Division of labor in the interpretation of declaratives and interrogatives*

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Abstract

This paper presents an account of the semantics and discourse effects of a range of sentence types in English, namely falling declaratives, polar interrogatives, and certain kinds of rising declaratives and tag interrogatives. The account aims to divide the labor between compositional semantics and conventions of use in a principled way. We argue that falling declaratives and polar interrogatives are unmarked sentence types. On our account, differences in their discourse effects follow from independently motivated semantic differences combined with a single convention of use, which applies uniformly to both sentence types. As a result, the Fregean 'illocutionary force' operators *Assertion* and *Question* become unnecessary. In contrast, we argue that rising declaratives and tag interrogatives are marked sentence types. On our account, their discourse effects consist of the effects that are dictated by the basic convention of use that is common to all sentence types considered here, augmented with special effects that are systematically connected to their formal properties. Thus, a central feature of our approach is that it maintains a parallelism between unmarked and marked sentence types on the one hand, and basic and complex discourse effects on the other.

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Contents

1 Introduction **3**

2 Previous approaches and desiderata **6**
2.1 The content/force distinction 6
2.2 Radical dynamics 8
2.3 A middle way 9
2.4 Unifying semantic types and conventions of use 12
2.5 Unmarked versus marked forms, basic versus special effects 14

3 Assumptions on semantic content and discourse contexts **16**
3.1 Semantic content in inquisitive semantics 16
3.2 Commitment-based discourse contexts 19

4 Semantic interpretation **21**
4.1 Sentence forms 21
4.2 Compositional semantics 24
4.3 Marked and unmarked sentence forms 28

5 Conventions of use **30**
5.1 The basic convention of use 30
5.2 Special discourse effects 33

6 Testing the account **37**
6.1 Baseline predictions 37
6.2 Further predictions: rhetorical questions and NPI licensing 42

7 Comparison with some related approaches **44**
7.1 Gunlogson (2001, 2008) 44
7.2 Condoravdi and Lauer (2012a) 45
7.3 Krifka (2014) 46
7.4 Malamud and Stephenson (2015) 46
7.5 Northrup (2014) 47
7.6 Westera (2013) 48

8 Conclusion **49**

1 Introduction

It is often assumed that the interpretation of an utterance involves at least three factors: (i) a compositional procedure which, given the lexical meaning of the words that the uttered sentence consists of and the way in which they are put together, determines the *semantic content* of the sentence, (ii) certain conventions of use connected to the sentence type involved (e.g. declarative versus interrogative) which, given the semantic content of the sentence, determine the *conventional discourse effects* of the utterance, i.e., those discourse effects that arise purely in virtue of linguistic conventions and are stable across different contexts of utterance, and (iii) pragmatic considerations about potential speaker intentions in the particular context of utterance which, given the conventional discourse effects of the utterance, determine possible further *pragmatic discourse effects*.[1]

To exemplify, consider the declarative in (1) and the polar interrogative in (2):

(1) Fido is hungry.

(2) Is /p/ a fricative?

The semantic content of (1) is usually construed as a proposition, i.e., a set of possible worlds, namely those worlds in which Fido is hungry. The conventional discourse effect of uttering (1) is usually assumed to be that the speaker proposes to add the proposition expressed by the sentence to the *common ground* of the conversation, i.e., the set of propositions that are mutually accepted by the conversational participants (Stalnaker, 1978). Finally, depending on the particular circumstances of utterance, several additional pragmatic discourse effects may arise. For instance, the utterance may function as a request for the addressee to provide some food, or in special circumstances as a warning or a threat.

The semantic content of (2) is often construed as a set of two propositions, one consisting of all worlds where /p/ is a fricative and the other consisting of all worlds where /p/ is not a fricative (Hamblin, 1973). The conventional discourse effect of uttering (2) is assumed to be that of raising the issue which of these propositions is true. In this case, too, additional pragmatic discourse effects may arise depending on the particular circumstances of utterance. For instance, the utterance may function as a request for information, conveying that the speaker does not know herself whether /p/ is a fricative, and that she considers it possible that the addressee does. On the other hand, the utterance may also function as a quiz question, testing the addressee's knowledge rather than requesting information that the speaker lacks. In yet other contexts, the utterance may function as a rhetorical question with the intention of embarrassing the addressee.

This paper is concerned with the first two factors—semantic content and conventional discourse effects—which are tied directly to the sentence form and do not depend on the circumstances of utterance.[2] In particular, it is concerned with the division of labor between *semantic interpretation*, which determines the semantic content of a given sentence in a compositional way, and *conventions of use*, which determine the conventional discourse effects of an utterance, based on the semantic content of the uttered sentence and possibly certain aspects of its form. Our first aim is to determine, in general terms, how these two components of grammar should work together in connecting sentences to their conventional discourse effects. Our second, more specific aim is to develop a concrete account of a class of sentence types which divides the labor between semantics

[1] The terminology we use here ('conventions of use', 'conventional discourse effects', 'pragmatic discourse effects') is adopted from the work of Condoravdi and Lauer (e.g., Condoravdi and Lauer, 2012a,b; Lauer, 2013). Other authors have used different terms for similar notions (e.g., 'force', 'illocutionary effects', 'perlocutionary effects').

[2] For recent discussion of the connection between conventional and pragmatic discourse effects, as well as references to earlier work on this issue, see Condoravdi and Lauer (2012a,b); Lauer (2013).

and conventions of use in a maximally parsimonious way.

The sentence types that we are concerned with are exemplified in (3)–(8), where ↑ and ↓ are used to indicate rising and falling intonation, respectively:

(3) Amalia left↓. [falling declarative]

(4) Amalia left↑? [rising declarative]

(5) Did Amalia leave↓? [falling polar interrogative]

(6) Did Amalia leave↑? [rising polar interrogative]

(7) Amalia left↓, didn't she↓? [falling tag interrogative]

(8) Amalia left↓, didn't she↑? [rising tag interrogative]

Whenever differences in intonation are irrelevant, we will simply speak of declaratives, polar interrogatives, and tag interrogatives, without specifying whether they are falling or rising.

We should note at the outset that when it comes to tag interrogatives and rising declaratives, we will not consider all varieties. In particular, besides the tag interrogatives exemplified above, where the polarity of the tag is the opposite of the polarity of the declarative anchor, there are also tag interrogatives where the polarity of the tag is the same as that of the anchor, exemplified in (9). We will leave this variety of tag interrogatives out of consideration.

(9) Amalia left, did she?

As for rising declaratives, we consider here only instances which, unlike falling declaratives, do not express speaker commitment to the sentence radical, and, like polar interrogatives, require a response that settles whether the radical holds or not. Instances of rising declaratives that do not meet these conditions include cases of 'uptalk' (McLemore, 1991; Cruttenden, 1994; Warren, 2005; Shokeir, 2008), as well as cases like (10)-(12) below, where a speaker signals that she is unsure about the relevance, sufficiency, or clarity of her contribution, but still commits to its truth.

(10) A: Was John at the party?
B: Well, he was planning to go↑. ⇝ not sure whether relevant (Westera, 2013)

(11) A: Do you speak Ladino?
B: I speak Spanish↑. ⇝ not sure whether sufficient (Ward and Hirschberg, 1985)

(12) (English tourist in a French café)
I'd like. . . err. . . je veux. . . black coffee↑. ⇝ not sure whether clear (Westera, 2013)

We assume for now that the rising declaratives in (10)-(12) are of a different nature than the ones we are concerned with, although ultimately we would of course like to better understand the connection between the different varieties and perhaps even come to a fully unified theory.[3] Our empirical reach is, however, more inclusive than that of Gunlogson (2008), who considers only those questioning uses of rising declaratives that are unrelated to an immediately previous utterance.

The sentences in (3)–(8) have three properties in common. First, a property that distinguishes declaratives and interrogatives in general from other sentence types like imperatives and exclamatives is that they are primarily used to exchange information. Because of this we view declaratives

[3]Westera (2013) presents a unified account of cases like (10)-(12), which assumes, roughly, that the final rise signals that the speaker is not sure whether she complies with all the maxims that govern cooperative behavior in the given type of conversation. As will be discussed in some detail in Section 7.6, the empirical coverage of this account is by and large complementary to the proposal developed in the present paper.

and interrogatives as a natural class and we think it is justified to consider them in isolation from the other sentence types.

Second, more specifically, a formal similarity between the sentences in (3)–(8) is that they have the same sentence radical, *Amalia left*. Third, in terms of discourse effects, they all induce a choice between two complementary alternatives, the alternative that Amalia left and the alternative that she did not leave.

Besides these commonalities, there are also a number of immediate differences between (3)–(8). First, in terms of form, there are differences in word order, intonation, and the presence/absence of a tag. Second, in terms of discourse function, the most salient difference concerns the *commitments* and *biases* that a speaker expresses in uttering these sentences. Globally speaking, we can distinguish three cases: (i) in uttering a falling declarative, a speaker fully commits to the alternative that Amalia left, (ii) in uttering a polar interrogative, either rising or falling, a speaker remains neutral between the two alternatives, i.e., she does not commit to any alternative and signals no bias for one alternative over the other, and (iii) in uttering a rising declarative or tag interrogative, a speaker expresses a bias, though not a full commitment, towards the alternative corresponding to the sentence radical, i.e., the alternative that Amalia left.[4] In sum:

Sentence type	*Type of commitment*
Falling declaratives	full commitment to one alternative
Rising declaratives	bias towards one alternative, but no full commitment
Tag interrogatives	bias towards one alternative, but no full commitment
Polar interrogatives	neutral

Besides these global differences, there are also more fine-grained contrasts between the different sentence types. For instance, Malamud and Stephenson (2015) show with examples like (13) and (14) below that there are contexts in which tag interrogatives are felicitous but rising declaratives are not, and vice versa.

(13) Context: *Belinda is going through a pile of job applications. Chris has not seen any of them yet. Belinda hands Chris the application that she just finished reading, and tells him to have a look at it. Chris to Belinda:*

a. This is a good one↑?
b. #This is a good one, isn't it?

(14) Context: *Belinda and Chris are looking at a sunset together. Belinda to Chris:*

a. #It's a beautiful sunset↑?
b. It's a beautiful sunset, isn't it?

In order to capture these and other contrasts between the various sentence types, as well as their commonalities, we need to address the following two basic questions:

Q1: What exactly are the conventional discourse effects of the different sentence types in (3)–(8)?
Q2: How should differences in conventional discourse effects be connected to differences in form?

In Section 2 we will discuss a number of answers that have been given to these questions in previous work, using the diagram in Figure 1 as a template to visualize and compare the various approaches.

[4]We will have much more to say about the precise kind of bias that is conveyed by rising declaratives and tag interrogatives. One important observation we will make is that while expressing a bias towards a certain alternative always involves signalling the presence of some evidence for that alternative, it does not necessarily imply that the speaker is ready to go along with this evidence.

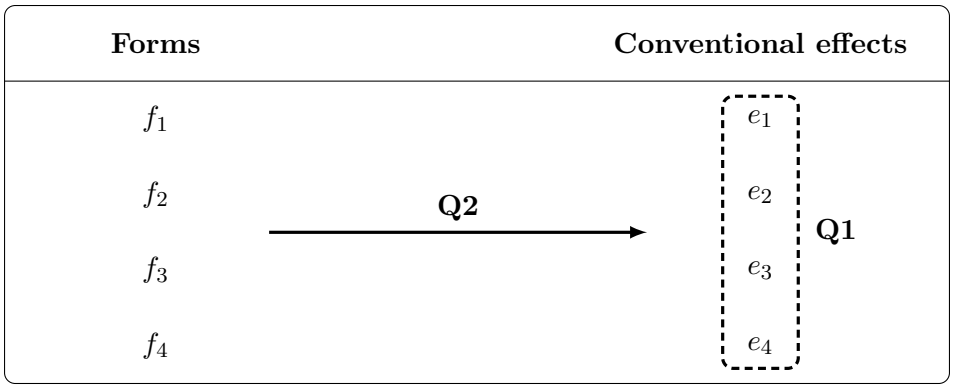


Figure 1: Visualization of the main questions to be addressed.

This discussion will bring out a number of theoretical desiderata, which, we argue, are not fully satisfied by any existing approach. We then turn to our own proposal. First, in Section 3, we lay out our general assumptions concerning semantic content and discourse contexts, building on recent work in inquisitive semantics and commitment-based discourse models (Farkas and Bruce, 2010; Ciardelli *et al.*, 2015, among others). Then, in Section 4 and 5, we formulate a concrete account of the relevant sentence types, which satisfies the given theoretical desiderata. Finally, in Section 7 we compare our account with some concrete alternative proposals in the recent literature, and Section 8 concludes.

2 Previous approaches and desiderata

There are many approaches to the problem of connecting sentence types with their conventional discourse effects, and we cannot survey all of them in full detail here.[5] Instead, we will identify the general characteristics of some of the most prominent approaches, and assess their high-level advantages and disadvantages. This will lead us to a set of desiderata, which will then serve as a target for our own proposal. We start our discussion with the classical approach, rooted in the work of Frege (1918).

2.1 The content/force distinction

Frege made a distinction between the *thought* that a sentence expresses—in modern terminology, its *semantic content*—and its *force*. On this view, a falling declarative like (3) and a polar interrogative like (6) have the same semantic content, namely the proposition that Amalia left, but they differ in force. In Frege's words:

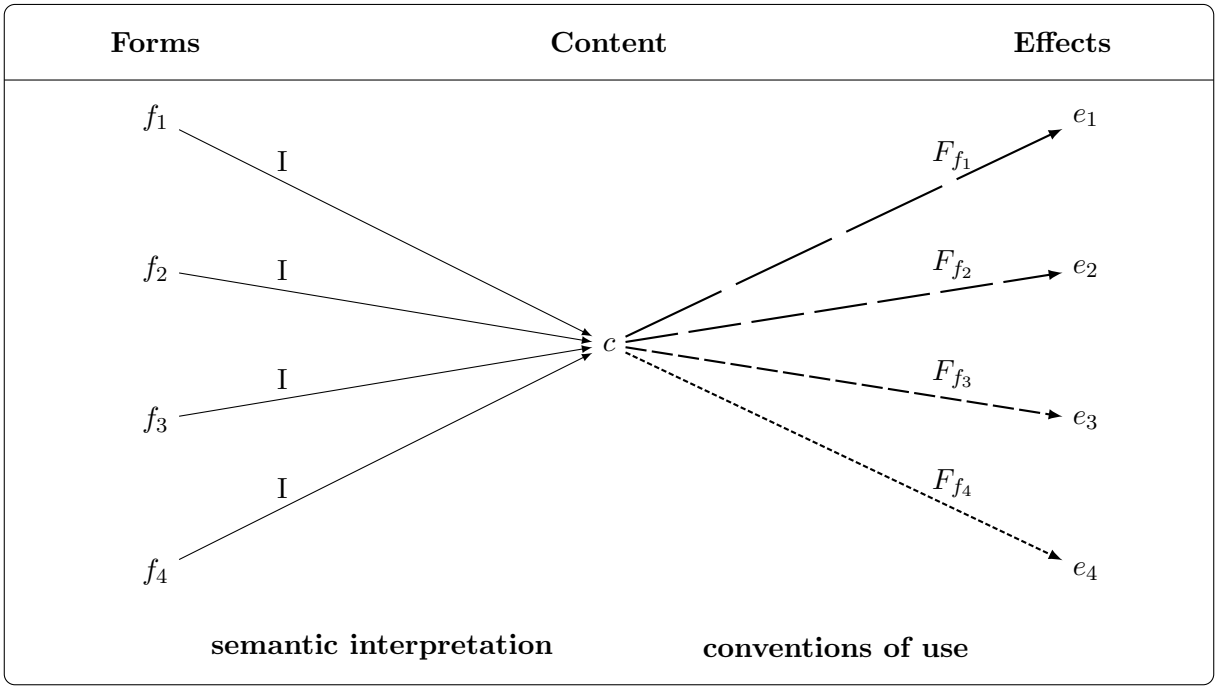
> "An interrogative sentence and an indicative one contain the same thought; but the indicative contains something else as well, namely, the assertion. The interrogative sentence contains something more too, namely a request. Therefore two things must be distinguished in an indicative sentence: the content, which it has in common with the corresponding sentence-question, and the assertion."
>
> (Frege, 1918, p.294)[6]

[5] Since we will not be concerned with pragmatic discourse effects, we will from now on use the unqualified term 'discourse effects' to refer to conventional discourse effects.

[6] The page reference is to the translated version, Frege (1956).

To say that the force of a falling declarative is assertive is to say that, when uttering the sentence, a speaker commits to the truth of the proposition that the sentence expresses. On the other hand, to say that the force of a polar interrogative is a request is to say that, when uttering a polar interrogative, a speaker does not commit to the truth of the proposition expressed by the sentence, but rather, requests information from other conversational participants to determine whether the proposition expressed by the sentence is true or false.

The distinction between content and force that Frege introduced has been very influential, particularly in work on *speech act theory* (Searle, 1969, et.seq.). The diagram below depicts how this approach deals with the issue of associating forms to their discourse effects. Forms are associated with a certain semantic content through a compositional semantic interpretation procedure I. Contents are taken to be propositions, i.e., sets of possible worlds. Suppose that the forms $f_1, \ldots, f_4$ all have the same sentence radical, but a different clause type (falling declarative, rising declarative, etcetera). Then each of these forms is associated with the same semantic content c. Besides semantic content, however, each form f_i also has a particular force, F_{f_i}. The discourse effects of a form are partly determined by its content, and partly by its force. A force can be seen as a function that maps contents to discourse effects. A discourse effect, in turn, can be modeled as a function over discourse contexts. For instance, if f_1 is a falling declarative then F_{f_1} could be construed as a function that takes the proposition $p := I(f_1)$ as its input and yields a function that maps any discourse context to a new context in which the speaker has commited to p and has proposed to make p common ground.



Theories of this general shape thus have two components: (i) a *semantic* component, which is concerned with the mapping from forms to content, and (ii) a *discourse* component, which is concerned with how the discourse effects of a given form are determined by its force and its content. The semantic component is kept as simple as possible: all forms with the same sentence radical are assigned the same semantic content. Consequently, a heavy burden is placed on the discourse component: differences in discourse effect between forms with the same sentence radical all have to be derived from differences in force. This means that, while there is a single, uniform semantic

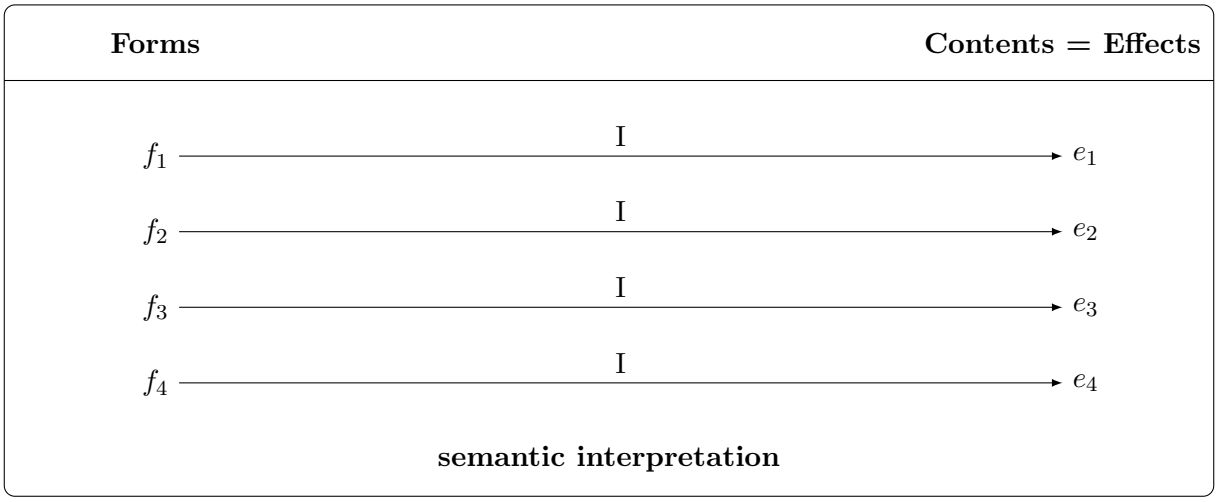
interpretation function I that maps forms to contents, many different forces have to be stipulated, one for each sentence type (depicted in the diagram above by arrows with different line patterns).

We will see below that this division of labor is not optimal. There are independent reasons to make the semantic interpretation procedure more discriminative, so as not to assign the same content to all sentence types. This, in turn, will make it possible to streamline the discourse component. Differences in discourse effects do not have to be stipulated for each form on a case-by-case basis because some differences in discourse effects become predictable from differences in content, and therefore it becomes possible for different forms to share the same force.

Before spelling out these ideas in more detail, however, we first consider another approach, which in a sense embodies the opposite of the Fregean view in that it places the whole burden on the semantic component, to the extent that it renders a separate discourse component superfluous.

2.2 Radical dynamics

On the radical dynamic approach, the semantic interpretation procedure directly determines the discourse effects of each form. The semantic content of a sentence is not taken to be a proposition but rather a *context change potential*, i.e., a function over discourse contexts. This dynamic notion of meaning is rooted in the classical work of Kamp (1981), Heim (1982), and Groenendijk and Stokhof (1991), which restricted its attention to falling declaratives. Dynamic semantic theories that are concerned with the discourse effects of both falling declaratives and polar/*wh*-interrogatives have been developed by Jäger (1996); Hulstijn (1997); Groenendijk (1998); Mascarenhas (2009) and Aloni *et al.* (2007). On these accounts, discourse contexts comprise both the contextual information, i.e., the *common ground*, and contextual issues, i.e., the *questions under discussion*. Falling declaratives are taken to enhance the common ground, and interrogatives are taken to add questions under discussion. To our knowledge, rising declaratives and tag interrogatives have not been considered explicitly in this line of work, but in principle they may be incorporated as well. However, discourse contexts would then have to be modeled in a more complex way, in order to be able to capture the biases that these sentence types induce. Provided that this extension is feasible, we would arrive at the following picture:



Unlike on the Fregean approach, in this setup there is no need to stipulate different forces; there is a direct, compositional mapping from forms to discourse effects. Note, however, that the simplification we arrived at comes at a price. Namely, the notion of semantic content that is needed here

would have to be much more complex than on the Fregean approach: rather than simple propositions, contents are construed as functions over discourse contexts, and in order to capture all the relevant differences in discourse effects, discourse contexts would have to be modeled as comprising more than just the common ground and the questions under discussion. This added complexity of the notion of semantic content would percolate down to all corners of the compositional semantics, with serious consequences. For instance, if contents are simple propositions, then the semantic contribution of connectives like disjunction and negation can be characterized straightforwardly; if, on the other hand, the notion of content would be refined in the way we just sketched, these operations would become much more cumbersome.

While it may be *possible* to implement a compositional interpretation procedure that directly derives all the subtle differences in discourse effects between the various sentence types, it seems to us that the high complexity of such a system is *unnecessary* and therefore undesirable. This is because the commitments and biases induced by a sentence do not have to be computed recursively; they can simply be determined at the root level.

To see this, first note that rising declaratives and tag interrogatives cannot be embedded in larger structures:

(15) *John told Bill that [Amalia left, didn't she].

(16) *Don't tell Bill that [Amalia left↑].

This means that we don't need to worry about how the biases expressed by these sentence types are *projected* by embedding verbs and other operators that form complex sentences out of simpler ones.

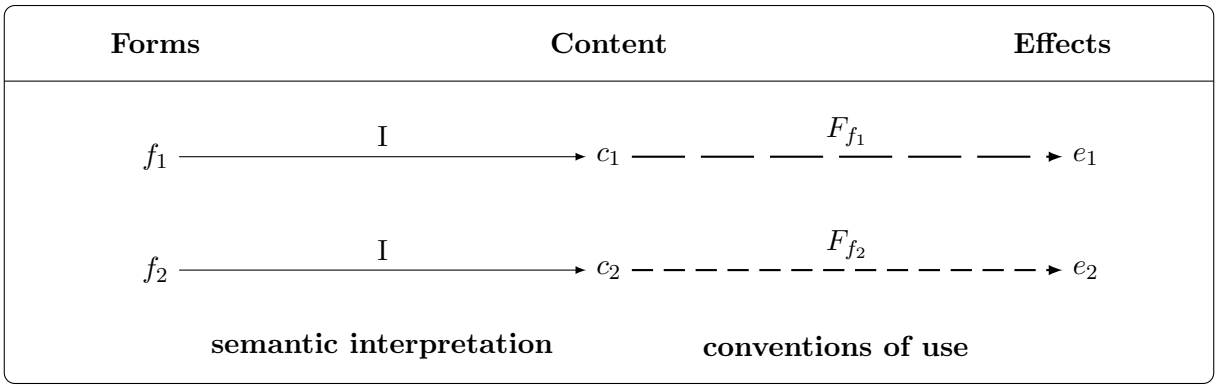
Moreover, even if we consider a sentence involving a plain declarative complement clause, like (17) below, the commitment that the embedded declarative would induce, if uttered in isolation, does not need to be taken into account in determining the discourse effects of the entire sentence. All we need is the propositional content of the embedded clause.

(17) John thinks that Amalia left.

It is probably for this reason that the radical dynamic approach has, to our knowledge, only been implemented for a restricted set of sentence types—falling declaratives and polar/*wh*-interrogatives—with a notion of discourse contexts that comprises the common ground and the questions under discussion, but not the commitments and biases of the individual discourse participants.

2.3 A middle way

The most widespread approach in the contemporary literature is one that, like the Fregean approach, assumes both a semantic component and a discourse component, but divides the labor between these two more evenly (see, e.g., Roberts, 1996; Ginzburg, 1996; Groenendijk, 1999; Beyssade and Marandin, 2006; Gunlogson, 2008; Farkas and Bruce, 2010; Murray and Starr, 2012; Condoravdi and Lauer, 2012a; Krifka, 2014; Northrup, 2014; Malamud and Stephenson, 2015). In particular, restricting our attention to falling declaratives and polar interrogatives for the moment, while these two sentence types are associated with different conventions of use (in Frege's terminology, different forces), they are also assigned different semantic values. This is depicted in the following diagram, where different conventions of use are again visualized with different line patterns:



Thus, some of the work in differentiating the two sentence types is done by the semantics, and some of it is done by the discourse component. As such, the approach strikes a middle way between the Fregean view, which places the entire workload on the discourse component, and the radical dynamic view, which places the entire workload on the semantics.

There are strong arguments for adopting a notion of semantic content that is more fine-grained than the one assumed on the Fregean approach, and which allows us to assign distinct semantic values to falling declaratives and polar interrogatives. These arguments, which have been articulated in great detail by Groenendijk and Stokhof (1997), can be summarized as follows.

The first argument concerns embedding. Consider the following two sentences:

(18) Bill knows that Amalia left.

(19) Bill knows whether Amalia left.

Clearly, the two sentences as a whole must differ in semantic content. But then, assuming that semantic content is determined compositionally, it follows that *that*-clauses and *whether*-clauses with the same sentence radical must differ in content as well: they cannot both be associated with the proposition expressed by their common sentence radical. Thus, our notion of semantic content needs to be enriched in order to semantically distinguish *that*-clauses from *whether*-clauses. Once this distinction is made at the embedded level, it is desirable to have it at the root level as well, assigning the same semantic value to falling root declaratives and embedded *that*-clauses on the one hand, and to polar root interrogatives and embedded *whether*-clauses on the other.

The second argument is based on the observation that polar interrogatives form a natural class with other kinds of interrogatives. Consider the following:

(20) a. Did Amalia leave?
b. Who left?
c. Who left when?
d. Did Amalia leave today or yesterday?
e. Did Amalia leave or didn't she?

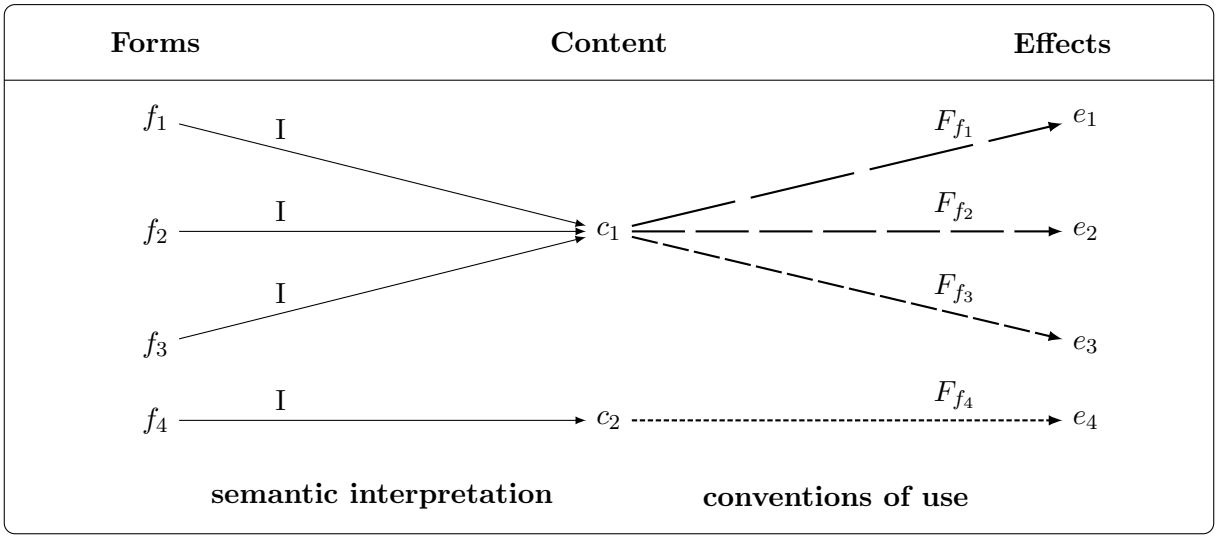
As Frege noted himself, the idea that declaratives and polar interrogatives semantically both express a proposition, and differ only in force, does not naturally extend to *wh*-interrogatives like (20b-c). The same holds for disjunctive interrogatives like (20d-e). Disjunctive and *wh*-interrogatives cannot be taken to express a simple proposition, but have to receive a more structured semantic value in order for the discourse component to be able to characterize their discourse effect in a suitable way. But then again, once such semantic values are made available, there is no longer any theoretical cost to treating polar interrogatives as being semantically different from declaratives. Instead, it becomes

natural to assign them the same kind of semantic value that disjunctive and *wh*-interrogatives receive.

To make this more concrete, we briefly sketch the account of Groenendijk (1999). Semantically, Groenendijk assumes that in any given world w, a declarative $!\varphi$ denotes a truth value, while an interrogative $?\varphi$ denotes a proposition, corresponding to the true and complete answer to $?\varphi$ in that world w (cf., Groenendijk and Stokhof, 1984). In particular, a *polar* interrogative $?p$ denotes the proposition expressed by p in every world where p is true, and the proposition expressed by $\neg p$ in every world where p is false; on the other hand, a constituent question $?x.Px$ denotes, in a world w, the proposition consisting of all worlds in which the set of individuals that have the property P is exactly the same as in w. Thus, polar interrogatives indeed receive the same kind of semantic value as *wh*-interrogatives, diverging in this respect from declaratives.

As for discourse effects, Groenendijk construes a *discourse context* as an equivalence relation R over a set of worlds C. What C captures is the *information* that is commonly shared by the conversational participants in the given context, i.e., the common ground; R corresponds to a *partition* of C, which encodes the issues that have been publicly raised in the conversation, i.e., the questions under discussion. With this notion of discourse context in place, Groenendijk proposes that the discourse effect of a declarative $!\varphi$ is to restrict C to those worlds in which $!\varphi$ is true (cf., Stalnaker, 1978, and many others). The discourse effect of an interrogative $?\varphi$, on the other hand, is to restrict the equivalence relation R, which technically amounts to a set of *pairs* of worlds, to those pairs in which $?\varphi$ denotes precisely the same proposition, i.e., in which $?\varphi$ has the same true and complete answer. Thus, in Frege's terminology, declaratives and interrogatives are associated with different forces: a declarative enhances the common ground, while an interrogative adds a question under discussion.

Some recent work within this general approach extends the basic account of falling declaratives and polar/*wh*-interrogatives to special sentence types such as rising declaratives and tag interrogatives (e.g., Beyssade and Marandin, 2006; Gunlogson, 2008; Krifka, 2014; Malamud and Stephenson, 2015). In this work, rising/falling declaratives and tag interrogatives are not differentiated at a semantic level. However, they are associated with different conventions of use. Thus, the general architecture of these approaches can be schematically depicted as follows.



At a semantic level, a distinction is made between two types of contents: c_1, shared by rising/falling declaratives and tag interrogatives, and c_2, assigned to polar interrogatives. As for the mapping

from semantic content to discourse effects, each sentence type is associated with a different convention of use (as reflected in the diagram by the different line patterns).[7]

In the next section we will see how this picture can be simplified. In particular, we will show that under certain semantic assumptions, which can be motivated independently, it is possible to connect the different sentence types with their discourse effects in a more uniform way: rather than associating every sentence type with a different convention of use, the discourse effects of plain falling declaratives and polar interrogatives can be characterized uniformly based on their semantic content.

2.4 Unifying semantic types and conventions of use

Notice that on the approach just discussed, declaratives and interrogatives do not only receive different semantic values, but they are also taken to be of different semantic *types*. That is, declaratives are taken to express propositions, while interrogatives are taken to express functions from worlds to propositions, or, alternatively, sets of propositions. So declaratives are of type $\langle s, t\rangle$, while interrogatives are either of type $\langle s, \langle s, t\rangle\rangle$ or of type $\langle\langle s, t\rangle, t\rangle$. These different kinds of semantic values are intended to capture different kinds of semantic content. The semantic value of a declarative sentence is intended to capture its truth conditions, i.e., its *informative* content. On the other hand, the semantic value of an interrogative sentence is intended to capture the issue it expresses, i.e., its *inquisitive* content.

In inquisitive semantics (e.g, Ciardelli *et al.*, 2013, 2015), the semantic value of a sentence, no matter whether it is declarative or interrogative, always captures *both* its informative and its inquisitive content. In the case of a declarative sentence, the inquisitive content is typically *trivial*; and vice versa, in the case of an interrogative sentence, the informative content is typically trivial. But having a notion of meaning that comprises both informative and inquisitive content allows for a more integrated semantic treatment of the two sentence types. One reason to pursue such an integrated semantic treatment (among several others which are not directly relevant for our present purposes), is that it allows for a simplification of the discourse component. To illustrate this, we have to say a bit more about the inquisitive notion of semantic content. The comments below will be brief; more details will be provided in Section 3.1.

The proposition expressed by a sentence in inquisitive semantics is not a set of worlds, but rather a set of *information states*, those information states that are said to *support* the sentence. Information states are modeled as sets of possible worlds. A falling declarative like *Amalia left* is supported by an information state s just in case every world in s is one in which Amalia left. On the other hand, a polar interrogative like *Did Amalia leave?* is supported by an information state s just in case (i) every world in s is one in which Amalia left, or (ii) every world in s is one in which Amalia did not leave. Thus, the support based notion of semantic content applies uniformly to

[7] Note that, while this general approach is different from the radical dynamic approach discussed in Section 2.2, it is compatible with a less radical dynamic view on interpretation, under which the semantic content of a sentence is construed dynamically (e.g., to deal with sentence-internal anaphora and presupposition projection) but the conventional discourse effects of a sentence are not fully determined by its semantic content, but also by the convention of use associated with the given sentence type. For instance, the sentences in (i) may all be assigned the same dynamic semantic content, but they may still be associated with different conventions of use, resulting in different discourse effects.

(i) a. Every farmer who own a donkey feeds it.
b. Every farmer who own a donkey feeds it?
c. Every farmer who own a donkey feeds it, doesn't he?

falling declaratives and polar interrogatives, as well as *wh*-interrogatives; all these sentence types are treated as being of the same semantic type.

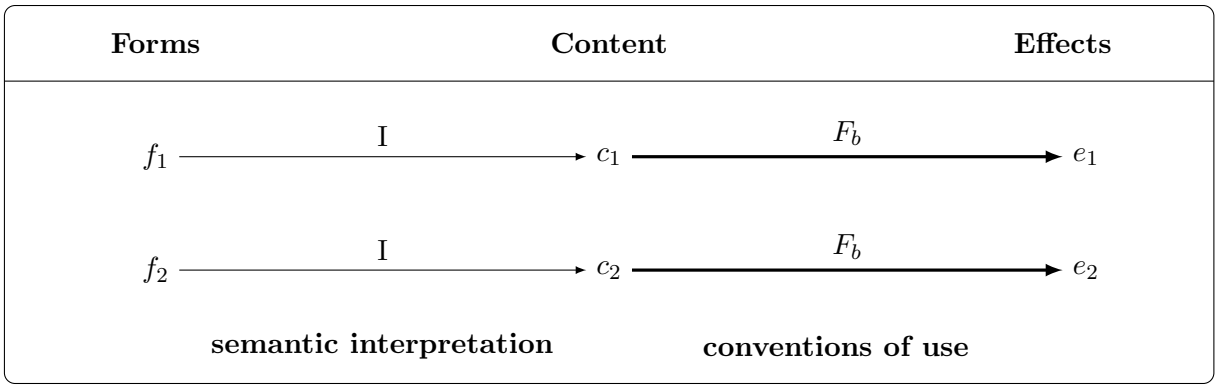
As for discourse effects, a speaker who utters a sentence φ, no matter whether this sentence is a falling declarative, a polar interrogative, or a *wh*-interrogative, is taken (i) to steer the common ground of the conversation towards an information state that supports φ, and (ii) to provide the information that the actual world is contained in one of these states, i.e., in $\bigcup[\![\varphi]\!]$, where $[\![\varphi]\!]$, the proposition expressed by φ, is the set of information states that support φ. It is customary to refer to $\bigcup[\![\varphi]\!]$ as the *informative content* of φ.

Thus, the discourse effects of falling declaratives and polar/*wh*-interrogatives are determined uniformly by their semantic value.[8] We only need to assume one basic convention of use, shared by all these basic sentence types. All differences in discourse effects are derived from differences in semantics. For instance, in uttering the falling declarative *Amalia left* the speaker provides the information that the actual world is contained in a state that supports the sentence, which is to say that it must be a world in which Amalia left. At the same time, the speaker steers the common ground of the conversation to a state that supports the sentence. In order to reach such a state, however, it is sufficient for all other participants to *accept* the information that the speaker herself provided; no additional information needs to be provided. Thus, a falling declarative is not inquisitive, i.e., its inquisitive content is trivial.

On the other hand, in uttering the polar interrogative *Did Amalia leave?* a speaker provides the information that the actual world is either one where Amalia left or one where Amalia did not leave; one of these two things, however, will always be the case, so here the informative content is trivial. At the same time, the speaker steers the common ground of the conversation towards a state that supports the sentence, i.e., a state which is either such that every world in it is one where Amalia left, or such that every world in it is one where Amalia did not leave. In order to reach such a state, it does not help for other participants to just accept the trivial information that the speaker herself provided; rather, additional information needs to be provided. Thus, the sentence is inquisitive, i.e., its inquisitive content is not trivial.

The resulting division of labor between the semantic component and the discourse component is depicted in the diagram below, restricting our attention for the moment to falling declaratives and polar interrogatives. The semantics assigns different contents to falling declaratives and polar interrogatives, respectively, though now these contents are of the same type. The discourse component no longer involves two different conventions of use, F_{f_1} and F_{f_2}, but rather a single basic convention of use, F_b, which applies uniformly to both sentence types.

[8] This uniformity could also be achieved in Hamblin's (1973) semantics, where both falling declaratives and polar/*wh*-interrogatives are taken to express sets of classical propositions—a singleton set in the case of falling declaratives and typically a non-singleton set in the case of polar/*wh*-interrogatives. As far as we know, however, work in Hamblin semantics has not explicitly attempted to give a uniform characterization of the conventional discourse effects of declaratives and interrogatives.



As far as falling declaratives and plain polar interrogatives are concerned, this approach is more parsimonious than the previous one we discussed, as well as the Fregean approach that we started out with, because it avoids the stipulation of multiple conventions of use. It does assign more complex semantic values to sentences than Fregean theories do, but this is justified on independent grounds (recall the arguments from Groenendijk and Stokhof, 1997, concerning embedded clauses and the broader spectrum of interrogatives). Thus, the differences in the conventional discourse effects of falling declaratives and polar interrogatives are derived from independently motivated differences in semantic content.

However, the picture we arrived at still leaves open how sentence types signalling a bias rather than a full commitment, i.e., rising declaratives and tag interrogatives, should be treated. Work on inquisitive semantics has not addressed this question so far. Below we lay out the main desiderata that, in our view, such an extension should satisfy.

2.5 Unmarked versus marked forms, basic versus special effects

The question that we face when considering how to bring rising declaratives and tag interrogatives into the picture is whether we should add complexity to the discourse component, to the semantic component, or to both. The answer, we suggest, is that the additional burden should be carried entirely by the discourse component. This is because, as we argued above when discussing the radical dynamic approach, the biases induced by rising declaratives and tag interrogatives do not have to be built up recursively; they can simply be determined at the root level. Therefore, as long as there is no independent reason to add further complexity to the semantics, it is preferable to associate rising declaratives and tag interrogatives with conventions of use that augment the basic convention of use associated with falling declaratives and plain polar/*wh*-interrogatives. These augmented conventions of use are then responsible for the special discourse effects of these sentence types, in particular the bias they express.

This means that, as on the Fregean approach and unlike on the basic inquisitive approach sketched above, the semantics will no longer do all the work in differentiating the various sentence types—some sentence types will be mapped to the same semantic content but will be associated with different conventions of use. For instance, a tag interrogative and a plain polar interrogative that have the same sentence radical will be assigned the same semantic value.

Crucially, however, among the different forms that are mapped to the same semantic value, some may be considered more marked than others, either because they are formally more complex or because they are more prone to misinterpretation. For instance, tag interrogatives are more verbose than plain polar interrogatives, and therefore more marked. We will refer to the least marked forms expressing a given content c as *unmarked* or *optimal* forms (for c), and to all other

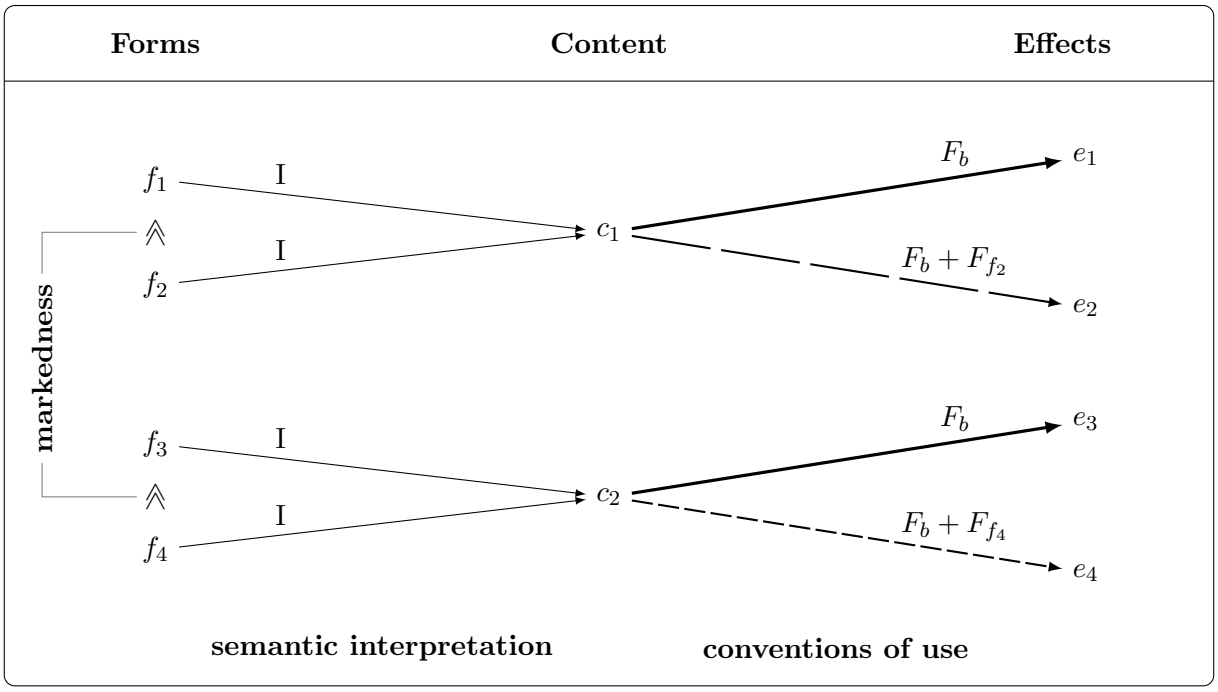


Figure 2: Desired division of labor between semantic interpretation and conventions of use.

forms expressing c as *marked* forms (for c). Given this distinction between marked and unmarked forms, we want our theory to satisfy the following principle:[9]

(21) **Division of labor principle**

a. The discourse effects of unmarked forms should be fully determined by their semantic content and the basic convention of use, F_b.

b. The discourse effects of marked forms should always include the discourse effects that are dictated by their semantic content and the basic convention of use F_b. In addition, they may include special discourse effects connected to the particular sentence type involved.

This is depicted in the diagram in Figure 2. This diagram is schematic in the sense that it may turn out that the different forms are to be distributed among the two different contents in a different way, e.g., it may be that more than two of them will be mapped to the same content—this will depend on compositionality considerations. The general constraint that the diagram is intended to visualize is just that all unmarked forms should have the same basic force, while marked forms may add 'special effects'.

In the remainder of the paper we will develop a theory that satisfies this principle. First, in Section 3, we briefly lay out our general assumptions about semantic content and discourse

[9]Clearly, this principle is in the spirit of Horn's principle of pragmatic division of labor: "The use of a marked (relatively complex and/or prolix) expression when a corresponding unmarked (simpler, less 'effortfull') alternative expression is available tends to be interpreted as conveying a marked message (one which the unmarked alternative would not or could not have conveyed)" (Horn, 1984, p.22). Both principles are based on a certain expectation about the connection between forms and interpretations, and insofar as this expectation is found to be natural, it provides a metric for theories that aim to capture this connection.

contexts. Then, in Sections 4 and 5, we articulate our account of the various types of declaratives and interrogatives.

3 Assumptions on semantic content and discourse contexts

In Section 3.1 we lay out our general assumptions about the kind of objects that the semantic interpretation procedure assigns to sentences. These assumptions are drawn from recent work on *inquisitive semantics* (e.g., Ciardelli *et al.*, 2013, 2015), which in turn builds on a large body of work on questions (e.g. Hamblin, 1973; Karttunen, 1977; Groenendijk and Stokhof, 1984; Groenendijk, 1999) and other alternative-inducing expressions like disjunction and indefinites (e.g., Kratzer and Shimoyama, 2002; Simons, 2005; Alonso-Ovalle, 2006; Aloni, 2007).

In Section 3.2 we specify our basic assumptions about discourse contexts. These assumptions are drawn from recent work on commitment-based models of discourse (Gunlogson, 2008; Farkas and Bruce, 2010), which in turn also builds on a long tradition of previous work (e.g., Hamblin, 1971; Stalnaker, 1978; Carlson, 1983; Clark, 1992; Ginzburg, 1996; Roberts, 1996; Gunlogson, 2001; Asher and Lascarides, 2003; Büring, 2003).

3.1 Semantic content in inquisitive semantics

Traditionally, the proposition expressed by a sentence is construed as a set of possible worlds, embodying the informative content of the sentence. A proposition, construed in this way, can be thought of as carving out a particular region in the set of all possible worlds. When a sentence is uttered, the speaker can be taken to provide the information that the actual world is located in the region that the proposition expressed by the sentence carves out. In this way, the proposition expressed by the sentence captures the informative content of the sentence, i.e., its potential to provide information when uttered.

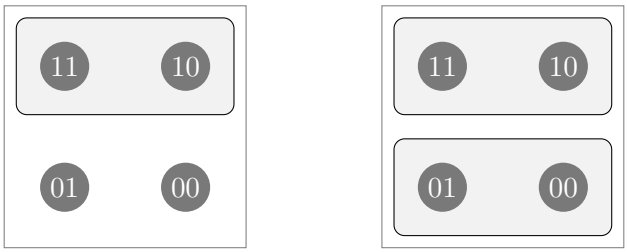
In inquisitive semantics, the proposition that a sentence expresses is not just intended to capture the informative content of the sentence, but also its inquisitive content, i.e., its potential to raise an issue. This means that propositions cannot simply be construed as sets of possible worlds.

However, there is a very natural generalization of the classical notion of propositions. Namely, rather than construing propositions as sets of possible worlds, we may construe them as sets of *information states*, which in turn are modeled as sets of possible worlds. The basic effect of uttering a sentence expressing a proposition $\mathcal{P}$ can then be taken to be two-fold. First, the speaker steers the common ground of the conversation towards one of the states in $\mathcal{P}$. Second, the speaker provides the information that at least one of the states in $\mathcal{P}$ must be compatible with the actual state of affairs, i.e., that the actual world must be contained in $\bigcup \mathcal{P}$.

Intuitively, a proposition in the sense of inquisitive semantics can be thought of as embodying a proposal to update the common ground in one or more ways. The information states that the proposition consists of determine precisely what is needed to comply with the proposal: namely, the common ground needs to be enhanced in such a way that one of these states is reached.

It is natural to assume that if a certain update complies with a given proposal, then any stronger update complies with the proposal as well. This means that propositions are *downward closed*, i.e., if they contain a certain information state s, they also contain any of its substates $t \subseteq s$.

The most restrained way to comply with a given proposal is to establish enough information for the common ground to reach one of the desired states, but not more information than is necessary to achieve this. Such updates are ones that lead the common ground to one of the *maximal elements* of the given proposition. These elements are referred to as the *alternatives* in the proposition.



(a) $\mathcal{P}_a$ (b) $\mathcal{P}_b$

Figure 3: Two simple propositions, depicting only alternatives.

Two simple propositions are depicted in Figure 3. It is assumed here that there are just four possible worlds in total: 11 is a world where both Amalia and Bill left, 10 a world where Amalia left but Bill didn't, 01 a world where Bill left but Amalia didn't, and 00 a world where neither Amalia nor Bill left. In visualizing a proposition, we just depict the alternatives that it contains. Since propositions are downward closed, we know that they contain all substates of the alternatives as well, but explicitly depicting these substates would make the diagrams much less transparent.

Consider the proposition $\mathcal{P}_a$ depicted in Figure 3(a), which may be associated with the falling declarative "Amalia left". As specified above, the basic effect of uttering a sentence that expresses this proposition is two-fold. First, the speaker provides the information that the actual world must be contained in $\bigcup \mathcal{P}_a = \{11, 10\}$, i.e., she provides the information that Amalia left. Second, she steers the common ground towards a state in $\mathcal{P}_a$, i.e., one in which it is commonly established that Amalia left. In order to reach such a common ground, it is sufficient for other participants to accept the information that the speaker herself provided; it is not necessary to provide additional information. In this sense, the issue that the sentence raises is trivial.

Next, consider the proposition $\mathcal{P}_b$ depicted in Figure 3(b), which may be associated with the polar interrogative "Did Amalia leave?". The effect of uttering a sentence expressing this proposition is again two-fold. On the one hand, the speaker provides the information that the actual world must be contained in $\bigcup \mathcal{P}_b$. Notice, however, that this information is trivial, since in this case $\bigcup \mathcal{P}_b$ amounts to the set of *all* possible worlds, and clearly the actual world must be one of them. On the other hand, the speaker steers the common ground towards some state in $\mathcal{P}_b$. In order to reach such a state, it is *not* sufficient for other participants to just accept the trivial information that the speaker herself provided in uttering the sentence; rather, it is necessary to provide additional information, either to the effect that Amalia left or to the effect that she didn't leave.

Informative and inquisitive propositions. For any proposition $\mathcal{P}$, we refer to $\bigcup \mathcal{P}$ as the *informative content* of $\mathcal{P}$, and denote it as $\mathsf{info}(\mathcal{P})$. We say that $\mathcal{P}$ is *informative* just in case its informative content is non-trivial: $\mathsf{info}(\mathcal{P}) \neq W$, where W is the set of all possible worlds. Similarly, we say that $\mathcal{P}$ is *inquisitive* just in case it raises a non-trivial issue, which obtains just in case $\mathsf{info}(\mathcal{P}) \notin \mathcal{P}$. According to these definitions $\mathcal{P}_a$ is informative but not inquisitive, while $\mathcal{P}_b$ is inquisitive but not informative, in line with our informal discussion above.

If one has a picture of a proposition $\mathcal{P}$ it is straightforward to determine whether it is inquisitive or not. This is because, under the assumption that there are only finitely many possible worlds—which is a safe assumption to make for all the examples to be considered in this paper—a proposition $\mathcal{P}$ is inquisitive just in case it contains at least two alternatives. For instance, $\mathcal{P}_a$ contains a single alternative, while $\mathcal{P}_b$ contains two. From this we can immediately conclude that $\mathcal{P}_b$ is inquisitive, while $\mathcal{P}_a$ is not.

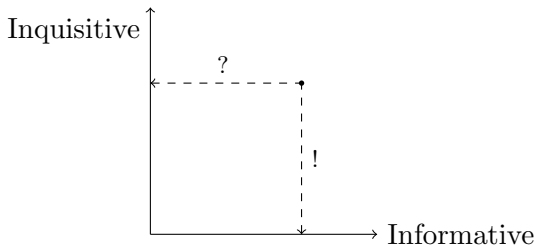


Figure 4: Projection operators.

Projection operators. As depicted in Figure 4, propositions in inquisitive semantics can be thought of as inhabiting a two-dimensional space. On the horizontal axis, there are propositions that are purely informative, i.e., whose inquisitive content is trivial. On the vertical axis, there are propositions that are purely inquisitive, i.e., whose informative content is trivial. All other propositions, which are both informative and inquisitive, are located somewhere in the plane, off the axes.

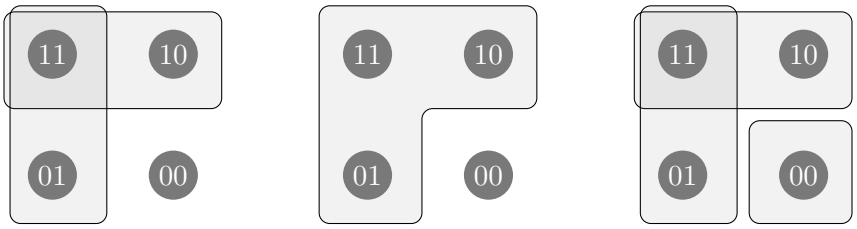
Given this picture, it is natural to consider operations that *project* any proposition onto one of the axes, trivializing either its inquisitive or its informative content. These operators are denoted in inquisitive semantics as ! and ?, respectively. ! is the non-inquisitive projection operator: it trivializes the inquisitive content of a proposition, while leaving its informative content untouched. ? is the non-informative projection operator: it trivializes the informative content of a proposition, while minimally weakening its inquisitive content (inquisitive content cannot be left completely untouched in this case, because then the informative content would also remain intact, see Roelofsen, 2013, for discussion). These projection operators will play an important role in our analysis of clause types (declarative/interrogative) and intonation (fall/rise).

The operators are defined as follows ($\wp$ denotes the *powerset operator*, which takes a set as its input and yields the set of all subsets of this set as its output):

$$!\mathcal{P} \;=\; \wp\big(\bigcup \mathcal{P}\big)$$
$$?\mathcal{P} \;=\; \mathcal{P} \cup \wp\Big(\overline{\bigcup \mathcal{P}}\Big)$$

To illustrate how the operators work, consider the proposition $\mathcal{P}_c$ depicted in Figure 5(a). Notice that this proposition is informative, since $\mathsf{info}(\mathcal{P}_c) \neq W$, and also inquisitive, since $\mathsf{info}(\mathcal{P}_c) \notin \mathcal{P}_c$. Now consider $!\mathcal{P}_c$, depicted in Figure 5(b). This proposition contains a single alternative, which means that it is no longer inquisitive. At the same time, its informative content is the same as that of $\mathcal{P}_c$ itself, because $\bigcup !\mathcal{P}_c = \bigcup \mathcal{P}_c$. Thus, indeed, ! trivializes the inquisitive content of the proposition while leaving its informative content intact. Next, consider $?\mathcal{P}_c$, depicted in Figure 5(c). This proposition contains three alternatives: two of these were already present in $\mathcal{P}_c$, and the third one is the complement of $\bigcup \mathcal{P}_c$. The three alternatives together cover the set of all possible worlds, which means that $?\mathcal{P}_c$ is not informative. Thus, indeed, ? trivializes informative content, while it weakens inquisitive content in a minimal way.

Highlighting. As mentioned above, the polar interrogative "Did Amalia leave?" may be taken to express the proposition $\mathcal{P}_b$ depicted in Figure 3(b), which contains two alternatives: one consisting of all worlds where Amalia left and the other consisting of all worlds where Amalia did not leave. This proposition suitably captures what kind of information is needed to resolve the issue that a speaker raises in uttering the polar interrogative. However, it does not capture the fact that the sentence



(a) $\mathcal{P}_c$ (b) $!\mathcal{P}_c$ (c) $?\mathcal{P}_c$

Figure 5: Projection operators applied to a proposition that is both informative and inquisitive.

form lends much more prominence to the first alternative, consisting of worlds where Amalia left, than to the second, consisting of worlds where she didn't. We say that the first alternative is *highlighted* (Roelofsen and van Gool, 2010; Farkas, 2011; Roelofsen and Farkas, 2015).

Highlighted alternatives function as propositional discourse referents, providing potential antecedents for subsequent anaphoric expressions. Such anaphoric expressions include particles like *otherwise* and *if so*, as well as answer particles like *yes* and *no*. For instance, in response to "Did Amalia leave?", *yes* confirms the highlighted alternative, establishing that Amalia indeed left, while *no* denies the highlighted alternative, establishing that Amalia did not leave.

We will see that the distinction between highlighted and non-highlighted alternatives is also needed to characterize the biases that a speaker signals in uttering a rising declarative or a tag interrogative.[10]

3.2 Commitment-based discourse contexts

Having spelled out the notion of semantic content that we assume, our next task is to specify a suitable notion of discourse contexts. We first recall the basic notion of discourse contexts proposed by Farkas and Bruce (2010) (building on much previous work, see references above). Once this notion is in place, we will further enrich it in order to be able to characterize special discourse effects.

One auxiliary notion that is needed is that of a *piece of information*, formally modeled as a set of possible worlds (just like information states), namely, those worlds that are compatible with it. For brevity, we will generally refer to a piece of information as a *possibility*. We now specify, in (22), what we take the basic components of a discourse context to be.

(22) A *basic discourse context* is a triple $\langle \mathsf{participants}, \mathsf{table}, \mathsf{commitments} \rangle$, where:

a. $\mathsf{participants}$ is the set of discourse participants;
b. table is a stack of propositions, representing the proposals made so far;
c. $\mathsf{commitments}$ is a function that maps every participant $x \in \mathsf{participants}$ to a set of possibilities, those possibilities that x has publicly committed to so far.

In terms of these basic discourse context components, several other notions may be defined. For instance, we may define the *commitment set* of a participant x, $cs(x)$, as the set of worlds that are compatible with all the possibilities that x has publicly commited to so far: $cs(x) = \bigcap \mathsf{commitments}(x)$.

In terms of the commitment sets of all the individual participants, the *common ground* may be defined as the smallest set of possible worlds s such that all discourse participants are publicly

[10] In Roelofsen *et al.* (2016) it is argued that highlighting does not only play a role in determining the discourse behavior of root interrogatives, but also in determining the semantic contribution of embedded interrogatives.

committed to the actual world being contained in s. In other words: $cg = \bigcup_{x \in P} cs(x)$. Thus, the standard Stalnakerian notion of the common ground/context set can be derived here, but is not taken as a basic component, let alone the defining characteristic, of a discourse context.[11]

The *initial* context of every discourse is one in which $\mathsf{table} = \emptyset$, which means that no proposals have been made yet, and for every discourse participant x, $\mathsf{commitments}(x) = \emptyset$, which means that the discourse participants have not made any public discourse commitments yet.[12]

We say that the discourse participants have *commonly decided* on a proposition $\mathcal{P}$ either if $cg \in \mathcal{P}$ or if $cg \cap s = \emptyset$ for all $s \in \mathcal{P}$. In the first case, the discourse participants have complied with the proposal embodied by $\mathcal{P}$. In the second case, they have commonly established that it is impossible to comply with the proposal. In a cooperative discourse, the goal of the participants is always to work towards a context in which every proposition $\mathcal{P} \in \mathsf{table}$ has been commonly decided.

This basic notion of discourse contexts is sufficient to capture the discourse effects of sentences that induce full commitments, like falling declaratives and polar interrogatives. However, in order to be able to capture the biases signalled by rising declaratives and tag interrogatives, we need a richer notion of discourse contexts.

We propose that both rising declaratives and tag interrogatives signal that the speaker has access to some *evidence* for the highlighted alternative. This distinguishes rising declaratives and tag interrogatives from plain polar interrogatives, and accounts for the fact that the former are not felicitous in contexts in which it cannot be assumed that the speaker has access to evidence for the highlighted alternative, exemplified in (23).

(23) *On a tax form:*

a. Did you earn more than 50.000 in 2015?
b. #You earned more than 50.000 in 2015?
c. #You earned more than 50.000 in 2015, didn't you?

Thus, our representation of discourse contexts should include, for every participant x, not only the list of possibilities that x has publicly committed to, $\mathsf{commitments}(x)$, but also a list of possibilities for which x has signalled to have some evidence. We will denote this list as $\mathsf{evidence}(x)$, and will refer to the possibilities that it contains as *evidenced possibilities*.

Now, recall from the introduction that there are contexts in which rising declaratives are felicitous but tag interrogatives are not, and vice versa (the examples, repeated below, are parallel to ones discussed by Malamud and Stephenson (2015); more examples will be considered in Section 5).

(24) Context: *Belinda is going through a pile of job applications. Chris has not seen any of them yet. Belinda hands Chris the application that she just finished reading, and tells him to have a look at it. Chris to Belinda:*

a. This is a good one↑?
b. #This is a good one, isn't it?

(25) Context: *Belinda and Chris are looking at a sunset together. Belinda to Chris:*

a. #It's a beautiful sunset↑?
b. It's a beautiful sunset, isn't it?

To capture these and other contrasts we will assume that rising declaratives and tag interrogatives

[11] For a general discussion of reasons to keep track of the commitments of all the individual discourse participants, rather than just the common ground, we refer to Farkas and Bruce (2010).

[12] Discourse commitments, in our technical sense, do not include general background assumptions. Of course, such assumptions play a crucial role in discourse at large but not for the phenomena considered here.

do not just signal that the speaker has access to some evidence for the highlighted alternative, but also her *credence level* w.r.t. this alternative, by which we mean the degree to which she believes the alternative itself to be more likely than its complement. For our purposes it will be sufficient to distinguish four credence levels. If the speaker considers the highlighted alternative α to be much more likely than $\overline{\alpha}$, we say that her credence in α is *high*; if she only considers α to be somewhat more likely than $\overline{\alpha}$, we say that her credence in α is *low*; in cases that fall in between these two extremes we say that the speaker's credence in α is *moderate*; and finally, if the speaker does not consider α more likely than $\overline{\alpha}$ at all, we say that her credence in α is *zero*. Note that the latter is compatible with situations in which the speaker considers α and $\overline{\alpha}$ *equally* likely as well as with situations in which she considers α *less* likely than $\overline{\alpha}$.

We will assume that rising declaratives signal that the speaker's credence in the highlighted alternative α is at most low, while rising tag interrogatives signal that the speaker's credence in α is at least moderate, and falling tag interrogatives signal that the speaker's credence in α is high. This explains why a tag interrogative is infelicitous in (24), where the speaker has only received an implicit hint that the highlighted alternative might be true, which should result in her having low credence in it. It also explains why a rising declarative is infelicitous in (25), where the speaker has no reason to have low credence in the highlighted alternative. After having developed the account in more detail in Sections 4 and 5, we will see that it explains a number of other contrasts as well.

Now let us return to the representation of discourse contexts. Given the above considerations, we will assume that for every participant x, $\mathsf{evidence}(x)$ is not just a list of possibilities, but rather a list of pairs $\langle p, i\rangle$, where p is a possibility, and i a *credence interval*, capturing the amount of credence x signals that she has in p. Anticipating the account that will be spelled out in more detail in Sections 4 and 5, for rising declaratives the credence interval will be [zero, low], for rising tag interrogatives [moderate, high], and for falling tag interrogatives just [high].

4 Semantic interpretation

In this section we provide a compositional semantics for the sentence forms we are concerned with, thereby specifying the I function that connects sentence forms with their contents in the diagram in Figure 2. All sentence forms will be assigned the same semantic type, i.e., they will all be treated as expressing propositions in the sense of inquisitive semantics. However, we will draw a semantic distinction between falling declaratives on the one hand, and rising declaratives, polar interrogatives, and tag interrogatives on the other hand, in that falling declaratives will be associated with non-inquisitive propositions while typical tokens of the other sentence types will be associated with inquisitive propositions.

In Section 4.1 we specify the internal structure of each sentence type, in Section 4.2 we provide a compositional semantics, and finally, in Section 4.3 we draw a distinction between marked and unmarked sentence forms. This distinction will play a crucial role in our treatment of the connection between sentence forms and conventions of use in Section 5.

4.1 Sentence forms

We assume that the syntactic representation of the sentence forms we consider involves two kinds of clause type markers:

(26) *Clause type markers*

a. DEC / INT

b. CLOSED / OPEN

In English root clauses, declarative word order marks the presence of DEC, and interrogative word order marks the presence of INT. In standard English embedded clauses, the distinction is not encoded by means of word order but by the presence of *that* versus *if/whether*. CLOSED is marked by sentence-final falling intonation, which we indicate by ↓, while OPEN is marked by a sentence-final rise, which we indicate by ↑.[13]

These two sets of clause type markers join forces to encode the distinction between inquisitive and non-inquisitive sentence content. We assume that this fundamental semantic distinction is formally marked in most languages, although the particular markers and their distribution will of course vary from language to language.

The separation of CLOSED and OPEN from DEC and INT is an important feature of our account, one that it shares with Gunlogson (2001).[14] To justify it, recall first that rising intonation occurs in English with both interrogative and declarative sentences, and when it occurs with the latter, it has significant interpretive consequences. Thus, as mentioned in Section 1, the conventional discourse effect of a falling declarative is to provide information, while that of a rising declarative is to raise an issue and indicate a bias for one of its resolutions. We see this distinction at work in the examples in (27), which involve preposed complements that have the formal marks of root clauses:

(27) a. 'Amalia left↓', it appears/*she wondered.
b. 'Did Amalia leave?', she wondered/*it appears.
c. 'Amalia left↑', she wondered/*it appears.

To explain the contrast between (27a) and (27b) we suggest that *wonder* requires a complement that expresses an inquisitive proposition, while *appear* requires a complement that expresses a non-inquisitive proposition.[15] In (27c) we see that rising declaratives pattern with polar interrogatives rather than with falling declaratives in that they can occur as preposed complements of *wonder* but not of *appear*. In our account, this fact follows from the presence of OPEN in (27c), which renders the content of the clause inquisitive.

Another contrast motivating our assumption that rising declaratives are inquisitive due to the presence of OPEN is given in (28).

(28) Context: *A and B pass by their friend Bill's house. Bill's car is not parked in front of the house. That day there is an important soccer match of the local team.*
a. A: Did Bill go to the match? B: It would be good to know.
b. A: Bill went to the match↓. B: #It would be good to know.
c. A: Bill went to the match↑. B: It would be good to know.

Here, the argument of *know* in B's response is left implicit, and its semantics has to be retrieved contextually. In (28a), where A uttered a polar interrogative, we see that this is unproblematic, and B's response is interpreted as saying that it would be good to know whether Bill went to the match. On the other hand, in (28b), where A uttered a falling declarative, B's response is odd.

[13] We take it that rising/falling intonation in English has semantic significance only in root clauses. Moreover, we assume that there is only a one way connection between rising intonation and the presence of OPEN. As briefly discussed in the introduction, rising intonation has further uses as well, for instance in 'uptalk' and in signalling uncertainty about the relevance, sufficiency, or clarity of one's contribution.

[14] In Gunlogson (2001) DEC signals commitment, and the rising or falling intonation signals whether the commitment is the speaker's (↓) or one that the speaker attributes to the addressee (↑). Our account is similar to Gunlogson's in separating the two components but while for Gunlogson they only come into play at the discourse level, for us they have semantic import.

[15] See Uegaki (2015); Ciardelli and Roelofsen (2015); Theiler *et al.* (2016) for possible accounts of these requirements.

This can be explained as follows. When retrieving the semantic content of the implicit argument of *know* in B's response, we have only one choice, namely the proposition expressed by A's falling declarative. Thus, B's response is interpreted as saying that it would be good to know *that* (not just *whether*) Bill went to the match. But A has just stated that Bill went to the match. So, presumably, she already knows. The fact that B's response ignores this makes it odd.

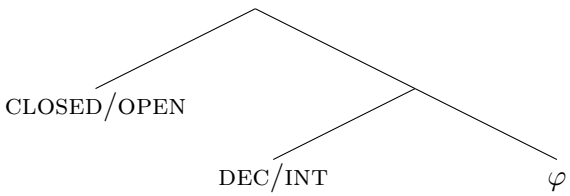
Now, crucially, the rising declarative in (28c) behaves like the polar interrogative in (28a) and not like the falling declarative in (28b). That is, in (28c), B's response is perfectly felicitous, and it is interpreted as saying that it would be good to know *whether* (rather than *that*) Bill went to the match. On our account, this will again follow from the presence of OPEN in rising declaratives, which renders them inquisitive.

Finally, note that in 'fragment answers', intonation is the sole formal mark of the distinction between an inquisitive and an informative response:

(29) a. A: What is the capital of South Korea?
b. B: Seoul↓.
c. B: Seoul↑?

B's response in (29b) fully answers A's question, as it happens, correctly. B's response in (29c) on the other hand, can only be taken as a question, albeit one that indicates a bias towards the correct answer. Note that the sole difference between these two responses is their intonation, which therefore must be able to encode the interpretive contrast. For further discussion and further examples of semantic contrasts encoded in the distinction between rising and falling intonation signalling the presence of OPEN and CLOSED in disjunctive interrogatives, we refer to Roelofsen and Farkas (2015).

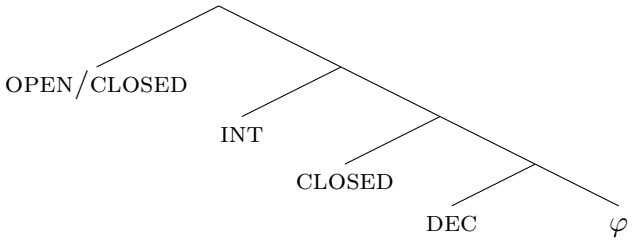
Next, we turn to the issue of how the clause type markers combine with a sentence radical. At the most basic level, we take it that a sentence radical φ combines first with DEC or INT and then the result combines with CLOSED or OPEN, as shown below:



In root clauses, which are the focus of our paper, the combination of the two kinds of clause type markers is unconstrained, resulting in two possible intonation patterns for both declarative and interrogative sentences. The assumed structures of falling and rising declaratives are given below:

The structures of rising and falling interrogatives differ from their declarative counterparts only in that the INT operator replaces the DEC operator in the structures above.

For tag interrogatives we assume a more complex structure corresponding to their more complex surface form. We treat them as being composed of a falling declarative, their *anchor*, and the tag, which in turn is made up of INT and either OPEN or CLOSED, as illustrated below:



Rising tag interrogatives differ from falling tag interrogatives in that the topmost operator of the former is OPEN, while the topmost operator of the latter is CLOSED.[16]

Thus, tag interrogatives result from combining INT with a clause that already contains DEC. Normally, the presence of either INT or DEC is signalled by interrogative or declarative word order in the clause. In the case of tag interrogatives, the word order of the clause is already fixed by DEC. The formal mark of INT in this case is the tag, which has interrogative word order. The final OPEN or CLOSED operator determines the rising or falling intonation of the tag, while the lower CLOSED operator determines the falling intonation of the declarative anchor. Next, we turn to the compositional semantics of these structures.

4.2 Compositional semantics

In this subsection we specify a compositional semantics for the syntactic structures introduced above.[17] We start with sentence radicals. The semantic value of a sentence radical is a proposition in the sense of inquisitive semantics, i.e., a downward closed set of information states. For instance, the proposition expressed by the sentence radical *Amalia left* is the set of all information states that consist exclusively of worlds in which Amalia left. This set contains a single alternative, namely the set of all worlds in which Amalia left, as well as all the subsets of this alternative. To make our formal notation compact and transparent, we will write $S^{\downarrow}$ for the downward closure of any set of information states S, i.e., for the set $\{t \subseteq s \mid s \in S\}$. Thus, for $[\![$ Amalia left $]\!]$ we write:

(30) $[\![$ Amalia left $]\!] = \{\{w : \text{Amalia left in } w\}\}^{\downarrow}$

The proposition expressed by a disjunctive sentence radical such as *Amalia or Bill left*, given in (31), is inquisitive. It contains two alternatives: the set of worlds in which Amalia left, and the set of worlds in which Bill left.

(31) $[\![$ Amalia or Bill left $]\!] = \{\{w\text{: Amalia left in } w\}, \{w\text{: Bill left in } w\}\}^{\downarrow}$

We now turn to the clause type markers, whose semantic contribution we specify in terms of the two projection operators discussed in Section 3.1. First, we treat DEC as an operator that takes the proposition $\mathcal{P}$ expressed by the sentence radical as its input, and applies the non-inquisitive projection operator ! to it, yielding $!\mathcal{P}$:

(32) $[\![\text{DEC}]\!] = \lambda\mathcal{P}.!\mathcal{P}$

When $\mathcal{P}$ is already non-inquisitive, we have that $!\mathcal{P} = \mathcal{P}$, so the semantic effect of DEC is vacuous, as exemplified in (33). When $\mathcal{P}$ is inquisitive, the semantic effect of DEC is non-vacuous, as exemplified

[16] We are dealing here only with reverse tag interrogatives. In order to capture the distinction between reverse and same polarity tag interrogatives (e.g., *Amalia left, did she?*), our analytical machinery would have to be enriched.

[17] What follows is a simplified version of the semantics for the four clause type markers DEC, INT and CLOSED, OPEN presented in Roelofsen and Farkas (2015). We abstract away here from details that are not relevant for our present concerns.

in (34):

(33) $[\![$ DEC Amalia left $]\!] = !\{\{w : \text{Amalia left in } w\}\}^{\downarrow} = \{\{w : \text{Amalia left in } w\}\}^{\downarrow}$

(34) $[\![$ DEC Amalia or Bill left $]\!] = !\{\{w\text{: Amalia left in } w\}, \{w\text{: Bill left in } w\}\}^{\downarrow}$
$= \{\{w : \text{Amalia or Bill left in } w\}\}^{\downarrow}$

Turning now to the semantics of INT, we take its role to be that of ensuring inquisitiveness. Thus, when the proposition $\mathcal{P}$ that it applies to is not yet inquisitive, INT applies the non-informative projection operator ? to it, yielding $?\mathcal{P}$. In the typical case in which $\mathcal{P}$ is neither a tautology nor a contradiction, the result is a proposition containing two alternatives, $\mathsf{info}(\mathcal{P})$ and its complement. When $\mathcal{P}$ is already inquisitive, INT has no semantic effect. We need this latter requirement in order to account for the interaction of interrogative sentence type and intonation in disjunctive sentences, an issue that we do not explicitly deal with here but see Roelofsen and Farkas (2015) for details. The interpretation of INT, then, is given in (35):

(35) $[\![$ INT $]\!] = \lambda\mathcal{P}.\langle ?\rangle\mathcal{P}$

The $\langle ?\rangle$ notation is used to mark the fact that INT contributes the non-informative projection operator ? when applied to a non-inquisitive proposition and is vacuous otherwise.

We illustrate below with a case where INT takes a non-inquisitive proposition as its argument:

(36) $[\![$ INT Amalia left $]\!] = \langle ?\rangle\{\{w\text{: Amalia left in } w\}\}^{\downarrow}$
$= \{\{w : \text{Amalia left in } w\}, \{w : \text{Amalia didn't leave in } w\}\}^{\downarrow}$

In sum, applying INT to the proposition $\mathcal{P}$ expressed by the sentence radical will typically result in an inquisitive proposition, containing two alternatives, the informative content of the sentence radical and its complement. Applying DEC to the proposition $\mathcal{P}$ expressed by the sentence radical will result in a non-inquisitive proposition containing a single alternative that is the informative content of $\mathcal{P}$.

Next, we turn to the semantics of CLOSED and OPEN. We assume here that the semantic contribution of CLOSED is vacuous, and that OPEN applies the ? operator to its input proposition:[18]

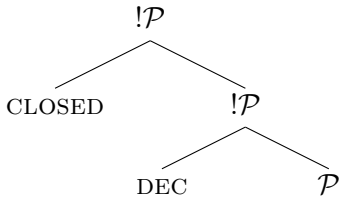
(37) a. $[\![\text{CLOSED}]\!] = \lambda\mathcal{P}.\mathcal{P}$
b. $[\![\text{OPEN}]\!] = \lambda\mathcal{P}.?\mathcal{P}$

Thus, the result of OPEN applied to a proposition $\mathcal{P}$ that is not a tautology or a contradiction will be an inquisitive proposition, independently of whether $\mathcal{P}$ itself is inquisitive or not. Therefore, in case $\mathcal{P}$ is neither a contradiction nor a tautology, the result of applying INT or OPEN to $\mathcal{P}$ is an inquisitive proposition while the result of applying DEC to $\mathcal{P}$ is a non-inquisitive proposition.

We are now ready to go through the compositional interpretation of each of the sentence types we are concerned with. The interpretation of a falling declarative sentence is schematized in (38).

[18] With respect to CLOSED this is a simplification; in a full account that applies to disjunctive interrogatives as well as polar ones, CLOSED should contribute an exclusive strengthening operation, and should apply to the sentence radical before DEC/INT. Because of this, it is assumed in Roelofsen and Farkas (2015) that OPEN and CLOSED are syntactically below DEC and INT, and have a slightly more complex semantic type than they do here. This, however, is irrelevant for our present concerns.

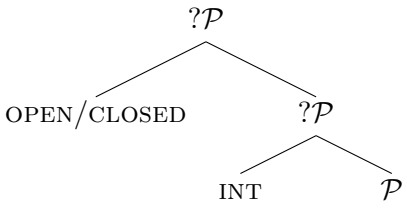
(38)



DEC contributes the ! operator. Thus, the result of combining DEC with the sentence radical is a non-inquisitive proposition, even if the proposition expressed by the sentence radical itself is inquisitive. Since CLOSED has no semantic effect, a falling declarative always expresses a non-inquisitive proposition.

The interpretation of a rising or falling interrogative whose sentence radical expresses a non-inquisitive proposition $\mathcal{P}$ is schematized in (39).

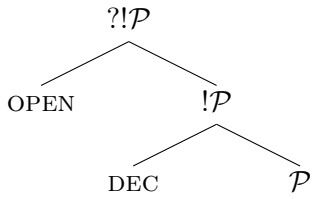
(39)



INT contributes the ? operator yielding an inquisitive proposition, provided that $\mathcal{P}$ is not a tautology or a contradiction. As for the highest operator, if it is CLOSED it has no semantic effect by definition; if it is OPEN, it has no semantic effect because its argument is already non-informative. In sum, an interrogative sentence with a non-inquisitive sentence radical which is not a tautology or a contradiction will always express an inquisitive proposition, independently of whether its intonation is rising or falling.

Turning now to rising declaratives, their interpretation is schematized in (40):

(40)

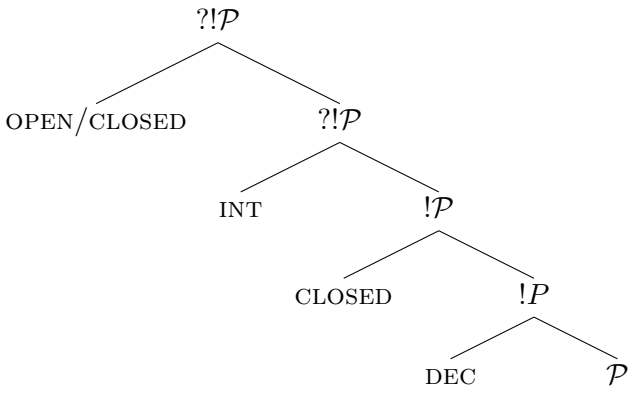


In this case, the result of combining DEC with the proposition expressed by the sentence radical is the non-inquisitive proposition $\{\text{info}(\mathcal{P})\}^{\downarrow}$ because DEC contributes the non-inquisitive projection operator !. The argument of OPEN is now a non-inquisitive proposition, and therefore the result of applying OPEN to it is a proposition containing two alternatives, $\mathsf{info}(\mathcal{P})$ and its complement. In the typical case in which $\mathcal{P}$ is not a tautology or a contradiction, this proposition is inquisitive.

Note that if a rising declarative and a polar interrogative have the same non-inquisitive sentence radical, they are predicted to express the same proposition. In the case of a polar interrogative intonation has no semantic effect, because INT already supplies the ? operator. In the case of a rising declarative, the rise signals the presence of OPEN, which contributes the ? operator.

We now turn to the interpretation of tag interrogatives, schematized in (41):

(41)



In the case of tag interrogatives, a falling declarative clause is embedded under an interrogative operator. In the typical case when $\mathcal{P}$ is not a tautology or a contradiction, the result is an inquisitive proposition.[19] Finally, note that the intonation of tag interrogatives is semantically vacuous, in the same way as it is in simple polar interrogatives.

On our account then, if a rising declarative and a tag interrogative have a non-inquisitive sentence radical, they express exactly the same proposition as a polar interrogative with the same sentence radical, although this proposition is derived in different ways. In particular, in the case of polar interrogatives and tag interrogatives, it is INT that contributes the crucial ? operator; OPEN and CLOSED have no semantic effect. On the other hand, in the case of rising declaratives, it is OPEN that contributes the ? operator.

To sum up, from the point of view of semantic interpretation, our sentence forms divide into the two groups in (42):

(42) *Semantic classification of sentence forms considered*

a. Typically informative, non-inquisitive:
   - falling declaratives

b. Typically inquisitive, non-informative:
   - polar interrogatives,
   - falling tag interrogatives,
   - rising declaratives.

Falling declaratives are non-inquisitive and informative unless tautological. The operator that ensures this is DEC. Polar interrogatives, rising declaratives and tag interrogatives are non-informative and inquisitive unless tautological.

Finally, recall that, following Roelofsen and Farkas (2015), we assume that the alternative contributed by the sentence radical is highlighted. The operators under consideration here do not affect highlighting, and in order not to complicate matters unnecessarily, we are considering here only examples where a single alternative is highlighted.

To illustrate, the proposition expressed by our falling declarative example in (43a) is given in (43b), where we use boldface to indicate the highlighted alternative (in this case the only alternative in the given proposition):

(43) a. Amalia left↓.
b. $\{\{\boldsymbol{w}$ **: Amalia left in** $\boldsymbol{w}\}\}^{\downarrow}$

[19] The opposite situation, i.e., a structure where an interrogative sentence would be embedded under a declarative operator is ruled out because it would be useless: such a combination would always result in a tautology.

The proposition expressed by our examples of rising or falling polar interrogatives, rising declaratives and rising or falling tag interrogatives in (44a) is given in (44b):

(44) a. Did Amalia leave? / Amalia left↑? / Amalia left, didn't she?
b. $\{\{\boldsymbol{w}$ **: Amalia left in** $\boldsymbol{w}\}$, $\{w$: Amalia didn't leave in $w\}\}^{\downarrow}$

The first alternative in (44b), the set of worlds in which Amalia left, is contributed by the sentence radical and is therefore highlighted; the second alternative, the set of worlds in which Amalia did not leave, is contributed by INT in the case of polar and tag interrogatives, and by OPEN in the case of rising declaratives.

Under the assumption that *wonder* requires an inquisitive complement, while *appear* requires a non-inquisitive complement, we account for the contrast noted in (27), repeated and expanded in (45) (intonation is left unspecified in the case of polar and tag interrogatives because in these sentence types it is semantically insignificant):

(45) a. 'Amalia left↓', it appears/*she wondered.
b. 'Did Amalia leave?', she wondered/*it appears.
c. 'Amalia left↑', she wondered/*it appears.
d. 'Amalia left, didn't she?', she wondered/*it appears.

In this section we have specified the I function in Figure 2, by giving a compositional semantics for the sentence forms we are considering. We now turn to markedness considerations, which will result in a classification that cross-cuts the one in (42) above. These markedness distinctions will be essential in determining how to connect sentence forms to conventions of use in a non-stipulative way, which will be done in Section 5. Recall from Section 2 that we aim to account for the conventional discourse effects of unmarked forms by means of a single basic convention of use; additional discourse effects can only be associated to marked forms.

4.3 Marked and unmarked sentence forms

In the spirit of neo-Gricean pragmatics advocated in the work of Horn and many others, as well as Optimality Theory, we look at the form-content connection both from the point of view of ensuring economy of form, and from the point of view of ensuring communicative success. If two forms have the same semantic content, one may be considered more marked than the other because it is formally more complex, or because it is more prone to misinterpretation and therefore less likely to ensure communicative success. We refer to the least marked forms expressing a given content c as *unmarked* or *optimal* forms (for c), and to all other forms expressing c as *marked* forms (for c).

The content of a falling declarative is a non-inquisitive, typically informative proposition. If this is the type of content the speaker wishes to express, a falling declarative is her only choice. This is so because, as we have seen above, an interrogative, with or without tag, or a rising declarative, if involving a sentence radical that is not a tautology or a contradiction, would receive an inquisitive interpretation, the former because of the presence of INT, the latter because of the presence of OPEN. A falling declarative is therefore the only, and thereby the optimal form for the content it expresses.

If, on the other hand, the speaker wishes to convey an inquisitive proposition containing two complementary alternatives, α and $\overline{\alpha}$, several candidate forms are available: a rising or falling polar interrogative, a rising or falling tag interrogative, or a rising declarative. We show next that rising polar interrogatives are optimal in this case.

Tag interrogatives, whether rising or falling, are more marked than rising polar interrogatives

simply because they are more complex in form. We thus have the markedness relation in (46):

(46) *Rising polar interrogatives vs. tag interrogatives*
rising polar interrogative < rising or falling tag interrogative

A rising declarative is more marked than a rising polar interrogative because in the case of the rising declarative, the only formal feature that signals inquisitiveness is rising intonation, reflecting the presence of OPEN. Were this signal to be missed, the conveyed proposition would not be the intended one, $\mathcal{P} = \{\alpha, \overline{\alpha}\}^{\downarrow}$, but rather $\mathcal{P}' = \{\alpha\}^{\downarrow}$. In the case of a rising polar interrogative on the other hand, if the word order clue alerting the addressee to the presence of INT were missed, the rising intonation, signalling the presence of OPEN would still be there to ensure that the intended interpretation is conveyed. Considerations of communicative success, then, lead to treating a rising polar interrogative as less marked than a rising declarative when it comes to conveying the type of inquisitive content associated to these forms.[20]

(47) *Rising polar interrogatives vs. rising declaratives*
rising polar interrogative < rising declarative

When we compare rising and falling polar interrogatives, it is not so clearcut which of the two is to be considered more marked. On the one hand, from the viewpoint of ensuring communicative success rising polar interrogatives are better than falling ones. Having both OPEN and INT in the makeup of a sentence meant to express a proposition of the form $\mathcal{P} = \{\alpha, \overline{\alpha}\}^{\downarrow}$ reinforces the inquisitive nature of the content expressed as mentioned above. In the case of a falling polar interrogative on the other hand, interrogative word order is the only clue that ensures that the intended content is conveyed. If that clue is missed, the conveyed content is the non-inquisitive proposition $\mathcal{P}' = \{\alpha\}^{\downarrow}$.

On the other hand, from the viewpoint of formal simplicity, falling polar interrogatives may be considered less marked than rising ones, given that pitch naturally decreases with lung pressure and therefore a falling pitch at the end of a sentence requires less effort than a rising pitch (Gussenhoven, 2004; Westera, 2014).

Thus, if formal simplicity and ensuring communicative success are given equal weight, rising and falling polar interrogatives are equally marked. If one of the factors is ranked higher than the other, the two forms would differ in markedness. In Optimality Theory it is assumed that such rankings may differ from language to language, which results in cross-linguistic variation. We leave open here how the factors are ranked in American English, and will not distinguish rising and falling polar interrogatives in terms of markedness. We also leave open here whether there are any systematic differences between the two in terms of conventional discourse effects.

The conclusion we reach is that falling declaratives are optimal forms to express non-inquisitive propositions of the form $\{\alpha\}^{\downarrow}$, while polar interrogatives are optimal forms to express inquisitive propositions of the form $\{\alpha, \overline{\alpha}\}^{\downarrow}$. In terms of markedness then, our sentence forms are classified as in (48):

(48) *Markedness classification*

[20]Note that on our account, rising polar interrogatives involve a certain type of *redundancy*: both INT and OPEN signal inquisitiveness. Since redundancy is often seen as a source of markedness, one may expect that this should lead us to the conclusion that rising polar interrogatives are marked sentence types as well. But we hold that the specific type of semantic redundancy involved here is not to be seen as a source of markedness. Crucially, we assume that a declarative or interrogative root sentence is *always* marked as being either INT or DEC, and either OPEN or CLOSED. So there is no particular cost in marking a sentence as being both INT and OPEN. Even though this signals inquisitiveness twice, it does not involve any formal complexity that could otherwise have been avoided.

a. Optimal, unmarked forms:
   - falling declaratives
   - polar interrogatives

b. Marked forms:
   - rising declaratives
   - tag interrogatives

The markedness distinction between polar interrogatives and rising declaratives is relevant to English, where inquisitiveness at the root level can be marked both by INT and by OPEN. In languages where the main signal of inquisitiveness is rising intonation, and there is no systematic word order difference between interrogative and declarative sentences, such a contrast does not arise. In such languages then, rising intonation accompanying declarative word order would be the optimal, unmarked form for expressing an inquisitive proposition of the form $\{\alpha, \overline{\alpha}\}^{\downarrow}$.

In the next section we turn to the connection between sentence form, semantic content, and conventions of use. In order to conform to our desiderata schematized in Figure 2 in Section 2, all the sentence forms under consideration should be associated with a single basic convention of use. For unmarked forms (that is, for falling declaratives and polar interrogatives) this basic convention of use should suffice to characterize their conventional discourse effects. Additional effects can only be associated to marked forms, and these should be connected to the particular forms in question.

5 Conventions of use

In this section we show how sentence form and semantic content interact in determining the conventional discourse effects of each sentence type we consider here, thereby specifying the relevant conventions of use. This amounts to characterizing the F functions on the right hand side of Figure 2. As mentioned at the end of the previous section, unmarked sentence forms are to be associated with a unique, basic convention of use. That is, there should be no need to stipulate separate conventions of use for falling declaratives and polar interrogatives. The conventional discourse effects of marked sentence forms will partly be determined by the basic convention of use as well, but in this case there will be additional effects associated with each particular form. We start with the unmarked forms and then move on to the marked ones.

5.1 The basic convention of use

We propose that the basic convention of use is as follows:

(49) **Basic convention of use**
If a discourse participant x utters a declarative or interrogative sentence φ, the discourse context is affected as follows:

1. The proposition expressed by φ, $[\![\varphi]\!]$, is added to the table.
2. The informative content of φ, $\bigcup[\![\varphi]\!]$, is added to $\mathsf{commitments}(x)$.

The result of the first step is to steer the conversation towards a context such that for some state $s \in [\![\varphi]\!]$, the participants in the conversation mutually agree that w_a, the world in which the conversation takes place, is a member of s.

The second step commits x, the participant who uttered the sentence, to the claim that w_a must be a member of some element of $[\![\varphi]\!]$, i.e., of $\bigcup[\![\varphi]\!]$. The second step is closely connected to

the first: for x to commit to w_a being contained in $\bigcup[\![\varphi]\!]$ is just for her to subscribe to her own proposal to pursue mutual agreement that, for some $s \in [\![\varphi]\!]$, w_a is in s.

On our account the conventional effects of unmarked sentence types, i.e., both falling declaratives and polar interrogatives, are fully determined by (49). Whatever differences there are in the conventional ways in which these two sentence types affect their input contexts should therefore follow from differences in the semantics of the two sentence types. We turn now to showing that this is indeed the case.

Falling declaratives. The proposition $\mathcal{P}$ expressed by a falling declarative is non-inquisitive, given that at the top level such sentences involve the DEC operator embedded under CLOSED. In this case, then, $\mathcal{P}$ contains a unique alternative α and this alternative is highlighted, so $\mathcal{P} = \{\boldsymbol{\alpha}\}^{\downarrow}$. Putting such a proposition on the table amounts to steering the conversation towards a state where the participants mutually agree that $w_a \in \alpha$. At the same time, α is added to commitments(x). The speaker is thereby committed to α and proposes that the other participants commit to it as well, so as to establish mutual agreement. If at a subsequent stage of the conversation the same speaker utters, without further qualification, a falling declarative expressing a proposition whose informative content is incompatible with α she would be guilty of inconsistency.

Thus, the conventional discourse effects obtained by applying (49) to a falling declarative can be summarized as follows:

(50) Conventional discourse effects of participant x uttering a falling declarative expressing the proposition $\{\boldsymbol{\alpha}\}^{\downarrow}$:

1. $\{\boldsymbol{\alpha}\}^{\downarrow}$ is placed on the table.
2. α is added to commitments(x).

Recall that we are restricting our attention to *conventional* discourse effects. Pragmatic considerations concerning the particular circumstances of utterance, including considerations concerning the speaker's reasons for uttering the sentence she uttered, are involved in achieving further effects and determining whether the utterance serves, e.g., as a reminder, a warning, a promise, or a threat.

Polar interrogatives. Polar interrogatives are associated with the same basic convention of use as falling declaratives, but because of the semantic differences between falling declaratives and polar interrogatives the resulting discourse effects are distinct as well.

Recall that because of the INT operator, polar interrogatives express an inquisitive proposition (unless they are tautological) containing two alternatives: a highlighted alternative α, which is the informative content of the proposition expressed by the sentence radical, and its complement, $\overline{\alpha}$.

According to the basic convention of use given in (49), when uttering a polar interrogative, the proposition expressed by the sentence is placed on the table, and the informative content of this proposition is added to the commitments of the speaker. In the typical (non-tautological) case then, the proposition placed on the table contains two complementary alternatives, α and $\overline{\alpha}$. Placing such a proposition on the table steers the conversation towards a context where the participants either mutually agree that w_a is in α or that it is in $\overline{\alpha}$. Since the two alternatives are complementary, the commitment entered on the speaker's discourse commitment list is the trivial commitment that w_a is an element of $\alpha \cup \overline{\alpha}$, which is the set of all possible worlds, W. In this case then, the speaker makes a trivial commitment and she remains neutral with respect to which alternative in the proposition expressed contains w_a. This is summarized in (51).

(51) Conventional discourse effects of participant x uttering a polar interrogative expressing the proposition $\{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$:

1. $\{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$ is placed on the table
2. W is added to commitments(x)

Thus, even though falling declaratives and polar interrogatives are associated with the same convention of use, a falling declarative registers commitment of the speaker to w_a being an element of the highlighted alternative, and steers the conversation towards a context where the other participants share this commitment, whereas a polar interrogative registers the speaker as neutral with respect to whether w_a is an element of the highlighted alternative, and steers the conversation towards a context where participants have either agreed that w_a is an element of this alternative, or that it is not. These differences in conventional discourse effects are due entirely to an independently motivated semantic difference between the two sentence forms.

Again, pragmatic considerations concerning the particular circumstances of utterance would be involved in deriving further effects. Thus, in an ordinary conversation one would assume that a speaker utters a polar interrogative because she doesn't know the answer, and hopes that her addressee does. In this case, the polar interrogative functions as an information seeking question. On the other hand, in a test situation, one assumes that the person uttering the interrogative in fact knows the answer and her reason for uttering it is to check whether the addressee knows the answer as well. In yet other circumstances the discourse context may be such that the answer is already common ground. In that case, a speaker may utter her sentence to point out the obviousness of the answer. This is the case in at least some rhetorical questions. As mentioned, such pragmatic discourse effects are not our main concern here. What (51) aims to capture are the conventional discourse effects of a polar interrogative, which are taken to be constant across contexts.

Note that although a speaker who utters a polar interrogative does not signal a bias for one alternative in the proposition expressed over the other, her epistemic state may in fact favor one over the other. When a speaker utters a falling declarative, on the other hand, she registers commitment to the unique alternative in the proposition expressed. In canonical cases, the speaker's epistemic state will support this commitment.[21]

In sum, the distinctions between the conventional discourse effects of a falling declarative and that of a polar interrogative are the following; (i) falling declaratives place a non-inquisitive proposition on the table and (ii) register commitment to the informative content of this proposition. Polar interrogatives (i) place an inquisitive (unless tautological) proposition on the table containing two complementary alternatives and (ii) do not register a bias for one alternative over the other. We have an account then of the conventional discourse effects of falling declaratives and polar interrogatives which fits the schema depicted in the figure on page 14, in that both sentence types are associated with the same basic convention of use, and their different discourse effects are due entirely to independently motivated differences in their semantics. This conforms to the first part of our division of labor principle, stated in (21), which we take to be an important result of our approach. Next, we turn to the special discourse effects induced by marked sentence types.

[21] The speaker may, of course, be lying. It may also happen that both the speaker and her addressee know that the speaker's actual epistemic state does not support her commitment, as in the case of conversations that are meant to deliberately mislead an eavesdropper, for instance. Lying and misleading are possible precisely because in making an utterance a speaker undeniably presents herself, in virtue of linguistic conventions, as making a certain commitment.

5.2 Special discourse effects

In line with the goals formulated at the outset, the discourse effects induced by the marked forms we deal with here, namely rising declaratives and tag interrogatives, will be taken to consist of the basic effects specified in (49), augmented by special effects connected to each particular form.

Recall that the semantic content of the marked forms under consideration here is identical to that of polar interrogatives. Assuming that the sentence radical *Amalia left* expresses the proposition $\mathcal{P} = \{\boldsymbol{\alpha}\}^{\downarrow}$, the sentences in (52a)-(52c) all express the proposition in (52d), with highlighting indicated by boldface:

(52) a. Did Amalia leave?
b. Amalia left↑?
c. Amalia left, didn't she?
d. $\{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$

In virtue of the basic convention of use, when one of the sentences in (52a)-(52c) is uttered by a speaker x, the inquisitive proposition in (52d) is placed on the table and the trivial possibility $\alpha \cup \overline{\alpha} = W$ is placed on commitments(x). This is the conventional discourse effect that polar interrogatives, rising declaratives and tag interrogatives share in virtue of their common semantics.

We now specify the conventional discourse effects of rising declaratives and tag interrogatives in detail, separating the basic effect that they share with polar interrogatives from the special effects that are connected to their specific form. We start with rising declaratives.[22]

(53) **Conventional discourse effects of a rising declarative**
When a discourse participant x utters a rising declarative φ, expressing the proposition $[\![\varphi]\!] = \{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$, the discourse context is affected as follows:

1. Basic effect — as defined in (49)
   - The proposition expressed by φ, $[\![\varphi]\!]$ is added to the table.
   - The informative content of φ, $\bigcup[\![\varphi]\!]$, is added to commitments(x).
2. Special effect
   - $\langle\alpha$,[zero, low]$\rangle$ is added to evidence(x).

A typical example is given in (54), modeled after a case discussed in Gunlogson (2001):

(54) Context: *Amalia walks in and Bert is struck by her new hairstyle.*
Bert: You've had a haircut?

Given the semantic content of the uttered sentence, Bert raises the issue of whether Amalia has had a haircut or not. By choosing to express this content via a rising declarative, Bert signals that he has some evidence for the highlighted alternative, and marks his credence in the evidenced possibility as falling somewhere within the interval between zero and low. Given the context, it is natural to assume that Amalia's new hairstyle is the evidence Bert considers, and that his credence in the highlighted alternative is above zero, since otherwise he would not have brought the matter up. If the change in Amalia's appearance is not dramatic it makes sense for Bert to signal that his credence in the highlighted possibility is not beyond low. Bert's utterance leaves it up to Amalia to confirm or deny the highlighted possibility, an eminently sensible move given the circumstances.

[22] As discussed in the introduction, there are cases of declarative sentences with a final rise that fall beyond the scope of our account, including cases of 'uptalk' and ones that signal uncertainty about the relevance, sufficiency, or clarity of one's contribution. Such cases are explicitly left out of consideration here.

In order for a rising declarative to be felicitous then, the context of utterance should be such as to make it reasonable to assume that the speaker has access to some evidence in favor of the highlighted alternative in order to justify her adding it to her evidenced possibilities list. At the same time, the circumstances should make it reasonable to assume that the speaker's credence in the higlighted alternative is at most low. Thus, we correctly predict that it would be strange for Bert to say (55) to Amalia, because, under normal circumstances, Bert should know full well whether he had a haircut or not, and thus be fully confident in the highlighted possibility.

(55) #I've had a haircut?

An important feature of our formulation of the special effect of rising declaratives is that it does not preclude their use in case the speaker has access to some evidence for the highlighted alternative but her credence in this possibility is nevertheless zero. Thus, rising declaratives should be appropriate in contexts where the speaker in fact rejects the highlighted alternative, despite the availability of some evidence in its favor. The example in (56) shows that this is correct:[23]

(56) Student: The answer to this problem is 5 because the square root of 9 is 2 and 2 + 3 is 5.
Teacher: The square root of 9 is 2?

Here the available evidence for the highlighted alternative is the student's prior commitment to it. In this context, the teacher is assumed to be authoritative, i.e., she is assumed to know whether the highlighted alternative is true or not. By her use of a rising declarative, she signals to the student that her credence in the highlighted alternative is at most low. Since she is assumed to be authoritative, this can only mean that her credence is zero, and that she is effectively rejecting the student's prior commitment and urging him to reconsider.

Thus, examples (54) and (56) show that rising declaratives can be used when the speaker is epistemically biased for the highlighted alternative but they are also felicitous in case she is in fact ready to commit to its complement, despite the availability of some evidence in favor of it. As will be discussed in some detail in Section 7, cases like (56) are problematic for many, if not all, existing accounts of rising declaratives. In particular, they cannot be accounted for in approaches where rising declaratives are taken to signal a 'contingent' or a 'conditional' commitment, as in Gunlogson (2008) and Malamud and Stephenson (2015), as well as earlier versions of the present paper. In such accounts, rising declaratives are taken to indicate that the speaker is ready to commit to the highlighted alternative provided that her interlocutor commits to this alternative first. In (56), however, the teacher clearly does not signal readiness to commit to the possibility that the square root of 9 is 2, even if the student were foolish enough to re-commit to this claim. More examples of this kind will be considered in Section 6.[24]

[23] We owe this observation, as well as the example in (56), to Jeroen Groenendijk.

[24] When confronted with (56) as a counterexample to an earlier version of our account (as well as other existing accounts of rising declaratives), our first thought was that this may be a case of *pretense*. Just like when the teacher were to say 'I'm not sure whether the square root of 9 is 2' she wouldn't really mean that she is unsure, in the case of (56) she may just be pretending to be biased in favor of the square root of 9 being 2, without really subscribing to such a bias. However, this escape hatch is problematic for at least two reasons. First, if it could be made to work for examples like (56) at all—in particular, if it could account for the fact that the student can conclude from the teacher's reaction that the square root of 9 is *not* 2—it seems impossible to generalize it to other cases where rising declaratives are used without an epistemic speaker bias; we will discuss several such cases in Section 6, see in particular examples (69), (70) and (79). Second, we do not see how this type of account could explain that in all the relevant cases we find a sharp contrast in felicity between rising declaratives and tag interrogatives. For instance, in (56) it would be infelicitous for the teacher to say 'The square root of 9 is 2, isn't it?', and the same contrast will be found in (69), (70) and (79). If it were possible for speakers to express a feigned bias towards the highlighted alternative by means of a rising declarative, why would it be impossible to do so by means of a tag interrogative?

Turning now to rising tag interrogatives, their conventional discourse effects are specified in (57).

(57) **Conventional discourse effects of rising tag interrogatives**
When a discourse participant x utters a rising tag interrogative φ, expressing the proposition $[\![\varphi]\!] = \{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$, the discourse context is affected as follows:

1. Basic effect — as defined in (49)
   - The proposition expressed by φ, $[\![\varphi]\!]$ is added to the table.
   - The informative content of φ, $\bigcup[\![\varphi]\!]$, is added to commitments(x).
2. Special effect
   - $\langle\alpha$,[moderate, high]$\rangle$ is added to evidence(x).

The crucial difference between rising declaratives and rising tag interrogatives, then, is that the latter signal higher speaker credence in the highlighted alternative. Due to this, when a speaker utters a rising tag interrogative, she signals epistemic bias in favor of this alternative.

A typical example of a rising tag interrogative is given in (58):

(58) Context: *Amalia and Bert are a couple looking to furnish their new apartment. They make purchasing decisions together. They are in a store, looking at a table they are thinking of buying, whose price is higher than what they would have expected. Amalia really likes it but she's not quite sure whether they can afford it.*

Amalia: It's a bit too expensive for us, isn't it↑?

The highlighted possibility, i.e., the possibility that the table is a bit too expensive, is added to Amalia's evidenced possibilities list, and Amalia's credence in this possibility is marked as being somewhere in the interval between moderate and high. The evidence she has is the price of the table, and her recollection of the budget. This context is consistent with Amalia having moderate to high credence in the highlighted alternative, given this evidence. She is using a rising tag interrogative rather than a declarative, presumably, because the decision should be a common one, and so Bert's confirmation is needed. Were Amalia to have uttered the rising declarative *This is too expensive?* she would have indicated low credence in the highlighted alternative.

Finally, the conventional discourse effects of falling tag interrogatives are specified in (59).

(59) **Conventional discourse effects of falling tag interrogatives**
When a discourse participant x utters a falling tag interrogative φ, expressing the proposition $[\![\varphi]\!] = \{\boldsymbol{\alpha}, \overline{\alpha}\}^{\downarrow}$, the discourse context is affected as follows:

1. Basic effect — as defined in (49)
   - The proposition expressed by φ, $[\![\varphi]\!]$ is added to the table.
   - The informative content of φ, $\bigcup[\![\varphi]\!]$, is added to commitments(x).
2. Special effect
   - $\langle\alpha$,[high]$\rangle$ is added to evidence(x).

The only difference between falling tag interrogatives and the other two marked forms discussed above is the fact that with a falling tag, the speaker signals high credence in the highlighted alternative. Thus, she signals epistemic bias for this alternative, just as in the case of rising tag interrogatives, but in the case of falling tags, the bias is stronger.

A typical example of a falling tag interrogative is given in (60):

(60) Context: *Amalia and Bert are a couple in the process of furnishing their new apartment. They are in a store looking at a table that sells for $3000. They have agreed that they won't spend more than $4000 on new furniture, and they need other items besides a table. Amalia is convinced they cannot afford it. But Bert is sometimes inclined towards extravagance and has spent quite some time admiring this expensive table.*

Amalia: It's too expensive for us, isn't it↓?

In this case, by using a tag interrogative Amalia is signalling her bias towards the highlighted alternative, i.e., that the table is too expensive, as in (58), and by using falling intonation on the tag she signals her high credence in this alternative, and therefore her heightened expectation that Bert will agree with her.

To sum up, the common property of rising declaratives and tag interrogatives is that they involve a marked form for the expressed sematic content. Because of this, their discourse effects do not only involve the basic effect that is shared by all sentence types considered here, but also special effects that are specifically connected to their form. The special effects associated with the marked forms considered here have one aspect in common, namely that of registering the highlighted alternative as an evidenced possibility, thereby signalling that the speaker has access to some evidence in favor of it. The three marked forms we consider differ in that they signal varying levels of credence in the higlighted alternative, with rising declaratives signalling zero to low credence, rising tag interrogatives signalling moderate to high credence, and falling tag interrogatives signalling high credence.

So far, then, we have specified the conventions of use associated with each of the marked forms we consider. The account meets the division of labor principle formulated in Section 2. All unmarked forms are associated with the same basic convention of use, while marked sentence forms are associated with complex discourse effects made up of the basic effect augmented by special effects triggered by the particular marked form involved.

Before testing the predictions of our account in more detail in the next section, we draw connections between the intonation that characterizes the marked forms and the details of their special discourse effects.

Connections between special effects and intonation in marked forms. On our account, rising declaratives and tag interrogatives signal different levels of credence in the highlighted alternative. We suggest that the signalled credence level is connected to intonational features of the forms involved. In particular, we propose that rising and falling intonation, besides signalling the presence of OPEN or CLOSED, respectively, may also signal differences in the speaker's credence level in the relevant possibility. Lowest credence is signalled by sentences that do not involve a fall, highest credence is signalled by sentences that do not involve a rise, and the credence level signalled by a combination of a fall and a rise is in between the other two. Schematically, then, the credence levels signalled by rising declaratives and tag interrogatives are connected to their intonation as follows:

(61) a. ↑ $\rightsquigarrow$ zero to low credence
b. ↓↑ $\rightsquigarrow$ moderate to high credence
c. ↓↓ $\rightsquigarrow$ high credence

Thus, the overall discourse effects of rising declaratives and tag interrogatives are connected in a systematic way to their semantics, syntax, and intonation.

6 Testing the account

We now turn to checking the predictions of the account by considering the various sentence types in contexts that fix the parameters involved, namely the evidence that the speaker has access to for the highlighted alternative and the credence level it is reasonable for her to have in this alternative. In Section 6.1 we focus on predictions of our account for cases discussed in previous literature, especially Gunlogson (2001, 2008), Northrup (2014), and Malamud and Stephenson (2015), as well as some related examples not considered earlier. In Section 6.2, we turn to predictions of the account concerning rhetorical questions and NPI licensing.

6.1 Baseline predictions

First, our account predicts that in contexts where the speaker is assumed to be authoritative, i.e., to have full knowledge of the relevant facts, while the addressee is neutral, falling declaratives are appropriate but polar interrogatives, rising declaratives and rising tag interrogatives are not. This is exemplified in (62):

(62) Context: *Doctor to patient, handing him a prescription*:

a. This medicine will cure you.
b. #Will this medicine cure you?
c. #This medicine will cure you?
d. #This medicine will cure you, won't it↑?
e. #This medicine will cure you, won't it↓?

Recall that on our account, polar interrogatives are compatible with contexts in which the speaker is assumed to have no evidence whatsoever for the highlighted alternative, since polar interrogatives express no bias for the highlighted alternative in the proposition they express over the non-highlighted one. The other sentence types are predicted not to be compatible with such a context, because falling declaratives express commitment to the highlighted alternative, while rising declaratives and tag interrogatives signal that the speaker has access to some evidence for the highlighted alternative. We see this prediction confirmed in the example below from Gunlogson (2008, her example 9):

(63) Context: *Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters from outdoors. Robin to newcomer:*

a. #Its raining.
b. Is it raining?
c. #Its raining?
d. #Its raining, isn't it↑?
e. #Its raining↓?

We now turn to contexts that differentiate between rising declaratives and tag interrogatives. The prediction our account makes is that in contexts where it is clear that the speaker has evidence for the highlighted alternative, and there is no reason for her not to trust this evidence, falling declaratives as well as tag interrogatives will be felicitous but rising declaratives and polar interrogatives will not be. This situation is exemplified in (64) below, which is parallel to example (3) in Malamud and Stephenson (2015):

(64) Context: *Belinda and Chris are looking at a sunset. Belinda says to Chris*:

a. This is a beautiful sunset.
b. #Is this a beautiful sunset?
c. #This is a beautiful sunset?
d. This is a beautiful sunset, isn't it↑?
e. This is a beautiful sunset, isn't it↓?

A falling declarative is predicted to be felicitous in this situation because Belinda is clearly in a good position to commit to the sunset being beautiful. A polar interrogative is infelicitous because, given that the context rules out a 'quiz question' interpretation for the polar interrogative, the speaker is presenting herself as neutral with respect to whether the sunset is beautiful or not, a situation that is at odds with ordinary assumptions about people's competence to assess the beauty of sunsets. A rising declarative is also infelicitous because by using it, the speaker presents herself as having at most low credence in the fact that the sunset is indeed beautiful. This is again at odds with common sense assumptions about people's competence to assess the beauty of sunsets. Falling and rising tag interrogatives, which signal moderate to high speaker credence, are correctly predicted to be felicitous.

Note, however, that the rising declarative, when pronounced with emphasis on *this*, becomes felicitous if Chris has previously committed to the claim that the sunset is beautiful but Belinda, derisively, wants to indicate that her standards are higher. In such a case the rising declarative is taken to signal that Belinda has zero credence in this being a beautiful sunset. Note that it is crucial here that Chris has already committed to the highlighted alternative. This provides contextual evidence for the alternative, which is accessible to Belinda, and thus allows her to use a rising declarative even though her credence in the alternative is zero and therefore, presumably, she does not have access to any evidence for it other than Chris's commitment. More examples where the speaker uses a rising declarative to signal disagreement with her interlocutor's prior commitment to the highlighted alternative will be discussed shortly.

An example that is analogous to (64) but does not involve a predicate of personal taste is given in (65).

(65) *Amalia and Bert have a colleague, Carla, who is admired by everyone for her problem solving skills. One day, at a department meeting, the chair raises an issue, and Carla immediately finds a solution that makes everyone happy. Amalia to Bert:*

a. She always finds a solution that makes everyone happy.
b. #Does she always find a solution that makes everyone happy?
c. #She always finds a solution that makes everyone happy?
d. She always finds a solution that makes everyone happy, doesn't she↑?
e. She always finds a solution that makes everyone happy, doesn't she↓?

The polar interrogative and the rising declarative are infelicitous here because, just as in (64), the context is incompatible with the speaker having low credence in the highlighted alternative.

A polar interrogative and a rising declarative become appropriate in a situation that differs from the one in (64) and (65) in that the speaker is not quite sure of what the applicability range of the adjective is. This is exemplified in (66):

(66) Context: *Belinda and Chris are looking at a painting depicting a sunset. Belinda is Chris's daughter, and Chris has been teaching her to distinguish between 'real art' and 'kitsch'. Belinda says to Chris:*

a. This is kitsch.

b. Is this kitsch?
c. This is kitsch?
d. This is kitsch, isn't it↑?
e. This is kitsch, isn't it↓?

A falling declarative is fine, under the assumption that Belinda has become confident that her assessment of the painting is true in this case, and thus having high credence in the highlighted possibility. The polar interrogative and the rising declarative are felicitous here as well because the context is consistent with Belinda marking low credence in the highlighted alternative under the assumption that she is not all that confident yet in her ability to distinguish between true art and kitch. Tag interrogatives are felicitous as well, since the context is also consistent with Belinda marking (moderate to) high credence in the relevant possibility, under the assumption that she is pretty confident in having learned to draw the distinction Chris has been teaching her.

In (67) we turn to a case (parallel to example (5) in Malamud and Stephenson, 2015) where a rising declarative is more felicitous than a rising tag interrogative because here the context clearly determines that the speaker has no good reason to be particularly confident in her evidence for the relevant alternative. While rising declaratives and polar interrogatives are predicted to be felicitous here, rising and falling tag interrogatives are predicted to be odd.

(67) Context: *Belinda is going through a pile of job applications. Chris has not seen any of them yet. Belinda hands Chris the application that she just finished reading, and tells him to have a look at it. Chris to Belinda:*

a. #This is a good one.
b. Is this a good one?
c. This is a good one?
d. #This is a good one, isn't it↑?
e. #This is a good one, isn't it↓?

In this situation, a neutral polar interrogative is appropriate because the context is consistent with a regular information seeking interpretation of the interrogative. The context is consistent with a rising declarative as well, since Chris may consider the fact that Belinda wants him to have a look at the application as evidence that the application is good, and with Chris marking his credence level in this possibility as low, given the totality of evidence he has for it. The tag interrogatives are less felicitous because there is no reason in the context for Chris to be particularly confident that the application Belinda is handing him is good.

We return now to the teacher-student interaction, repeated and expanded in (68).

(68) Student: The answer to this problem is 5 because the square root of 9 is 2 and 2 + 3 is 5.

Teacher:

a. #The square root of 9 is 2.
b. Is the square root of 9 2?
c. The square root of 9 is 2?
d. #The square root of 9 is 2, isn't it↑?
e. #The square root of 9 is 2, isn't it↓?

Recall that the rising declarative is good and will be interpreted by the alert student as rejecting his prior commitment to the highlighted alternative. This is so because the authoritative teacher can only signal by her utterance of a rising declarative that the credence she has in the highlighted alternative is zero. The obvious evidence she has in favor of it is provided by the student's prior

commitment, and therefore the student correctly infers that this commitment has to be reconsidered. The teacher doesn't directly provide the correct information, presumably because she wants the student to arrive at it himself.

The polar interrogative is fine in this context because polar interrogatives do not signal bias and thus are consistent with contexts where the speaker knows the answer and is checking whether her addressee does as well – the 'quiz' question case. Again, the student in this context will infer that the answer to his teacher's question is negative because otherwise the teacher's question would be superfluous. The falling declarative is infelicitous under the assumption that the teacher is knowledgeable. The tag interrogatives are infelicitous as well, given that the rising tag signals moderate to high credence in the highlighted alternative, and the falling tag signals high credence, both inconsistent with the assumption that the teacher knows that the square root of 9 is not 2.

Our account of rising declaratives predicts that they will be appropriate in contexts where the speaker expresses that she is surprised by the evidenced possibility. This is so because being surprised entails having expected the opposite, i.e., having had high credence in the complement of the relevant possibility. As a result, the possibility one is surprised about is not given high credence despite the contextual evidence for it. An example is given in (69):

(69) Context: *Mother sees child putting on cleats*:
Mother: What? You are going to play soccer? No way! You are staying home and doing your homework.

Just like in the teacher-student case in (68) above, the mother is supposed to be authoritative, but in this case her authority is deontic: she is in control of the way her child is going to spend the afternoon. By using the rising declarative she is signalling zero credence in the highlighted possibility, which means that she knows that the child is in fact not going to play soccer. In this context a polar interrogative would also be appropriate, while a tag interrogative, whether rising or falling, would not be. A similar example is given in (70):

(70) Context: *Mother asks her child to set the table and he does a particularly bad job of it but appears to consider the chore finished.*
Mother: This table is set? Where are the wine glasses? Where are the napkins?

Rising declaratives may express surprise also in contexts where the speaker is not authoritative but simply had some evidence she trusted against the highlighted alternative, and she is now confronted with evidence for it. Going back to Belinda and Chris, consider the example in (71):

(71) Context: *Chris is in the process of writing his dissertation and, on a sunny Sunday morning, Belinda sees him putting on his running shoes.*
Belinda: You are going jogging? I thought you would spend the morning writing.

Next, we note that our account explains the contrast between rising declaratives and tag interrogatives in responses that question either what is asserted or what is presupposed by the preceding utterance of the addressee, as exemplified in (72) and (73).[25]

(72) *Belinda:*
I went to see Amalia.

[25]We owe example (72) to Cleo Condoravdi. Examples (73) and (74) are parallel to examples (27) and (28) in Malamud and Stephenson (2015), which Malamud and Stephenson present as problematic for their own account. For similar examples involving a rising declarative, though not the contrast between rising declaratives and tag interrogatives, see Gunlogson (2001) and Trinh and Crnič (2011).

Chris:

a. You went to see Amalia?
b. #You went to see Amalia, didn't you?

(73) *Belinda:*

My sister will be in town next week.

Chris:

a. You have a sister?
b. #You have a sister, don't you?

We will consider (73); the explanation for (72) is analogous. Belinda's utterance in (73) presupposes that she has a sister. With his rising declarative, Chris indicates that his credence in this possibility is at most low. This can only mean that Chris's epistemic base just prior to Belinda's utterance led him to expect that Belinda did not have a sister, and therefore Belinda's presupposition is hard for him to accommodate without comment. Chris's utterance thus conveys surprise at Belinda's having a sister. A rising or falling tag interrogative on the other hand is odd precisely because by using one of these forms Chris indicates that his credence in the highlighted alternative is moderate to high. But if this were the case, it would have been most appropriate for Chris to just accommodate Belinda's presupposition without comment.

We also explain why the speaker may request addressee ratification for her own presupposition with a tag interrogative but not with a rising declarative in contexts like (74):

(74) *Chris to Belinda:*

You could ask your sister to help with this translation.

Still Chris:

a. #You have a sister?
b. You have a sister, don't you?

Chris's initial utterance presupposes that Belinda has a sister. For such an utterance to be appropriate, Chris's credence in the possibility that Belinda has a sister must be high. If, however, he is not absolutely certain, he can elicit Belinda's ratification with a tag interrogative. A tag interrogative, whether rising or falling, is compatible with high credence in the highlighted alternative. A rising declarative on the other hand is not appropriate because the low credence in the highlighted alternative that it signals is not compatible with Chris having presupposed the truth of this alternative in his initial utterance.[26]

The contrast between rising declaratives and tag interrogatives observed in (74) also arises in cases where the speaker seeks ratification of implicit assumptions that were not explicitly presupposed. This is exemplified in (75) and (76):

(75) *Chris to Belinda:*

You should tell Amanda to be more polite when talking to customers.

Still Chris:

[26] An anonymous reviewer notes that the remarks above do not constitute a full account of the use of rising declaratives and tag interrogatives in (73) and (74) insofar as we have not provided an explicit account of presupposition and accommodation within the framework that we have adopted. We will not provide such an account here but hope that our discussion is useful in indicating how the use of rising declaratives and tag interrogatives in (73) and (74) *could* be accounted for under reasonable assumptions about presupposition and accommodation.

a. #After all, you are her boss?
b. After all, you are her boss, aren't you?

(76) *Chris to Belinda:*

I suspect Bill has a special announcement to make tonight.

Still Chris:

a. #He doesn't normally dress up like this?
b. He doesn't normally dress up like this, does he?

In (75), Chris uses the discourse marker "after all" in his second utterance to indicate that the assumption that Belinda is Amanda's boss provided the ground for the advice that he gave Belinda in his first utterance. A rising declarative is predicted to be infelicitous here (and more generally in combination with the discourse marker "after all") because if Chris's credence in the highlighted alternative, i.e., Belinda being Amanda's boss, were low, then he would have lacked justification for his initial utterance. On the other hand, a tag interrogative is predicted to be felicitous here (and again more generally in combination with "after all") because a tag interrogative is compatible with the possibility that Chris has high credence in the highlighted alternative.[27] A similar explanation can be given for the contrast in (76).

Note that (74) and (75) could not be explained under the assumption that the relevant parameter that rising declaratives and tag interrogatives are sensitive to is the *relative* epistemic authority of the speaker and the addressee, where 'epistemic authority' involves the assumed knowledgeability of an individual w.r.t. a piece of information. Consider a hypothetical alternative account, on which a rising declarative indicates that the speaker takes herself to have lower epistemic authority than the addressee w.r.t. the highlighted alternative. The rising declaratives in (74) and (75) would then be predicted to be felicitous, since Belinda is certainly in a better position than Chris to know whether she has a sister or not, and whether she is Amanda's boss or not. Thus, the explanation of the observed contrasts would be lost.

Finally, note that while in many contexts discussed above, the evidence that the speaker has for the highlighted alternative arises from the immediate context, it is not necessary for this evidence to be contextually provided, as shown by the following example from Beun (2000):

(77) Agent: Schiphol Information.
Caller: Hello, this is G.M. I have to go to Helsinki, from Amsterdam.
Can you tell me which flights leave next Sunday?
Agent: Just a moment. Yes, there are several flights.
One leaves at 9.10, one at 11.10 and one at 17.30.
Caller: The flight takes about three hours?

Here the caller's evidence for the highlighted possibility is not rooted in information provided by the context but rather, presumably, in her recollections of previous flights.

6.2 Further predictions: rhetorical questions and NPI licensing

Rhetorical questions. The account of rising declaratives and tag interrogatives presented here makes specific predictions concerning the use of these sentence forms as rhetorical questions, i.e.,

[27] Our example (75) was inspired by examples (6) and (7) in Reese and Asher (2007), which show that tag interrogatives can be used in combination with "after all", just like falling declaratives and unlike polar interrogatives. Reese and Asher do not, however, observe the contrast between tag interrogatives and rising declaratives.

questions asked in a context where it is common knowledge that the answer is obvious. First consider the case in (78):

(78) Context: *Bill is talking to his therapist about his son, Sam, who has high student loans and not enough income to pay them off. Bill himself is well-off and has been agonising about whether to help Sam out or not.*

Bill: Should I help him pay his loans?

Therapist:

a. You are his father, aren't you? / #You are his father?
b. #You are not his father, are you? / You are not his father?

In this context, the therapist's reaction is meant to point out to Bill that, as Sam's father, he should help him. The tag interrogative in (78a) (whether rising or falling) is predicted to be fine because the context is consistent with the therapist having high credence in the highlighted alternative, i.e., that Bill is Sam's father; after all, this fact is assumed to be common ground, and is precisely what makes the question rhetorical.

On the other hand, our account predicts that the rising declarative in (78a) is not felicitous in this context. In using a rising declarative, the therapist signals that she has at most low credence in the highlighted alternative, i.e., that Bill is Sam's father. This is not consistent with the context, in which this fact is assumed to be common knowledge.

We predict the judgments to be reversed in (78b). The tag interrogative is predicted to be infelicitous here because the context is not consistent with the therapist having moderate to high credence in the possibility that Bill is *not* Sam's father. On the other hand, the rising declarative is predicted to be felicitous because the context is consistent with the therapist having zero credence the possibility that Bill is not Sam's father.

Next, consider the same sentences in a context in which Bill is known not to be Sam's father, exemplified in (79). We predict that the pattern here will be the opposite from that in (78).

(79) Context: *Bill is talking to his therapist about his neighbor's son, Sam, who has high student loans and not enough income to pay them off. Bill himself is well-off and is struggling with the question of whether to offer to help Sam or not.*

Bill: Should I help him pay his loans?

Therapist:

a. #You are his father, aren't you? / You are his father?
b. You are not his father, are you? / #You are not his father?

In (79a), a tag interrogative is not felicitous because the context is now inconsistent with the therapist having moderate to high credence in the highlighted alternative. On the other hand, the rising declarative in (79a) is felicitous because the contextually established facts are consistent with the therapist having zero credence in the highlighted alternative.

Just as before, the judgments are reversed in (79b). Now the context is consistent with the therapist having high credence in the highlighted alternative, and the tag interrogative is felicitous while the rising declarative is not.

NPI licensing. Rising declaratives are known to differ from polar interrogatives in that the latter but not the former license NPIs (see, e.g., Trinh and Crnič, 2011; Horn, 2016):

(80) a. Is anybody home?

b. *Anybody is home? (Horn, 2016, p.295)

Horn suggests two possible accounts for this contrast. According to the first, NPI licensing requires an overt grammatical trigger that precedes the NPI. Subject-auxiliary inversion in (80a) would qualify as a trigger, while the final rise in (80b) would not (see Progovac, 1994, among others).

The second possible explanation interacts with our account because it connects the impossibility of an NPI in a rising declarative to the non-neutrality of this sentence type, as opposed to polar interrogatives. Horn quotes the following hypothesis, suggested to him by Gunlogson (p.c.):

> "NPIs are licensed only when the context is compatible with the assumption that the speaker has no particular reason (i.e., no evidence) to favor p over not-p." (p.296)

As further support for Gunlogson's suggestion, Horn notes the contrasts in (81), where an NPI is not licensed when the sentence entails the existence of evidence in favor of the truth of the clause in which the NPI occurs, even though no particularly high credence in this possibility is apparent:

(81) a. If (#as you say) you've ever lived in France, you'll recognize an escargot.
b. If (#as he claims) Joe has ever eaten so much as a bite of truffled porcupine...

Now let us consider how Gunlogson's suggestion about NPIs combines with our account of rising declaratives and polar interrogatives. Since rising declaratives are taken to signal the existence of some evidence for the highlighted alternative, they are predicted to block NPIs.[28] Polar interrogatives, on the other hand, are not taken to signal the existence of any evidence for the highlighted alternative, and are therefore predicted to license NPIs. Note that the relevant parameter here is quite subtle: all that is required is the existence of some evidence for the highlighted alternative; the speaker does not have to be epistemically biased towards this alternative, which is precisely what our account of rising declaratives entails.

To conclude, we have presented an account of the sentence forms under consideration that fits both our general theoretical desiderata concerning the association of conventional discourse effects with sentence form and semantic content, and the main empirical properties of these sentence types. In the next section we briefly compare the account with some previous proposals.

7 Comparison with some related approaches

We briefly consider some representative proposals whose empirical reach and theoretical aims overlap considerably with ours. As we will see, an important distinguishing feature of our account is its concern with dividing the labor between compositional semantics and conventions of use in a principled way.

7.1 Gunlogson (2001, 2008)

Gunlogson's work on rising declaratives has served as an inspiration to the approach we have developed here. A fundamental insight we take over from this work is the distinction between the contribution of clause type (declarative vs. interrogative) and intonation (rising vs. falling). A major conceptual difference, however, is that Gunlogson's account relies entirely on the discourse

[28] Similarly, the account correctly predicts that NPIs are blocked in tag interrogatives as well, as exemplified in (i):

(i) *You saw anybody, didn't you?

component, while our approach divides the analytical burden between semantics and conventions of use.

Gunlogson focuses on rising declaratives, with falling declaratives and polar interrogatives receiving minimal attention. Gunlogson's 2008 paper concentrates on 'initiating declarative questions', i.e., rising declaratives that function as questions, and whose content is not related to that of a preceding utterance. The class of rising declaratives we consider in this paper is more inclusive in that we do not restrict our attention to initiating ones.

Gunlogson (2008) refines her earlier account by introducing two new distinctions: one between commiting as *source* and commiting as *dependent*, and one between *actual* and *contingent* commitments. The former distinction is rooted in the type of evidence the speaker has to support her commitment. The latter distinction concerns the issue of whether the speaker requires addressee ratification for her commitment or not.

While these distinctions have influenced our account of rising declaratives and tag interrogatives, the approach we propose departs from them. Instead of contingent commitments we rely on the notion of evidenced possibilities, which allows us to capture cases where a speaker uses a rising declarative even though she takes the highlighted alternative to be false, as in the teacher-student example in (68), the surprise example in (69), and the rhetorical question example in (79). Instead of Gunlogson's *source* and *dependent* distinction we have used credence intervals, again in order to achieve wider empirical coverage, in particular to capture differences between rising declaratives and tag interrogatives that Gunlogson does not consider.

7.2 Condoravdi and Lauer (2012a)

On the theoretical side, an important feature that our account shares with that of Condoravdi and Lauer (2012a) is the recognition that the full impact of an utterance on the context in which it is made is determined not only by its semantic content and the conventions of use associated with the sentence, but also by effects brought about via pragmatic reasoning as to *why* the speaker made that particular contribution to the conversation. We have borrowed the term 'convention of use' from their work, and take it that their discussion of this issue is fully compatible with what we have proposed here.

On the empirical side, Condoravdi and Lauer (2012a) are concerned only with falling declaratives and polar interrogatives.[29] The semantics they assume is a classical one: they take the semantic value of declaratives to be a proposition in the classical sense, while the semantic value of an interrogative is assumed to be a different type of entity, one that determines the set of possible answers to the issue that the interrogative raises.

Condoravdi and Lauer assume that declaratives and interrogatives do not only have different types of semantic values, but also come with different conventions of use. The convention of use associated with declaratives commits the speaker to a belief in the proposition expressed by the declarative. On the other hand, the convention of use associated with interrogatives commits the speaker to an effective preference for the addressee to commit to a belief in one of the possible answers determined by the semantic value of the interrogative.

Thus, Condoravdi and Lauer's account instantiates the 'middle way' approach we discussed in general terms in Section 2.3. What is characteristic for this approach, as we schematized in the diagram on page 9, is that declaratives and interrogatives are differentiated both in their semantics and in their conventions of use.

[29] For closely related work which deals with imperatives and exclamatives, see Condoravdi and Lauer (2012b); Chernilovskaya, Condoravdi, and Lauer (2012); Lauer (2013).

In this paper we have attempted to streamline this approach. The account we propose is couched in a semantic framework that allows us to assign the same type of semantic values to declaratives and interrogatives. This in turn makes it possible to associate falling declaratives as well as polar and wh-interrogatives with a single basic convention of use. Differences in their discourse effects follow from independently motivated differences in their semantics.

Our proposal also differs from that of Condoravdi and Lauer (2012a) in the details of the convention of use associated with interrogatives. While their account evokes a speaker preference for the addressee to commit to one of the possible answers determined by the semantic value of the interrogative, we rely on the notion of steering the conversation towards a context in which the issue raised is settled, thus unifying the conventional effects of declaratives and interrogatives. By not directly involving the addressee in the formulation of this convention of use, our approach generalizes more directly to cases in which the addressee is not necessarily the participant supposed to commit to a belief in an answer to the question, such as when polar interrogatives function as rhetorical or deliberative questions.

Finally, our account concerns marked cases as well, and aims to account for the similarities and contrasts between marked and unmarked sentence types.

7.3 Krifka (2014)

The major common thread between our approach and that of Krifka (2014) is one we share with Gunlogson's work as well, namely the separation of the role assigned to clause type (declarative vs. interrogative) and intonation (fall vs. rise). But the use made of these components in Krifka's approach and ours is different. As we have seen, for us these elements play a role in the compositional semantics of the sentence while for Krifka, just as for Gunlogson, they only determine the relevant convention of use – in Krifka's terms, the speech act operator that determines how the sentence affects the input context.

Krifka's account also instantiates the 'middle way' approach in that it associates declaratives and interrogatives with different semantic values, as well as different conventions of use. We have seen that a more parsimonious division of labor is possible; this result could in principle be incorporated into Krifka's theory while keeping other components intact.

At a more detailed level, Krifka assumes that falling declaratives and polar interrogatives differ syntactically in the following two respects. First, declaratives involve the speech act operator ASS while polar interrogatives involve the speech act operator QU. The job of these operators is to determine the relevant conventional discourse effects of an utterance of the sentence. Second, there must be an additional syntactic difference, responsible for the different semantic values of declaratives and interrogatives, the former denoting propositions and the latter sets of propositions. From our perspective, this is an unnecessary multiplication of syntactic operators.

As for the various speech act operators that Krifka assumes in his account of falling and rising declaratives, polar interrogatives, and tag interrogatives, it is not directly clear how these operators and their combinations may account for the various felicity contrasts discussed here.

7.4 Malamud and Stephenson (2015)

Malamud and Stephenson's work focuses on what we call here marked sentence forms. They cover rising declaratives, and in the realm of tag interrogatives they consider both 'reverse' tag interrogatives and 'same' tag interrogatives, i.e., cases where the polarity of the anchor and the tag are the same. Within the former group, they do not, however, distinguish between rising and falling tag interrogatives. With respect to falling declaratives and polar interrogatives, they

adopt the account in Farkas and Bruce (2010), which assigns them separate semantic contents and separate conventions of use.

Similar to the other work discussed in this section, Malamud and Stephenson do not frame their approach in terms of unmarked and marked sentence forms and basic and special conventions of use. Instead, they specify for each form a particular series of discourse effects which remain unrelated to the semantics or the form of the particular sentence types they are associated with, so they too, fall within the 'middle way' category discussed in Section 2.3.

Turning now more specifically to rising declaratives and tag interrogatives, Malamud and Stephenson's account relies on the notion of 'projected commitments', which represent 'the expected next stage of the conversation' (p.14). By projecting a commitment rather than going ahead and making it, a speaker gives rise to 'an implicature of tentativeness'. It is not clear how this notion could deal with cases in which rising declaratives are used in contexts where the speaker is ready to commit to the opposite of the sentence radical.

The contrast between tag interrogatives and rising declaratives is also dealt with differently in Malamud and Stephenson than in our proposal. For us, the contrast concerns a difference in credence level marking; in Malamud and Stephenson's account, it involves the presence or absence of a meta linguistic issue regarding the proposition on the table. The precise nature of this issue is determined contextually. We framed our account in terms of credence levels because relying on such intervals gives us a finer grained tool better suited to capture the details of the uses of these sentence types, such as cases where the speaker is ready to commit to the opposite of the sentence radical or cases like (72)-(75).

7.5 Northrup (2014)

Northrup (2014) discusses in detail the discourse effects of rising declaratives, high negation polar interrogatives, and the full repertory of tag interrogatives in English, as well as two Japanese discourse particles, *yo* and *ne*. Northrup's approach and ours agree in treating rising declaratives and tag interrogatives as sharing the semantics of polar interrogatives and as encoding a bias for one of the two alternatives.

An essential conceptual difference between Northrup's approach and ours is that in his account there is no connection between the semantics of a sentence and its basic convention of use, as in the current proposal. Just like in Gunlogson (2001, 2008), Krifka (2014), and Malamud and Stephenson (2015), the main analytical burden is on the discourse component.

Our differentiation in terms of the speaker's credence level in the relevant possibility is a close relative of Northrup's differentiation in terms of 'weak' and 'strong' evidence underlying a speaker's commitment. However, when it comes to the details of the proposals, there are some important differences. In particular, Northrup proposes that in uttering a rising declarative, a speaker commits to the highlighted possibility, signalling that the evidence supporting the commitment is weak but would turn into a full commitment if ratified by the addressee. As we have seen, this is problematic for the teacher-student example in (68), the surprise example in (69), and the rhetorical question example in (79).

As for tag interrogatives, Northrup proposes that, just like rising declaratives, they commit the speaker to the highlighted alternative, signalling that the commitment is based on weak evidence, but unlike rising declaratives, they do not explicitly signal that the speaker becomes fully committed upon addressee ratification.[30] We have seen, however, that tag interrogatives actually require higher credence in the highlighted alternative than rising declaratives. In particular, in contexts where the

[30]Northrup makes further assumptions to distinguish rising from falling tag interrogatives. We leave these out of consideration here.

speaker's evidence for the highlighted alternative is very weak, as exemplified in the job applications scenario in (67), a rising declarative is felicitous but a tag interrogative is not, and in contexts where the speaker's evidence for the highlighted alternative is high, as exemplified in the sunset scenario in (64), a rising declarative is not felicitous while a tag interrogative is.

7.6 Westera (2013)

As mentioned in the introduction, Westera (2013) proposes a unified theory of a number of cases of rising declaratives that we do not cover, repeated below:

(82) A: Was John at the party?
B: Well, he was planning to go↑. ⇝ not sure whether relevant (Westera, 2013)

(83) A: Do you speak Ladino?
B: I speak Spanish↑. ⇝ not sure whether sufficient (Ward and Hirschberg, 1985)

(84) (English tourist in a French café)
I'd like. . . err. . . je veux. . . black coffee↑. ⇝ not sure whether clear (Westera, 2013)

The gist of the account is that the final rise signals that the speaker is not sure whether her contribution complies with the Gricean maxims governing cooperative conversational behaviour. This assumption gives a unified explanation of the three examples above: in (82) the rise can be taken to signal uncertainty about compliance with the maxim of Relevance, in (83) with the maxim of Quantity, and in (84) with the maxim of Manner.

Westera also considers the inquisitive use of rising declaratives that has been the focus of the present paper. In this case, he argues, the rise signals that the speaker does not comply with the maxim of Quality, i.e., that her epistemic base does not guarantee that the sentence is true. While the unifying nature of the account is clearly attractive, we believe that, as it stands, it does not capture the main empirical properties of the inquisitive use of rising declaratives in a fully satisfactory way. To see this, let us consider Westera's proposal in some more detail.

First, the fact that inquisitive rising declaratives request a response from the addressee, just like polar interrogatives and unlike falling declaratives, is taken to follow from two assumptions, one concerning the rise and one concerning declarative word order. The rise, as mentioned above, is taken to signal that the speaker's epistemic base does not guarantee that the proposition α expressed by the sentence (in our terms, the highlighted alternative) is true. On the other hand, declarative word order is taken to signal that the speaker intends α to become common ground. These two assumptions together predict that a response is requested from the addressee—the only way for α to become common ground would be for the addressee to establish its truth.

The bias associated with inquisitive rising declaratives is derived from the same two assumptions. A speaker who expresses the desire to make α common ground implies that she considers it possible that α will become common ground. If, at the same time, with the rise, she conveys that her own epistemic base does not guarantee the truth of α, this implies that she has reason to think that the addressee may believe α, since otherwise it would be impossible for α to become common ground. This explains why, in the absence of any evidence for α, i.e., when the speaker has no reason to think that the addressee might believe α, an inquisitive rising declarative is odd.

Thus, the two basic properties of inquisitive rising declaratives—that they request a response from the addressee, and that they require the speaker to have access to some evidence for the proposition expressed by the given sentence—are accounted for.[31] There are, however, at least two

[31] Westera notes that his account of inquisitive rising declaratives is very similar to that of Truckenbrodt (2006). The advantage of Westera's proposal is that it applies in a uniform way to other kinds of rising declaratives as well,

remaining challenges for the account.

The first concerns the assumption that rising declaratives signal the speaker's intention to add α to the common ground. This assumption is problematic in the face of the teacher-student example in (68), the surprise example in (69), and the rhetorical example in (79) above. In these cases, the contexts are incompatible with the speaker wanting to add α to the common ground. Thus, the assumption that declaratives always signal the speaker's intention to add α to the common ground is not warranted, and this undermines Westera's account of the two basic properties of rising declaratives summarized above. This problem does not arise for our own account because we take rising declaratives to signal that the speaker wants to make either α or $\overline{\alpha}$ common ground, rather than just α itself.

The second challenge concerns the assumption that the semantic content of rising declaratives is the same as that of falling declaratives. Under this assumption, the contrast between these sentence forms with respect to the possibility of occurring as preposed complements of *wonder* and *appear*, as exemplified in (27) above, remains unexplained. On our account, rising declaratives do not have the same semantic content as falling declaratives, and the contrast in (27) is explained straightforwardly.

Thus, we conclude that Westera's account of rising declaratives and our own are complementary in empirical coverage. For now, we assume that the final rise may be interpreted either as realizing OPEN, yielding an inquisitive interpretation, or, meta-linguistically, as expressing uncertainty concerning compliance with the maxims governing cooperative conversational behaviour. Ultimately, we would of course like to come to a better understanding of the connection between the two interpretations, or even a fully unified theory. But this must be left for another occasion.

8 Conclusion

The major advantage of the account proposed here w.r.t. previous work is the fact that it associates sentences with their conventional discourse effects in a non-stipulative fashion, in line with the division of labor principle formulated in Section 2.

As depicted in Figure 6, unmarked forms—falling declaratives and polar interrogatives—are associated with a single basic convention of use. The differences between their conventional discourse effects are entirely due to independently motivated semantic differences. The marked forms we considered here—rising declaratives and tag interrogatives—have conventional discourse effects that involve a combination of the basic effect, dictated by their semantics and the basic convention of use, with special effects systematically connected to the particular marked sentence type involved.

The special discourse effects of rising declaratives and tag interrogatives concern a particular type of bias, which we modelled as signalling that the speaker has evidence for the sentence radical, as well as determining the level of credence that the speaker has in the relevant possibility—at most low in the case of rising declaratives, at least moderate in the case of rising tag interrogatives, and high in the case of falling tag interrogatives. This was sufficient to account for the distribution of rising declaratives and tag interrogatives across a substantial range of contexts.

The proposed account makes some general typological predictions. Across different languages, we generally expect to find sentence types corresponding to the unmarked sentence types of English considered here, namely falling declaratives and polar interrogatives. We expect these sentence types to be differentiated in their semantics in the same way as their English counterparts and to have the same conventional discourse effects. We also expect these two sentence types to be

as exemplified in (82)-(84) above.

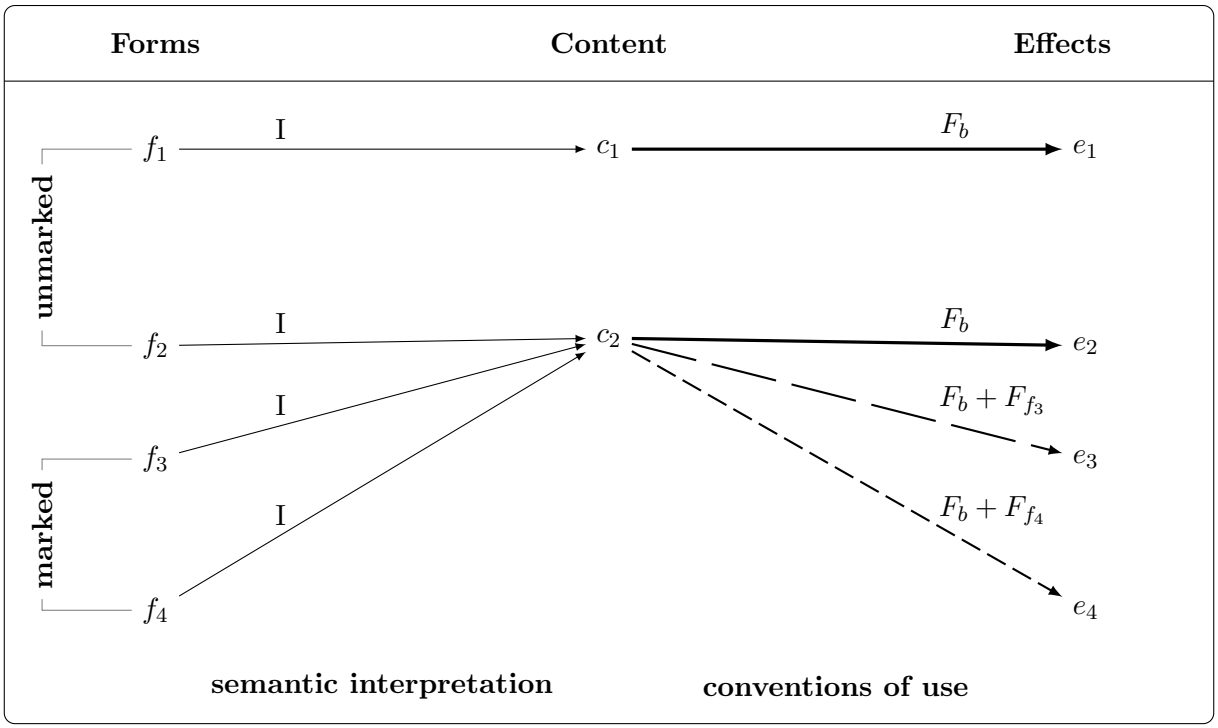


Figure 6: Division of labor between semantic interpretation and conventions of use on our account.

formally distinguished, though of course the particular means to do so will vary from language to language.

We also expect languages to have marked forms similar to the marked forms in English considered here, forms whose conventional discourse effects are special in that they involve bias for the sentence radical but no full commitment. Again, the particular means of marking these forms will vary from language to language.

What we do *not* expect is a language that has a simple form used to pose biased questions and a complex form used to pose neutral ones. We also do not expect to find a language where the conventional discourse effect associated with falling declaratives in English is associated with a complex form.

Among the many issues that remain open is a typology of marked forms whose semantics is that of polar interrogatives. The marked cases we have considered here all involve a certain type of bias for the highlighted alternative in the proposition expressed by the sentence. Is this the only type of special effect such marked forms can have? At a more fine-grained level, are there other factors besides evidence and credence levels that can be involved (e.g., expectations or preferences)? And in which ways do the evidential biases signalled by special sentence types interact with morphological evidentiality markers in languages where both are present? More work is needed to address these questions. We hope, however, that the way we have framed the issues and the particular ways in which we have proposed to resolve some of them is a useful step in the right direction.

References

Aloni, M. (2007). Free choice, modals and imperatives. *Natural Language Semantics*, **15**(1), 65–94.

Aloni, M., Beaver, D., Clark, B., and van Rooij, R. (2007). The dynamics of topics and focus. In M. Aloni, A. Butler, and P. Dekker, editors, *Questions in Dynamic Semantics*. Elsevier.

Alonso-Ovalle, L. (2006). *Disjunction in Alternative Semantics*. Ph.D. thesis, University of Massachusetts, Amherst.

Asher, N. and Lascarides, A. (2003). *Logics of Conversation*. Cambridge University Press.

Beun, R. (2000). Context and form: Declarative or interrogative, that is the question. In H. Bunt and W. Black, editors, *Abduction, Belief and Context in Dialogue*. John Benjmins.

Beyssade, C. and Marandin, J.-M. (2006). From complex to simple speech acts: a bidimensional analysis of illocutionary forces. In R. Fernández and D. Schlangen, editors, *Brandial '06: Proceedings of the 10th Workshop on the Semantics and Pragmatics of Dialogue (SemDial-10)*. University of Potsdam.

Büring, D. (2003). On d-trees, beans, and accents. *Linguistics and Philosophy*, **26**, 511–545.

Carlson, L. (1983). *Dialogue Games*. Reidel, Dordrecht.

Chernilovskaya, A., Condoravdi, C., and Lauer, S. (2012). On the discourse effects of wh-exclamatives. In *Proceedings of the 30th West Coast Conference on Formal Lingsuistics*, pages 109–119.

Ciardelli, I. and Roelofsen, F. (2015). Inquisitive dynamic epistemic logic. *Synthese*, **192**(6), 1643–1687.

Ciardelli, I., Groenendijk, J., and Roelofsen, F. (2013). Inquisitive semantics: a new notion of meaning. *Language and Linguistics Compass*, **7**(9), 459–476.

Ciardelli, I., Groenendijk, J., and Roelofsen, F. (2015). Inquisitive semantics. ESSLLI lecture notes, available via www.illc.uva.nl/inquisitivesemantics.

Clark, H. (1992). *Arenas of Language Use*. University of Chicago Press, Chicago.

Condoravdi, C. and Lauer, S. (2012a). The basic dynamic effect of interrogative utterances. Presented at the 13th Texas Linguistics Society Conference.

Condoravdi, C. and Lauer, S. (2012b). Imperatives: Meaning and illocutionary force. *Empirical issues in syntax and semantics*, **9**, 37–58.

Cruttenden, A. (1994). Rises in english. In W. Lewis, editor, *Studies in general and English phonetics*, pages 155–173. Routledge.

Farkas, D. F. (2011). Polarity particles in English and Romanian. In J. Herschensohn, editor, *Romance Linguistics 2010. Selected papers from the 40th Linguistic Symposium on Romance Linguistics*, pages 303–328. John Benjamins.

Farkas, D. F. and Bruce, K. B. (2010). On reacting to assertions and polar questions. *Journal of semantics*, **27**, 81–118.

Frege, G. (1918). Der Gedanke. *Beitrage zur Philosophie des Deutschen Idealismus*, **1**, 58–77. Translated as Frege (1956).

Frege, G. (1956). The thought: A logical inquiry. *Mind*, **56**(259), 289–311.

Ginzburg, J. (1996). Dynamics and the semantics of dialogue. In J. Seligman, editor, *Language, Logic, and Computation*, volume 1.

Groenendijk, J. (1998). Questions in update semantics. In J. Hulstijn and A. Nijholt, editors, *Formal semantics and pragmatics of dialogue (Twendial '98)*, pages 125–137.

Groenendijk, J. (1999). The logic of interrogation. In T. Matthews and D. Strolovitch, editors, *Semantics and Linguistic Theory*, pages 109–126. Cornell University Press.

Groenendijk, J. and Stokhof, M. (1984). *Studies on the Semantics of Questions and the Pragmatics of Answers*. Ph.D. thesis, University of Amsterdam.

Groenendijk, J. and Stokhof, M. (1991). Dynamic predicate logic. *Linguistics and Philosophy*, **14**, 39–100.

Groenendijk, J. and Stokhof, M. (1997). Questions. In J. van Benthem and A. ter Meulen, editors, *Handbook of Logic and Language*, pages 1055–1124. Elsevier.

Gunlogson, C. (2001). *True to Form: Rising and Falling Declaratives as Questions in English*. Ph.D. thesis, University of California at Santa Cruz.

Gunlogson, C. (2008). A question of commitment. *Belgian Journal of Linguistics*, **22**, 101–136.

Gussenhoven, C. (2004). *The Phonology of Tone and Intonation*. Cambridge University Press, Cambridge.

Hamblin, C. L. (1971). Mathematical models of dialogue. *Theoria*, **37**, 130–155.

Hamblin, C. L. (1973). Questions in Montague English. *Foundations of Language*, **10**(1), 41–53.

Heim, I. (1982). *The Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, University of Massachusetts, Amherst.

Horn, L. R. (1984). Towards a new taxonomy of pragmatic inference: Q-based and R-based implicatures. In D. Schiffrin, editor, *Meaning, Form, and Use in Context*, pages 11–42. Georgetown University Press.

Horn, L. R. (2016). Licensing NPIs: Some negative (and positive) results. In P. Larrivée and C. Lee, editors, *Negation and Polarity: Experimental Perspectives*, pages 281–305. Springer.

Hulstijn, J. (1997). Structured information states: raising and resolving issues. In A. Benz and G. Jäger, editors, *Proceedings of MunDial*.

Jäger, G. (1996). Only updates: on the dynamics of the focus particle *only*. In P. Dekker and M. Stokhof, editors, *Proceedings of the 10th Amsterdam Colloquium*.

Kamp, H. (1981). A theory of truth and semantic representation. In J. Groenendijk, T. Janssen, and M. Stokhof, editors, *Formal Methods in the Study of Language*, pages 277–322. Mathematical Centre, Amsterdam.

Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy*, **1**, 3–44.

Kratzer, A. and Shimoyama, J. (2002). Indeterminate pronouns: The view from Japanese. In Y. Otsu, editor, *The Proceedings of the Third Tokyo Conference on Psycholinguistics*, pages 1–25.

Krifka, M. (2014). Negated polarity questions as denegations of assertions. To appear in *Contrastiveness and scalar implicatures*.

Lauer, S. (2013). *Towards a dynamic pragmatics*. Ph.D. thesis, Stanford University.

Malamud, S. and Stephenson, T. (2015). Three ways to avoid commitments: Declarative force modifiers in the conversational scoreboard. *Journal of Semantics*, **32**, 275–311.

Mascarenhas, S. (2009). Inquisitive semantics and logic. Master Thesis, University of Amsterdam.

McLemore, C. (1991). *The pragmatic interpretation of English intonation: Sorority speech*. Ph.D. thesis, University of Texas at Austin.

Murray, S. E. and Starr, W. B. (2012). The structure of communicative acts. *Ms. Cornell University*.

Northrup, O. (2014). *Grounds for Commitment*. Ph.D. thesis, UCSC.

Prince, A. and Smolensky, P. (2008). *Optimality Theory: Constraint interaction in generative grammar*. John Wiley & Sons.

Progovac, L. (1994). *Negative and positive polarity: A binding approach*. Cambridge University Press.

Reese, B. and Asher, N. (2007). Prosody and the interpretation of tag questions. In E. Puig-Waldmüller, editor, *Proceedings of Sinn und Bedeutung 11*, pages 448–462.

Roberts, C. (1996). Information structure in discourse. In J. Yoon and A. Kathol, editors, *OSU Working Papers in Linguistics*, volume 49, pages 91–136. Ohio State University.

Roelofsen, F. (2013). Algebraic foundations for the semantic treatment of inquisitive content. *Synthese*, **190**(1), 79–102.

Roelofsen, F. and Farkas, D. F. (2015). Polarity particle responses as a window onto the interpretation of questions and assertions. *Language*, **91**(2), 359–414.

Roelofsen, F. and van Gool, S. (2010). Disjunctive questions, intonation, and highlighting. In M. Aloni, H. Bastiaanse, T. de Jager, and K. Schulz, editors, *Logic, Language, and Meaning: Selected Papers from the Seventeenth Amsterdam Colloquium*, pages 384–394. Springer.

Roelofsen, F., Herbstritt, M., and Aloni, M. (2016). The **whether* puzzle. To appear in *Questions in Discourse*, edited by Klaus von Heusinger, Edgar Onea, and Malte Zimmermann.

Searle, J. R. (1969). *Speech acts: an essay in the philosophy of language*. Cambridge University Press.

Shokeir, V. (2008). Evidence for the stable use of uptalk in South Ontario English. *University of Pennsylvania Working Papers in Linguistics*, **14**(2).

Simons, M. (2005). Dividing things up: the semantics of *or* and the modal/*or* interaction. *Natural Language Semantics*, **13**(3), 271–316.

Stalnaker, R. (1978). Assertion. *Syntax and Semantics*, **9**, 315–332.

Theiler, N., Roelofsen, F., and Aloni, M. (2016). A truthful resolution semantics for declarative and interrogative complements. Submitted for publication.

Trinh, T. and Crnič, L. (2011). On the rise and fall of declaratives. In I. Reich, E. Horch, and D. Pauly, editors, *Proceedings of Sinn und Bedeutung 15*, pages 645–660.

Truckenbrodt, H. (2006). On the semantic motivation of syntactic verb movement to C in German. *Theoretical Linguistics*, **32**(3), 257–306.

Uegaki, W. (2015). *Interpreting questions under attitudes*. Ph.D. thesis, MIT.

Ward, G. and Hirschberg, J. (1985). Implicating uncertainty: The pragmatics of fall-rise intonation. *Language*, pages 747–776.

Warren, P. (2005). Patterns of late rising in New Zealand English. *Language Variation and Change*, **17**, 209–230.

Westera, M. (2013). 'Attention, I'm violating a maxim!' A unifying account of the final rise. In *Proceedings of the 17th Workshop on the Semantics and Pragmatics of Dialogue (SemDial)*.

Westera, M. (2014). Grounding topic and focus in biological codes. In *Proceedings of Tonal Aspects of Language*.