Questions with NPIs

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Abstract

This paper investigates how the distribution of negative polarity items can inform our understanding of the underlying semantic representation of constituent questions. It argues that the distribution of NPIs in questions is governed by the same logical properties that govern their distribution in declarative constructions. Building on an observation due to Guerzoni and Sharvit (2007) that strength of exhaustivity in questions correlates with the acceptability of negative polarity items, I propose a revision of the semantics of questions that can explain this link in terms already familiar from the literature of negative polarity, namely the availability of a local downward entailing environment. I argue for a new theory of questions that takes strength of exhaustivity to be encoded internal to the question nucleus rather than in different answer-hood operators (Heim 1994). This switch, while conceptually a simple move, has far-reaching consequences in the domain of questions. I also show how this new analysis can account for a host of issues related to NPIs, such as the subject-object asymmetry noted by Han and Siegel (1997), the interaction between NPIs and high versus low *wh*-adjuncts, the varying acceptability of NPIs in the restrictor of *which*-phrases, and the contrast between weak and strong NPIs.

1 Introduction

The goal of this paper is to argue for a unified account of the distribution of negative polarity items (henceforth NPIs) in *wh*-questions, which has posed a problem for both the semantics of questions and theories of NPIs. These items are acceptable in questions, despite the fact that questions do not *prima facie* share the key properties we find in the other environments in which NPIs surface. Specifically, within current frameworks of question semantics there is no way to argue that questions give rise to downward-entailing inferences, which is what unifies all other NPI environments. Building on an insight by Guerzoni and Sharvit (2007) that the distribution of NPIs in questions is even more constrained than initially thought, namely that NPIs are acceptable only in questions that receive a strongly exhaustive interpretation, I maintain, with others, that current theories of questions are not fine-grained enough to account for the systematic behavior of NPIs in questions, on the one hand, and declaratives, on the other. I will argue that this calls for a re-evaluation of the semantics of questions, particularly with respect to how to encode the ambiguity in strength exhibited in embedded contexts. I will show that via a conceptually minimal switch in the semantics of questions we can not only explain why the distribution of NPIs should correlate with the strength of the question, but we can also do so in a manner that allows us to

maintain a unified account for the behavior of NPIs in both declarative and interrogative contexts. I will furthermore show that this new approach to questions allows us to account for the insight in Han and Siegel (1997) that in root questions, the acceptability of NPIs is governed by the c-command relation between the trace of the NPI and the *wh*-phrase.

1.1 The problem of NPIs at a glance

Negative polarity items can be found in a number of contexts, as shown below for *ever*, a prototypical NPI.

(1) a. Negation
  (i) I don't think that Angela ever liked pizza.
  (ii) *I think that Angela ever liked pizza.
 b. Negative Quantifiers
  (i) Few/no/at most 10 people have ever heard of linguistics.
  (ii) *Many/most people have ever heard of linguistics.
 c. Left argument of *every*
  (i) Everyone who has ever taken a math class passed the admission test.
  (ii) *Everyone who has taken a math class ever passed the admission test.
 d. Antecedent of conditionals
  (i) If she ever wants to visit us, she should give us a call.
  (ii) *If she wants to visit us, she should ever give us a call.
 e. Scope of *only*
  (i) Only Andy_{F} has ever failed this class.
  (ii) *Andy_{F} has ever failed this class.
 f. Questions
  (i) Who has ever failed this class?
  (ii) *Andy has ever failed this class.

What unifies (most of) these environments is the fact that they can be shown to give rise to downward entailing (DE) inferences, an observation that goes back to Fauconnier (1975, 1979) and Ladusaw (1979). Consider, for example, the case of *every*. In (2) we can see that the left but not the right argument of *every* allows for inferences from sets to subsets, i.e. downward entailing inferences. In (2a) we can infer from the fact that everyone who took a math class passed the test that everyone who took a calculus class passed it. Note that the inference does not go the other way around as well. That is, if (2a-ii) is true it does not automatically follow that (2a-i) is true as well. Once we turn to the right argument of *every*, namely its nuclear scope, the direction of the inference is switched: given a set, we can only infer that something holds true of a superset of that set.

(2) a. Left argument of *every*: set $\Rightarrow$ subset
  (i) Everyone [who has taken a math class] [passed the test].
  $\Downarrow \quad \not\Uparrow$
  (ii) Everyone [who has taken a calculus class] [passed the test].
 b. Right argument of *every*: subset $\Rightarrow$ set

(i) Everyone [who passed the test] [has taken a math class].
$\Downarrow \quad \Uparrow$
(ii) Everyone [who passed the test] [has taken a calculus class].

von Fintel (1999), building on Ladusaw's observation, states the condition on the licensing of NPIs as in (3):

(3) a. A NPI is only grammatical if it is in the scope of an α such that $[\![\alpha]\!]$ is downward entailing.
b. A function F of type $\langle \sigma, \tau \rangle$ is downward entailing iff for all x, y of type σ such that $x \Rightarrow y$: F(y) $\Rightarrow$ F(x). (von Fintel 1999, p. 100)
['$\Rightarrow$' stands for cross-categorial entailment]

The same pattern of deduction can be argued to hold for every environment in the examples in (1), with one glaring exception: questions (cf. Progovac 1993, Giannakidou 1999, among many others).

What would it mean to define a notion of entailment between questions? Under an account such as Groenendijk and Stokhof (1984) which takes questions to denote propositional concepts, the definition of entailment provided above could be carried over straightforwardly to deal with entailment between these propositional concepts. There is also an intuitive way to think about what entailment between questions would require, and that involves looking at their answers. The idea would be that if a complete answer to one question entails a complete answer to another question, asking the first question should automatically lead to asking the second question. The problem is that according to this intuitively natural definition of entailment, questions are not DE, for there is no sense in which asking (4a) leads to asking (4b).

(4) a. Did Suzy pass a math class?
b. Did Suzy pass a calculus class?

We see then that this characterization of entailment does not make questions downward entailing. There are other theories of questions according to which they are DE, such as Higginbotham (1993), where questions are analyzed as involving a covert universal quantifier. A constituent question such as (5a) would be analyzed as a universal statement, akin to the following: 'For every *x*, if *x* ate pizza, I want to know it'. In this sense, the question could be said to occur in the restrictor of a DE operator, the universal determiner. The problem is that once again there is no intuitive sense in which asking (5a) leads to asking (5b).

(5) a. Who ate pizza?
b. Who ate pizza with mushrooms?

This constitutes a real problem for accounts of NPIs that take their licensing to be governed by the ability of their environment to give rise to DE inferences. In fact, even if one were to find a semantics for questions according to which they can be argued to create downward-entailing environments, such as the analysis argued for by Higginbotham (1993), this would still not be enough to understand why NPIs are good in them, because not all types of question license NPIs, as has recently been argued by Guerzoni and Sharvit (2007). NPIs are acceptable across the board in root questions (modulo intervention facts due to Han and Siegel (1997) which will be discussed in the second part of this paper):

(6) a. Who will bring anything to eat for this party?
b. Which one of you has ever vacationed in Iceland?
c. Did she read any relevant articles?

However, as pointed out by Guerzoni and Sharvit, once we turn to embedded questions a contrast in acceptability arises:

(7) a. Angela knows which boys brought her any gifts.
b. Andy wonders who has ever been to Paris.
c. Chris asked me who took any linguistics classes.
d. Jenny discovered who has ever participated in that competition.

(8) a. *It surprised Angela which boys brought her any gifts.
b. *It amazed her which girls had ever participated in a dance competition.
c. *Jay was disappointed by who sold any antique books.
d. *Will was annoyed at which guys had ever dated his girlfriend.

The authors observe that the split in acceptability correlates with an independently noted ambiguity in embedded questions, namely that questions can receive either a weakly or a strongly exhaustive reading, depending on the predicate that embeds them (cf. Heim 1994, Beck and Rullmann 1999, among others). The questions in (7) receive a strongly exhaustive (SE) interpretation while those in (8) receive a weakly exhaustive (WE) interpretation. In a nutshell, the difference in strength amounts to different answers to the same question, and predicates differ with respect to which answer to the embedded question they make reference to. In (7a), for example, for Angela to know who brought her gifts, typically she needs to know for every boy who brought her gifts that he did, and for every boy who didn't bring her gifts that he didn't.[1] The same holds true of all other predicates in (7). Turning now to the examples in (8), e.g. (8a), the intuition is that for Angela to be surprised by who brought her gifts, she must be surprised at the fact that the boys who brought her gifts brought her gifts (i.e., someone she didn't expect to bring gifts ended up bringing gifts); (8a) cannot be true if she's surprised by the fact that someone she expected to bring her gifts didn't. Again, it can be shown that the same inference holds for all other predicates in (8).

The conclusion drawn by Guerzoni and Sharvit (2007) is that NPIs are only acceptable in questions that receive a strongly exhaustive (SE) reading: the questions in (7) receive a strongly exhaustive interpretation and allow NPIs in their scope, whereas the questions in (8) receive a weakly exhaustive interpretation and thus do not allow NPIs in their scope.

This immediately raises the question of how we can account for the correlation between the strength of a question and the distribution of NPIs and, more specifically, what it is about being interpreted as strongly exhaustive that makes a question license NPIs. Guerzoni and Sharvit claim that there is no way to account for this correlation, that is, that SE questions are no more DE than WE questions. Based on this conclusion, the authors have argued for a reassessment of the distribution of NPIs in questions, whereby their distribution is governed not by the monotonicity of the question but rather by its strength. Note again that the lack of entailment between the (i) and (ii) examples below holds regardless of the embedding predicate.

[1] I say 'typically' because questions embedded under *know* can also receive a weakly exhaustive interpretation, but the preferred reading is the strongly exhaustive one. I will return to this issue later on; see also footnotes 5 and 7.

(9) a. (i) Angela knows who passed a math class.
(ii) Angela knows who passed a calculus class.
b. (i) It surprised Andy who passed a math class.
(ii) It surprised Andy who passed a calculus class.

Given that lack of entailment holds not only between questions that receive a weakly exhaustive interpretation, as in (9b), but also between those that receive a strongly exhaustive interpretation, as in (9a), Guerzoni and Sharvit (2007) conclude that we must appeal to a "multi-layered approach in which both entailment reversal and strength of exhaustivity of the hosting linguistic environment must play a crucial role" (Guerzoni and Sharvit 2007, p. 5). In this paper I will argue that we can actually maintain a uniform analysis of the distribution of NPIs in both declaratives and interrogatives by re-evaluating the semantics of questions, and in particular by reconsidering the source of the weak/strong exhaustivity split. In order to do so, however, we first need to understand what this difference in strength is, and how it has been previously analyzed.

1.2 The semantics of constituent questions

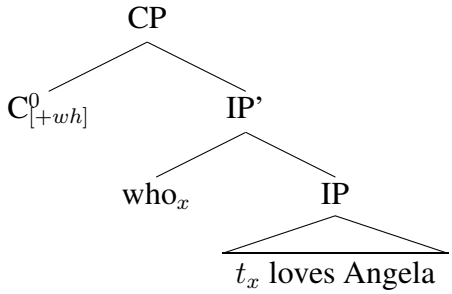
There are two main approaches to the semantics of questions, which differ along two crucial dimensions: (i) the meaning of *wh*-phrases, and (ii) what it is that questions ultimately denote. The Groenendijk and Stokhof approach takes questions to be built up from abstracts and to denote partitions (Groenendijk and Stokhof 1982, 1984). To get a sense of this approach, consider the question in (10).

(10) Who loves Angela?

The underlying representation of this question is provided in (11a), with the meaning of the *wh*-phrase given in (11b) (following Caponigro 2004 and George 2011) and the meaning associated with the interrogative C head provided in (11c). Putting the pieces together, we obtain the question denotation in (11d), which represents a world-dependent proposition, namely a proposition with a free world variable. Once we abstract over this free variable, w, as in (11e), we get the intension of the question, which ends up being a partition on the logical space.[2] The intension of a question is thus a function from worlds to sets of worlds (type $\langle s, st\rangle$) which maps every world to the set of worlds which are equivalent to it with respect to the property denoted by the question abstract. In the case at hand, assuming that there are two individuals in the domain of the *wh*-phrase, the question intension will wind up representing a partition with four cells, indicating whether or not the two individuals love Angela.

[2] A partition of a set A is a set of non-empty subsets of A such that the union of those subsets equals A and no two of those subsets overlap.

(11) a.



b. $[\![\text{who}]\!] = \lambda P_{\langle e,st\rangle}.\ \lambda x.\ P(x)$

c. $[\![C_{0[+wh]}]\!] = \lambda P_{\langle e,st\rangle}.\ \lambda w.\ \lambda w'\ [(\lambda w.P)(w) = (\lambda w.P)(w')]$[3]

d. $[\![\text{CP}]\!] = \lambda w.\ \lambda w'.\ [(\lambda x.\ x\ \text{loves}_w\ \text{Angela}) = (\lambda x.\ x\ \text{loves}_{w'}\ \text{Angela})]$

e. Domain: {Andy, Dwight}
p_1 = Dwight loves Angela, p_2 = Andy loves Angela.

p_1= 1, p_2= 1	p_1= 1, p_2= 0	p_1= 0, p_2= 1	p_1= 0, p_2= 0

Under this partition semantics of questions, the answer to the question is simply the extension of the question in the world of evaluation, w_o, namely the set of worlds, or proposition, which coincide with the world of evaluation in terms of who loves Angela. If in the current world only Dwight loves Angela, the extension of the question, namely its answer, will be the set of worlds in which Dwight but not Andy loves Angela, i.e. the second cell in (11f).

(12) $\lambda w.\ [(\lambda x.\ x\ \text{loves}_{w_o}\ \text{Angela}) = (\lambda x.\ x\ \text{loves}_w\ \text{Angela})]$

The second approach, which I adopt in this paper, is dubbed the Hamblin/Karttunen approach. Within this framework, questions denote sets of propositions and *wh*-phrases are analyzed as generalized quantifiers (cf. Hamblin 1973 and Karttunen 1977). What that means is that a question such as (13a) will be analyzed as denoting the set consisting of its possible answers, a set of propositions.

(13) a. Who loves Angela?
b. {Dwight loves Angela, Andy loves Angela, Dwight and Andy love Angela}
c. $\lambda p_{\langle s,t\rangle}.\exists x\ [\text{person}_{w_o}(x)\ \&\ p{=}\lambda w.\ x\ \text{loves}_w\ \text{Angela}]$

I follow Karttunen (1977) and take *wh*-phrases to be existential quantifiers with essentially the same semantics as a regular existential quantifier like *someone*. The only difference between the two quantifiers is that *who* is additionally endowed with a [WH] feature.

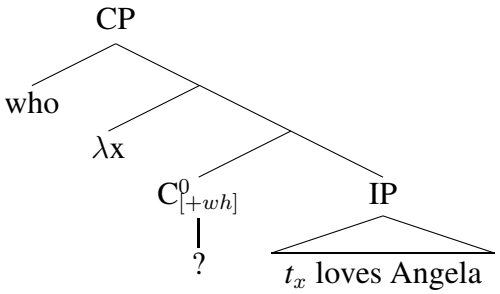
(14) a. $[\![\text{who}]\!] = \lambda P_{\langle e,t\rangle}.\exists x\ [\text{person}(x) \wedge P(x)]$ $\langle et, t\rangle$
a.' $[\![\text{which}]\!] = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.\ \exists x[P(x) \wedge Q(x)]$ $\langle et, ett\rangle$
b. $[\![\text{someone}]\!] = \lambda P_{\langle e,t\rangle}.\exists x\ [\text{person}(x) \wedge P(x)]$ $\langle et, t\rangle$
b.' $[\![\text{some}]\!] = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.\ \exists x[P(x) \wedge Q(x)]$ $\langle et, ett\rangle$

[3] Although note that the meaning of C would have to be generalized as in (i) in order to account for its ability to act on polar questions as well as multiple *wh*-questions:

(i) $[\![C_{0[+wh]}]\!] = \lambda\alpha.\ \lambda w'\ [\alpha = (\lambda w.\alpha)(w')]$

In order to compositionally derive the set in (13b-c) we need to assume that questions, unlike declaratives, additionally contain a semantically non-vacuous morpheme, call it '?', in the head position of the CP. There have been different proposals for how this head combines with its sister to ultimately yield the set of possible answers, but what they all agree on is that syntactically it carries a [WH] feature which drives the movement of the *wh*-phrase(s) to its specifier position, as in (15a), while semantically it denotes the relation of identity in (15b).

(15) a.



b. $[\![?]\!] = \lambda q_{\langle s,t\rangle}.\ (p = q)$ $\langle st, t\rangle$

c. $[\![CP]\!] = \exists x[person(x)\ \&\ p{=}\lambda w.\ x\ loves_w\ Angela]$

This, by itself, does not yield the desired meaning for the question, given that the type of the CP in (15) is a truth value. Following Sauerland (1998), who in turn follows von Stechow (1996), I take the initially unbound propositional variable *p* introduced by ? to be bound higher up in the structure, above the level of the moved *wh*-phrase, as in (16a), with the meaning of the corresponding question as in (16b).[4]

(16) a. λp [who [λx [? [t_x loves Angela]]]]

b. $\lambda p.\ \exists x[person(x)\ \&\ p{=}\lambda w.\ x\ loves_w\ Angela]$

Given this semantics of questions, the next task is figuring out how the answer to a question is obtained. Under an approach such as the Karttunen/Hamblin approach to questions, the notion of an answer-hood operator must be invoked. The role of such an operator is two-fold. First, it determines what an answer to a root question is supposed to be, namely how to go from a question to an answer. Second, it allows us to understand what happens in embedded questions, namely how the relation between an agent and a question is connected to the relation that holds between the agent and the answer to that question, a relation which is generally assumed to be one of entailment, as in (17).

(17) $R(x, Q) \rightarrow R(x, Ans(Q))$

[4]This move by itself is not optimal as it does not represent a seamless translation of the syntactic logical form into the semantic form of representation, given that we generally assume that lambda abstractors like λp in (15) are introduced as a result of movement. In order to avoid appealing to such special composition rules, one could follow Fox (2012) in assuming that the interrogative head is actually a complex head, consisting of two elements: *C*, which creates the proto-question, as in (ia), and an operator *Op* that moves out and creates the abstraction over propositions, with the meaning in (ib).

(i) a. $[\![C]\!] = \lambda p_{\langle s,t\rangle}.\lambda q_{\langle s,t\rangle}.\ (p = q)$

b. $[\![Op]\!] = \lambda Q_{\langle st,t\rangle}.\ Q$

Heim (1994) has argued that, depending on the predicate embedding it, an embedded question may receive one of two possible answers: a weakly exhaustive (WE) answer or a strongly exhaustive (SE) answer. The WE answer corresponds to the proposition that denotes the conjunction of all the true members in the question denotation, while the SE answer denotes the proposition that the conjunction of all the true members is the complete answer. Let's use as an example *know*, which has been argued to allow for both a WE and SE reading of its embedded question.[5] For someone to know (18) on its WE reading, they need to know for every x such that x loves Angela that x loves Angela. Assuming that Dwight is the only one who loves Angela, this would amount to the propositional knowledge in (18b).[6]

(18) Who loves Angela?

a. {**Dwight loves Angela**, Andy loves Angela, Dwight and Andy love Angela}

b. Jim knows who loves Angela. $\xrightarrow{\text{WE}}$ Jim knows that Dwight loves Angela.

On the other hand, the SE answer to (18) is the proposition that the conjunction of the true members is the complete answer, namely the proposition that *Dwight and nobody else loves Angela*. To know the SE answer to this question is to know for every x who loves Angela that x loves Angela, and furthermore to know for every x who doesn't love Angela that x doesn't love Angela, that is, for the entailment in (19a) to hold.

(19) Who loves Angela?

a. Jim knows who loves Angela. $\xrightarrow{\text{SE}}$ Jim knows that Dwight and nobody else loves Angela.

One way to test whether this distinction is made in the grammar is by seeing whether there are predicates that can only select for one of these answers. Consider the case of question-embedding *surprise* and the following sentence.

(20) Kevin was surprised by who came to the party.

The idea is that there are situations in which (20) is judged as false despite the fact that Kevin is surprised by the strongly exhaustive answer to the question *who came to the party*. Such examples involve cases where Kevin's expectations are at odds (hence surprising) only with the SE answer, and not with the WE answer. Consider the situation in (21):

(21)

	Angela	Pam	Kelly
party goers	yes	yes	no
Kevin's expectations	yes	yes	yes

In this situation Kevin expected all those who showed up, Angela and Pam, to show up, but he furthermore expected someone else, Kelly, to show up even though she ended up not coming to the party. In such a situation the SE answer to *who came to the party* would be that Angela and Pam and nobody else showed up, which would be surprising to Kevin given that he expected Angela and Pam and Kelly to show up. And yet (20) is judged as false, suggesting that appealing to the

[5] I'm making the crucial assumption that *know* can embed both WE and SE readings, despite much debate in the literature with respect to this issue; see in particular George (2011) who advocates that *know* is exclusively SE.

[6] From this point on I will use bolding as a way to indicate which propositions are assumed to hold true in the actual world.

SE answer in this case gives us the wrong result. On the other hand, if we look at the WE answer, namely the proposition that *Angela and Pam showed up*, we can see that the sentence in (20) is correctly judged as false given that Kevin's expectations regarding the WE answer conform with the facts, hence imply lack of surprise at who came. Such cases have been taken by Heim (1994), following Berman (1991), to indicate that strong exhaustivity is too strong in certain cases and thus that a notion of weak exhaustivity needs to be appealed to as well.

Proponents of this way of approaching embedded *wh*-questions advocate that strength should be represented by means of two answer-hood operators (cf. Heim 1994) that combine with the set of possible answers and deliver the two answers above. Taking Q to be the extension of the derived set of propositions, as in (22), the two types of answer operators can be defined as in (22a-b):

(22) $[\![Q]\!] = \lambda p_{\langle s,t\rangle}.\exists x\ [\text{person}_{w_o}(x)\ \&\ p{=}\lambda w.\ x\ \text{loves}_w\ \text{Angela}]$

a. $[\![\text{ANS.WE}]\!] = \lambda Q.\lambda w.\lambda w'.\ \forall p{\in}Q\ [p(w){=}1 \rightarrow p(w'){=}1]$

b. $[\![\text{ANS.SE}]\!] = \lambda Q.\lambda w.\lambda w'.\ \forall p{\in}Q\ [p(w) = p(w')]$

The role of these operators is to take a set of propositions and return a function from worlds to the proposition that constitutes the true, and possibly complete, answer given that set, i.e. a propositional concept. For example, given a set of propositions Q and a world of evaluation w_o, the two possible answers to the question in (21) in w_o will be the propositions in (23a) and (23b), respectively:

(23) a. $[\![\text{ANS.WE}]\!](Q)(w_0) = \lambda w.\ \forall p{\in}\{p\text{: }\exists x\ [\text{person}_{w_o}(x)\ \&\ p{=}\lambda w.\ x\ \text{came}_w]\}$
$[p(w_0){=}1 \rightarrow p(w){=}1]$

⋆ *the set of worlds such that the people who came to the party in w_0 also came to the party in those worlds*

b. $[\![\text{ANS.SE}]\!](Q)(w_0) = \lambda w.\ \forall p{\in}\{p\text{: }\exists x\ [\text{person}_{w_o}(x)\ \&\ p{=}\lambda w.\ x\ \text{came}_w]\}$
$[p(w_0){=}p(w)]$
$= \lambda w.\ \forall p{\in}\{p\text{: }\exists x\ [\text{person}_{w_o}(x)\ \&\ p{=}\lambda w.\ x\ \text{came}_w]]\}$
$[p(w_0){\rightarrow}p(w) \wedge p(w){\rightarrow}p(w_0)]$

⋆ *the set of worlds which agree with w_0 in terms of the people who came to the party*; *the set of worlds such that the people who came to the party in w_0 also came in those worlds and, furthermore, the people who came to the party in those worlds also came in w_0*

1.3 Motivating a new take on strength

As noted above, the fact that question strength is a real distinction made by grammar can also be seen when we look at the behavior of NPIs in embedded interrogatives. Guerzoni and Sharvit (2007) observe that the acceptability of NPIs in the nucleus of an embedded question is sensitive to the nature of the embedding predicate. Specifically, it appears to be the case that only when a question can receive a strongly exhaustive reading will an NPI be allowed in its scope. Take, for example, the contrast between (24) and (25). The predicates in (24) have been argued to embed questions only on their WE readings, while those in (25) clearly do embed questions on their SE readings. The same argumentation as above can be used to show that the predicates in (24) cannot make reference to SE interpretations.

(24) a. *It surprised Angela which boys brought her any gifts.
b. *It amazed her which girls had ever participated in a dance competition.
c. *Jay was disappointed by who sold any antique books.
d. *Will was annoyed at which guys had ever dated his girlfriend.

(25) a. Angela wants to know which boys brought her any gifts.
b. Andy wonders who has ever been Paris.
c. Chris asked me who took any linguistics classes.
d. Jenny discovered who stole anything from her home.

To further drive this point home, namely that NPI acceptability correlates with the strength of the question, consider the case of questions embedded under *know*. While typically such questions tend to receive a strongly exhaustive interpretation, it's been argued that *know* can also allow for weakly exhaustive interpretations of its embedded question (cf. Guerzoni and Sharvit 2007).[7] Crucially, when it does, NPIs are no longer acceptable. Consider the following scenario. Dwight and Michael are playing a game that requires Michael to put on a pair of glasses with two different lenses: the left lens is such that it has no effect, while the right one neutralizes all colors to gray. Dwight then shows Michael a picture of six people each wearing colorful attire, namely (26a). Since Michael only sees color through his left lens, what he sees is the image in (26b).

(26) a.  seen by Dwight

b.  seen by Michael

The question we need to ask ourselves is what Dwight can report regarding Michael's knowledge. Given the discussion on what counts as a WE versus SE reading of the embedded question, the statement in (27) is true on its WE reading and false on its SE reading since Michael knows of all the purple-wearers that they are purple-wearers but doesn't know who isn't a purple-wearing person.

(27) Michael knows which of these guys is wearing purple.
a. ✓ weakly exhaustive reading
b. ✗ strongly exhaustive reading

And in fact it seems completely plausible for Dwight to make the following claim:

(28) Michael knows who's wearing purple, and once I replace his right lens, he'll know who isn't wearing purple as well.

[7] Recent experimental work has argued that while *know* does allow for readings weaker than SE readings, these readings are still stronger than what has generally been referred to as the WE reading (Cremers and Chemla in press). In particular, going back to an analysis already proposed in Spector and Egré (2007), the claim is that what we see with questions embedded under *know* is an intermediate exhaustive interpretation, namely one that looks at the positive extension of the question and furthermore imposes a requirement of no false beliefs on the part of the knower. There are various ways one could derive such readings, and I refer the interested reader to those works (cf. also Roelofsen et al. 2014). The distinction between the WE and the intermediate reading is orthogonal to the discussion in this paper, so I will conflate both readings under the label weak exhaustivity, with the hope that the interested reader will be able to tease the two apart if necessary.

The idea is that (28) can be felicitously uttered only if *know* is interpreted as weakly exhaustive, since otherwise it would give rise to a contradiction; for to know something strongly exhaustively, one needs to know both the positive and negative extension, i.e. Michael would already have to know who isn't wearing purple. Crucially, note that in these circumstances it's infelicitous for Dwight to report (29), where an NPI is used. This is an expected outcome and supports Guerzoni and Sharvit's claim that strength of exhaustivity correlates with NPI licensing, for we see that even though *know* can be used felicitously in a non-exhaustive setting, (28), the NPI is not licensed.

(29) *Michael knows which of these guys is wearing any purple.

On the other hand, when the question is interpreted strongly exhaustive, the NPI becomes acceptable. Dwight, who has complete knowledge about everybody in the domain, can be said to know who's wearing purple under a strongly exhaustive interpretation and thus can claim the following, contrary to Michael:

(30) Dwight: I know who's wearing any purple.

The problem with the current, or for that matter, any other previous analyses of questions is that there is no way to account for the correlation between the strength of a question and the acceptability of an NPI in that question, at least not without abandoning a licensing-by-DE account of NPIs.[8]

The goal of this paper is to argue that NPIs are in fact subject to the same set of constraints in both declaratives and questions, namely the presence of a local DE context. In order to show this I will argue that when a question is interpreted as strongly exhaustive, and crucially only then – that is, not when it is weakly exhaustive – a local DE context is present. The crux of the proposal is that strength should be encoded at the level of the question, rather than in different answer-hood operators. Specifically, I will claim that in order to derive the two readings, instead of having two answer-hood operators apply to the question denotation, we ought to locate the difference internal to the question, giving us two distinct sets of propositions: the set of weakly exhaustive answers and the set of strongly exhaustive answers, as in (31):

(31) a. The WE answer set, call it Q_w is the same as before
Q_w = {Dwight loves Angela, Andy loves Angela, Dwight and Andy love Angela}
b. The SE answer set, call it Q_s, is the set of exhaustive propositions
Q_s = {Dwight and nobody else loves Angela, Andy and nobody else loves Angela, Dwight and Andy and nobody else love Angela}

While my approach will ultimately yield the same interpretation for WE/SE questions in terms of what constitutes a possible answer, I will depart from previous proposals in terms of the compo-

[8]While Guerzoni and Sharvit (2007) abandon this licensing-by-DE account in the case of questions, some other, more drastic proposals claim that DE-ness should be removed completely from the analysis of NPI licensing (cf. Giannakidou 1999, 2011, Israel 1996, 2011 and van Rooy 2003 for arguments against an analysis of NPIs that takes their acceptability to be governed by the monotonicity of their local environment). By abandoning DE-ness as the licensing force, these proposal fare better when it comes to bringing interrogatives under the same umbrella as other NPI licensors but they still fail at explaining the Guerzoni and Sharvit generalization that question strength affects the acceptability of NPIs.

sitional steps that derive these answers. Specifically, I will argue for a more nuanced underlying representation of SE questions which will allow us to understand why NPIs are acceptable in these types of questions; I will do so by showing that the source of strength in questions is the same as the source of NPI licensing more generally, namely the presence of a downward entailing operator. The idea, in a nutshell, will be that globally, SE questions denote sets of propositions that create non-monotonic environments (hence the lack of entailment between questions), but that at some level underlyingly, a Strawson-DE environment is created. The presence of this local Strawson-DE level will turn out to be crucial for NPI licensing (cf. von Fintel 1999) and will explain a host of facts related to NPIs that up to this point have proven puzzling.

2 Moving the ambiguity to the question nucleus

As discussed in the previous section, the specification in strength is often encoded at the level of the answer-hood operator. In this section I propose a new way to think about this distinction, one which takes the difference to be encoded lower, namely internal to the question nucleus. That is, instead of talking about the weak and the strong answer, we can now talk about the weak answer set and the strong answer set. This approach is very much in line with a recent analysis by George (2011), who also locates the difference in exhaustivity internal to the question rather than in different answer-hood operators. The proposals differ, however, both in the semantics of questions being employed (George assumes a partition semantics for questions), as well as in the implementation. We already know what the weak answer set is, namely the Hamblin set, provided in (32).

(32) Who loves Angela?
Q_w = {Dwight loves Angela, Andy loves Angela, Dwight and Andy love Angela}

The question now is what the strong answer set is, and how we can derive it without making reference to ANS.SE. Recall what ANS.SE delivers for a question such as *Who loves Angela?*. It provides a proposition of the form *x and nobody else loves Angela*, where x is an element in the domain of the *wh*-phrase. The strong answer set should thus consist of all possible propositions of this form, as in (33).[9]

(33) Who loves Angela?
Q_s = {Dwight and nobody else loves Angela, Andy and nobody else loves Angela, Dwight and Andy and nobody else love Angela}

Essentially, we can think of the SE answer set as a set of exhaustified propositions, which is in line with our intuitions about what it means to be a possible SE answer. Observe that each proposition in (33) can be seen as the conjunction of two components: that *x loves Angela* and that *nobody who is not x loves Angela*, which essentially amounts to adding an exclusivity component to the weakly exhaustive answer. Notice that the second of these components creates an environment that is

[9] George (2011) takes a similar approach but within a Groenendijk and Stokhof framework, namely by taking *wh*-phrases to be abstracts. His claim is that SE questions contain an *X* operator which basically extracts the set of people who love Angela in the actual world, with the final question denotation being the singleton set containing the proposition that those people are the people who love Angela.

downward entailing. This, I will argue, is going to turn out to be the crucial piece when reasoning about the acceptability of NPIs. Latching onto this insight, I propose that at some level in the derivation of a SE question these two components are separate enough so that the DE component is the only part of meaning that the NPI licensing mechanism is sensitive to.

Observe that a proposition like (34) is itself decomposable into these components, with the only difference being that (34a) is presupposed rather than asserted.

(34) Only Dwight loves Angela.

a. Dwight loves Angela. *presupposition*
b. Nobody who's not Dwight loves Angela. *assertion*

Environments where the assertive component is DE but the presupposition non-DE, such as those created by the presupposition trigger *only* above, are labeled Strawson downward monotonic by von Fintel (1999), who shows that such environments are capable of supporting NPIs (cf. also Chierchia (2004, 2013), Homer (2008, 2009), and Gajewski (2011), among others, on the role of presuppositions in the licensing of NPIs). Simplifying a bit, the idea is that NPIs like *any* and *ever* are only sensitive to one component of meaning, namely the assertive component, and that as long as the assertive component is downward entailing, they will be acceptable, hence their acceptability in (35):

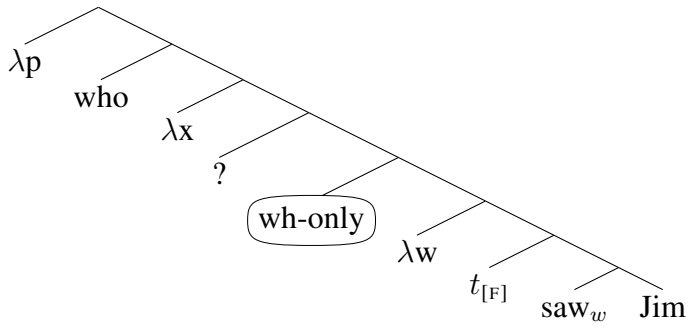
(35) Only Dwight loves anyone.

a. *Dwight loves anyone. *presupposition*
b. Nobody other than Dwight loves anyone. *assertion*

I claim that SE questions are underlyingly more complex than WE questions in that they consist of an additional projection which hosts a presuppositional operator akin to the focus-sensitive operator *only*. This additional projection resides above the question nucleus and right below the question-forming operator and associates with the trace of the *wh*-phrase. Throughout the remainder of this paper I will be referring to this operator as *wh-only*. The claim I will pursue in this paper is that strongly exhaustive readings are obtained as a result of the *wh*-phrase having to go through this additional projection in the left periphery of the question; *wh-only* will thus associate with the trace of the *wh*-phrase, giving us the LF in (36a) and the question denotation in (36b). It will be shown that this way of construing strongly exhaustive *wh*-questions explains the licensing of NPIs as well as the correlation between their licensing and the strength of the question.

(36) Who saw Jim?

a.



b. λp. $\exists$x [x$\in[\![\text{person}]\!]^{w_o}$ $\wedge$ p = only *x* saw Jim]

The crucial bit of the analysis rests on the assumption that *wh-only* has the same semantics as regular focus-sensitive *only*. I am assuming that this operator is presuppositional, like overt *only*, and unlike the silent exhaustifier $\mathcal{E}xh$ invoked when deriving scalar implicatures. I will return to the topic later, but this treatment of *wh-only* will, more or less, remain a necessary stipulation.[10] Just as with overt *only*, I following Rooth (1992) in analyzing *wh-only* as a two-place operator that takes a contextual variable and a proposition *p*, its prejacent; the variable, henceforth referred to as $\mathscr{A}lt$(p), represents a contextually determined set of alternatives which is obtained by replacing the trace of the *wh*-phrase with an alternative provided by the domain of the *wh*-phrase, illustrated in (37) for the question in (36):

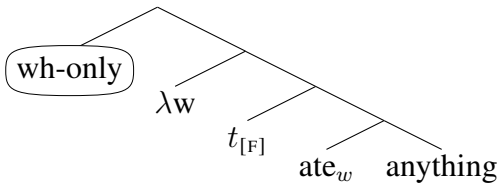
(37) $\mathscr{A}lt(\lambda$w. g(1) ate cake) = $\{\lambda$w. x saw$_w$ Jim $\mid$ x$\in[\![\text{person}]\!]\}$

The denotation of *wh-only* will be taken to be that in (38): a function from a proposition *p* and a set of alternatives to *p*, to the negation of all alternatives not entailed by *p*.

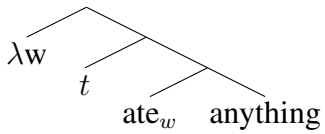
(38) $[\![\text{wh-only}]\!](\mathscr{A}lt(\text{p}))(\text{p}) = \lambda\text{w. } \forall\text{q}\in\mathscr{A}lt(\text{p}) \text{ [p}\not\subseteq\text{q} \rightarrow \text{q(w)=0]}$ *equivalently*
$= \lambda\text{w. } \forall\text{q}\in\mathscr{A}lt(\text{p}) \text{ [q(w)=1} \rightarrow \text{p}\subseteq\text{q]}$

Crucially, the assertive contribution of *wh-only* reverses the monotonicity of its scope, rendering the question nucleus a downward entailing environment and thus ideal for NPI licensing. By taking the difference in strength to be contingent on the presence versus absence of *wh-only* and recognizing that *wh-only* is a Strawson-DE operator, we will essentially have gone from a description of the facts, namely Guerzoni and Sharvit's claim that strength is relevant for NPI licensing, to an explanation of these facts. Informally, the layout of the argument will be as follows. If the acceptability of NPIs is, in a sense to be spelled out later, dependent on the monotonicity of their environment, and if *wh-only* reverses the entailment pattern, we should be able to show that the embedded IP is the level at which NPI licensing either works, in the case of SE questions, (39a), or fails, in the case of WE readings, (39b).

(39) a. NPI licensed
SE question



b. NPI not licensed
WE question



In its simplest form, the argument is that NPIs are licensed in SE questions for the same reason they are licensed in the declarative corresponding to the question IP, namely (40).

(40) Only John$_{[\text{F}]}$ ate anything.

Similarly, we can account for their unacceptability in WE questions by noting their unacceptability in (41), the declarative counterpart of (39b).

[10] Given its high attachment place, this operator is not expected to exhibit the same behavior as the overt propositional *only* with respect to intervention effects.

(41) *John ate anything.

By reducing the behavior of NPIs in questions to their behavior in declaratives, this account avoids the need for additional machinery to derive the (un-)acceptability of NPIs. That is, whatever analysis one uses to account for the acceptability of NPIs in the scope of *only* in regular declaratives will carry over to account for their behavior in strongly exhaustive questions. In Sections 4 and 5 I provide an in-depth analysis of NPIs in questions and argue that this proposal for deriving SE questions can account for a host of data, such as the subject-object asymmetry noted by Han and Siegel (1997), as well as the interaction with the plurality of the *which*-phrase when NPIs occur in the *wh*-restrictor.

In the remainder of this section, however, we will focus on the implementation of this analysis wherein exhaustivity is encoded via a covert presuppositional *wh-only*.

2.1 The presupposition of *wh-only*

What presupposition overt *only* contributes has been highly debated in the literature (cf. Horn 1969, 1996, Rooth 1985, Geurts and van der Sandt 2004, Ippolito 2008, among many others). One claim is that *only* presupposes its prejacent, as in (42).

(42) $[\![\text{only}]\!](\mathscr{A}lt(\text{p}))(\text{p}) = \lambda\text{w: } \underline{\text{p(w)=1}}.\ \forall\text{q}\in\mathscr{A}lt(\text{p})\ [\text{q(w)=1} \rightarrow \text{p}\subseteq\text{q}]$[11]

Carrying this analysis over to *wh-only* means that a strongly exhaustive question will have the denotation in (43), namely a set of partial propositions that each have the presupposition that *x saw Jim*, where *x* is a person or group of people, and assert that everybody who's not *x* did not see Jim.

(43) Who saw Jim?
λp. $\exists$x[person$_{w_o}$(x) $\wedge$ p = λw: x saw$_w$ Jim. $\forall$a$\in\mathscr{A}lt$(x) [(a saw$_w$ Jim) $\rightarrow$ (x saw$_w$ Jim) $\subseteq$ (a saw$_w$ Jim)]]

So a potential answer to *Who saw Jim?* would be *Only Dwight saw Jim*, which, under the analysis provided above, would amount to asserting that nobody other than Dwight saw Jim. Under the assumption that presuppositions are definedness conditions, such an answer would only be defined if the presupposition that *Dwight saw Jim* is part of the common ground. However, as pointed out to me by Veneeta Dayal (p.c.), it seems highly unlikely that one would seek information about something that is already part of the common ground. That is, given the semantics of SE questions that I am proposing, namely one in which *wh-only* associates with the trace of the *wh*-phrase, the question should be rendered un-askable since the answer, or at least a part of it, is assumed to be part of the common ground.

It would appear then that we have hit a wall with this approach. On the one hand we want SE questions to denote propositions of the form *'only x saw Jim'* to account for the acceptability of NPIs, while on the other hand we saw that assuming a presuppositional semantics for *wh-only* appears to give rise to un-askable questions.[12]

[11] Here and throughout I adopt the notation in Heim and Kratzer (1998) to represent partial functions. $\lambda\phi$: ψ. χ stands for 'The function that maps ϕ to χ is defined only if ψ'.

[12] One could have considered instead an analysis of *wh-only* that takes it to have a weaker, existential presupposition. The issue with such an approach, however, is that it gives rise to a weak meaning. Namely, in a situation in which

Let's re-evaluate the intuition that this presupposition is part of the common ground. Specifically, we need to ask ourselves how/whether presuppositions project out of questions. The general take on presupposition projection, going back to Heim (1983) and more recently Schlenker (2006), is that in quantificational contexts presuppositions project universally, as in (44):

(44) None of these guys knows that his wife is waiting outside.
presupposes: All of these guys' wives are waiting outside.

Since questions are quantificational structures, the prediction is that here too presuppositions should project universally, and we see that this is indeed the case quite systematically (cf. Heim 1992, Abrusán 2007, Guerzoni 2003, among others).

(45) a. Which of the three projects did Angela stop working on?
presupposes: Angela was working on all three projects.
b. Which of your students took the SAT again?
presupposes: All of your students took the SAT before.

The idea then is that given a presuppositional trigger such as *wh-only* within the question nucleus, we expect the presupposition associated with it to project universally. But having every presupposition associated with *wh-only* in the denotation of a question like *Which of those two guys saw Jim?* project would amount to presupposing that for every *x* in the domain of the *wh*-phrase, *x* saw Jim, which is clearly not what we want for a question like (46).

(46) Which of those two guys saw Jim?
presupposes: Both guys saw Jim.

The issue then is not just that the question presupposes that an answer to it is true, but that every possible answer is true, which seems to clash with the pragmatics of the discourse.[13] In other words, letting the presupposition of *wh-only* project universally would give rise to a defective question, and in order to prevent that, we need to allow the presupposition associated with *wh-only* to be locally accommodated. This will amount to saying that SE questions are locally Strawson-DE (i.e., good for NPI licensing but bad for questioning purposes) but globally non-monotonic (i.e., good for questioning purposes but bad for NPI licensing).

One question that arises is whether this need to accommodate should be seen as a specific characteristic of questions or as an instance of a more general rule that calls for local accommodation whenever global accommodation would give rise to a clash with the pragmatics of the discourse (cf. Heim 1983, 1992). If this were a specific requirement for questions we would predict that a question such as (47a), which presupposes for every *x* in the domain of the *wh*-phrase that *x* has a father, would actually be interpreted as in (47b), which is not the case. We can make the same argument for the questions in (45).

Andy and Dwight saw Jim, it would suffice for Kelly to know that Andy saw Jim in order for her to count as knowing who saw Jim, contrary to our intuitions about what it means to know a question strongly exhaustively. I leave it to the reader to work out the shortcomings of such a proposal.

[13] I leave open the issue of how this can be implemented formally, be it via a requirement that the local context not entail every answer to the question, or a requirement of uncertainty to be attributed to the questioner regarding the truth of the answers.

(47) a. Who talked to his father?
b. Who has a father and talked to him?

The second option is thus not only conceptually appealing, but also empirically better. The idea is that *wh-only* gives rise to a defective question and that this calls for a targeted form of local accommodation, to be explicated below.

One proposal is to appeal to the assert operator $\mathcal{A}$ (Beaver and Krahmer 2001) as a way to "wipe out" presuppositions—an operator that can be merged at any scope position and acts on the presuppositions in its scope. When applied to a partial proposition, ϕ_p, this operator returns a total proposition that represents the conjunction of the proposition with its presupposition, p, as in (48).

(48) $[\![\mathcal{A}]\!](\phi_p) = \phi_p \wedge p$

Before delving into the analysis, let's consider what the contribution of $\mathcal{A}$ is in run-of-the-mill contexts such as (49), adopted from Romoli (2012), where there are two possible scope positions where $\mathcal{A}$ can adjoin. If we accommodate globally, as in (49a), we derive a meaning that is in contradiction with the continuation. In order to avoid such contradictions, we have the option of locally merging $\mathcal{A}$ below negation, as in (49b), thus obtaining a meaning compatible with the continuation.

(49) Andy doesn't drive his Ferrari to school. He doesn't have one.
a. $\mathcal{A}$[¬[Andy drives his Ferrari to school]]
Andy has a Ferrari and he doesn't drive it to school.
b. ¬[$\mathcal{A}$ [Andy drives his Ferrari to school]]
It's not true that [Andy has a Ferrari and drives it to school].

In a sense, what I want to propose for the case of questions parallels what we see in the example above. Without local accommodation, the presupposition induced by *wh-only* in questions would lead to a clash with the pragmatics of the discourse, similarly to the way in which global (= lack of local) accommodation in (49) leads to a clash with the continuation.

I propose that the $\mathcal{A}$ operator is merged right above the question nucleus and before the level of question-formation, as in (50). In (50a-c) I provide the denotations at the relevant nodes.

(50) λp [who [λ1 [? [$_{CP_2}$ $\mathcal{A}$ [$_{CP_1}$ wh-only [$_{IP}$ λw [g(1)$_{[F]}$ [saw$_w$ Jim]]]]]]]]
a. $[\![\text{IP}]\!] = \lambda$w. g(1) saw$_w$ J
b. $[\![\text{CP}_1]\!] = \lambda$w: g(1) saw$_w$ J.
$\forall$a$\in\mathscr{A}lt$(g(1)) (a saw$_w$ J) $\rightarrow$ (g(1) saw$_w$ J) $\subseteq$ (a saw$_w$ J)
c. $[\![\text{CP}_2]\!] = \lambda$w. g(1) saw$_w$ J $\wedge$
$\forall$a$\in\mathscr{A}lt$(g(1)) (a saw$_w$ J) $\rightarrow$ (g(1) saw$_w$ J) $\subseteq$ (a saw$_w$ J)

Assuming that the presupposition associated with *wh-only* is locally accommodated gets us around the issue of how this presupposition projects out of questions, since at the level of question formation there no longer is such a presupposition, given that the question nucleus is reinterpreted as asserting said presupposition. What this means is that globally, the question denotes a set of total propositions of the form in (51).

(51) $\{x_1$ and nobody other than x_1 saw Jim, x_2 and nobody other than x_2 saw Jim, x_3 and

nobody other than x_3 saw Jim, ... }

Crucially, by the point the question-forming operator applies, the $\mathcal{A}$ operator will have turned the Strawson-DE environment at the CP_1 level into a non-monotonic environment. If the licensing of NPIs were to be checked globally, they would turn out not to be licensed in SE questions, given the non-DE character of the overall environment. However, we know that NPI licensing can be checked with respect to a local environment, i.e. CP_1 above, since NPIs can be felicitous even in globally non-DE environments, such as (52), as long as there is a local level, IP_1 in (52), that creates a downward entailing context.

(52) [$_{IP_2}$ Kevin doubts that [$_{IP_1}$ Andy didn't talk to anybody]]

a. IP_1 is DE

b. IP_2 is non-DE

It is thus crucial that the presupposition become part of the assertive component at a separate stage in the derivation, so as to maintain a level in the derivation where NPIs can be licensed.[14]

An anonymous reviewer raises the concern that besides the need for NPI licensing, there is no other evidence that the presupposition I claim is present in SE questions is actually necessary. This is a valid reaction, and at present I can see no additional way to argue for the presence of this presupposition. Given the LF I propose for SE questions, we cannot directly test for the presence of that presupposition. And that is because as soon as it is introduced, it gets wiped out by the Assert ($\mathcal{A}$) operator which adjoins right above it. This should be seen as an advantage of this system: the presupposition is rendered undetectable for independent reasons, namely in order to repair an infelicitous conversational move, and thus does not add any new dimension of meaning to questions. The fact that there is this "hidden" presupposition is, at the end of the day, a necessary assumption, but my goal throughout the paper is to convince the reader that (i) this assumption creates no problems for the theory of exhaustification in questions (all it does is shift the locus of exhaustification), (ii) it succeeds at providing a unified and arguably elegant account of the source of exhaustivity in questions and the licensing of NPIs, (iii) it explains the Han and Siegel effects (Sect. 4.1), and (iv) it explains why only a certain class of NPIs is acceptable (Sect. 4.2). The second point is especially important, since the relation between NPI licensing and strength of exhaustivity has remained an open problem for much too long.

2.2 How many *only*'s?

A concern raised by the architecture of this account is that it seems to overgenerate to non-interrogative cases. Note specifically that locally accommodating the presupposition of *wh-only* gives us essentially the same result as if we had applied the regular silent exhaustifier that we appeal to when deriving scalar implicatures (cf. Chierchia et al. 2012). This operator, generally referred to as $\mathcal{E}xh$, takes as its argument a proposition and returns the conjunction of that proposition with the negation of its weaker alternatives.

[14]Note that we need to assume that $\mathcal{A}$ operates selectively on the presupposition induced by *wh-only* so as not to wipe out all of the presuppositions in the question nucleus. That this is independently needed was observed by Romoli (2011). One possible way to implement it would be to claim that $\mathcal{A}$ operators can be co-indexed with specific presuppositional triggers but I leave this to future research.

(53) a. $\mathcal{E}xh$(p) = λw. p(w) $\wedge$ $\forall$q$\in\mathscr{A}lt$(p) [p$\not\subseteq$q $\rightarrow$ q(w)=0]
b. $\mathcal{E}xh$ [Some students finished their homework] =
Some but not all students finished their homework.

In fact, some authors have even suggested that the strongly exhaustive answer operator can be thought of as an exhaustivity operator tackled onto the ANS.WE operator (cf. Klinedinst and Rothschild 2011 and, to a lesser degree, also Spector 2007 and Menéndez-Benito 2010). To some extent, even Groenendijk and Stokhof (1984) themselves suggest that a silent exhaustivity operator can be employed in order to make answers congruent with the strongly exhaustive question meaning. So one option could have been to say that the strongly exhaustive answer set is derived via point-wise application of $\mathcal{E}xh$, as in (54).

(54) $\mathcal{E}xh$(Q) = $\{\lambda$w. p(w) $\wedge$ $\forall$q$\in$Q [p$\not\subseteq$q $\rightarrow$ q(w)=0] | p$\in$Q$\}$

The semantics of $\mathcal{E}xh$ is similar to that of overt *only*, and in turn *wh-only*, with the main difference being that $\mathcal{E}xh$ entails the proposition it attaches to, rather than merely presupposing it. In short, this exhaustivity operator is the accommodated version of our run-of-the-mill focus operator *only*, i.e. (55):

(55) $\mathcal{E}xh(\phi)$ = $\mathcal{A}$[*only*(ϕ)]

While (54) may be a good representation of the strongly exhaustive answer set, it cannot derive the acceptability of NPIs since the presence of $\mathcal{E}xh$ creates a non-monotone environment, which is not conducive to NPI licensing. That this silent exhaustivity operator does not license NPIs can be seen when we compare the following two:

(56) a. Some students finished their homework.
b.*Some students finished any homework.

I crucially argued that we need the separation between $\mathcal{A}$ and *wh-only* in the underlying representation of questions so as to account for the acceptability of NPIs. Thus one might wonder why this option is not also available in the case of regular declaratives, as in (57), given that the end result is the same.[15]

(57) $\mathcal{A}$ [*wh-only* [Some students finished their homework] =
Some but not all students finished their homework.

If the representation in (57) were possible, then we would wrongly predict NPIs to be licensed in overtly non-DE contexts such as (56b), since there would be a level in the underlying representation that is DE with respect to the NPI, namely the level before $\mathcal{A}$ is applied:

It stands to reason then that the $\mathcal{A}$+*wh-only* 'bundle' should not be available in declaratives. There are a few reasons why this looks like the correct conclusion. One is that we need to constrain the distribution of this covert presuppositional operator. In other words, it cannot be unleashed every which way, for then we would end up having propositions presupposing themselves without any overt indication. For example, if *wh-only* adjoined to (56a), this proposition would end up being presupposed rather than asserted. We generally take it for granted that when an interlocutor

[15]This was pointed out to me independently by Uli Sauerland and Benjamin Spector.

asserts a proposition, he doesn't take it to be part of the common ground but in fact indicates that it should be newly included into the common ground, i.e. that his assertion is a signal that the proposition is meant as an update.

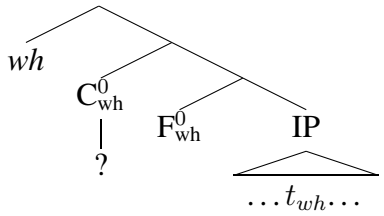
The idea then is that there cannot be null presuppositional triggers, especially not factive ones, such as *wh-only*. So if a covert presuppositional operator like *wh-only* did exist, it would have to be made visible somehow. What I want to claim is that *wh*-movement does just that: it renders the covert *wh-only* visible in some sense, thus no longer making it subject to the restriction against null presuppositional triggers—a move not available in regular declaratives such as (57). A prediction we can make from this is that there could still be a covert presuppositional trigger in non-*wh*-contexts if somehow it could be made visible. One instance where I claim we see just this is in clefting constructions such as (58) where, despite the absence of a lexically realized exhaustifier, (58) presupposes that Fred was the only person invited. Without going into the details of the analysis (Büring and Krič 2013), the idea is that cleft constructions are accompanied by an exhaustivity claim which functions as a presupposition despite the absence of an overt, phonologically realized trigger.

(58) It was Fred she invited.

For our purposes it suffices to note the parallel between this construction and questions in terms of the availability of an exhaustivity presupposition in the absence of a phonologically realized trigger, and furthermore the fact that both constructions involve some type of overt movement which I take to be the trigger of such a presupposition.

Another option, possibly very similar to the one above, is to say that there is no covert *wh-only per se*, but that instead there is a null functional head in the extended projection of C_{WH}, with the same meaning of *only*, through which the *wh*-phrase must move, as in (59):

(59)



The natural follow-up question is the following: are there languages where we see this overtly? Namely, languages where the movement of *wh* through a focal position is prosodically marked? At first glance, Japanese and Korean seem to fit the bill, as does Hungarian (Horvath 1986, 1998) but more crosslinguistic work needs to be done in order to verify what the connection is between prosodic marking and strength of exhaustivity.

It's crucial to note that this proposal should not be taken as an argument for an expansion of our inventory of covert exhaustivity operators, but at most as a loosening of the notion of what counts as lexically visible in the domain of presupposition triggers—a move that might need to be made independently, in order to deal with the presupposition invoked by cleft constructions.

2.3 Taking stock

In this section I have offered a proposal for dealing with strength in questions which encodes the ambiguity between WE and SE questions at the level of the question nucleus, i.e. before the

question-forming operator is merged. To reiterate, I claimed that the LFs for the WE and SE readings of the question in (60) are as in (60a) and (60b), respectively.

(60) Who loves Angela?

a. λp [who [λ1 [? [λw [g(1) [loves$_w$ Angela]]]]]]

b. λp [who [λ1 [? [$\mathcal{A}$ [wh-only [λw [g(1)$_{[F]}$ [loves$_w$ Angela]]]]]]]]

This analysis, I've argued, allows us to finally understand why NPIs are acceptable only in questions that receive a SE reading, as observed by Guerzoni and Sharvit (2007)—that is, why there should be a correlation between strength and NPI licensing. As discussed in the beginning, encoding strength via the answer operators, a longstanding tradition in the semantics of questions starting with Heim (1994), leaves the behavior of NPIs unexplained as there is no way to unify their pattern of acceptability in interrogatives with their acceptability in declaratives, a domain for which we have an arguably coherent grasp of their behavior. I am putting off a formal account of NPIs in questions under this new analysis until the next section, where I will focus exclusively on their behavior and show that this analysis is unique in its ability to offer a uniform account for the peculiar distribution of NPIs both in the nucleus and restrictor of *wh*-phrases, the difference between weak and strong NPIs, and lastly the Han and Siegel effects.

An immediate consequence of this proposal is that by removing the ambiguity from the answer operators and placing it in the question nucleus we have essentially rendered the ANS.SE operator superfluous. We could, at this point, claim that Heim's ANS.WE operator, repeated in (61), is all there is, and that depending on which LF it merges with, this operator will deliver either the weakly exhaustive or the strongly exhaustive answer to a question.

(61) $[\![\text{ANS.WE}]\!] = \lambda Q.\lambda w.\lambda w'.\ \forall p \in Q\ [p(w)=1 \rightarrow p(w')=1]$

In a sense, the story could easily just end here. We've set out to account for the correlation between the acceptability of NPIs in a question and the strength of the question and we have shown how that can be achieved. But there are arguments that our answer operator is too weak and in fact should be further strengthened in order to account for issues related to maximality and uniqueness in questions. An observation dating back to Srivastav (1991) and later developed in Dayal (1996) is that while (62a) allows for either response in (63), a question with a singular *which*-phrase, like (62b), will only accept an answer that names a single woman, namely (63b).

(62) a. Who does Andy like?

b. Which woman does Andy like?

(63) a. Andy likes Angela and Erin.

b. Andy likes Angela.

Dayal (1996) proposes to account for these nuances by taking the choice of *wh*-phrase to dictate what types of propositions can comprise the answer set. Namely, she takes monomorphemic *wh*-phrases, like *who* in (62), to range over atomic and sum individuals, while restricting singular *which*-phrases to range exclusively over atomic individuals, drawing on Sharvy (1980) and Link (1983) in her approach to the domain of individuals. That is, the Hamblin set associated with (62a) will be as in (64a), while that associated with (62b) will be as in (64b).

(64) a. {Andy likes Angela, Andy likes Erin, Andy likes Pam, Andy likes Angela and Erin, Andy likes Angela and Pam, Andy likes Erin and Pam, Andy likes Angela and Erin and Pam}
b. {Andy likes Angela, Andy likes Erin, Andy likes Pam}

This move by itself is not enough to account for the observation above. The issue is that Heim's ANS.WE operator imposes no restriction on how many propositions in the Hamblin set can hold true, meaning that in a situation in which Andy likes Angela and Erin, applying the ANS.WE operator to either set in (64) will return the same set of worlds, namely those in which Andy likes Angela and Erin. We want, however, a way to rule out such answers when the question involves a singular *which*-phrase. Dayal suggests that one way to think about these cases is by invoking the notion of maximality; specifically, by requiring the answer to a question to denote the maximally informative proposition in the answer set, similar in a sense to the contribution of the definite article *the*. Redefining the answer-hood operator to accomplish this would amount to the following two claims: (i) that the answer to a question needs to be a true proposition belonging to the denotation of the questions, and (ii) that, furthermore, this proposition needs to be the strongest such proposition, as in (65).

(65) $[\![\text{ANS}]\!] = \lambda Q.\lambda w$: $\exists p\ [p(w) = 1 \wedge Q(p) = 1 \wedge \forall p' \in Q\ (p'(w) \rightarrow p \subseteq p')]$.
$\iota p\ [p(w) = 1 \wedge Q(p) = 1 \wedge \forall p' \in Q\ (p'(w) \rightarrow p \subseteq p')]$

This updated version of the answer operator can predict the behavior of *which*-phrases as well as a number of other issues related to multiple *wh*-questions (Dayal 1996, in progress) and questions involving negative islands (cf. Rullmann 1995, Fox and Hackl 2007, Spector and Abrusán 2011, Fox 2010, among others).

Recapping, I have argued that the ambiguity of strength exhibited by questions should be encoded internal to the logical form of questions via a presuppositional operator *wh-only*, thus making the need for two answer-hood operators superfluous. I proposed instead that we have a single answer-hood operator, and have argued based on facts about singular *which*-phrases that this operator should be the answer operator proposed in Dayal (1996).

2.4 Subcategorizing for SE questions

One issue that remains is how to account for the fact that *surprise*-like predicates cannot embed strongly exhaustive questions. Specifically, why is it that *surprise*, as well as other emotive factives that behave similarly with respect to embedding (e.g. *amaze, disappoint, annoyed*), cannot embed questions that receive SE readings? Within a framework that takes the difference between these readings to come about as the result of applying different answer-hood operators to the question denotation, the argument is that *surprise*-like predicates subcategorize for a particular answer operator, as in (66):

(66) a. surprise$_Q$ [ANS.WE [question]]
b. *surprise$_Q$ [ANS.SE [question]]

On the other hand, predicates like *know* are argued to be underspecified, in the sense that either of (67a) or (67b) would be allowed by the grammar.

(67) a. know$_Q$ [ANS.WE [question]]

b. know$_Q$ [ANS.SE [question]]

This subcategorization story could, in principle, be carried over to the present account. If we take *wh-only* to be hosted by a dedicated projection, call it F_{wh} in the extended CP_{wh} projection, then the subcategorization would take the form in (68):[16]

(68) *surprise [$_{CP_{wh}}$ . . . [$_{F_{wh}}$ *wh-only*] . . .]

However, the problem with these subcategorization stories is that they are merely descriptive and fail to capture some very crucial generalizations: (i) in root questions and when embedded under *know*-like predicates both the WE and SE readings are available, but the SE reading is the preferred reading, and (ii) all the predicates that disallow embedding SE questions are Strawson-DE in their propositional incarnation. In the remainder of this section I suggest a different approach, in which we begin to do away with subcategorization altogether and let the split between WE and SE question-embedding predicates be governed by a combination of constraints already present in the grammar, namely the Strongest Meaning Hypothesis and a principle of structural economy.

Recall that strong exhaustivity amounts to a strengthening of the potential answers, as in (69a). In unembedded and upward entailing (UE) environments, a strongly exhaustive answer is going to be stronger, more informative, than its weakly exhaustive variant, as illustrated by the entailment in (69b).

(69) Let p be a WE answer and q other possible answers, then

a. SE answer: $p \wedge \neg q$
b. $(p \wedge \neg q) \rightarrow p$

Let's first tackle the observation that the SE reading is the preferred, possibly default, reading for root questions as well as for questions embedded under *know*-like predicates. One solution that immediately suggests itself is that of appealing to a version of the Strongest Meaning Hypothesis (cf. Heim 1991, Dalrymple et al. 1998, Singh 2011), a pragmatic principle which says that in a sentence with two possible readings, there is a preference for the strongest possible interpretation. In the case of questions, that would mean that the SE reading, the stronger reading, is the preferred reading.[17] The WE reading is still a possible reading, but contrary to the SE reading its use needs to be signaled either by an explicit denial, and/or by a continuation that contradicts the stronger SE reading. For example, in the scenario from before, repeated below, one cannot, out of the blue, make the claim in (71a).

(70) a.  original picture

b.  seen by Michael

[16] This is similar to what happens when predicates select for a particular mood on the embedded verb.

[17] Invoking the Strongest Meaning Hypothesis requires us to define a proper notion of entailment between questions, something that has proved to be very difficult for Hamblin/Karttunen approaches to questions. While in the case of embedded questions the entailment could be defined at the proposition level (above the embedded answer operator), in the case of root questions defining entailment becomes a real problem (cf. Groenendijk and Stokhof 1984 and, more recently, Roelofsen 2013).

(71) a. Speaker A: Michael knows_{WE} who's wearing purple.
Speaker B: Well, not really, he doesn't know_{SE} who's wearing purple because he doesn't know_{WE} who's not wearing purple.
b. Speaker C: Michael knows_{WE} who's wearing purple, and after I replace his right lens, he'll know_{WE} who isn't wearing purple as well.

Speaker B misinterprets Speaker A's statement as involving the SE use of *know*, and corrects it by adding that Michael doesn't know the negative extension of the question, which he expresses by using the WE reading of *know*. Similarly, in (71b), the speaker indicates that he's using the WE reading by adding a continuation which would have made the statement redundant had the SE reading been intended.

Next, let's turn to the issue of why *surprise* disallows SE readings of its embedded question. My proposal for this rests on a principle of economy. First, I assume, following Guerzoni and Sharvit (2007), that unlike in their propositional incarnations, emotive factives like *surprise* are not Srawson-DE when they embed questions.[18] This assumption is necessary in order to account for the fact that NPIs are not licensed in the scope of these predicates when they embed a question, contrary to what happens when they embed a proposition containing an NPI. Given that they do not create either an UE or (Strawson-)DE environment, it seems fair to conclude that they create a non-monotonic context when embedding questions. By virtue of being non-monotonic, neither a WE nor a SE reading of the embedded question would count as more informative, suggesting that as far as the Strongest Meaning Hypothesis is concerned, neither interpretation of the question is stronger. I claim that in such instances, a principle of economy kicks in and selects the more economical structure, namely the WE question, which lacks the additional functional projection hosting *wh-only*. [19]

One problem with such an account pointed out to me by an anonymous reviewer is that the behavior of *realize* seems to go against an analysis in terms of the Strongest Meaning Hypothesis. The issue is that unlike with *surprise*, there is no indication that *realize* is either (Strawson-)DE or non-monotonic; everything about its behavior would suggest that it creates an upward entailing environment. Under the proposal put forth above we would thus expect *realize* to embed strongly exhaustive questions, contrary to what the data in (72) indicates (adapted from Guerzoni and Sharvit 2007):

(72) #Michael didn't realize who loves Angela because he didnt realize that Dwight loves Angela.

We are faced with a couple of options at this point. We could continue pushing for the proposal above and try to come up with evidence for a (Strawson-)DE or, more likely, a non-monotonic semantics for question-embedding *realize*. The challenge wouldn't end there, though, for there are other predicates which disallow WE readings and yet are not as obviously non-UE, such as

[18]Note that in doing so, I'm assuming two lexical entries for *surprise*, one for when it embeds propositions and another for when it embeds questions; the latter is given in (i).

(i) $[\![\text{surprised}_Q]\!] = \lambda w.\lambda Q.\lambda x.\ \exists p\ \exists w'\ [Q(w')=p \wedge p(w) \wedge \text{surprised}_p(w)(p)(x)]$

Whether this is the right approach is still very much up for debate, but I will adopt it here for lack of a better alternative. See Crnič (2011) for a proposal that takes emotive factives not to be Strawson-DE across the board.

[19]Floris Roelofsen points out an interesting problem: in the case of NPIs under *surprise*, the insertion of *wh-only* would make the sentence grammatical/non-contradictory. So the question is whether such a structure should win over one without *wh-only*, even if it's at the expense of structural economy.

pleased. Finding a common semantic property for all of these predicates has been attempted before and continues to prove a daunting task (cf. Guerzoni 2007), so I will have to leave such endeavors for future research. I will suggest two other options here, both of which are more in the subcategorization spirit of the analyses currently entertained in the literature. One option, already mentioned above and repeated below in (73), would take WE-embedding predicates to disallow *wh-only* from their scope.

(73) *surprise/realize $[_{\text{CP}_{\text{wh}}} \ldots [_{\text{F}_{\text{wh}}}$ *wh-only*$] \ldots]$

There is, however, another way we could look at the problem. Instead of thinking about subcategorization for certain syntactic objects, e.g. the F_{wh} projection, we can think about it in terms of subcategorization for certain semantic objects. Recall that the propositions denoted by the exhaustified Hamblin set for the question in (74), provided in (74a), are always going to be mutually inconsistent, in that for no world will it ever be possible for more than one proposition in that set to be true. The same cannot be said for the plain Hamblin set, (74b).[20]

(74) Who came?

a. $Q_s = \{\text{only } x_1 \text{ came, only } x_2 \text{ came, only } x_1 \text{ and } x_2 \text{ came}\}$
b. $Q_w = \{x_1 \text{ came}, x_2 \text{ came}, x_1 \text{ and } x_2 \text{ came}\}$

Given that *surprise*-like predicates can only take as their argument the set in (74b), what we can say is that certain predicates (semantically) subcategorize for a set of mutually compatible propositions, i.e. for Q_w. In other words, a subcategorization story is viable even after switching from a system with answer-hood operators to one where the strength of exhaustivity is encoded within the question nucleus, the only difference being that now we talk about semantic rather than syntactic subcategorization.[21,22]

Summing up, in this subsection I have provided the beginning steps for an analysis that takes the distribution of *wh-only* in questions to be driven by an optimization principle. In particular, I have argued that in the presence of an upward-monotone verb we tend to go for the SE question unless something else blocks it, while in the context of a non-monotone verb, an economy condition kicks in and selects the WE question as the structurally more economical option. This proposal requires more empirical substantiation, but it's worth noting that if such an optimization story could be made to work, it would prove to be a conceptual step forward over subcategorization stories.[23]

[20] One could also think about it in terms of Q_w, but not Q_s, being closed under conjunction.

[21] George (2011) pursues a similar approach.

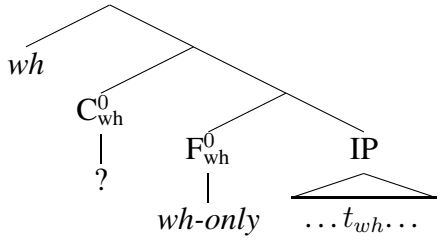
[22] It was pointed out to me that this approach would run into trouble when we look at embedded questions such as 'who the president is', for such questions as well denote sets of mutually incompatible propositions due to the uniqueness presupposition triggered by the definite article. Even so, predicates of the *surprise* class have no problem embedding such questions. While I agree with this observation, I'm not sure the example of presidency is necessarily the best to make a general case since, as soon as we change the predicate to something that is not restricted to singletons, the issue of incompatibility does no longer arise—suggesting that the notion of compatibility should be blind to the facts of the real world, e.g. that there can only ever be a single president.

[23] See also the proposal in Uegaki (2014), who pursues a similar idea.

3 Quantifiers in questions

Having postulated the presence of a covert operator in the structure, we now need to make sure that its presence does not give rise to unattested readings. Specifically, we're interested in what readings are predicted to arise when we look at the interaction between *wh-only*, a propositional operator that associates with the trace of the *wh*-phrase, and other scope-bearing elements in the structure. Given the underlying structure I propose for strongly exhaustive questions, repeated in (75), wherein I assume a certain structure for the left periphery of the *wh*-CP, the present account predicts that the relative scope of *wh-only* and quantifiers should be fixed, with *wh-only* always receiving highest scope with respect to quantifiers since quantifiers can only QR locally.

(75)



Questions with quantifiers have been known to give rise to multiple readings, such as single-pair, pair-list, and functional readings. For the purposes of this paper, we will focus solely on the single-pair reading, which is taken to come about as a result of moving the quantifier, for type-theoretical reasons, right under the question operator, as in (76) and (77). For each question below, (a) represents its LF, (b) its semantics, and (c) the set it denotes.

(76) Who did everyone kiss?

a. λp [who [2 [? [everyone [1 [t_1 kissed t_2]]]]]]
b. λp. $\exists$x [person(x) $\wedge$ p = $\forall$y [person(y) $\rightarrow$ y kissed x]]
c. {Everyone kissed Mary, Everyone kissed John, Everyone kissed Bill, . . . }

(77) Who kissed everyone?

a. λp [who [1 [? [everyone [2 [t_1 kissed t_2]]]]]]
b. λp. $\exists$x [person(x) $\wedge$ p = $\forall$y [person(y) $\rightarrow$ x kissed y]]
c. {Mary kissed everyone, John kissed everyone, Bill kissed everyone, . . . }

Direct questions, however, by virtue of being interpreted strongly exhaustively, have a more complex underlying representation than shown in (76)-(77). The presence of a covert *wh-only*, a scope-bearing element itself, allows for a second scope position, meaning that a quantifier (QP for short) should have the option to QR either below or above *wh-only*, as illustrated in (78).

(78) a. wh-only [QP kissed who]

$\left\{ \begin{array}{ll} \text{lowQR:} & \text{who [2 [Q [wh-only [QP [1 [}t_1 \text{ kissed } t_2\text{]]]]]]} \\ \text{highQR:} & \text{who [2 [Q [QP [1 [wh-only [}t_1 \text{ kissed } t_2\text{]]]]]]} \end{array} \right.$

b. wh-only [who kissed QP]

$\left\{ \begin{array}{ll} \text{lowQR:} & \text{who [1 [Q [wh-only [QP [2 [}t_1 \text{ kissed } t_2\text{]]]]]]} \\ \text{highQR:} & \text{who [1 [Q [QP [2 [wh-only [}t_1 \text{ kissed } t_2\text{]]]]]]} \end{array} \right.$

Let's begin by looking at *every* in both subject and object position, and at the two possible readings that come about depending on whether the quantifier QRs below or above *wh-only*. The first case we'll consider is *every* in subject position, and for transparency, we'll only look at what happens below the ? operator, i.e. what follows $p =$ in the final denotation. (Since *wh-only* associates with the trace of the *wh*-phrase, these LFs should be read as 'It's only the case that everyone kissed g(2)$_F$'.)[24]

(79) wh-only [everyone kissed who]

a. wh-only [everyone [1 [t_1 kissed g(2)]]]
$\forall a \in \mathscr{A}lt(g(2))\ [(\forall x(x \text{ kissed } a)) \rightarrow (\forall x(x \text{ kissed } g(2))) \subseteq (\forall x(x \text{ kissed } a))]$

b. everyone [1 [wh-only [t_1 kissed g(2)]]]
$\forall x[\text{person}(x) \rightarrow \forall a \in \mathscr{A}lt(g(2))\ [(x \text{ kissed } a) \rightarrow (x \text{ kissed } g(2)) \subseteq (x \text{ kissed } a)]]$

These LFs yield different truth conditions. (79a) is true in those worlds where the only person who was kissed by everyone is g(2), while (79b) furthermore imposes the restriction that g(2) be the only person who was kissed; that is, that every person kissed only g(2).[25] Observe that the highQR reading, namely *every*>*wh-only*, entails the lowQR reading, *wh-only*>*every*. When we step back and look at what the question *Who did everyone kiss?* is asking, we see that the lowQR construal yields the correct interpretation, since (79a) but not (79b) corresponds to the salient reading for this question. For example, consider a situation where everybody kissed Mary, and furthermore, some, but not all boys also kissed Suzy. There is no individual who satisfies the highQR LF in this situation, since even though Mary was kissed by everyone, she's not the only one who was kissed, as required by (79b). Given that in this situation *nobody* is not an appropriate answer, but a misleading answer at best, we can conclude that the highQR reading is disallowed.

Turning now to the question in (80), where the *wh*-phrase c-commands the quantifier, we derive the two readings in (80a) and (80b), depending on the QR site of the quantifier with respect to *wh-only*.

(80) wh-only [who kissed everyone]

a. wh-only [everyone [2 [g(1) kissed t_2]]]
$\forall a \in \mathscr{A}lt(g(1))\ [(\forall x(a \text{ kissed } x)) \rightarrow (\forall x(g(1) \text{ kissed } a)) \subseteq (\forall x(a \text{ kissed } x))]$

b. everyone [2 [wh-only [g(1) kissed t_2]]]
$\forall x[\text{person}(x) \rightarrow \forall a \in \mathscr{A}lt(g(1))\ [(a \text{ kissed } x) \rightarrow (g(1) \text{ kissed } x) \subseteq (a \text{ kissed } x)]]$

Here once again we see that the low QR, (80a), gives rise to a weaker reading, which coincides with our interpretation of the corresponding interrogative. (80a) requires that only g(1) be such that he kissed everyone, while (80b) furthermore requires that no one be kissed by anyone other than g(1). Summing up, it looks as if in order to derive the readings corresponding to the information sought by the question, the universal quantifier needs to QR below *wh-only*.

Let's turn now to existential quantifiers like *someone*. Here the judgments are much more subtle, which is mainly due to the nature of indefinites which can also be interpreted as specific indefinites. We begin by looking at cases where the indefinite is in subject position, as in (81):

[24] We'll also be ignoring the Assert operator $\mathcal{A}$ since its contribution is irrelevant for present purposes.

[25] I'm silently assuming that g(2) here can quantify over atoms as well as pluralities, i.e. groups of people, given that this is generally the assumption we make about the elements that belong to the quantificational domain of monomorphemic *wh*-phrases (cf. Dayal 1996).

(81) wh-only [someone kissed who]

a. wh-only [someone [1 [t_1 kissed g(2)]]]
$\forall a \in \mathscr{A}lt(g(2))$ [$\exists x$(x kissed a) $\rightarrow$ $\exists x$(x kissed g(2)) $\subseteq$ $\exists x$(x kissed a)]

b. someone [1 [wh-only [t_1 kissed g(2)]]]
$\exists x$[people(x) $\wedge$ $\forall a \in \mathscr{A}lt(g(2))$ [x kissed a $\rightarrow$ x kissed g(2) $\subseteq$ x kissed a]]

The LFs in (81) correspond to the following two readings: under the lowQR LF in (81a), the question corresponds to a reading for which the only (group of) person(s) that was kissed is g(2), while on its highQR LF in (81b) it says that there are some people who kissed only g(2), without excluding cases where other people were kissed. The lowQR LF gives us the reading that corresponds most closely to what we ask for when we pose the question *Who was kissed by someone?*. As for the reading corresponding to the highQR LF, unlike in the case of universals, I believe that it too is possible and that in fact it constitutes the most natural single-pair reading for a question such as *Who did one of your friends kiss?*. That this reading would be more salient is due to the fact that indefinites have a tendency to be interpreted specifically and that this is what QRing them high amounts to: a specific reading.

We have two options at this point: we could either give up on the claim that *wh-only* targets a special high position where quantifiers cannot QR above it—a necessary assumption given my implementation of the underlying structure of root questions—or we could see if there is another way to derive the specific reading for indefinites, without appealing to high QR. In fact, there is such a way. It is a well documented phenomenon that indefinites appear to exhibit unusually high scope, insofar as their scope-taking abilities don't seem to be syntactically constrained in the same manner as those of other quantifiers. It has been argued, however, that these specific readings do not necessarily have to be attributed to the fact that indefinites undergo high QR. One such proposal is due to Schwarzchild (2002), who claims that we can still maintain normal scopal behavior (akin to that of universals, say) by taking indefinites to be existential quantifiers over singleton domains. Taking an indefinite such as *one of your friends* to have as its domain a singleton set essentially renders the quantifier scopeless. The idea is that if such an indefinite denotes a singleton, whether the indefinite QRs above or below a scope-bearing element will become irrelevant since the two structures would give rise to the same interpretation; this is essentially identical to treating *one of your friends* on par with the lifted version of a definite description, which we know to be immune to scope. Suffice it to say, the fact that indefinites exhibit highQR-like readings is not necessarily a reflection of their syntactic behavior. We can thus continue to assume that indefinites, just like universals, QR below *wh-only*, but that unlike universals, they also have the option of quantifying over singleton domains, giving rise to a second possible reading. The same situation seems to hold when the indefinite is in object position, as in (82):

(82) wh-only [who kissed someone]

a. wh-only [someone [2 [g(1) kissed t_2]]]
$\forall a \in \mathscr{A}lt(g(1))$ [$\exists x$(a kissed x) $\rightarrow$ $\exists x$(g(1) kissed x) $\subseteq$ $\exists x$(a kissed x)]

b. someone [2 [wh-only [g(1) kissed t_2]]]
$\exists x$[person(x) $\wedge$ $\forall a \in \mathscr{A}lt(g(1))$ [a kissed x $\rightarrow$ g(1) kissed x $\subseteq$ a kissed x]]

Here again we see that the lowQR LF more closely corresponds to the non-specific reading of the indefinite, while the highQR LF gives us the interpretation for the specific reading. (82a)

says that only g(1) did any kissing, while (82b) says that there is someone that only g(1) kissed, but doesn't exclude kissing situations involving non-g(1) people. Just as before, I claim that the specific reading in these cases comes about via the same lowQR LF in (82a), with the difference being that the domain of the existential is a singleton.

Lastly, we see that the same condition holds true when we look at negative quantifiers: here too *wh-only* requires highest scope within the question IP.

(83) wh-only [nobody kissed who]

a. wh-only [nobody [1 [t_1 kissed g(2)]]]
$\forall a \in \mathscr{A}lt(g(2))$ [$\neg\exists x(x \text{ kissed } a) \rightarrow \neg\exists x(x \text{ kissed } g(2)) \subseteq \neg\exists x(x \text{ kissed } a)$]

b. nobody [1 [wh-only [t_1 kissed g(2)]]]
$\neg\exists x[\text{people}(x) \wedge \forall a \in \mathscr{A}lt(g(2))$ [x kissed a $\rightarrow$ x kissed g(2) $\subseteq$ x kissed a]]

For the question corresponding to (83), *Who did nobody kiss?*, only (83a) is a possible reading; (83a) says that nobody kissed g(2), while (83b) says that nobody is such that they kissed only g(2), which is clearly not the reading we get for such questions. Similarly for (84):

(84) wh-only [who kissed nobody]

a. wh-only [nobody [2 [g(1) kissed t_2]]]
$\forall a \in \mathscr{A}lt(g(1))$ [$\neg\exists x(a \text{ kissed } x) \rightarrow \neg\exists x(g(1) \text{ kissed } x) \subseteq \neg\exists x(a \text{ kissed } x)$]

b. nobody [2 [wh-only [g(1) kissed t_2]]]
$\neg\exists x[\text{person}(x) \wedge \forall a \in \mathscr{A}lt(g(1))$ [a kissed x $\rightarrow$ g(1) kissed x $\subseteq$ a kissed x]]

(84a) corresponds to a reading that picks out the (group of) individual(s) that kissed nobody, as requested by the question. (84b), on the other hand, selects the individuals who are such that they are not the only ones who kissed a particular person, i.e., the people who kissed someone who was also kissed by somebody else. This reading is clearly not available for such questions.

In summary, I have shown that when it comes to the relative scope of quantifier phrases and the covert operator *wh-only* I claim to be present in direct questions, *wh-only* always ends up receiving highest scope. This is to be expected under the assumption that *wh-only* resides in a dedicated functional projection in the extended periphery of the CP—which is to say, above the local environment of QR.

In the remainder of this paper I turn to a detailed analysis of the peculiar behavior of NPIs in constituent questions. In Sect. 4 I look specifically at the pattern of acceptability of NPIs in the scope of questions and discuss a contrast observed by Han and Siegel (1997), namely that NPIs are licensed only when they are c-commanded by the *wh*-phrase. I will show how the present account gives us all the necessarily tools to deal with this contrast and furthermore predicts that non-argumental *wh*-phrases should exhibit the same asymmetry with respect to their position relative to the NPI. One other prediction that will fall out seamlessly under the present account concerns strong NPIs like *in weeks*, which turn out to be disallowed from questions regardless of their strength or the relative c-command order with the *wh*-phrase, a novel prediction made by the present account. Finally, in Sect. 5 we change gears, switching our attention from the nuclear scope of the *wh*-phrase to its restrictor. Here I build on an observation made by Guerzoni and Sharvit (2007), who noted that plural but not single *which*-phrases allow NPIs in their restrictor, regardless of the overall strength of the question; I provide a compositional analysis for why this should be

so. I will conclude by arguing that our understanding of this contrast can also help us make sense now of why NPIs can never function as (or embedded within) the focus associate of overt *only*.

4 NPIs in the scope of questions

4.1 A contrast in questions with NPIs

Observe the contrast in (85), where it appears that the relative base positions of the *wh*-phrase and the NPI have an effect on the acceptability of these questions. Namely, if the NPI is not c-commanded by the *wh*-phrase, the only possible reading is that of a rhetorical question.[26] For the remainder of this section, a starred question is one that cannot receive a non-emphatic interpretation.

(85) a. Who ate anything at the party yesterday?
b. *What did anybody eat at the party yesterday?

To adduce support for this generalization, and to furthermore reinforce the fact that this is not simply a constraint against having *any* in subject position, observe the facts in (86), where the NPI acts as the object of a ditransitive verb. Han and Siegel (1997) note that an NPI is acceptable in a double-object construction (DOC) only if it acts as the indirect object and the *wh*-phrase as the direct object—that is, if the NPI is c-commanded by the *wh*-phrase in their base positions.[27,28]

(86) a. Who did Jeff introduce to anyone at the party?
b. *Who did Jeff introduce anyone to at the party?

Yet more evidence that this contrast is real comes from looking at adverbial NPIs like *ever*, which also appear sensitive to their position relative to the base position of the *wh*-phrase.

(87) a. Which girls have ever visited Paris?
b. *Which girls did John ever kiss?

The goal of any theory of questions that aims to account for the behavior of NPIs is to explain why NPIs receive non-emphatic interpretations in constituent questions only when the *wh*-phrase c-commands the NPI in their base positions, as summarized in (88).

(88) a. ✓ *wh*>NPI *acceptable*

[26] Rhetorical questions differ from regular constituent questions in that they are not information-seeking, but instead are used for declarative purposes, suggesting that they ought to be given a different analysis to begin with. I will not discuss such questions in this paper, but the interested reader can consult Han (2002), Abels (2003), Guerzoni (2004) and Caponigro and Sprouse (2007), among others.

[27] Recall that direct objects asymmetrically c-command indirect objects in DOCs (cf. Barss and Lasnik 1986, Bruening 2001).

[28] Further reinforcing the fact that this contrast is related to the interaction between the NPI and the *wh*-word, and not due to a constraint against having NPIs in subject position in questions, is the observation that in polar questions NPIs may serve as either the subject or the object, without giving rise to unacceptability:

(i) a. Did you eat anything?
b. Did anyone eat the cake?

b. *NPI>*wh* *ruled out*

Recall that, informally, the analysis we're pursuing here takes the acceptability of NPIs in a question to depend on their acceptability in the declarative corresponding to the question IP. Since direct questions are always interpreted exhaustively—that is to say, there is no weak/strong exhaustivity distinction—the questions in (85) will correspond to the declaratives in (89), respectively.

(89) a. It's only the case that x ate anything.
b. It's only the case that anyone ate x.

At this point we need to understand what it is about (89b) that makes the corresponding question unacceptable under a non-emphatic interpretation. Intuitively, the solution seems pretty straightforward: in (89b), but not in (89a), the NPI linearly intervenes between the covert *wh-only* and its associate, the *wh*-trace. However, for a proper analysis we need to show how this generalization can be compositionally derived. Essentially, we want the argument to go as follows: (i) when the NPI is c-commanded by the *wh*-phrase, it ends up being interpreted in the scope of *wh-only*, which creates a downward entailing context, as required by the NPI; and (ii) when the NPI c-commands the *wh*-phrase, it ends up being interpreted outside the scope of *wh-only*, hence in a non-DE environment, rendering the NPI unacceptable.

4.1.1 The problem

Let's begin by taking a closer look at the underlying structures of these types of questions. Recall that we're dealing with a quantifier, the NPI, which needs to undergo QR. The key to the solution lies in the position which the NPI QRs to, with respect to *wh-only*. Recall our argument from the previous section that quantifiers are ruled out from QRing above *wh-only*. That means that the only possible landing site for the NPI is below *wh-only*, as in (90):

(90) wh-only [who likes anyone]
LF: who [1 [Q [wh-only [anyone [2 [t_1 likes t_2]]]]]]

(91) wh-only [anyone likes who]
LF: who [2 [Q [wh-only [anyone [1 [t_1 likes t_2]]]]]]

As discussed at the beginning of this section, (90) and (91) contrast in acceptability. (91) is unacceptable, and the consensus in the literature is that this is due to the fact that the *wh*-phrase does not c-command the NPI in their base positions. However, as it stands, nothing in our arsenal of constraints helps us distinguish between the two LFs above: it is not predicted to matter where the NPI is with respect to the trace of the *wh*-phrase, since the NPI ends up being interpreted in the DE environment created by *wh-only* regardless of whether it is the subject or the object; so we falsely predict it to be licensed. We can see this by looking at the formulas in (92), which correspond to the two LFs in (90) and (91), and noting that both are downward entailing with respect to D.[29]

[29] Let's prove that (92b) is downward entailing with respect to D. In order to do so we need to show that (ia) entails (ib), where D' is a subset of D.

(i) a. $\forall a \in \mathscr{A}lt(y)\ [\exists x \in D\ like(x,a) \rightarrow (\exists x \in D\ like(x,y) \subseteq \exists x \in D\ like(x,a))]$
b. $\forall a \in \mathscr{A}lt(y)\ [\exists x \in D'\ like(x,a) \rightarrow (\exists x \in D'\ like(x,y) \subseteq \exists x \in D'\ like(x,a))]$

(92) a. $\forall$a$\in\mathscr{A}lt$(y) [$\exists$x$\in$D like(a,x) $\rightarrow$ ($\exists$x$\in$D like(y,x) $\subseteq$ $\exists$x$\in$D like(a,x))]
b. $\forall$a$\in\mathscr{A}lt$(y) [$\exists$x$\in$D like(x,a) $\rightarrow$ ($\exists$x$\in$D like(x,y) $\subseteq$ $\exists$x$\in$D like(x,a))]

And yet we know that (91) is unacceptable, contrary to what is predicted if this LF is available in cases where the NPI is not c-commanded by the trace of the *wh*-phrase; that is, if (91) receives the interpretation in (92b) then we are out of luck. The goal thus is to pinpoint what other independently motivated constraint we can use to rule out this QR configuration in cases where the NPI c-commands the *wh*-phrase so as to derive the fact that such questions are unacceptable, i.e. that they cannot receive the interpretation in (92b).

One could say then that we are at an impasse, as it appears that our way of construing strongly exhaustive questions overgenerates: while it accounts for the acceptability of NPIs in such questions, like (90), it also wrongly predicts that NPIs should be acceptable in strongly exhaustive questions across the board, as in (91). Fortunately, the analysis is not as simple as I have made it out to be here. The careful reader will have noticed that so far we have completely ignored the question of how exactly NPIs are "licensed." For ease of exposition I have simply been assuming that NPIs are acceptable whenever they appear in a DE environment, which up to this point served our purposes just fine. That NPIs are licensed in DE environments, however, is simply a description of the facts and provides no explanatory value; not to mention that it makes the wrong predictions in some cases, such as the ones we are concerned with here.

In the following section I will show why taking seriously the issue of how NPIs are licensed will provide us with the necessary tools to rule out the unacceptable configuration in (91). By taking the distribution of NPIs to be governed by the interplay between their activation of alternatives and a grammatical requirement that alternatives be used up by an exhaustivity operator, the problematic configuration will fall out as a violation of the constraint against crossing dependencies.

4.1.2 An intervention account

The account I will provide for the contrast in (93) relies on an exhaustification-based analysis of NPIs (cf. Krifka 1995; Lahiri 1998; Chierchia 2006, 2013).

(93) a. Who ate anything?
b. *What did anybody eat?

Let's begin by briefly outlining the exhaustification-based account of NPIs. NPIs have the semantics of regular existential quantifiers, the only difference being that they are additionally endowed with obligatorily active (scalar and domain) alternatives, as shown in (94a-b). Grammar encodes the presence of alternatives via a feature on the item, call it [D], and the alternatives' need to be used up (since alternatives need to be incorporated into the meaning) by requiring all items that bear such features to enter into an Agree-relation with an alternative-exhaustifying operator that bears the same feature, call it $\mathscr{E}xh_{[\text{D}]}$. Besides checking the feature on the NPI, this exhaustifier also makes a semantic contribution, given in (94c), namely that of negating all non-entailed

We proceed with a proof by contradiction. Assume that (ia) is true and (ib) is false. For (ib) to be false it must be the case, by the rules of logic, that the antecedent is true and the consequent false. For the consequent to be false, however, it has to be the case that $\exists$x$\in$D' like(x,a)) is false, namely that its own consequent is false. But we already assumed that the antecedent of (ib), $\exists$x$\in$D' like(x,a)), is true, so it cannot be the case that $\exists$x$\in$D' like(x,a)) is false. We have thus shown that (ia) cannot be true while (ib) is false.

alternatives.

(94) a. anything = λP. $\exists$x$\in$D [thing(x) $\wedge$ P(x)]
b. anything$^{\mathscr{A}lt}$ = $\{\lambda$P. $\exists$x$\in$D' [thing(x) $\wedge$ P(x)]: D'$\subseteq$D$\}$
c. $\mathscr{E}xh$ = λp. λw. p(w) $\wedge$ $\forall$q$\in\mathscr{A}lt$(p) [q $\rightarrow$ p$\subseteq$q]

In such a system, the fact that NPIs end up being acceptable only in DE environments falls out without our having to stipulate a 'licensing by DE-operators' condition. Once we take into account the nature of the alternatives (subdomains) and the semantics of the exhaustifying operator, we see that in UE environments a contradiction will ensue, while the operator's contribution in DE contexts is vacuous and simply returns the assertion.

(95) a. *$\mathscr{E}xh_{[D]}$ [$_{UE}$ ... anything$_{[D]}$ ...] *contradiction*

b. $\mathscr{E}xh_{[D]}$ [$_{DE}$ ... anything$_{[D]}$ ...] *vacuous*

Returning now to the issue of NPIs in questions, I claim that we can account for the unacceptable cases by looking at the interaction between focus association of covert *wh-only* with the *wh*-trace, on the one hand, and the exhaustification of the NPI, on the other. Specifically, the unacceptability of (93b) will turn out to be due to conflicting requirements between the syntactic constraints that govern agreement relations and the semantics of the operators involved.

Take a look at the two questions in (96) and (97). For each question we have to consider the two possible LFs that come about as a result of adjoining $\mathscr{E}xh_{[D]}$ either below or above *wh-only*$_{[F]}$, which, recall, is obligatorily present in direct questions given that they are always interpreted strongly exhaustive.

(96) Who ate anything?

a. wh-only$_{[F]}$ [$\mathscr{E}xh_{[D]}$ [$t_{[F]}$ ate anything$_{[D]}$]] *crossing dependencies*

b. $\mathscr{E}xh_{[D]}$ [wh-only$_{[F]}$ [$t_{[F]}$ ate anything$_{[D]}$]] *nesting dependencies*

(97) What did anyone eat?

a. wh-only$_{[F]}$ [$\mathscr{E}xh_{[D]}$ [anyone$_{[D]}$ ate $t_{[F]}$]] *nesting dependencies*

b. $\mathscr{E}xh_{[D]}$ [wh-only$_{[F]}$ [anyone$_{[D]}$ ate $t_{[F]}$]] *crossing dependencies*

What we see above is that the relative positions of the NPI and the *wh*-trace dictate the relative adjunction sites of the two covert operators in terms of what type of dependency is created. Assuming that crossing dependencies are ruled out by the syntax (cf. Pesetsky 1982, Kitahara 1997), and that the acceptability of a structure depends on the satisfaction of both syntactic and semantic constraints, we can put aside the cases where we have crossing dependencies and look only at the nesting dependencies to check whether the semantics gives rise to a coherent interpretation. When we consider configurations with nesting dependencies it is generally assumed that the outer dependency is evaluated with respect to the result of the innermost one. In other words, for our purposes,

we can assume that the most embedded dependency is calculated first, as outlined below. In the case of (96b), we first take care of the [wh-only$_{[F]}$ ... g(1)$_{[F]}$] dependency, as in (98a), and then the [$\mathscr{E}xh_{[D]}$ ... anyone$_{[D]}$] dependency, as in (98b).

(98) $\mathscr{E}xh_{[D]}$ [wh-only$_{[F]}$ [g(1)$_{[F]}$ ate anything$_{[D]}$]]

a. wh-only$_{[F]}$ [g(1)$_{[F]}$ ate anything$_{[D]}$]

$\forall a \in \mathscr{A}lt(g(1))\ [\exists x \in D(a \text{ ate } x) \rightarrow \exists x \in D(g(1) \text{ ate } x) \subseteq \exists x \in D(a \text{ ate } x)]]$

b. $\mathscr{E}xh_{[D]}$ [wh-only [g(1) ate anything$_{[D]}$]]

$\forall a \in \mathscr{A}lt(g(1))\ [\exists x \in D(a \text{ ate } x) \rightarrow \exists x \in D(g(1) \text{ ate } x) \subseteq \exists x \in D(a \text{ ate } x)]]$

Since the [wh-only$_{[F]}$ ... g(1)$_{[F]}$] dependency is calculated first, this creates a downward entailing environment, by virtue of the semantics of *wh-only*, as in (98a). This means that when it comes to calculating the [$\mathscr{E}xh_{[D]}$ ... anyone$_{[D]}$] dependency, the NPI will end up being interpreted as a regular indefinite given that the exhaustification of its alternatives is vacuous, as in (98b).[30] This is precisely the meaning corresponding to this question: 'Who are the people who ate something?'.

Turning now to (97a), repeated below in (99), we see that here we are dealing with the reverse situation. We first have to take care of the [$\mathscr{E}xh_{[D]}$ ... anyone$_{[D]}$] dependency, followed by the [wh-only$_{[F]}$ ... g(1)$_{[F]}$] dependency, as spelled out below.

(99) wh-only$_{[F]}$ [$\mathscr{E}xh_{[D]}$ [anyone$_{[D]}$ ate g(1)$_{[F]}$]]

a. $\mathscr{E}xh_{[D]}$ [anyone$_{[D]}$ ate g(1)$_{[F]}$]

$\exists x \in D(x \text{ ate } g(1)) \wedge \forall D' \subseteq D\ \neg \exists x \in D'(x \text{ ate } g(1)) = \bot$

b. wh-only$_{[F]}$ [$\mathscr{E}xh$ [anyone ate g(1)$_{[F]}$]] = $\bot$

Here we see that syntactically, the NPI needs to be exhaustified before *wh-only* has been able to apply and create the DE environment necessary for the NPI's consistent exhaustification, rendering it ungrammatical. In a sense, the NPI is checked for semantic coherence to the exclusion of *wh-only*, showing that just because the NPI is c-commanded by a DE-creating operator does not ensure that the environment supports downward entailing inferences at every single node in its c-commanding domain.[31] Given that the NPI is exhaustified in an upward entailing environment, a contradiction will ensue even before the second dependency can be calculated, thus rendering the entire construction unacceptable.

Putting these observations together, as in (100), we can see straight away why NPIs give rise to unacceptable questions when not c-commanded by the *wh*-trace: of the four possible LFs, only one satisfies both the syntactic and the semantic constraints discussed above.[32]

[30] Recall that exhaustification is vacuous whenever the alternatives are entailed.

[31] Basically, the NPI is too close to the DE operator for it to have the necessary effects.

[32] An anonymous reviewer points out that employing $\mathscr{E}xh$ instead of *wh-only* would have given us the same effects. I disagree with this observation for the same reasons as before: $\mathscr{E}xh$ does not create an environment in which exhaustification of the NPI will proceed non-contradictorily.

(100) a. Who ate anything?

i. wh-only$_{[F]}$ [$\mathscr{E}xh_{[D]}$ [$t_{[F]}$ ate anything$_{[D]}$]]

ii. $\mathscr{E}xh_{[D]}$ [wh-only$_{[F]}$ [$t_{[F]}$ ate anything$_{[D]}$]]

b. What did anyone eat?

i. wh-only$_{[F]}$ [$\mathscr{E}xh_{[D]}$ [anyone$_{[D]}$ ate $t_{[F]}$]]

ii. $\mathscr{E}xh_{[D]}$ [wh-only$_{[F]}$ [anyone$_{[D]}$ ate $t_{[F]}$]]

SYN	SEM	ALL
✗	✗	✗
✓	✓	✓
✓	✗	✗
✗	✓	✗

A possible follow-up question could be whether we can rule out the problematic constructions on purely semantic grounds. In other words, is there a way we can think of the syntactic constraint on crossing dependencies in terms of a violation of semantic principles? One such possibility would be to say that covert *wh-only* is an unselective binder. What that would mean is that in (100b.ii) *wh-only* would not be able to "skip over" the NPI's alternatives as it targets the trace: that is, it would operate unselectively on both sets of alternatives. Given that the NPI's alternatives are all stronger than the assertion, *wh-only* operating on them amounts to negating them all, which would result in a crash. Basically, the ungrammaticality of (100b.ii) could be attributed to the same factors that rule out a declarative such as *Only anyone came to the party*. In (100a.ii), however, *wh-only* can stop once it hits its target, meaning that it is not forced to enter into an Agree-relation with any lower alternative-bearing items as long as it hits its target.

In conclusion, I have shown that the unacceptable constructions are those where the only semantically coherent interpretation would arise by assuming a configuration with crossing dependencies, which is independently ruled out on syntactic grounds (and possibly semantic grounds as well). For this type of account to hold, we had to assume that NPIs need to enter into an Agree-relation with an exhaustifying operator $\mathscr{E}xh$ (cf. Chierchia 2013) and furthermore that a covert *wh-only* needs to associate with the *wh*-trace. We've dubbed our approach an "intervention account" because it appeals to the same principles used to rule out cases such as (101), which involve the intervention of a universal quantifier between the NPI and the DE-creating operator (cf. Linebarger 1980, Gajewski 2011, among others).[33]

(101) *Mary didn't tell everybody to buy any books.

While the problem here is of a different nature, the solution is essentially the same: an analysis of the interplay between the syntactic constraint against crossing dependencies and the semantic requirements of the exhaustifiers. Simplifying a bit for ease of exposition, let us assume that all quantifiers are endowed with active scalar alternatives, represented by the feature [σ], which must be exhaustified by an operator that eliminates all non-entailed alternatives, $\mathscr{E}xh_{[\sigma]}$. In the case of *everybody*, the quantifier's scalar alternative will be the existential, as in (102a). If exhaustification occurs above negation, the alternative becomes stronger and its exhaustification gives rise to a

[33] Such sentences can, however, receive an acceptable interpretation if the intervening quantifier "moves out of" the path of negation, in other words, if it receives wide scope. For this sentence, this reading would be something along the lines of 'Everyone is such that Mary didn't tell them to buy any books'.

scalar implicature, as in (102b).

(102) a. everyone$^{\mathscr{A}lt}$ = {λP. $\forall$x [person(x) $\rightarrow$ P(x)], λP. $\exists$x [person(x) $\wedge$ P(x)]}
b. $\mathscr{E}xh_{[\sigma]}$ Mary didn't see everybody$_{[\sigma]}$ = $\neg\forall$x [person(x) $\rightarrow$ saw(Mary, x)] $\wedge$ $\exists$x [person(x) $\wedge$ saw(Mary,x)]

So returning to the intervention cases, we see that just as before, in the presence of two distinct dependencies we expect two possible LFs, depending on the relative order of the two exhaustifiers, as illustrated in (103). Of these two LFs, only one conforms to the syntactic requirement of non-crossing dependencies, namely (103a). The problem with this configuration, however, is that the scalar implicature is calculated first, meaning that by the point at which the exhaustification of the NPI takes place, the environment will no longer be DE, but rather non-monotonic (see (102b)), which renders the exhaustification contradictory. In (103b) the exhaustification of the NPI is calculated before the implicature associated with *everybody* is included, resulting in a semantically coherent LF. The problem with this LF though, as mentioned, is that it requires crossing dependencies, which are ruled out independently by the syntax.

(103) *Mary didn't give everybody anything.
$\mathscr{E}xh_{[\text{D}]}$ $\mathscr{E}xh_{[\sigma]}$ Mary didn't give everybody$_{[\sigma]}$ anything$_{[\text{D}]}$
$\mathscr{E}xh_{[\sigma]}$ $\mathscr{E}xh_{[\text{D}]}$ Mary didn't give everybody$_{[\sigma]}$ anything$_{[\text{D}]}$

SYN	SEM	ALL
✓	✗	✗
✗	✓	✗

There is a preponderance of such instances in the literature on polarity items, including intervention by presuppositional elements (cf. Homer 2011 and Chierchia 2013 on how to implement these fact within an alternative-based approach), as well as the peculiar behavior that governs the co-occurrence of PPIs and NPIs discussed in Homer (2011).

4.1.3 A previous account: Han and Siegel (1997)

To date, the most detailed account for the asymmetry in (104) is due to Han and Siegel (1997).

(104) a. Who ate anything?
b. *What did anybody eat?

The authors assume a Groenendijk and Stokhof (1984) analysis of questions wherein questions denote partitions, but argue that their proposal is also compatible with a semantics of questions which takes them to denote sets of possible answers. To facilitate this discussion, I will present Han and Siegel's account in a Hamblin/Karttunen style. They assume that the questions in (104) denote the sets of answers in (105a) and (105b), respectively.

(105) a. $\left\{ \begin{array}{l} \text{Nobody ate anything,} \\ \text{Mary ate anything,} \\ \text{John ate anything,} \\ \vdots \end{array} \right\}$ b. $\left\{ \begin{array}{l} \text{Anybody ate nothing,} \\ \text{Anybody ate cake,} \\ \text{Anybody ate salad,} \\ \vdots \end{array} \right\}$

Their proposal is quite brilliant in its simplicity. The idea is that what is responsible for the licensing of the NPI in (105a) but not in (105b) is the availability of a proposition in the answer set in which the NPI is licensed, namely the negative proposition 'Nobody ate anything'. They claim that whenever the NPI is c-commanded by the *wh*-phrase in their base positions, one of the possible answers is going to be the proposition in which the NPI is c-commanded by a negative quantifier. Given that NPIs are licensed by negative quantifiers in regular declaratives, the acceptability of NPIs in these questions would fall out instantly. On the other hand, whenever the NPI is not c-commanded by the *wh*-phrase, no answer, not even the one with a negative quantifier, would constitute a proposition in which the NPI is licensed, as seen by the form of the answers in (105b).

This account, while elegant in its simplicity, suffers from a number of pitfalls. Among them is the crucial reliance on the presence of negative answers. In order for the contrast to obtain under their account, Han and Siegel need to assume that question denotations contain negative answers. This, however, goes against what is generally assumed to be the case. As we discussed in the previous section, questions carry an existence presupposition (be it due to an answer-hood operator or a filter), meaning that negative answers will never actually be part of the denotation of the question. There are, of course, cases where negative answers are felicitous. In order to account for the felicity of a discourse such as in (106), the general take has been to assume that negative answers implicitly deny the presupposition of the question, rather than actually answering it (cf. Dayal 1996, Comorovski 1996, among others).

(106) Who ate cake?
Nobody did.

Dayal points out a contrast with cleft questions to illustrate this more clearly. The idea here is that cleft constructions carry a conversational implicature to the effect that it is part of the common ground that somebody ate cake, making a negative answer infelicitous: the hearer cannot implicitly deny a presupposition that he himself holds in his common ground already.

(107) Who is it that ate cake?
#Nobody did.

Another issue that arises with Han and Siegel's account is the fact that it has nothing to say about the weak/strong exhaustivity distinction and why that seems to play a role in the acceptability of NPIs. Given the way they set up their proposal, it is hard to imagine how they would deal with WE questions other than by possibly claiming that WE questions do not allow negative answers—a purely stipulative move.

Finally, I'd like to point out another set of data that would render their account inadequate. As far as I know, these data have not been discussed in the literature on NPIs in interrogatives. They involve so-called strong NPIs, which have a more restricted distribution than the *any*/*ever*-type NPIs. Among these strong NPIs we find *in weeks* and *either*. Just like *any* and *ever*, they are ruled out in positive contexts and acceptable in the scope of negation and negative quantifiers.

(108) a. Mary has *(not) seen John in weeks/either.[34]
b. Nobody has talked to me in weeks/either.
c. Mary has *(not) seen anybody.

[34] A star before parentheses indicates that the sentence is unacceptable without the element in the parentheses.

d. Nobody ever talked to anybody.

Unlike *any* and *ever*, however, they are not acceptable in the scope of *few* and *only*, as shown below.

(109) a. Few students brought anything to the reception.
b. Only the students brought anything to the reception.
c. *Few students have seen her in weeks.
d. *Only John has talked to me either.

Incidentally, these strong NPIs are also ruled out from questions, even when they are c-commanded by the *wh*-phrase.

(110) a. *Who read that essay *either*?
b. *Who has visited Mary *in weeks*?

These facts create a problem for an account that takes the acceptability of NPIs to be dependent on their acceptability in the negative answer (granting that there actually is such an answer). Given that both *either* and *in weeks* are perfectly acceptable in the scope of negative quantifiers, as shown above, Han and Siegel's account would lead us to conclude that they should also be acceptable in questions, contrary to fact. In the following subsection I outline how the present account of questions can derive—and in fact actually predicts—that this asymmetry should hold between weak NPIs like *any* and strong NPIs like *in weeks*.

4.2 Prediction: Strong NPIs in questions

Strong NPIs such as *in weeks* and *either* (cf. Gajewski 2011) are characterized by their inability to survive in weakly negative environments, such as the scope of *only*.

(111) a. Bill hasn't visited Mary *in weeks*.
b. *Only Bill has visited Mary *in weeks*.

(112) a. Mary doesn't like you *either*.
b. *Only Mary likes you *either*.

As mentioned above, it turns out that strong NPIs are also disallowed from occurring in questions, both embedded and non-embedded, as shown in (113).

(113) a. *Mary wants knows who has visited John *in weeks*.
b. *Who read that essay *either*?
c. *Who has visited Mary *in weeks*?

The present analysis straightforwardly accounts for these facts since it assumes the presence of a covert *wh-only*, with a semantics equivalent to overt *only*, in questions. Within this analysis, we can reduce the unacceptability of strong NPIs in questions to their unacceptability in the scope of overt *only*; that is, whatever account we use to rule out strong NPIs from the scope of overt *only* in declaratives we can use to account for their unacceptability in questions.

One proposal for the asymmetry between weak and strong NPIs comes from Gajewski (2011) and Chierchia (2013). These authors claim that weak NPIs like *any* and *ever* are licensed in a partial proposition as long as they are licensed in the assertive component of meaning. In other words, that *any* is acceptable in (114) is due to the fact that the entailment from (114a) to (114b) goes through, that is, because *any* is in a DE environment with respect to the non-presuppositional contribution of *only*.

(114) Only Bill ate any pizza.
   a. Nobody other than Bill ate pizza.
   b. Nobody other than Bill ate mushroom pizza.

On the hand, in order to account for the unacceptability of *in weeks* or *either* in these same environments, they propose that strong NPIs are also sensitive to other components of meaning. Since the presuppositional component of an *only* proposition, namely its prejacent, creates an upward entailing environment, the enriched meaning will no longer be downward entailing (but merely non-monotonic). So the fact that these NPIs are unacceptable under *only*, as seen in (115), can be attributed to the lack of entailment between (115a) and (115b), two non-monotonic propositions (I'm using *in days* to represent a subset alternative to *in weeks*).

(115) *Only Bill has seen Mary in weeks.
   a. Bill has seen Mary in weeks and nobody else has seen her in weeks.
   b. Bill has seen Mary in days and nobody else has seen Mary in days.

One way to implement this in an alternative exhaustification framework is to say that the exhaustifier that agrees with strong NPIs is different from the one that agrees with weak NPIs. The strong NPI exhaustifier, call it $\mathscr{E}xh_{[\text{D-S}]}$, is such that it negates alternatives whenever they are not entailed by the assertion with respect to the enriched meaning. Since the enriched meaning of *only* is always going to be non-monotonic, all subdomain alternatives will be non-entailed, and thus required to be negated. Negating them, however, will contradict the assertion, rendering these NPIs unacceptable in such environments. I outline the contrast between weak and strong NPIs in (116).

(116) a. *$\mathscr{E}xh_{[\text{D-S}]}$ [only ... in weeks$_{[\text{D-S}]}$ ...] *contradiction*

   b. $\mathscr{E}xh_{[\text{D}]}$ [only ... anything$_{[\text{D}]}$ ...] *vacuous*

In conclusion, what I have shown in this subsection is that given an analysis of questions that takes their strongly exhaustive reading to be the result of a covert *wh-only*, the asymmetry between weak and strong NPIs in the scope of such questions falls out immediately, simply by an appeal to independently motivated proposals for the behavior of such NPIs.

In more recent work, Guerzoni and Sharvit (2014) propose to account for the licensing of NPIs in strongly exhaustive questions by claiming that these questions are underlyingly of the form 'whether or not *p*' with the 'whether or not' undergoing ellipsis. This, they argue, provides a common source for strong exhaustivity as well as NPI licensing. They face a problem, however, when it comes to the data I discussed above, namely the ungrammaticality of strong NPIs in these questions. In order to address this, the authors point to data such as (117), involving vehicle change.

The idea is that the ellipsis of 'whether or not' is similar in nature to what we see in vehicle change, so NPI licensing should behave on a par in the two constructions.

(117) a. Bill didn't buy any books but Fred did.
b. ??I haven't seen Mary for weeks, but Bill has.

The problem is that (117b) is by no means as degraded as they claim it is. Native speakers confirm that in fact they observe no difference between (117a) and (117b), meaning that weak and strong NPIs exhibit no difference with respect to licensing in vehicle change constructions. So it seems that the challenge still remains for Guerzoni and Sharvit's proposal. However, even putting this point aside, it's still unclear how they would go about accounting the Han and Siegel effects discussed earlier.

4.3 Prediction: High vs low *wh*-adjuncts

Another prediction made by our account relates to the behavior of NPIs with respect to non-argumental *wh*-phrases. Specifically, we should expect a difference between high and low *wh*-adjuncts with respect to the acceptability of subject NPIs. If we assume that low *wh*-adjuncts, such as *how* and *where*, adjoin at the VP level and are thus base-generated below the subject, questions with subject NPIs should only allow for a rhetorical interpretation, similarly to cases where the *wh*-phrase is the object of the verb. Effectively, a low adjunct should behave like an object *wh*-phrase with respect to an NPI in subject position since the NPI ends up outside the c-commanding domain of the *wh*-trace. That this contrast holds can be seen in (118), where we show that high *wh*-adjuncts like *why* allow for non-emphatic readings even with subject NPIs.[35]

(118) a. Why did anyone leave before the party was over?
b. *How did anyone cook this?
c. *Where did any linguist go to grad school?

At the same time, we expect no difference in acceptability between high and low adjuncts when the NPI is in object position, as shown in (119). The idea here is that regardless of the high/low distinction, *wh*-adjuncts will always attach only as low as the VP, meaning that transitive objects will always end up in their c-command domain.

(119) a. Why did Mary bring anything?
b. How did he manage to cook anything?
c. Where does Mary do any of her homework?

Further arguments that this is a robust structural asymmetry derive from double object constructions involving manner adverbs such as *how*.[36] Consider the examples below:

(120) a. *How did John sell any students tickets?
b. How did John sell his students any tickets?

[35] Recall that I use an asterisk to indicate the unavailability of a non-emphatic reading.
[36] I'd like to thank Masha Polinsky for bringing these examples to my attention.

Since we are dealing with a double object construction, we know that the dative object, the NPI *any students* in (120a), is generated high, in Spec of VP, and that the manner adverb, *how*, is a VP adjunct, hence lower in the structure than the NPI (Larson 1988, 1990). On the other hand, when the NPI serves as the direct object, it functions as the complement of the verb and thus ends up being c-commanded by the adjunct, helping us understand the contrast between the sentences in (120). The structures we are dealing with in (120) are provided in (121a) and (121b), respectively:

(121) a. [$_{vP}$ John [$_{VP}$ any students [$_{VP}$ how [$_{V'}$ sell tickets]]]]
b. [$_{vP}$ John [$_{VP}$ his students [$_{VP}$ how [$_{V'}$ sell any tickets]]]]

This prediction regarding *wh*-adjuncts is not necessarily specific to my account, but rather falls out as a consequence of the claim that NPIs are licensed only if c-commanded by the *wh*-phrase. One could imagine that Han and Siegel's account could explain this observation as well, under the assumption that questions with *wh*-adjuncts also allow for negative answers, although it would be quite difficult to imagine what such answers might look like.[37]

5 NPIs in the restrictor of the *wh*-phrase

5.1 The problem

Our discussion up to this point has focused exclusively on the behavior of NPIs in the nucleus of questions. However, as pointed out by Guerzoni and Sharvit (2007), when NPIs appear in the restrictor of the *wh*-phrase, their acceptability appears to be independent of whether the question is interpreted as strongly or weakly exhaustive. In (122) below we have two unembedded questions which are independently assumed to be strongly exhaustive. In (123), on the other hand, the questions are embedded under *surprise*, which is assumed to embed only weakly exhaustive questions. The fact that we observe the same variability in both cases in terms of the acceptability of the NPI in the restrictor of the *wh*-phrase suggests that NPI acceptability in these environments is to be attributed to a different source.

(122) a. Which students who have any books on NPIs are selling them?
b. *Which student who has any books on NPIs is selling them?

(123) a. It surprised her which students who took any linguistics passed the exam.
b. *It surprised her which student who took any linguistics passed the exam.

For the present account, the fact that NPIs are acceptable even in questions such as (123b) suggests that the licensing of the NPI occurs at a more embedded level than what we have been assuming to be the case when NPIs occur in the nucleus of the question; in other words, (123a) but not (123b) has a level at which the NPI can be said to be licensed. At the same time, we see that whatever licenses NPIs in strongly exhaustive questions as in (122) is either not available, or simply blocked, as can be see by the fact that (122b) is unacceptable. What I hope to convince the reader of in this section is that what is interesting about this data set is not so much the fact that

[37] I can imagine that some might find even the questions marked as "good" bad. One potential response to that could be that their grammars simply don't allow *wh-only* to associate with non-arguments.

NPIs can, sometimes, be acceptable in weakly exhaustive questions, like (123a), but rather the fact that they are not uniformly acceptable in strongly exhaustive ones, like (122b).

Looking at the data in (122) and (123), we see that the only difference between the (a) and (b) sentences is the fact that the *wh*-phrase is plural in (a) and singular in (b). So the first question we need to address is what it is about the plurality of *wh*-phrases that, in a sense, rescues NPIs from an environment that otherwise would have led to a crash. In trying to account for this observation, Guerzoni and Sharvit point out the parallel with sentences such as those in (124), where we see that NPIs are licensed in the restrictor of a plural definite phrase, (124a), but not in the restrictor of a singular definite, (124b).

(124) a. The students who took any linguistics classes passed the exam.
b. *The student who took any linguistics classes passed the exam.

To account for why NPIs are licensed in the restrictor of the plural definite determiner, consider the truth-conditions of (124a), given in (125). The idea is that the assertive component of the definite determiner, given in (125a), is precisely the same as that of *every*, meaning that its left argument, the restrictor, supports downward entailing inferences: hence the acceptability of NPIs in this position.

(125) The students who took any linguistics passed the exam.
a. *Assertion*: $\forall$x [(x is a student who took any ling) $\rightarrow$ (x passed)]
Presupposition: $|\{\lambda$x. x is a student who took any ling$\}| \neq \emptyset$
b. [$\mathscr{E}xh_{[D]}$ [the students who took [any ling]$_{[D]}$]] passed ✓ $\mathscr{E}xh>$the$_{pl}$

Turning now to the singular definite determiner, I follow Gajewski (2011) and Chierchia (2013) and propose that its assertive component is as in (126a), with the difference between the singular and plural being that the singular also has an existence requirement incorporated into the assertive component. See Yablo (2005) for a discussion on why the behavior of singular definites might suggest that the non-empty requirement is part of the assertive component (rather than merely a presupposition). It's precisely this additional requirement that disrupts the otherwise downward monotonicity of the restrictor, accounting for the unacceptability of the NPI in this position.

(126) *The student who took any linguistics passed the exam.
a. *Assertion*: $\exists$y [(y is a student who took any ling) $\wedge$
$\forall$x [(x is a student who took any ling) $\rightarrow$ (x passed)]]
Presupposition: $|\{\lambda$x. x is a student who took any ling$\}| = 1$
b. *[$\mathscr{E}xh_{[D]}$ [the student who took [any ling]$_{[D]}$]] passed ✗ $\mathscr{E}xh>$the$_{sg}$

To recap, the denotations of the determiners are as in (127):

(127) a. $[\![\text{the}_{pl}]\!] = \lambda$P.$\lambda$Q:|P|$\neq\emptyset$. $\forall$x[P(x) $\rightarrow$Q(x)]
b. $[\![\text{the}_{sg}]\!] = \lambda$P.$\lambda$Q:|P|=1. $\exists$y[P(y) $\wedge$ $\forall$x[P(x) $\rightarrow$ Q(x)]]

Guerzoni and Sharvit (2007) propose to account for the facts regarding NPIs in the restrictor of *which*-phrases by taking these phrases to behave like definite noun phrases: "The idea would be, then, that a *which*-phrase contains a hidden, cross-categorial, *the* (which means that the restrictor

of *which* is in the scope of *the*)" (Guerzoni and Sharvit 2007, p. 19).[38,39] Noting the similarities between the two sets of data represents a very significant insight on their pair. However, they do not provide a compositional account that shows why this parallel should hold. The next section presents one such account.

5.2 A reconstruction account

5.2.1 Weakly exhaustive questions

Building on the insight by Guerzoni and Sharvit laid out above I propose to account for the contrast we observe in (128) by the same means that give us the contrast discussed above between the singular and plural definite article.

(128) a. It surprised her which girls who took any linguistics classes passed the exam.
b. *It surprised her which girl who took any linguistics classes passed the exam.

The trick behind compositionally deriving the parallel between the restrictor of *which*-phrases and that of the definite article is to consider how *wh*-traces are interpreted. Incidentally, the semantics of movement, namely the copy theory of movement, takes us one step closer (cf. Chomsky 1993; Sauerland 1998; Fox 1999, 2002). For transparency, up to this point I have taken the trace of the *wh*-phrase to be interpreted as a plain variable, as it made no difference one way or the other for the purposes of the analysis. We know, however, that copies can be more complex than that. Specifically, in the case of hand, I propose that the traces of the *which*-phrases will be interpreted as in (129a) and (129b), respectively, where I provide the LFs for the nucleus of the question, namely the embedded IPs, a well as their corresponding interpretations.

(129) a. [$_{IP}$ the$_{pl}$ [girls who took any ling] [passed]]
$\rightarrow$ $\forall$x [(girl took any$^{\checkmark}$ ling)(x) $\wedge$ x=z]$\rightarrow$[passed(x)]
b. [$_{IP}$ the$_{sg}$ [girl who took any ling] [passed]]
$\rightarrow$ $\exists$y [(girl took any$^{\times}$ ling)(y) $\wedge$ y=z] $\wedge$
$\forall$x [(girl took any$^{\checkmark}$ ling)(x) $\wedge$ x=z]$\rightarrow$[passed(x)]

Assuming, as we have, that the NPI can be licensed/exhaustified within the nucleus of the question, it should be pretty easy to see that the NPI will be licensed in (129a) and not in (129b), since it

[38] They actually assume a different analysis for why plural and not singular definite articles license NPIs, but the details of this are orthogonal to the present discussion.

[39] An anonymous reviewer wonders why we couldn't have offered an analysis of NPI licensing in questions that builds on their licensing in definites. The reviewer draws on claims in Krifka (1995) and Lahiri (2002) that given the all-or-nothing presuppositions concerning answers to questions like (i), the use of a covert definite article seems to be called for regardless.

(i) Bill doesn't know who was at the party.

I definitely agree with the intuition behind this approaches and I concur that like it is needed to capture the meaning in (i), possibly by making the definiteness part of the answer-hood operator but I can't see how far such an approach will get us with respect to the issues of NPI licensing: weak versus strong exhaustive questions and subject-object asymmetries. It's unclear what the difference between strong and weak exhaustivity would end up being if we say that strong but not weak exhaustivity involves a definite description. It can't be an issue of universal (definite description) versus existential quantification since weak exhaustivity is not akin to existential quantification (unlike mention some readings). Furthermore, what would we want to say about the Han and Siegel effects?

occurs in a DE environment in the former—the restriction of a universal—but not in the latter. Note that for this parallel to hold, it's crucial to assume that the definite article is specified for whether it is plural or singular.

We still need to worry about the higher copy of the moved *wh*-phrase, however. If we assume that *which*-phrases are existential quantifiers, as we have been doing all along, and that the relative clause is also interpreted in the higher copy, then we make the prediction that NPIs should be ruled out regardless of the plurality of the head noun. To see why, consider the LFs for the full question in (130a) and (130b).

(130) a. [$_{CP}$ which girls who took any ling [1 [? [$_{IP}$ the$_{pl}$ girls who took any ling passed]]]]
b. [$_{CP}$ which girl who took any ling [1 [? [$_{IP}$ the$_{sg}$ girls who took any ling passed]]]]

Under the assumption that the relative clause is also interpreted in the highest copy, we now have to check whether the NPI is licensed in this position as well. Given an account that takes *which*-phrases to be existential quantifiers, the NPI in the higher copy will always end up being interpreted in the restrictor of an existential, irrespective of the plurality of the head noun. Since the restrictor of an existential is not the right environment for an NPI, we predict NPIs to fail across the board. In (131) I offer the semantics corresponding to the LFs in (129) and (130) and use ✗ and ✓ to indicate which copy of the NPI is licensed where.

(131) a. $\exists$z [(girl took any$^{✗}$ ling)(z) $\wedge$
p = $\forall$x [(girl took any$^{✓}$ ling)(x) $\wedge$ x=z]$\rightarrow$[passed(x)]]
b. $\exists$z [(girl took any$^{✗}$ ling)(z) $\wedge$
p = $\exists$y [(girl took any$^{✗}$ ling)(y) $\wedge$ y=z] $\wedge$
$\forall$x [(girl took any$^{✓}$ ling)(x) $\wedge$ x=z]$\rightarrow$[passed(x)]

What we see, then, is that in order for NPIs to survive in the restrictor of a *which*-phrase, the relative clause containing the NPI cannot be interpreted in its surface position, as the semantics in (131) shows. What we want now is a way to interpret only the lower copy of the NPI. This can easily be achieved by imposing obligatory reconstruction of the relative clause, a phenomenon independently observed in cases of binding (cf. Fox 1999, 2002; Sauerland 2000). Consider the examples below:

(132) a. *[Which argument that John$_i$ was wrong]$_j$ did he$_i$ accept t_j in the end?
b. [Which girl that John$_i$ saw]$_j$ did he$_i$ like t_j better?
c. [Which girl that he$_i$ saw]$_j$ did John$_i$ like t_j better?

The ungrammaticality of (132a) shows us that arguments, in this case *that John was wrong*, are obligatorily reconstructed in their base positions. Since *John* is part of the argument of the head noun, it must reconstruct, ending up in a position c-commanded by the co-indexed pronominal *he*. This, however, induces a Condition C violation, hence the ungrammaticality of (132a). Adjuncts, unlike arguments, do not have to reconstruct, as can be seen by the acceptability of (132b) (cf. Safir 1999). However, in cases where lack of reconstruction would induce a Condition C violation, the adjunct does have the option of reconstructing, as it must be the case in (132c). In other words, we see that adjuncts can optionally reconstruct whenever interpretation in their surface position would give rise to an unacceptable configuration.

Returning to the case at hand, I claim that in order for questions with NPIs in the restrictor of *which*-phrases to be acceptable, the *wh*-phrases must reconstruct, which, in effect, is similar to what goes on in (132c), where the only plausible interpretation is one involving reconstruction of the *wh*-phrase below the R-expression.[40] Thus the actual LFs for the questions under discussion will be as in (133):

(133) a. [$_{CP}$ which girls [1 [Q [$_{IP}$ the$_{1(pl)}$ [girls who took any ling] [passed]]]]]
$\exists$z [girl(z) $\wedge$ p = $\forall$x [(girl took any$^{\checkmark}$ ling)(x) $\wedge$ x=z]$\rightarrow$[x passed]]

b. [$_{CP}$ which girl [1 [Q [$_{IP}$ the$_{1(sg)}$ [girl who took any ling] [passed]]]]]
$\exists$z [girl(z) $\wedge$ p = $\exists$y [(girl took any$^{\times}$ ling)(y) $\wedge$ y=z] $\wedge$
$\forall$x [(girl took any$^{\checkmark}$ ling)(x) $\wedge$ x=z]$\rightarrow$[x passed]

Before turning to strongly exhaustive questions, let's consider a final derivation involving NPIs in the restrictor of a non-subject *wh*-phrase, as in (134). We'll see that even though this derivation is slightly more complex than those presented above, it ultimately gives us the intended meaning, assuming once again that the relative clause can reconstruct to a position where the NPI is licensed.

(134) It surprised me which girls who took any linguistics you passed.

Since the *which*-phrase originates in object position, it must undergo two separate movements: one in order to resolve the type mismatch caused by the fact that we are dealing with a quantifier in object position, and another to check the [+*wh*] feature.[41] Assuming trace conversion throughout, the first QR must leave behind a copy of type *e* in order to satisfy the type requirements of the verb. In order to leave a type e trace behind, the definite article needs to be interpreted as the uniqueness operator. The second instance of QR, i.e. the *wh*-feature-driven movement, will leave behind a copy headed by the higher type definite determiner, similarly to what we assumed above. In (135) I provide the LF of the plural *which*-phrase and the corresponding interpretation (the gray material corresponds to the copies that end up not being interpreted).

(135) [$_{CP}$ which girls who took any ling [1 [Q [$_{IP}$ the$_{1(pl)}$ girls who took any ling [1 [you passed the$_{1(\iota)}$ girls who took any ling]]]]]]

a. $\exists$z [girl(z) $\wedge$ [λv. p = the$_{pl}$[λx. (girls who took any ling)(x) $\wedge$ x=v][λv. you passed the$_{\iota}$[λy. (girls who took any ling)(y) $\wedge$ y=v]]](z)]

b. $\exists$z [girl(z) $\wedge$ [p = the$_{pl}$[λx. (girls who took any ling)(x) $\wedge$ x=z][λz. you passed the$_{\iota}$[λy. (girls who took any ling)(y) $\wedge$ y=z]]]

c. $\exists$z [girl(z) $\wedge$ p = $\forall$x[(girls who took any ling)(x) $\wedge$ x=z] $\rightarrow$ [you passed ιy[(girls who took any ling)(y) $\wedge$ y=x]]]

d. $\exists$z [girl(z) $\wedge$ p = $\forall$x[(girls who took any ling)(x) $\wedge$ x=z] $\rightarrow$ [you passed x]]

[40] I am ignoring the question of whether the head noun is also interpreted in the upstairs copy since this issue is still being debated in the literature and makes no difference one way or the other for our purposes. For more on this issue, see Sauerland (1998, 2000), Safir (1998), Sharvit (1999), to name just a few.

[41] Note that in general, a single move would suffice to satisfy both requirements. This is not an option in the present case, however, since a single move would leave us with no landing site at which the singular and plural *which*-phrases would be differentiated for the purposes of NPI licensing, given that the lowest copy will always be interpreted as the unique individual satisfying the relevant property.

So what we see here is that in order for the NPI to be licensed, we need genuine reconstruction of the relative clause to a QR position, namely the middle copy. I'm assuming that the relative clause is not interpreted in the lowest copy, since that would mean having the NPI in the nucleus of a universal—that is, an upward-entailing environment.[42]

There are also cases such as (136) which involve both the potential for a Condition C violation as well as the issue of NPI licensing.

(136) [Which boys who gave Mary$_i$ any flowers]$_j$ did she$_i$ ask t_j on a date?

On the one hand we need the adjunct to reconstruct so as not to have the NPI be interpreted in the restrictor of an existential, while at the same time we need to stay clear of complete reconstruction so as to avoid a Condition C violation which would come about by interpreting the R-expression below the pronoun. Such examples also point to the need for intermediate reconstruction.[43]

5.2.2 Strongly exhaustive questions

What about the strongly exhaustive questions in (137)?

(137) a. Which students who took any linguistics classes passed?
b. *Which student who took any linguistics classes passed?

The acceptability of (137a) is quite straightforward since it follows from the same principles as the acceptability of an NPI in the restrictor of a plural *which*-phrase under *surprise*. What's not as straightforward, however, is why (137b) is unacceptable, given that the NPI ends up in the scope of the covert *wh-only* which is assumed to always be present in direct questions. In other words, what we need to ask ourselves is why the NPI can't be licensed/exhaustified above the covert *wh-only*, where it should be felicitous given that *wh-only* supports downward entailing inferences in its scope. One answer might be that the NPI is in the subject position: we saw earlier on that NPIs are never acceptable in subject position (modulo rhetorical questions). Notice, however, that what is actually relevant is the relative position of the NPI with respect to the *wh*-phrase. So the fact that the NPI is (embedded within) the subject is irrelevant, as supported by the following example, where the NPI is in object position and still unacceptable.

(138) *Which student who took any linguistics did you pass?

[42]This same issue arises in simple cases such as (i) where the trace of the QRed object must be interpreted as a plain variable, as in (ia), in order to avoid having the NPI also be interpreted in the nucleus of the universal, as in (ib).

(i) John passed every girl who ever took a linguistics course.

a. every [λx. girl who ever took a linguistics course(x)][λy. John passed the girl y]
b. every [λx. girl who ever took a linguistics course(x)][λy. John passed the (girl who ever took a linguistics course) y]

But consider cases like (ii), which have the NPI in an argument position.

(ii) John read every review of any linguistics book.

Since arguments obligatorily reconstruct, the NPI will end up being interpreted in the nuclear scope of the universal, an UE position, so the sentence should be ruled out. Incidentally, my informants agree that there is a contrast between (i) and (ii), so this account might be on the right track.

[43]I'd like to thank Uli Sauerland for bringing these constructions to my attention.

So essentially we need to figure out why the licensing cannot take place above *wh-only*. In a framework that assimilates licensing conditions with agreement relations between an alternative-bearing item, the NPI, and a covert exhaustifier, the question becomes the following: why can't exhaustification occur above the covert *wh-only*, as in the first LF in (139)? The analysis we used to account for the subject-object asymmetry in the previous section readily suggests itself for this set of facts. Here too we witness a clash between the syntactic conditions on dependencies (crossing versus nesting) and the semantic requirements of exhaustification.

(139) *Which girl who took any linguistics passed?

$\mathscr{E}xh_{[D]}$[wh-only$_{[F]}$[[the girl who took [any ling]$_{[D]}$]$_{[F]}$ passed]]

wh-only$_{[F]}$[$\mathscr{E}xh_{[D]}$[[the girl who took [any ling]$_{[D]}$]$_{[F]}$ passed]]

SYN	SEM	ALL
✗	✓	✗
✓	✗	✗

That this is not a problem when we turn to plural *which*-phrases is apparent in the second LF in (140), where we see that the presence of a plural definite description allows for the NPI to be exhaustified below *wh-only*, thus satisfying the syntactic requirement.

(140) Which girls who took any linguistics passed?

$\mathscr{E}xh_{[D]}$[wh-only$_{[F]}$[[the girls who took [any ling]$_{[D]}$]$_{[F]}$ passed]]

wh-only$_{[F]}$[$\mathscr{E}xh_{[D]}$[[the girls who took [any ling]$_{[D]}$]$_{[F]}$ passed]]

SYN	SEM	ALL
✗	✓	✗
✓	✓	✓

What I showed in this section is that the licensing of NPIs when they occur in the restrictor of a plural *which*-phrase takes place at the level of the (reconstructed) *wh*-phrase, rather than at the level of the embedded question, which is what otherwise dictates the acceptability of NPIs in the scope of *wh*-phrases. This is in line with the generalization proposed by Guerzoni and Sharvit that the licensing of NPIs in the restrictor of *wh*-phrases is independent of the strength of the question. The way this generalization is couched in the present analysis is by showing that exhaustification necessarily takes place below *wh-only* when the NPI is in the restrictor of the *wh*-phrase, thus rendering the presence, or lack thereof, of *wh-only* irrelevant for the purposes of exhaustification. This is in sharp contrast with the cases discussed in the previous section, where the acceptability of NPIs in the nucleus of the question is reliant on the presence of *wh-only*, in that exhaustification must take place above the *wh-only* operator.

5.3 Prediction: NPIs within the focus associate of overt *only*

The account presented in this section has immediate consequences for our understanding of why NPIs are ruled out from the focus associate of overt *only*, a generalization argued for by Wagner (2006). While Wagner's ultimate goal is to present an association-via-movement account of *only*, Wagner points out the significant empirical observation that when *only* associates with a DP, no NPIs are licensed within it, as shown by the contrast in (141).

(141) a. *Only [an author of any comic]$_{[F]}$ met Particle Man.
b. Only [an inhabitant of Twin Earth]$_{[F]}$ ever met any aliens.

Wagner (2006, ex. (23b,c))

This peculiar aspect of the behavior of NPIs, namely the fact that they are acceptable only outside the focus associate of *only*, remains a mystery, particularly for accounts which take *only* to be a propositional operator. The problem is that as a propositional operator, *only* is blind to the subconstituency of its propositional argument. That is, the notion of restrictor versus scope does not arise when calculating the semantics of *only*. We saw this same problem come up in the discussion of NPI subject-object asymmetry in questions in the previous section, when I argued that both (142a) and (142b) are downward entailing with respect to *x*.

(142) a. $\forall a \in \mathscr{A}lt(y)\ [\exists x \in D\ like(a,x) \rightarrow (\exists x \in D\ like(y,x) \subseteq \exists x \in D\ like(a,x))]$
b. $\forall a \in \mathscr{A}lt(y)\ [\exists x \in D\ like(x,a) \rightarrow (\exists x \in D\ like(x,y) \subseteq \exists x \in D\ like(x,a))]$

The idea pursued in this section, which I claim can be extended beyond the domain of questions, is that while semantically *only* is a propositional operator, syntactically it enters into an agreement relation with a constituent of its argument. Thus we can have long-distance agreement between *only* and its focus associate, as in (143).

(143) only [... [[ ]$_F$ ...]]

As soon as an NPI comes into the picture, a second agreement relation needs to be established between it and an exhaustifier. Whenever there are multiple agreement relations, the constraint against crossing dependencies needs to be respected. As I show in the examples below, the only configuration involving an NPI in the scope of *only* which is both syntactically and semantically coherent is one where the NPI is distinct from the focus associate of *only* and furthermore c-commanded by it, as in (145).

(144) NPI is embedded in the focus associate of *only*

a. only [$\mathscr{E}xh_{[D]}$ [[... NPI$_{[D]}$ ...]$_F$ ...]] ✓syntax, ✗semantics

b. $\mathscr{E}xh_{[D]}$ [only [[... NPI$_{[D]}$ ...]$_F$ ...]] ✗syntax, ✓semantics

(145) NPI is distinct from and follows the focus associate

a. only [$\mathscr{E}xh_{[D]}$ [... [[.....]$_F$ NPI$_{[D]}$]]] ✗syntax, ✗semantics

b. $\mathscr{E}xh_{[D]}$ [only [... [[.....]$_F$ NPI$_{[D]}$]]] ✓syntax, ✓semantics

Summing up, the prediction made by this take on questions is that given an unacceptable question containing an NPI, we expect the corresponding assertive sentences involving overt association of a focused element with *only* to also be ruled out, as shown below. The generalization that comes out from this is that the focus associate of *only* needs to c-command the NPI in order for it to be licensed.

(146) a. (i) *What did anyone eat?

(ii) *I only said that anyone ate cake$_{F}$.

b. (i) Who ate anything?

(ii) I only said that John$_{F}$ ate anything.

6 Conclusion

In this paper I argued that a unified account of negative polarity items in *wh*-questions is desirable; I then offered a new semantics of strongly exhaustive questions that shows how this is possible.[44] I proposed that the ambiguity exhibited by questions in terms of their weakly versus strongly exhaustive interpretations should be encoded at the level of the question nucleus, via a covert presuppositional *wh-only*, rather than in different answer-hood operators. Adopting this assumption allowed us to make a number of predictions both in the domain of questions and with regard to the distribution of NPIs. With respect to questions I showed how such an account can explain why root questions receive as a default the strongly exhaustive interpretation, and I offered a line of inquiry that might begin to explain why certain predicates embed only questions that receive a weakly exhaustive interpretation. I then turned to the distribution of NPIs in questions and showed how this analysis of strong exhaustivity is very effective in explaining a number of previously puzzling and unrelated contrasts, such as the subject-object asymmetries NPIs exhibit when they occur in the question nucleus, the correlation between the acceptability of an NPI in the *wh*-restrictor and the plurality of the head noun, and the varying acceptability of weak versus strong NPIs in questions.

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[44] See Nicolae (2014) for how this proposal can be extended to account for NPIs in alternative questions, as well as Nicolae (2013) for a new approach to polar questions that elucidates why NPIs are acceptable in these types of questions.

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