟨CT₁, R₁⟩, F₁⟩ but ⟨⟨CT₂, R₂⟩, F₂⟩. Umbach’s claim is that the asserted component of but is similar to the contribution of the more neutral conjunction and: it asserts the truth of each conjunct. In addition to this, but also conveys an implicature expressing the fact that the predication on the focus of the second conjunct does not hold for the first focus. She calls it the denial condition. With the structure and notations given above, we can spell out the condition as follows:

Assertion: ((R₁)CT₁)F₁ and ((R₂)CT₂)F₂

Denial condition: ¬((R₁)CT₂)F₁

Applied to (22), this gives (22-a) and (22-b).

(22) [John]CT₁ [cleaned up the room]F₁, but [Bill]CT₂ [did the dishes]F₂

a. Assertion: John cleaned up the room and Bill did the dishes
b. Denial Condition: Bill did not clean the room.

3.1.1 Wrong Predictions of the Denial Condition

If we apply the above analysis of but to our key-example (9-b) (repeated in (23-a)), the prediction of the denial condition (given in (23-b)) is not satisfactory.

(23) a. #[Lemmy]CT answered [all the questions]F but [Ritchie]CT [some of them]F.

= (9-b)

b. Denial Condition: ¬(Ritchie answered all the questions)

The denial condition does not predict any inconsistency in (23-a); rather its content matches that of the scalar implicature that would be attached to the second conjunct of (9-b). Even worse, the denial condition predicts that (10-b) should be out because the denial condition (given in (24-b)) directly contradicts the second conjunct.

⁴Throughout this section we use the following notations:
• F: marks an informational focus
• CT: marks a contrastive topic
• BG: marks the background of an utterance (the part of the utterance to which the focus applies)
• R: marks the background minus the contrastive topic
(24) a. \([\text{Lemmy}]_{CT}\) answered [some of the questions]$_F$ but \([\text{Ritchie}]_{CT}\) [all of them]$_F$. (=10-b)

b. Denial Condition:\(\neg (\text{Ritchie answered some of the questions}) = \neg \text{Ritchie answered no questions}\).

**Exhaustification Again**

To save Umbach’s analysis, one could argue that the denial condition in (24-a) takes the exhaustified meaning of some in the first conjunct, i.e. that it yields the implicature Ritchie did not answer some but not all the questions, which is consistent with the second conjunct of (24-a). But this solution faces the problem of (25) where an exhaustified interpretation of the left quantifier is blocked by the presence of at least. In this case the denial condition is identical to the one in (24-b), and therefore inconsistent with the whole utterance.

(25) \([\text{Lemmy}]_{CT}\) answered [at least some of the questions]$_F$ but \([\text{Ritchie}]_{CT}\) [all of them]$_F$.

Still, if we assume that exhaustivity can in some way rescue (24-a), this would be of no help to exclude (23-a). Then a possible way to exclude (23-a) could be to assume that the denial condition clashes with a strictly non-exhaustified interpretation of some in the second conjunct, i.e. with Ritchie answered some, if not all, the questions. Therefore, what should enter the semantics of but is:

- an exhaustified meaning of the left conjunct (to validate (24-a))
- a strictly non-exhaustified meaning of the right conjunct (to exclude (23-a))

These requirements appear contradictory in nature and we will thus assume that but is not sensitive to exhaustification, but to other properties of the foci.

Assuming that the right conjunct in (23-a) can be exhaustified, we can formulate another hypothesis about exhaustive implicatures. Comparing (23-a) with (26) shows that the use of an overt restriction yields a felicitous utterance.

(26) Lemmy answered all the questions but Ritchie only some of them.

It has been proposed that exhaustification yields a meaning similar to an overt restriction operator such as only (cf. Chierchia et al. (2008)). Since only is felicitous where naked exhaustification is not, we can assume that only adds something that implicatures lack. The argumentative approach we present below will give us a proper way to capture this: only switches the argumentation of its host, whereas exhaustivity implicatures do not modify it.

### 3.2 Standard Argumentative Approaches

Since argumentation theory is not familiar to most readers, before presenting its analysis of but we first briefly present the main tenets of the theory. Then we look at the
argumentative properties of *but* and their shortcomings.

### 3.2.1 Brief Introduction to Argumentation

Argumentation theory stems from a very basic observation: the same sentence can have a truth-conditional content that contradicts the purpose of the sentence. For example, (27-b) entails that the dinner is not ready, but yet it is understood as a positive answer to the question (27-a).

(27)  

a. Is the dinner ready?  
   
b. Yes, almost.

Anscombre and Ducrot (1983) analyze (27-b) by teasing apart its truth-conditional content and what they call its *argumentative orientation*. The item *almost* is thus described as conveying the negation of its argument, but retaining the same argumentative properties as this argument. Therefore, (27-b) is said to argue in the same way as "The dinner is ready" would, which explains that it can felicitously follow the affirmative *Yes*.

The argumentative orientation of an utterance has three remarkable properties:

- It is always relative to an argumentative goal that is contextually determined.
- It is oriented for, or against this goal.
- It is quantified: it is possible to order (at least partially) the arguments for a given goal.

Some linguistic items have conventional argumentative properties. This is the case for the already mentioned *almost*, and a score of other items have also been described in the literature (e.g. *negation* and *only* that revert the orientation of their hosts). Although Anscombre and Ducrot treat argumentation as a primitive, Merin (1999) proposed a way to derive the argumentative power of an utterance in a probabilistic framework. One can calculate the *relevance* of an utterance $p$ to a goal $H$ (which is noted $r_H(p)$). If $r_H(p)$ is positive, $p$ is said to argue for $H$, if not, it argues against $H$ ($r_H(p) < 0$) or is neutral towards $H$ ($r_H(p) = 0$). The exact definition of the relevance function can vary (see (van Rooij, 2004) for examples) and does not interest us here.

### 3.2.2 The meaning of *but*

Argumentative approaches analyze the meaning of an utterance of the form $p$ *but* $q$ as follows:

- It asserts both $p$ and $q$
• There is an argumentative orientation condition on the conjuncts: \( p \) and \( q \) must have opposite argumentative orientation \( (r_H(q) < 0 < r_H(p)) \).

• There is an argumentative strength condition \( r_H(p \land q) < 0 \), i.e. the conjunction as a whole must argue in the same direction as \( q \) (roughly: \( q \) “wins” the argument).

The strength condition captures the difference between (28-a) and (28-b).

(28) Should we buy this ring?
   a. It’s nice but expensive.
   b. It’s expensive but nice.

The question (28) sets the buying of the ring as the argumentative goal of the answer. In (28-a), the second conjunct is understood as being stronger, i.e. the ring should not be bought because it’s expensive; whereas in (28-b), it’s the niceness that is understood to prevail in favour of the buying.

### 3.2.3 Shortcomings

As such, standard argumentation approaches cannot deal with the examples we have seen so far. Among their defects are the following:

• Information structure is not taken into account in the description of \( \textit{but} \). This means that the predictions for (8) are independent of its information structure, whereas we observed that its felicity varied according to the informational status of the quantifiers.

• As stated, the strength condition has a dubious interpretation in the “semantic opposition” cases. For example in (29), there is no obvious way to tell why and for which conclusion is \( \textit{Ritchie plays the guitar} \) a better argument than \( \textit{Lemmy plays the bass} \).

(29) Lemmy plays the bass, but Ritchie the guitar.

• The strength condition is contradictory with the orientation condition in some cases (cf. van Rooij (2004) in the case that \( p \models q \)).

### 3.3 Detailed Proposal

Our proposal will integrate the best aspects of both Umbach’s proposal and the argumentation theory. What we are looking for is a description of \( \textit{but} \) that:

\[5\text{We consider that } H \text{ is fixed as the argumentative goal of the first conjunct. If } H \text{ is taken as the goal of the second conjunct, then the first one argues for } \neg H \text{ which means that the ordering must be reversed in all formulas.}\]
• Keeps the sensitivity to information structure, without deriving the faulty inferences of the denial condition.

• Relies on an argumentative framework, because it accounts well for concessive readings and ensures the link with the world-knowledge of the participants.

• Keeps an asymmetric constraint similar to the strength condition: by itself, the orientation condition is symmetric and cannot account for the asymmetry of the examples we have observed\(^6\).

Our solution is thus to reformulate the strength constraint by including our observations about weak items in focus.

We describe the meaning of \(\langle BG_1, F_1 \rangle\) but \(\langle BG_2, F_2 \rangle\) as such:

**Assertion:** \(p = (BG_1)F_1\) and \(q = (BG_2)F_2\)

**Orientation Condition:** \(p\) and \(q\) must have opposite argumentative orientation:

\[ r_H(q) < 0 < r_H(p) \]

**New Strength Condition:** the proposition obtained by substituting foci in the first conjunct must be stronger than \(p\) or than \(\neg p\):

- let \(q' = (BG_1)F_2\)
- then \(r_H(q') \notin [r_H(\neg p), r_H(p)]\)

The new strength condition is illustrated on Fig. 1: the relevance of the constructed \(q'\) can appear anywhere, except in the gray zone.

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\(^6\) It is also worthwhile noting that a strength condition for adversatives is independently assumed in some works, e.g. in Jasinkaja and Zeevat (2009))

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3.3.1 Applications

We now show how to apply our proposal to the more characteristic examples we have seen so far.
Non-felicitousness: First, we check that (9-b) (repeated in (30-b)) is predicted to be anomalous.

(30) a. How many questions did Lemmy and Ritchie answer each?
    b. \#Lemmy\CT answered [all the questions]\F but [Ritchie]\CT [some of them]\F.

\(= (9-b)\)

With the previous notations we have:

- \(p = \text{Lemmy answered all the questions}\)
- \(q' = \text{Lemmy answered some of the questions}\)
- Usually, scalar items such as the quantifiers \(\langle \text{all}, \text{some} \rangle\) form scales\(^7\) , i.e. \(r_H(q') \in \left[0, r_H(p)\right]\)
- Since \(r_H(q')\) is in the forbidden range of value, we correctly predict the non-felicitousness of (30-b).

Quantifiers as Contrastive Topics Now, (10-b) is shown to be felicitous.

(31) a. Who answered all the questions and who answered some of them?
    b. [Lemmy]\F answered [all the questions]\CT but [Ritchie]\F [some of them]\CT.

\(= (10-b)\)

We have

- \(p = \text{Lemmy answered all the questions}\)
- \(q' = \text{Ritchie answered all the questions}\)
- Here \(p\) and \(q'\) do not stand in a systematic argumentative relation. Their actual ranking depends on the context of utterance. Since the context in (31-a) is neutral, nothing prevents the accommodation of the proper relation between the propositions and the utterance is understood as felicitous.

Non-scalar items Let’s now look at what our analysis predict for utterances without scalar items such as (32-b).

(32) a. What do Lemmy and Ritchie play?
    b. [Lemmy]\CT plays [the bass]\F, but [Ritchie]\CT [the guitar]\F.

The analysis gives:

\(^7\)An emphasis on \textit{usually} is mandatory: it is not always true that quantifiers form scale, although the proper contexts can be hard to build. See (Winterstein, 2008) for an example.
• $p = \text{Lemmy plays the bass}$

• $q' = \text{Lemmy plays the guitar}$

As in (31-b), $p$ and $q'$ do not stand in any systematic argumentative relation. There are two options for their relative ranking, which roughly correspond to how one understands the relation between \textit{playing the bass} and \textit{playing the guitar}: it can either be the case that the second is better than the first or it can be that it is opposed to it. We can speculate on the kind of goal $H$ that each ranking could correspond to:

• If $r_H(p) < r_H(q')$, then the argumentative goal $H$ would be akin to \textit{Lemmy’s a better musician than Ritchie}, and the whole coordination argues against this goal: because he plays the guitar, it’s Ritchie who is the best musician of the two.

• If $r_H(q') < r_H(\neg p)$, the argumentative goal $H$ would be akin to \textit{Lemmy and Ritchie both play the bass}. The first conjunct gives a partial argument for such a goal, and the second one denies it.

This speculation on argumentative goals is only valid when no particular goal is explicit in the discourse, or when \textit{but} is used in a discourse that does not require its presence. In (32-a), the use of \textit{but} is not called for by the form of the question: the use of \textit{and} would have felt more natural. If the speaker of (32-b) elected to use \textit{but}, it must be because he has his own agenda, and wishes to convey more than a plain answer to (32-a). We hypothesize that the two interpretations of (32-b) we have given do cover the range of possibilities to explain the use of \textit{but} in (32-b).

4 Conclusion

In this work we have argued for a unified semantics for the adversative connective \textit{but}. Our proposal relied on previous approaches: one based on the notion of semantic contrast and the other based on argumentation theory. We described \textit{but} as being sensitive to two different dimensions of discourse: argumentation and information structure, and blind to the exhaustive interpretation of its conjuncts.

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