

## Embedded Quantifiers in *Which-* and *Whether-*Questions

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Quantified noun phrases in WH-complements of *find out*-type verbs seem to exhibit exceptional wide scope. In this they differ from quantified noun phrases in complements of *wonder*-type verbs. This paper attributes this contrast to Quantificational Variability.

### 1. The Main Claim

Many quantified noun phrases (henceforth, QNPs) in *which*-interrogative clauses embedded under verbs of the *find out*-class (i.e., *find out*, *know*, *remember*, *discover*, etc.) may have exceptional wide scope (Szabolcsi 1997). That is to say, they may be understood as having scope over the embedding verb. This is illustrated in (1) for the QNP *exactly three men*:

- (1) John found out which woman exactly three men love.  
Can mean: “exactly three men are such that John found out which woman each of them loves.”

That the wide scope of *exactly three men* in (1) is truly exceptional can be inferred from (2), which shows that *exactly three men* cannot scope out of a *which*-interrogative when the embedding verb belongs to the *wonder*-class (*wonder*, *ask*, *inquire*, etc.; see Szabolcsi 1997); from (3), which shows that *exactly three men* cannot have wide scope when embedded in a *whether*-interrogative (cf. Karttunen and Peters 1980); and from (4), which shows that *exactly three men* cannot have wide scope when embedded in a declarative.

- (2) John wonders which woman exactly three men love.  
Cannot mean: “exactly three men are such that John wonders which woman each of them loves.”
- (3) John found out/wondered whether exactly three men left.  
Cannot mean: “exactly three men are such that John found out/wondered whether each of them left.”
- (4) John found out that exactly three men left.  
Cannot mean: “exactly three men are such that John found out that each of them left.”

Rather than claiming that *which*-complements of *find out*-type verbs are exceptional in that they allow QNPs to move out of them at LF (as opposed to

*whether*-complements, and to *which*-complements of *wonder*-type verbs, which do not), I claim that the wide scope of the embedded QNP in cases such as (1) is only apparent. It is, in fact, a Quantificational Variability (henceforth, QV) effect. Accordingly, the abstract analysis of (1) looks more like (5a) (where the embedded question is moved above the embedding verb) than like (5b) (where the QNP itself is moved above the embedding verb).

- (5) a. [which woman exactly three men love]<sub>1</sub> [John found out t<sub>1</sub>]  
 b. [exactly three men]<sub>1</sub> [John found out which woman t<sub>1</sub> loves]

Under the QV analysis, we expect constructions such as (1) to exhibit the behavior characteristic of QV-constructions. This is indeed the case. For example, the absence of wide scope for *exactly three men* in (2) now follows, because, as is well known (Berman 1991; Lahiri 1991, 2000, 2002), *find out*-type verbs support QV, but *wonder*-type verbs do not:

- (6) John partly found out who cheated.  
 Can mean: “For some x that cheated, John found out that x cheated”  
 (7) John partly wonders who cheated.  
 Cannot mean: “For some x, John wonders whether x cheated”

Likewise, the absence of wide scope in (3) and (4) also follows, because neither *whether*-questions nor declaratives support QV:

- (8) John remembers in part whether everyone left.  
 Cannot mean: “For some x, John remembers whether x left.”  
 (9) John believes/knows/remembers in part that everyone left.  
 Cannot mean: “For some x, John believes/knows/remembers that x left.”

In the next section I explain why assigning wide scope to the QNP itself, either via the syntax or via the semantics, is not the correct explanation of exceptional wide scope. Sections 3-4 discuss the QV analysis and its predictions.

## 2. Syntactic and Semantic Exceptional Wide Scope

### 2.1. Szabolcsi’s Observations and Their Significance

Rephrasing Szabolcsi’s claims a little, the main observation in Szabolcsi 1997 is that the term “pair list question” cannot refer to a single phenomenon. A naïve approach to pair list (PL) interrogatives views them as interrogatives with a QNP that is understood as having wide scope:

- (10) Which woman does every man love?  
 PL interpretation: “for every man x, which woman does x love?”  
 Possible answer: *John loves Mary and Bill loves Sally.*

It turns out, however, that not all syntactic environments behave in the same way. In particular, matrix interrogatives differ from embedded interrogatives with respect to the scope options available to QNPs that appear inside them on the surface. While *every*-NP in the matrix interrogative in (10) supports a PL reading, no other QNP does (this is illustrated in (11)-(12)).<sup>1</sup> On the other hand, the range of QNPs embedded in *find out*-type verbs that can be understood as having scope above the embedding verb is much larger. This is illustrated in (13)-(14).

- (11) Q: Which woman do most/more than five/exactly five men love?  
A: \*John loves Mary, Bill loves Sally, Fred loves Kelly,...
- (12) Q: Which woman does no man love?  
A: \*John doesn't love Kelly, Bill doesn't love Nina,...
- (13) John found out which woman every man loves.  
"Every man is such that John found out which woman he loves".
- (14) John found out which woman most men/more than five men/exactly five men/at most five men love.  
"Most men/more than five men/exactly five men/at most five men are such that John found out which woman each of them loves".

As for *wonder*-verbs, they usually do not permit QNPs to scope above them, but they do allow a PL reading of an embedded question with *every*-NP.

- (15) John wonders which woman most/more than five/exactly five/at most five men love.  
Cannot mean: "most/more than five/exactly five/at most five men are such that John wonders which woman each of them loves".
- (16) John wonders which woman every man loves.  
Can mean: "John wonders what the answer to the PL question 'which woman does every man love' is".

Because of this variation, if one indeed thinks of PL interrogatives as interrogatives with QNPs where the QNP is understood as having scope over its immediate clause, one cannot simply say that whatever analysis is assigned to the matrix interrogative in, say, (10) carries over to the same interrogative when it is embedded. Embedded interrogatives, says Szabolcsi, require a separate treatment. I accept her conclusion without further discussion.<sup>2</sup> I have nothing special to say about matrix PL questions, and assume that Szabolcsi's view of those (see 2.3) is essentially correct.

## 2.2. Long Distance QR

At a first glance, the most plausible solution to the problem of exceptional wide scope may seem to be assignment of widest scope to the QNP in (1) at LF, via long distance QR. This is the position taken in Fox and Lasnik, to appear. Support

for it comes from the following well-formed Antecedent Contained Deletion (ACD) construction:

- (17) I found out how much every item in this store costs that John did.  
 “Every item *x* in this store that John found out how much *x* costs is such that I found out how much *x* costs”

The LF underlying (17), according to this analysis, is this:

- (18) [every item in this store that John found out how much *t* costs][I found out how much *t* costs]

This LF is the result of long distance QR (of [*every item in this store that John ...*]) and copying (of [*found out how much t costs*]). Long distance QR seems essential here to generate the right reading.

Without going into the question of how long distance QR is constrained (for example, why it cannot apply when the embedding verb is of the *wonder-*class), let me point out that it cannot be the explanation for the general phenomenon of exceptional wide scope, because it cannot be argued to apply to all the relevant QNPs, as the following ill-formed ACD constructions show:

- (19) ##I found out how much more than three items in this store cost that John did.  
 Cannot mean: “more than three items *x* in this store that John found out how much *x* costs are such that I found out how much *x* costs”.
- (20) ##I found out how much at most three items in this store cost that John did.  
 Cannot mean: “at most three items *x* in this store that John found out how much *x* costs are such that I found out how much *x* costs.”

But *more than three* and *at most three* do support ACD when the QR operation involved is “short” (e.g., *I read at most three books that John did*). Moreover, they have exceptional wide scope (see (14)). So although Fox and Lasnik may very well be right that *every-NP* can undergo long distance QR, this is not true of other QNPs that have exceptional wide scope, and therefore a different explanation has to be sought.

### 2.3. “Lifted” Questions

Szabolcsi’s solution to the problem of exceptional wide scope is to assign the embedded QNP wide scope via the semantics of the question that contains it. The implementation of this proposal is based on her particular view of PL questions. She argues that PL questions come in two varieties. Matrix questions and questions embedded under *wonder-*type verbs are one kind of PL questions, and questions embedded under *find out-*type verbs are another kind of PL questions. Let us examine this proposal in some detail.

The main problem for any semantic theory of exceptional wide scope is to decide what the semantic difference between the two verb classes is. Szabolcsi adopts a theory of questions in the spirit of Groenendijk and Stokhof 1984, according to which the basic question denotation is that of a proposition. *Find out*-type verbs are “extensional”, and take  $\langle s, t \rangle$ -complements; *wonder*-type verbs are “intensional”, and take  $\langle s, \langle s, t \rangle \rangle$ -complements. In addition, she assumes that in principle, any question with a QNP can be a “layered” quantifier (see Moltmann and Szabolcsi 1994), i.e., a “lifted” question – a generalized quantifier over  $\langle s, t \rangle$ -objects (type  $\langle \langle \langle s, t \rangle, t \rangle, t \rangle$ ; cf. Karttunen 1977). The interpretation follows the schema below ( $w$  is a world-pronoun):

$$(21) \quad [3 \text{ [QNP-}w \text{ [1 [which}_3 \text{ NP } t_1 \text{ Embd-V]]}]]^{\mathfrak{E}} = \\ \lambda P \in D_{\langle \langle s, t \rangle, t \rangle}. [\text{QNP-}w]^{\mathfrak{E}}([\lambda x \in D_e. P([\lambda w' \in D_s. [\lambda y \in D_e. [\text{NP}]^{\mathfrak{E}}([\mathbf{w}]^{\mathfrak{E}})(y)=1 \text{ and} \\ [\text{Embd-V}]^{\mathfrak{E}}([\mathbf{w}]^{\mathfrak{E}})(y)(x)=1] = [\lambda y \in D_e. [\text{NP}]^{\mathfrak{E}}(w')(y)=1 \text{ and} [\text{Embd-} \\ \text{V}]^{\mathfrak{E}}(w')(y)(x)=1]])])$$

When a lifted question is raised above a *find out*-type verb, it leaves behind a trace of type  $\langle s, t \rangle$ , which the verb takes as its internal argument. The lifted question is of the right type to combine with the  $\lambda$ -abstract formed by abstracting over the trace of the question. For example, the LF of *John found out which woman at most three men love* is as in (22), and its interpretation – as in (23).

$$(22) \quad [3 \text{ [at-most-three-men}_w \text{ [1 [which}_3 \text{ woman } t_1 \text{ love]]}] [2 \text{ [John found} \\ \text{out-}w \text{ } t_2]]]$$

$$(23) \quad [\lambda P \in D_{\langle \langle s, t \rangle, t \rangle}. [\text{at-most-three-men}_w]^{\mathfrak{E}}([\lambda x \in D_e. P([\lambda w' \in D_s. \\ [\lambda y \in D_e. [\text{woman}]^{\mathfrak{E}}([\mathbf{w}]^{\mathfrak{E}})(y)=1 \text{ and} [\text{love}]^{\mathfrak{E}}([\mathbf{w}]^{\mathfrak{E}})(y)(x)=1] = \\ [\lambda y \in D_e. [\text{woman}]^{\mathfrak{E}}(w')(y)=1 \text{ and} [\text{love}]^{\mathfrak{E}}(w')(y)(x)=1]])])][\lambda p \in D_{\langle s, t \rangle}. \text{John} \\ \text{found out } p \text{ in } [\mathbf{w}]^{\mathfrak{E}})] = 1 \\ \text{iff } |\{x \in D_e: x \text{ is a man and John found out which woman } x \text{ loves}\}| \leq 3.$$

Thus, interpreting the embedded question as a lifted question results in effectively assigning the QNP wide scope (without moving the QNP itself in the syntax). The result is precisely the interpretation we are after.

Szabolcsi argues that matrix questions with QNPs are “non-lifted” question-intensions interpreted via domain restriction. The domain is the unique witness set of the QNP. For example, *who does every man love* is interpreted as follows:

$$(24) \quad \lambda w \in D_s. \lambda w' \in D_s. [\lambda x \in \text{UWITNESS}([\text{every man}]^{\mathfrak{E}})(w). [\lambda y \in D_e. x \text{ loves } y \text{ in} \\ w]] = [\lambda x \in \text{UWITNESS}([\text{every man}]^{\mathfrak{E}})(w). [\lambda y \in D_e. x \text{ loves } y \text{ in } w']]$$

Why do only *every*-NPs support PL readings in matrix questions? Because UWITNESS not only extracts a unique witness set (already restricting the range of possible QNPs considerably, because not all QNPs have unique witnesses), but also comes with a presupposition that the QNP is increasing (this excludes QNPs

such as *John and no one else* which does have a unique witness but still doesn't support PL readings in matrix questions).<sup>3</sup>

*Wonder*-type verbs take intensional objects as their internal arguments. This means that they can take question-intensions such as (24), and the prediction for, say, *John wonders who every man loves* is that its embedded question has a PL reading, but no other QNP will support such a reading. In Moltmann and Szabolcsi another option is considered: a *wonder*-type verb may also take an intension of a "layered" quantifier as its internal argument:

- (25)  $\lambda w \in D_s. \lambda P \in D_{\langle\langle s, t \rangle, t \rangle}. [\text{every-man}]^{\mathcal{E}}(w)([\lambda x \in D_e. P([\lambda w' \in D_s. [\lambda y \in D_e. [\text{woman}]^{\mathcal{E}}(w)(y) = 1 \text{ and } [\text{love}]^{\mathcal{E}}(w)(y)(x) = 1] = [\lambda y \in D_e. [\text{woman}]^{\mathcal{E}}(w')(y) = 1 \text{ and } [\text{love}]^{\mathcal{E}}(w')(y)(x) = 1]])])$

Crucially, the internal argument cannot raise above the subject to yield a wide scope interpretation of the QNP, because it is of type  $\langle s, \langle\langle s, t \rangle, t \rangle, t \rangle$ , and its sister would be of type  $\langle\langle s, \langle s, t \rangle \rangle, t \rangle$  (cf. (22)).

The basic facts, then, are accounted for. But there is an interesting observation that the theory seems to have very little to say about. It was observed in section 1 that the same verbs that allow exceptional wide scope support QV. It seems that any theory that doesn't tie the two phenomena together misses an important generalization. Moreover, it is not clear how QV readings of questions with QNPs are accounted for at all. Lahiri (1991) observes that such questions support QV readings, as in the following example:

- (26) For the most part, John found out what everyone bought.  
Can mean: "For most  $x$ , John found out what  $x$  bought."

If the material that appears after the adverb of quantification is interpreted as "for all  $x$ , John found out what  $x$  bought" (as implied by Szabolcsi's theory), it isn't clear what variable *for the most part* binds in order to yield the QV interpretation. To overcome this, Szabolcsi appeals to Groenendijk and Stokhof's (1994) Dynamic Logic-based theory of QV. However, Lahiri independently argued that this particular theory contains a fatal error, and cannot account even for simpler cases of QV effects. The reader is referred to Lahiri 2002 for details.

But more importantly, the correlation between QV and exceptional wide scope extends to verbs that are not expected, according to Szabolcsi, to allow the latter. It is observed in Lahiri 1991, 2000, 2002, that the verbs *agree (on)* and *certain* support QV, as the following examples show:

- (27) John and Mary partly agree on who cheated.  
Can mean: "some  $x$  (that John and Mary have an opinion about) is such that John and Mary agree that  $x$  cheated."
- (28) For the most part, Bill is certain who will come to the party.  
Can mean: "most individuals  $x$  (that Bill thinks might come to the party) are such that Bill is certain that  $x$  will come to the party"

Interestingly, these verbs also allow exceptional wide scope:

- (29) John and Mary agree on which woman exactly two men love.  
Can mean: “exactly two men  $x$  are such that John and Mary agree which woman  $x$  loves.”
- (30) Bill is certain which book exactly three students borrowed.  
Can mean: “exactly three students  $x$  are such that Bill is certain which book  $x$  borrowed.”

The semantics of *agree (on)* and *certain* do not “look at” actual true answers to their complements (for example, John and Mary may agree on who cheated, while being completely mistaken about it), as opposed to *find out* and *know* whose semantics “look at” actual true answers to their complements. This means that *agree (on)* and *certain* are, like *wonder*, “intensional” in the Groenendijk and Stokhof sense. But if so, they shouldn’t allow exceptional wide scope according to Szabolcsi (whether they are expected to support QV depends, of course, on one’s theory of the phenomenon; more on this in section 3).

The next sections discuss a proposal according to which exceptional wide scope is a by-product of QV. The correlation between the two is thus expected.

### 3. The QV Proposal

I propose that the (un)availability of wide scope for embedded QNPs is a QV effect. Embedded QNPs may license a QV interpretation, sometimes with a covert default adverb of quantification.

According to this proposal all verbs that support QV take internal arguments of type  $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$  (i.e., Hamblin question-intensions). Interrogative-taking verbs differ from each other in terms of the presuppositions they bring about, if any, and it is this aspect of their meaning that is crucial to whether or not they license QV/exceptional wide scope.

Supporting evidence for the QV theory of exceptional wide scope comes from the fact that the adverb can be overt, as in the following examples:

- (31) John partly knows which woman every man loves. (cf. Lahiri, 1991)
- (32) John remembers in part which woman more than three men love.
- (33) Bill and Mary agree in part on which book most students borrowed.

My proposal is based on the theory of QV proposed in Sharvit and Beck 2001 and Beck and Sharvit, in press.

3.1. *QV – Quantification over Questions*

Since Berman 1991 and Lahiri 1991, it has been widely accepted that only verbs that are both declarative-taking and interrogative-taking support QV. This is corroborated by the contrast between (6) and (7) above. The analysis proposed by Lahiri (1991, 2000, 2002) indeed predicts this. Lahiri proposes that the adverb of quantification in a QV structure quantifies over relevant answers to the embedded question, itself analyzed as a Hamblin-extension – a set of possible answers:

- (34) a. John partly knows who cheated.  
 b. Some proposition *p* that is a true atomic member of the Hamblin-extension of ‘who cheated’ is such that John knows *p*.

The Hamblin-extension of ‘who cheated’ is the set of possible answers – {Bill cheated, Fred cheated, Fred+Bill cheated,...}. The set of its atomic members is {Bill cheated, Fred cheated,...}. Lahiri assumes, along with Berman (1991), that the presuppositions of the nuclear scope are accommodated into the restriction of *partly*.<sup>4</sup> Because declarative-taking *know* is factive, *partly* quantifies over true atomic members of the Hamblin-extension. However, if the main verb is declarative-taking but not factive, the adverb need not quantify over true answers:

- (35) John and Mary partly agree on who cheated.  
 Some *p* that is an atomic member of the Hamblin-extension of ‘who cheated’ (and that John or Mary think that *p*) is such that John and Mary agree that *p*.

If the main verb is exclusively interrogative-taking, a QV reading is not possible. This is the reason why, according to Lahiri, verbs of the *wonder*-class don’t support QV. However, as argued by Beck and Sharvit (cf. Ginzburg 1995a,b), some verbs that are interrogative-taking but lack a declarative-taking meaning support QV. *Depend* and *decide* are relevant examples:

- (36) Which candidates will be admitted, depends, for the most part, exclusively on this committee.  
 “Most candidates *x*, whether *x* will be admitted depends exclusively on this committee”
- (37) For the most part, this committee decides which candidates will be admitted  
 “Most candidates *x* are such that this committee decides whether *x* will be admitted”

Regarding (36), notice that the QV reading relies on the presence of *exclusively* (without it, the sentence can be interpreted with *for the most part* quantifying over degrees of dependency, and does not have a genuine QV reading; see Lahiri 2002). As for (37), notice that *decide* here cannot be analyzed as declarative-taking. This is so for two reasons: (a) the QV reading is paraphrased with a

*whether*-question, not a *that*-clause (i.e., the paraphrase cannot be: “most candidates are such that this committee decides that they will be admitted”); and (b) *decide* appears in the “generic” tense, which is usually odd when the verb is followed by a declarative (e.g., *??This committee decides that Fritz will be admitted*).

But even *wonder* itself, the verb that has traditionally been used to show that QV is impossible with verbs that are exclusively interrogative-taking, sometimes supports QV readings. This usually requires the help of a presuppositional element such as *still*:

- (38) Smith: Has John made up his mind about the cheating?  
 Jones: So far he has only made up his mind regarding Susie and Bill. For the most part, he is still wondering who cheated.  
 “For most relevant *x*, John is still wondering whether *x* cheated”

Based on these facts, Beck and Sharvit argue that QV effects are the result of quantification over Hamblin-questions. Accordingly, the interpretation of *John partly found out who cheated* is roughly as follows:

- (39) There is at least one question *Q* (type:  $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$ ) such that *Q* is a relevant subquestion of **[who cheated]**<sup>g</sup> and John found out *Q*.

The idea is that the set of relevant subquestions of **[who cheated]**<sup>g</sup> is a set of questions whose true answers entail the complete true answer to **[who cheated]**<sup>g</sup>. Suppose Fred, Mary, and Bill cheated. Then **{[did Fred cheat]**<sup>g</sup>, **[did Bill cheat]**<sup>g</sup>, **[did Mary cheat]**<sup>g</sup>} is the set of relevant subquestions of **[who cheated]**<sup>g</sup>, because the true answers to these questions (i.e., “Fred cheated”, “Bill cheated”, “Mary cheated”) jointly provide the complete true answer to **[who cheated]**<sup>g</sup>. According to (39), John has to find out the true answer to at least one member of the set of relevant subquestions, in order to qualify as partly having found out who cheated.

The definition of ‘subquestion’ in (41) relies on the definition of ‘Ans’ in (40) (which is based on similar notions in Lahiri 1991, Heim 1994, and Dayal 1996):<sup>5</sup>

- (40)  $\text{Ans}(Q)(w)$  is the unique proposition *p* in  $Q(w)$ , if there is one, such that  $w \in p$ , and for any *q* in  $Q(w)$  such that  $w \in q$ ,  $p \subseteq q$ . Otherwise,  $\text{Ans}(Q)(w) = \emptyset$ .
- (41) A question-intension *Q'* is a subquestion of a question-intension *Q* iff there is a world *w* and a proposition *p* such that:
- (i)  $\text{Ans}(Q')(w) \neq \emptyset$  and  $\text{Ans}(Q')(w) \subseteq p$ ; and
  - (ii) there is a world *w\** s.t.  $\{w' \in D_s : \text{Ans}(Q)(w') = \text{Ans}(Q)(w^*)\} \cap p = \emptyset$ .

Accordingly, **[did Fred cheat]**<sup>g</sup> is a subquestion of **[who cheated]**<sup>g</sup>. To see why, let  $\{w' \in D_s : \text{Fred cheated in } w'\}$  be *p*. Then there is a world *w* where  $\text{Ans}(\text{[did Fred cheat]}^g)(w)$  is a subset of *p* (any world where Fred cheated is such a world).

There is also a world  $w^*$  where  $\{w' \in D_s : \text{Ans}([\mathbf{who\ cheated}]^{\mathfrak{E}})(w') = \text{Ans}([\mathbf{who\ cheated}]^{\mathfrak{E}})(w^*)\} \cap p$  is the empty set (a world where Fred didn't cheat is such a world). (The reader can verify that  $[\mathbf{did\ Fred\ and\ Bill\ cheat}]^{\mathfrak{E}}$  is also a subquestion of  $[\mathbf{who\ cheated}]^{\mathfrak{E}}$ .)

(39) talks about relevant subquestions. A set of relevant subquestions is a set of subquestions whose answers jointly entail the answer to the “big” question. Beck and Sharvit call such a set ‘division’. The definition I use for the term ‘division’ is given in (42).<sup>6</sup> In my semantic representations below, I also use the predicate **DIV**, which is defined in (43):

- (42) A set  $S$  of question-intensions is a division of a question-intension  $Q$  into subquestions in a world  $w$  iff (i)-(iv) hold:
- (i)  $|S| > 1$ ;
  - (ii) for all  $Q'$  in  $S$ ,  $Q'$  is a subquestion of  $Q$ ;
  - (iii)  $\cap \{\text{Ans}(Q')(w) : Q' \in S\} \subseteq \text{Ans}(Q)(w)$ , and there is no  $S'$ ,  $S' \subset S$ , such that  $\cap \{\text{Ans}(Q')(w) : Q' \in S'\} \subseteq \text{Ans}(Q)(w)$ ;
  - (iv) there is a  $Q'$  in  $S$  such that for any world  $w'$ , if  $\text{Ans}(Q)(w') \neq \emptyset$ , then  $\{w'' \in D_s : \text{Ans}(Q)(w'') = \text{Ans}(Q)(w')\} \subseteq \text{Ans}(Q')(w')$ .
- (43) For any set of questions  $A$ , world  $w$ , and question  $Q$ ,  $[\mathbf{DIV}]^{\mathfrak{E}}(Q)(w)(A) = 1$  iff  $A$  is a division of  $Q$  into subquestions in  $w$ .

Going back to our example,  $\{[\mathbf{did\ Fred\ cheat}]^{\mathfrak{E}}, [\mathbf{did\ Bill\ cheat}]^{\mathfrak{E}}, [\mathbf{did\ Mary\ cheat}]^{\mathfrak{E}}\}$  is indeed a division of  $[\mathbf{who\ cheated}]^{\mathfrak{E}}$ . This is because: (i) the cardinality of this set is greater than 1; (ii) each of these questions is a subquestion of  $[\mathbf{who\ cheated}]^{\mathfrak{E}}$ ; (iii) in the situation described above, the conjunction of the true answers to these questions entails  $\text{Ans}([\mathbf{who\ cheated}]^{\mathfrak{E}})$  ( $= \{w \in D_s : \text{Fred} + \text{Mary} + \text{Bill\ cheated\ in\ } w\}$ );<sup>7</sup> and (iv) for any relevant world  $w'$ ,  $\{w'' \in D_s : \text{Ans}([\mathbf{who\ cheated}]^{\mathfrak{E}})(w'') = \text{Ans}([\mathbf{who\ cheated}]^{\mathfrak{E}})(w')\}$  is a subset of  $\text{Ans}([\mathbf{did\ Fred\ cheat}]^{\mathfrak{E}})(w')$ .

To derive the meaning in (39) for *John partly found out who cheated* compositionally, I propose the LF in (39'a).<sup>8</sup> The embedded question moves above the subject, where it combines with the (phonetically null) **DIV**, yielding a set of divisions of  $[\mathbf{who\ cheated}]^{\mathfrak{E}}$  in  $[\mathbf{w}]^{\mathfrak{E}}$ . A (phonetically null) choice function variable – **ch** (type:  $\langle \langle \langle \langle s, \langle \langle s, t \rangle, t \rangle \rangle, t \rangle, t \rangle, \langle \langle s, \langle \langle s, t \rangle, t \rangle \rangle, t \rangle \rangle$ ) – is applied to the output of that, yielding a division of the embedded question. The choice function variable is existentially closed at the top-most level:

- (39') a.  $\exists \text{ch} [\mathbf{PARTLY} [\text{ch} [\mathbf{DIV} [\mathbf{who\ cheated}] \mathbf{w}]] [\mathbf{1} [\mathbf{John\ found\ out-w\ } t_1]]]$   
 b.  $[[\mathbf{1} [\mathbf{John\ found\ out-w\ } t_1]]]^{\mathfrak{E}} = \{Q \in D_{\langle \langle s, \langle \langle s, t \rangle, t \rangle \rangle, t \rangle, t} : \text{John\ found\ out\ } Q \text{ in } [\mathbf{w}]^{\mathfrak{E}}\}$ .  
 c.  $[[\mathbf{DIV} [\mathbf{who\ cheated}] \mathbf{w}]]^{\mathfrak{E}} = \{A \in D_{\langle \langle s, \langle \langle s, t \rangle, t \rangle \rangle, t \rangle, t} : A \text{ is a division of } [\mathbf{who\ cheated}]^{\mathfrak{E}} \text{ in } [\mathbf{w}]^{\mathfrak{E}}\}$

- d.  $[\text{ch} [\text{DIV} [\text{who cheated}] \mathbf{w}]]^{\mathfrak{B}}$  is some member of (39'c).
- e.  $[\exists \text{ch} [\text{PARTLY} [\text{ch} [\text{DIV} [\text{who cheated}] \mathbf{w}]] [\mathbf{1} [\text{John found out-w } \mathbf{t}_1]]]]^{\mathfrak{B}} = 1$  iff there is a choice function  $f$  from sets of divisions to divisions, such that at least one  $Q'$  is an element of  $f([\text{DIV}]^{\mathfrak{B}}([\text{who cheated}]^{\mathfrak{B}})([\mathbf{w}]^{\mathfrak{B}}))$  and of  $\{Q \in D_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle} : \text{John found out } Q \text{ in } [\mathbf{w}]^{\mathfrak{B}}\}$ .

Why do *who/which*-questions support QV, but *whether*-questions do not? This is thanks to clause (42iv) (but see Beck and Sharvit, in press, for a different view). Consider (44), which doesn't have a QV reading:

(44) John partly remembers whether every man cheated.

If (44) had a QV reading, it would, according to the current proposal, be read off an LF such as the following:

(45)  $\exists \text{ch} [\text{PARTLY} [\text{ch} [\text{DIV} [\text{whether every man-w cheated}] \mathbf{w}]] [\mathbf{2} [\text{John remembers-w } \mathbf{t}_2]]]$

But  $[\text{whether every man-w cheated}]^{\mathfrak{B}}$  doesn't have a division. While  $[\text{did John cheat}]^{\mathfrak{B}}$  is a plausible potential member of a division of  $[\text{whether every man-w cheated}]^{\mathfrak{B}}$ , there is no  $Q$  among the potential members such that for any relevant world  $w'$ ,  $\{w'' \in D_s. \text{Ans}([\text{whether every man-w cheated}]^{\mathfrak{B}})(w'') = \text{Ans}([\text{whether every man-w cheated}]^{\mathfrak{B}})(w')\}$  is a subset of  $\text{Ans}(Q)(w')$ .

Why don't embedded declaratives support QV? Because the adverb of quantification quantifies over  $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$ -objects (i.e., questions), not  $\langle s, t \rangle$ -objects (i.e., propositions).

Why does *agree (on)*, which doesn't "care" about actual true answers, support QV? Because the division that the adverb quantifies over need not be a division of the complement in the actual world. Beck and Sharvit assume that the adverb's restriction may contain a hidden modal, which picks out a division in the relevant worlds. For example, the interpretation of *John and Mary partly agree on who cheated* is this:

(46) There is a choice function  $f$  from sets of divisions to divisions, such that at least one  $Q'$  is an element of  $\{Q \in D_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle} : \text{for all } w', \text{ if } R([\mathbf{w}]^{\mathfrak{B}})(w') \text{ then } Q \text{ is in } f([\text{DIV}]^{\mathfrak{B}}([\text{who cheated}]^{\mathfrak{B}})(w'))\}$  and of  $\{Q \in D_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle} : \text{John and Mary agree on } Q \text{ in } [\mathbf{w}]^{\mathfrak{B}}\}$ .

$R$  stands for an accessibility relation, and its value is determined, to a large extent, by the semantics of the main verb. If the main verb "looks at" actual true answers; e.g., *find out*), the value of  $R$  is fixed as  $[\lambda w_1 \in D_s. \lambda w_2 \in D_s. w_1 = w_2]$  (yielding a division of  $[\text{who cheated}]^{\mathfrak{B}}$  in the actual world). If the main verb is, for example, *agree on* (as is the case in (46)),  $R$  is  $[\lambda w_1 \in D_s. \lambda w_2 \in D_s. w_1 \text{ is a belief world of John or Mary in } w_2]$ . In effect,  $R$  does the work of accommodating the

presuppositions of the nuclear scope into the adverb's restriction. *Agree on*, unlike *find out*, doesn't presuppose that its complement has an actual true answer, but rather a true answer in the worlds compatible with the beliefs of those individuals that the plural subject phrase refers to.

Finally, why is it that verbs of the *wonder*-class usually don't support QV? The answer to this question is not as straightforward. Beck and Sharvit speculate that this is due to the fact that verbs belonging to that class have much weaker presuppositions. This makes it hard to pick out the right division. In the case of *find out* and its cousins (*remember*, *discover*), the division is picked out in the actual world. In the case of *agree on* and its cousins (*certain*), the division is picked out in the belief worlds of the subject(s). But *wonder* and its cousins (*ask*, *inquire*) have very weak presuppositions, and it isn't clear in what world(s) the relevant division has to be picked out. Beck and Sharvit point out that when the context provides a presupposition regarding the division, QV readings are possible even with *wonder*. Consider (38) again, repeated below as (47):

- (47) Smith: Has John made up his mind about the cheating?  
 Jones: So far he has only made up his mind regarding Susie and Bill. For the most part, he is still wondering who cheated.  
 "For most relevant x, John is still wondering whether x cheated"

The presence of *still* indicates that *for the most part* quantifies over a division of *who cheated* that contains subquestions of it such that John has been wondering about them (i.e., he has been in a state of not knowing the answers to them). The predicted interpretation is the following:

- (48) There is a choice function  $f$  from sets of divisions to divisions, such that there are more questions in  $\{Q \in D_{\langle s, \langle s, t \rangle, t \rangle} : \text{for all } w', \text{ if } R([\mathbf{w}]^s)(w') \text{ then } Q \text{ is in } f([\mathbf{DIV}]^s([\mathbf{who\ cheated}]^s)(w'))\}$  than there are questions in  $\{Q \in D_{\langle s, \langle s, t \rangle, t \rangle} : \text{John is still wondering } Q \text{ in } [\mathbf{w}]^s\}$ , than there are questions in  $\{Q \in D_{\langle s, \langle s, t \rangle, t \rangle} : \text{for all } w', \text{ if } R([\mathbf{w}]^s)(w') \text{ then } Q \text{ is in } f([\mathbf{DIV}]^s([\mathbf{who\ cheated}]^s)(w'))\}$  that are not.  
 $R = [\lambda w_1 \in D_s. \lambda w_2 \in D_s. w_1 \text{ is a belief world of John in } w_2, \text{ and there is a belief world } w_3 \text{ of John in } w_2 \text{ such that } \{x : x \text{ cheated in } w_1\} \text{ has been distinct from } \{x : x \text{ cheated in } w_3\}]$

In short, for a QV reading to arise, there has to be a good division of the embedded question in the relevant world(s).<sup>9</sup> For this to happen, the nuclear scope must provide enough presuppositional material.

In the next section I extend the QV analysis to questions with QNPs, and derive their exceptional wide scope.

### 3.2. *Embedded QNPs*

I propose that embedded QNPs can support QV, with a silent universal adverb of quantification. The embedded question, which raises above the verb and combines

with **DIV**, is sometimes a functional question (in the sense of Engdahl 1986, Groenendijk & Stokhof 1984, Chierchia 1993). Let us illustrate this with *John found out which woman more than three men love*, where *more than three men* may be understood as taking wide scope. The proposed LF is this:

- (49)  $\exists \text{ch} [\text{ALL} [\text{ch} [\text{DIV} [\text{1 which}^{<e,e>} \text{-C woman-}w_1 \text{ more than three men-}w \text{ love}]] \text{ w}]] [\text{2 [John found out-}w \text{ } t_2]]]$

*Which* is superscripted with  $<e,e>$ . This is to indicate that the question is supposed to be understood as a functional question, that is to say, as roughly meaning: “which function  $f$ , from men to women, is such that more than three men  $x$  love  $f(x)$ ?”. Let us clarify this point.

When unembedded, *which woman do more than three men love* does not have a PL reading (recall Szabolcsi’s claim (section 2) that only *every*-NP supports genuine PL readings of unembedded questions). However, nothing prevents it from receiving a functional reading (and being answered by, for example, *more than three men love their mother*). I assume that when the embedded question raises above the embedding verb, it can only receive an interpretation that it would receive if it were unembedded. Since *which woman do more than three men love* can, when unembedded, receive a functional interpretation, it can receive the same interpretation here.

Given this assumption, the embedded question in (49) receives the following interpretation (**C** is a phonetically null pronominal element, which denotes the set of contextually relevant  $<e,e>$ -functions):

- (50)  $[\text{1 which}^{<e,e>} \text{-C woman-}w_1 \text{ more than three men-}w \text{ love}]^g =$   
 $\lambda w' \in D_s. [\lambda p \in D_{<s,t>}. \text{there is a function } g \in D_{<e,e>} \text{ s.t. } g \in [\text{C}]^g \text{ and for all } x \in \text{Dom}(g), g(x) \text{ is a woman in } w', \text{ and } p = \{w'' \in D_s : |\{x \in D_e : x \text{ is a man in } [w]^g \text{ and } x \text{ loves } g(x) \text{ in } w''\}| > 3\}]$

If  $[\text{C}]^g = \{\text{the actual-mother-of function, the actual-sister-of function}\}$ , the extension of  $[\text{1 which}^{<e,e>} \text{-C woman-}w_1 \text{ more than three men-}w \text{ love}]^g$  in  $[w]^g$  (which is the actual world) is:

- (51)  $\{\{w' \in D_s : \text{more than three actual men love their actual mother in } w'\},$   
 $\{w' \in D_s : \text{more than three actual men love their actual sister in } w'\}\}$

But the  $<e,e>$ -functions themselves do not have to correspond to linguistic expressions such as *their mother*. So  $[\text{C}]^g$  could be:<sup>10</sup>

- (52)  $\{\{<\text{Bill}, \text{Mary}>, <\text{Fred}, \text{Kate}>, <\text{Sam}, \text{Sally}>, <\text{Tom}, \text{Sue}>\},$   
 $\{<\text{Bill}, \text{Betty}>, <\text{Fred}, \text{Sally}>, <\text{Sam}, \text{Sue}>, <\text{Tom}, \text{Sue}>\}\}$

Suppose Bill, Fred, Sam, and Tom are the actual men, Bill loves only woman Mary, Fred loves woman Kate, Sam – woman Sally, and Tom – woman Sue. John is required, by (49), to have found out the answers to all members of a division of

**[1 which<sup><e,e></sup>-C woman-w<sub>1</sub> more than three men-w love]<sup>g</sup>**. One such division is **{[1 does Bill love woman-w<sub>1</sub> Mary]<sup>g</sup>, [1 does Fred love woman-w<sub>1</sub> Kate]<sup>g</sup>, [1 does Sam love woman-w<sub>1</sub> Sally]<sup>g</sup>, [1 does Tom love woman-w<sub>1</sub> Sue]<sup>g</sup>}**. Let us see why **[1 does Bill love woman-w<sub>1</sub> Mary]<sup>g</sup>** is a subquestion of **[1 which<sup><e,e></sup>-C woman-w<sub>1</sub> more than three men-w love]<sup>g</sup>** (where **[C]<sup>g</sup> = (52)**). This is because there is a world *w* (any world where Mary is a woman and Bill doesn't love her) and a proposition *p* (say,  $\{w' \in D_s: \text{Bill doesn't love woman-}w' \text{ Mary in } w'\}$ ) such that **Ans([1 does Bill love woman-w<sub>1</sub> Mary]<sup>g</sup>)(*w*)** entails *p*. Furthermore, there is a world *w\** (e.g., the actual world) where  $\{w' \in D_s: \text{Ans([1 which}^{\langle e,e \rangle} \text{-C woman-}w_1 \text{ more than three men-w love]}^g)(w')\} \cap p$  is the empty set.

Notice that this interpretation of *John found out which woman more than three men love* is very different from the interpretation of the same sentence, when the embedded functional question does not move:

- (53) John found out the answer to **[1 which<sup><s,<e,e>></sup> woman [2 more than three men-w<sub>1</sub>/w<sub>2</sub> love]<sup>g</sup>**

This is a narrow scope reading, according to which John found out, say, that more than three men love their mother (he may not know who the men are, or who is whose mother).

### 3.3. *The Monotonicity Problem*

The attentive reader has probably noticed by now that the QV analysis gives wrong results for QNPs of the *exactly three* and *at most three* variety:

- (54) John remembers which woman exactly three men love.  
Can mean: “exactly three men are such that John remembers which woman each of them loves”

The QV theory assigns (54) the following LF:

- (55)  $\exists \text{ch} [\text{ALL} [\text{ch} [\text{DIV} [\text{1 which}^{\langle e,e \rangle} \text{-C woman-}w_1 \text{ exactly three men-w love}] w]] [2 [\text{John remembers-w } t_2]]]$

It seems that we want some division that looks like this: {‘which woman does John love?’, ‘which woman does Bill love?’, ‘which woman does Fred love?’, ‘which woman does no one else love?’}. The conjunction of the answers to these questions may, indeed, give us a proposition that entails the answer to ‘which woman exactly three men love?’. But there are various problems with such a division, one of them being that the truth of (54) entails that John cannot have any memory regarding more than three men. This is not predicted by (55), with any division of the sort just described. *Exactly three* simply isn't “sitting” in the right place. Note that Szabolcsi's theory, which effectively lets the QNP take widest scope, makes the right prediction.<sup>11</sup>

But we have a good reason to want to maintain the QV analysis, even for *exactly three*-NPs. The reason is that the exceptional wide scope of these QNPs correlates with classical QV, just like the exceptional wide scope of other QNPs. This is shown by: (a) examples (1)-(4) in section 1 (which illustrate the *find out/wonder* contrast, and the fact that *whether*-questions and declaratives don't allow exceptional wide scope of such QNPs); (b) examples (29)-(30) in section 2 (which show that *agree (on)* and *certain* allow exceptional wide scope of these QNPs); (c) the fact that *decide* and *depend* do so too (as illustrated in (56) below); and (d) the fact that the *find out/wonder* contrast is relaxed in the expected environments (as illustrated in (57) below):

- (56) Which candidates exactly three professors will choose depends on this committee.  
Can mean: "exactly three professors  $x$  are such that which candidates  $x$  will choose depends on this committee".
- (57) Bill is still wondering which candidate exactly three professors will choose.  
Can mean: "exactly three professors  $x$  are such that Bill is still wondering which candidate  $x$  will choose."

Given this, I think the QV theory should be amended so as to accommodate these QNPs (rather than be given up). I propose, therefore, that the quantifier part of the QNP has the option of separating from the noun part, and moving to the adverb position. This will result in the following LF for (54):

- (58)  $\exists$ ch [exactly three [ch [DIV [1 which<sup><e,e></sup>-C woman-w<sub>1</sub> \_ men-K-w love] w]] [2 [John remembers-w t<sub>2</sub>]]]

In addition, I assume an operation that interprets [ $\_$  men-K-w] as the generalized quantifier  $[\lambda P \in D_{\langle e,t \rangle}. \{x \in D_e : x \in [\mathbf{K}]^e \text{ and } x \text{ is a man in } [\mathbf{w}]^e\} \subseteq \{x \in D_e : P(x)=1\}]$ , resulting in roughly the following meaning for the raised question: "which  $\langle e,e \rangle$ -function  $f$  is such that every individual  $x$  who is a man and a member of  $[\mathbf{K}]^e$  loves  $f(x)$ ".  $[\mathbf{K}]^e$  is fixed by the context as the largest set whose intersection with the set of men yields the set of relevant men. Accordingly, (54) roughly means: 'exactly three questions  $Q$  are members of  $\{Q' \in D_{\langle s, \langle \langle s,t \rangle, t \rangle \rangle} : Q' \text{ is a subquestion of "which } \langle e,e \rangle\text{-function } f \text{ is such that every individual } x \text{ who is a man and is a member of } [\mathbf{K}]^e \text{ loves } f(x)\text{"}\}$  and of  $\{Q' \in D_{\langle s, \langle \langle s,t \rangle, t \rangle \rangle} : \text{John remembers } Q'\}$ ' (the fact that  $\exists$  in (58) is "above" **exactly three** has no undesired effect, because all the choice functions applied to [DIV [1 which<sup><e,e></sup>-C woman-w<sub>1</sub> \_ men-K-w love] w] pick out sets of questions whose answers are the same).

But there doesn't seem to be solid independent evidence for the separation of the quantifier part of the QNP from the noun phrase part. In fact, in many cases such a separation would yield wrong results. For example:

- (59) a. John believes that every man left.  
b. Every [John believes that  $\_$  man left]

- c. For all x, John believes that x is a man and that x left.

Clearly, (59c) is not any of the meanings of (59a). But notice that here, *every* binds the variable that it leaves behind. This is not so in (58), where the moved quantifier binds a different variable – the variable left behind by the movement of the quantifier gets bound by a universal which is inserted independently. Still, independent motivation for this separation is required.

Some justification for the separation of the quantifier from the noun phrase is provided by the fact that decreasing and non-monotonic QNPs, unlike other QNPs, do not have exceptional wide scope when there is an overt adverb of quantification. The contrast between (60) and (61) illustrates this.

- (60) ##John partly remembers which woman at most/exactly three men love.  
 (61) John partly remembers which woman more than three men love.

In the current theory, this contrast is explained as follows. In (60), *partly* occupies the position that *at most three/exactly three* “wants” to occupy. In (61), there is no competition over that position.

#### 4. The Correlation with “Classical” QV

Since the ability of quantifiers to take exceptional wide scope is a QV effect, it is predicted to correlate with the availability of “classical” QV readings (see 3.1).

First, the *find out/wonder* contrast with respect to exceptional wide scope is predicted to correlate with the *find out/wonder* contrast with respect to QV:

- (62) a. John partly found out who cheated.  
       “For some x that cheated, John found out that x cheated”  
       b. John found out which woman at most/more than three men love.  
       “*At most/more than three men x are such that John found out who x loves*”  
 (63) a. ##John partly wonders who cheated.  
       “*For some x, John wonders whether x cheated*”  
       b. John wonders which woman at most/more than three men love.  
       Cannot mean: “*At most/more than three men x are such that John wonders who x loves.*”

Secondly, as noted in 3.1, some verbs that are exclusively interrogative-taking support QV. It turns out that they also allow exceptional wide scope:

- (64) a. Who will be admitted depends, for the most part, exclusively on this committee.  
       “*For most relevant x, whether x will be admitted depends exclusively on this committee.*”

- b. Which candidate less than three professors will interview, depends exclusively on this committee.  
 “For less than three professors *x*, which candidate *x* will interview depends exclusively on this committee”

Thirdly, the *find out/wonder* contrast with respect to QV may be relaxed when the verb is accompanied by a presuppositional element. It turns out that it is also relaxed with respect to exceptional wide scope:

- (65) Smith: Has John found out who cheated?  
 a. Jones: So far he has found out about Susie and Bill. For the most part, he is still wondering who cheated.  
 “For most *x*, John is still wondering whether *x* cheated”  
 b. Jones: So far he has found out that Susie copied the first part and Bill the last part. He is still wondering which part more than fifty students copied.  
 “For more than fifty students *x* that John has been wondering which part *x* copied, he is still wondering which part *x* copied.”

Fourthly, *agree on* and *certain*, which unlike *find out* do not “care” about actual true answers, which unlike *wonder* are not exclusively interrogative-taking, and which support QV, allow exceptional wide scope:

- (66) a. John and Mary partly agree on who cheated.  
 “For some *x*, John and Mary agree that *x* cheated”  
 b. John and Mary agree on which woman at most three men love.  
 “At most three men *x* are such, that John and Mary agree on which woman *x* loves”

In addition, as noted in section 1, declaratives allow neither exceptional wide scope nor QV. This is also true of *whether*-questions, and predicted:

- (67) a. #John partly believes that every professor left.  
 Cannot mean: “For some professor *x*, John believes that *x* left”  
 b. It isn’t true that John believes that more than three professors left.  
 Cannot mean: “It isn’t true that more than three professors *x* are such that John believes that *x* left.”

(68) #John partly remembers whether more than five men left.

- (69) John found out whether more than five men left.  
 Cannot mean: “more than five men *x* are such that John found out whether *x* left.”

The general conclusion, then, is that exceptional wide scope is nothing more than a QV effect.

## 5. Summary

Both Szabolcsi's theory and the current proposal rely on the assumption that exceptional wide scope involves interpreting the entire embedded question above the embedding verb. They differ in how the raised question combines with the other parts of the construction. I see very little sense in trying to compare these theories on the basis of their (in)elegance, since both can be argued to have a substantial stipulative component. The basis for comparison should therefore be what they have to say about the correlation between exceptional wide scope and the phenomena that have been traditionally viewed as QV effects.

In principle, it should be possible to derive the *find out/wonder* contrast from the "extensional"/"intensional" contrast, in the spirit of Groenendijk and Stokhof/Szabolcsi. The problem with this view, as pointed out in section 2, is that the extensional/intensional distinction doesn't cut the pie the way we want it to. The verbs *agree (on)* and *certain* are "intensional" in the sense of Groenendijk and Stokhof, but they support exceptional wide scope as well as QV.

In Lahiri's theory of QV, *agree (on)* and *certain* are predicted to support QV because they have a declarative-taking meaning. The problem with that theory, though, is that verbs that are exclusively interrogative-taking are not predicted to support QV, contrary to fact. For this reason it is also hard to see how the theory could be extended to account for exceptional wide scope.

However, in the current theory, verbs whose surface complements are interrogatives are not distinguished on the basis of type (as in Groenendijk and Stokhof/Szabolcsi's theory): all interrogative-taking verbs take Hamblin question-intensions. They are not distinguished in terms of whether they have a declarative-taking meaning alongside their interrogative-taking meaning (as in Lahiri's theory) either. What matters for the emergence of a QV reading is what kind of presuppositions – if any – a given verb has. A division of the embedded question (i.e., the set of subquestions over which the adverb quantifies over) is selected on the basis of these presuppositions. Verbs such as *find out* presuppose that their complement has a true answer in the actual world. Verbs such as *agree (on)* presuppose that their complement has a true answer in the belief worlds of the attitude holder(s). Verbs such as *wonder* presuppose neither. This is the basis for the contrasts between the different verb classes with respect to QV, and by extension, with respect to exceptional wide scope.

## Endnotes

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<sup>1</sup> See Szabolcsi 1997 for a convincing argument that so-called “choice questions” (e.g., *who/which women do two men love*, which seem to allow an answer such as *John loves Mary and Bill loves Sally*) are not genuine PL questions.

<sup>2</sup> See Preuss 2002 for some objections to Szabolcsi’s empirical generalizations. For lack of space, I cannot discuss their (ir)relevance to the current discussion.

<sup>3</sup> Szabolcsi doesn’t formulate this as a presupposition.

<sup>4</sup> This is not entirely correct. In Lahiri 2002 it is argued that what restricts the adverb is determined partly by the presuppositions of the nuclear scope, and partly by purely contextual factors.

<sup>5</sup> I am giving a somewhat simplified version of Beck and Sharvit’s theory, since it suffices to cover the range of data discussed here. In addition, I incorporate Dayal’s 1996 notion of answerhood into the definition of ‘Ans’ since it accounts for uniqueness presuppositions of singular *which*-questions.

<sup>6</sup> Beck and Sharvit’s definition of ‘division’ lacks clause (iv).

<sup>7</sup> The non-overlap condition (42iii) ensures, for example, that ‘did Bill cheat’ and ‘did Fred and Bill cheat?’ will not find themselves in the same division of ‘which students cheated’, when both Fred and Bill cheated. This is crucial when the adverb is *for the most part*.

<sup>8</sup> See Beck and Sharvit, in press, for the analysis of QV induced by *depend* and *decide*. The analysis relies on strong answerhood, ignored here for simplicity.

<sup>9</sup> Some speakers seem to allow a QV reading in such cases, when the embedding verb is *know*. See Beck and Sharvit for some discussion of this.

<sup>10</sup> If these functions can consist of “random” pairs, we should ask why a PL answer (which spells out these pairs) is unavailable for the matrix *which woman do more than three men love*. I think the problem is much more general, because as long as we concede that *which woman do more than three men love* has a “natural function” reading, we have to wonder why we cannot answer it by spelling out the extension of the function in the actual world.

<sup>11</sup> Notice that neither theory accounts for absence of wide scope with *no*-QNP and *few*-QNP.

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