

Pluralities of Questions

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Abstract

This paper proposes a novel semantic analysis of the quantificational variability data discovered by Berman (1991). We suggest that the adverb of quantification in those data quantifies over semantic questions. Its domain is a division of the original question into subquestions, where a legitimate division into subquestions is one in which each member contributes towards the answer to the original question, and together the answers to all subquestions provide the complete answer to the original question. Thus the question itself is associated with a part/whole structure, based on information. We show that there are quantificational variability effects in which the matrix verb is exclusively question-embedding. These data pose a problem for other theories of quantificational variability in questions (specifically Berman 1991 and Lahiri 2002) and motivate our analysis. There are other desirable consequences of our theory, including flexibility in what counts as a subquestion and flexibility in what counts as a complete answer. Beyond quantificational variability, associating questions with a part/whole structure receives independent motivation from questions that occur in collective and cumulative embedded contexts.

1 INTRODUCTION

The topic of this paper is the semantic analysis of data like (1a) under reading (1b).

- (1) a. Mary mostly knows who cheated.
b. For most people who cheated, Mary knows that they cheated.

Such data have been discovered by Berman (1991) and have since been discussed under the term quantificational variability effects (QVE). The interesting aspect of (1) is that the adverb of quantification in the matrix clause appears to quantify over answers, in some sense, to the embedded question. In this example, we seem to talk about most cheaters. The problem posed by this interpretation is how the adverb finds its domain of quantification, and what exactly that domain is.

Different answers have been given to this question, most prominently by Stephen Berman (Berman 1991) and Utpal Lahiri (Lahiri

2002; see also Lahiri 1991, 2000; Groenendijk & Stokhof 1994; Ginzburg 1995a,b; Williams 2000; Preuss 2001). We will add yet another proposal, different from all preceding ones, according to which the adverb quantifies over subquestions of the question denoted by the embedded interrogative.

The structure of the paper is as follows: In section 2 we briefly review Berman's and Lahiri's influential proposals. We then introduce a set of data that force us to abandon both, and motivate an approach in terms of quantification over (sub-)questions. Section 3 develops the theory: what is a subquestion, and how do we find the relevant subquestions to a given question? The basic theory leaves open several issues that arise in connection with QVE, such as the role of the question embedding verb and the effect of presuppositions. Those are discussed in section 4. Section 5 addresses a consequence of our analysis of QVE: questions are plural objects. We will bring forth some further supporting evidence for this view. Section 6 concludes the paper.

2 QUANTIFICATIONAL VARIABILITY EFFECTS: QUANTIFICATION OVER WHAT?

2.1 *Previous proposals*

We will first sketch Berman's (1991) theory of QVE and then Lahiri's (2002) analysis. A comment on our decision to select these two from the set of theories available in the literature: In terms of general analyses of QVE that are substantially different from our two representatives, we are neglecting Groenendijk & Stokhof (1994) and Ginzburg (1995a,b). We are convinced by the discussion in Lahiri (2002) that Groenendijk & Stokhof's analysis contains a fatal problem (see Lahiri 2002: chapter 3). We also follow Lahiri (2002) in regarding Ginzburg's crucial data and their analysis to be a different phenomenon than QVE proper. In Lahiri's terms, the adverb measures degrees to which the matrix predicate holds of the embedded question; this is not the case with regular QVE. See Lahiri (2002: chapter 5) for discussion. Finally, we selected Lahiri (2002) as the representative of Utpal Lahiri's work because it is the most recent and comprehensive study.

2.1.1 *Berman* Let's start by considering a few more examples of QVE. Data like (2)–(4) were noted by Berman.

- (2) a. Sue remembers, for the most part, what she got for her birthday

- b. For most things that Sue got for her birthday, Sue remembers that she got them for her birthday.
- (3) a. John knows in part who cheated on the final exam.
 b. For some people who cheated on the final exam, John knows that they cheated on the final exam.
- (4) a. With few/no exceptions, Sally told me who cheated.
 b. For (almost) all people who cheated, Sally told me that they cheated.

In all of these data, the most obvious intuitive paraphrase is one in which the adverb quantifies over individuals. Berman takes this as evidence for a semantic representation in which the adverb is associated with an individual variable, the one introduced by the *wh*-phrase. The logical form for (3a), for example, is (5). (5) can straightforwardly be interpreted to yield truth conditions equivalent to the paraphrase in (3b).

- (5) Some x [x cheated on the final exam]
 [John knows that x cheated on the final exam]

Less clear is how we can derive this representation. Berman proposes that the embedded interrogative makes the semantic contribution indicated in (6a)—it denotes an open proposition. The *wh*-phrase itself is then also an open sentence, as given in (6b). On Berman's analysis, *wh*-phrases in these constructions are like indefinites in a Heim/Kamp framework, in that they contribute a variable that other operators can quantify over (Heim 1982; Kamp 1981).

- (6) a. who cheated on the final exam \rightarrow
 x cheated on the final exam
 b. who $\rightarrow x$

Note that the embedded interrogative denotes a proposition (type $\langle s, t \rangle$), not a semantic question; semantic questions are objects of type $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$, as we will assume (following Hamblin 1973 and Karttunen 1977).

So far, then, we have an idea of how to derive the nuclear scope of the logical form in (5). Berman suggests that the adverb finds its restriction via a process of presupposition accommodation. We specify a simplified version in (7).

- (7) Presupposition Accommodation (simplified):
 If the nuclear scope of an adverbial of quantification is $P(x)$ and $P(x)$ presupposes $S(x)$, then insert $S(x)$ in the restriction.

The verb in all the QVE data above is factive; thus for John to know a proposition p presupposes that p is true. Hence presuppositions of the nuclear scope in (5) amount to precisely what we need as a restrictive term, and will be added to the restriction by accommodation.

The analysis makes one attractive prediction. The data in (8) do not permit a QV reading (the judgment indicated refers to that—other readings may be possible).

- (8) a. # Sue mostly wonders what she got for her birthday.
 b. ? For most things that Sue got for her birthday, Sue wonders that/if she got them for her birthday.
 c. # Bill mostly asked which students cheated.

Note that the verbs in (8), in contrast to the ones in (2)–(4), cannot embed propositions:

- (9) *Sue wonders/asked that Bill cheated.

Berman derives the different behaviour of the two classes of verbs with respect to QVE from this fact. Since *wonder* requires a complement that is semantically a question, the embedded interrogative has to have the semantics in (10) (like Berman, we will assume a Hamblin/Karttunen semantics of questions throughout).¹

- (10) a. $\llbracket \textit{who cheated} \rrbracket = \lambda w \lambda p \exists x [p = \lambda w' [x \textit{ cheated in } w']]$
 b. {that Bill cheated, that Sally cheated, that Frank cheated, ...}

(10a) is the question intension; in any given world, the embedded interrogative will denote a set of propositions like (10b). Berman suggests that this denotation is derived from a structure that contains an invisible question operator, as indicated in (11). The semantics of the question operator is given in (12). This results in the desired Hamblin/Karttunen semantics.

¹ Our semantics is like both Hamblin's (1973) approach and Karttunen's (1977) approach in that the extension of a question is a set of propositions. Like Hamblin and unlike Karttunen, the propositions in that set are possible (rather than true) answers to the question. Like Karttunen and unlike Hamblin, we assume a *de re* interpretation of wh-phrases in which the restrictor is interpreted outside the question propositions. These choices are made for convenience—they are not the issue of the paper. Moreover, we will consistently pretend that the variable introduced by the wh-phrase ranges over singularities. Thus our Hamblin answers will always be what Lahiri calls atomic answers. This is once more for convenience—the Hamblin answers we make reference to can always be reconstructed from a reasonable plural semantics by the means Lahiri employs.

(11) $[Q_1 [\text{who } x_1 \text{ cheated } x_1]]$

(12) $[[Q_{1\dots n}(S(x_1 \dots x_n))]] = \lambda p \exists x_1 \dots x_n [p = S(x_1 \dots x_n)]$

The question operator binds the variable introduced by the *wh*-phrase. Hence it cannot get bound by a higher adverb of quantification. The lack of QVE with *wonder*-type verbs thus follows from the fact that they cannot combine with a proposition.

Berman's analysis of QVE forces him to say that an interrogative like 'which students cheated' has two different meanings, depending on whether it is embedded under *know* or under *wonder*—regardless of the fact that syntactically, the two structures look exactly the same. Thus we have an odd split in the mapping from syntax to semantics. Also, Berman's analysis does not relieve him of the need to assume a verb *know* that combines with a semantic question: a *whether*-question intension would be of type $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$ according to Berman.

(13) John knows whether Bill cheated.

These asymmetries were part of the basis for Lahiri's criticism of Berman, and motivation for an alternative analysis.

2.1.2 *Lahiri* Lahiri, through the several stages of his work (Lahiri 1991, 2000, 2002) identifies several problems with Berman's specific analysis and assumptions, which we will not recapitulate here. Suffice it to say that there is an attraction to preserving an analysis of interrogatives in which they uniformly correspond to semantic questions (cf. Lahiri 2002 for extensive discussion). This, however, precludes an analysis of QVE in which the adverb binds the variable introduced by the *wh*-phrase: that variable is already bound within the interrogative. Thus for Lahiri the adverb quantifies not over individuals, but over answers to the embedded question in a different sense: propositional answers. He suggests the logical form (14b) for (14a):

- (14) a. John mostly knows which students cheated on the final exam.
 b. Most p [p is an answer to 'which students cheated on the final exam' and p is true]
 [John knows p]

The denotation of the embedded interrogative is the standard Hamblin/Karttunen semantics, given in (15).

- (15) a. $\llbracket \textit{which students cheated} \rrbracket = \lambda w \lambda p \exists x [x \text{ is a student in } w \text{ and } p = \lambda w' [x \text{ cheated in } w']]$
 b. {that Bill cheated, that Sally cheated, that Frank cheated, ...}

We still need to say what it means to be an answer to a question. We will make the following simplifying assumption (Lahiri's actual proposal is more sophisticated, in ways that do not matter for our discussion).

- (16) Simplification: $\text{Ans}(p, Q, w)$ is true iff $p \in Q(w)$

We call the members of the question extension Hamblin answers. We can then formalize the idea in (14) as in (17) (where Q is the semantic question in (15)).

- (17) a. John knows, for the most part, which students cheated.
 b. $\text{Most } p [\text{Ans}(p, Q, w) \ \& \ p(w)] [\text{John knows } p \text{ in } w]$

(17b) thus means that John knows most of the propositions that are true members of the Hamblin denotation of the question 'which students cheated'. This will have the same outcome in terms of the intuitive truth conditions of (17a) as Berman's analysis (John can identify most cheaters); however, it allows us to maintain a question semantics for the embedded interrogative. A remaining problem is once more how to derive the representation in (17b). Lahiri (2002) suggests that the embedded clause raises at LF, and yields the structure in (18a). Such structures are interpreted to yield the representation in (18b) (see Lahiri 2002 for details).

- (18) a. $[\text{IP}[\text{CP} \textit{which students cheated}]_i [\text{ for the most part } [\text{IP} \text{John knows } t_i]]]$
 b. $\text{Most } p [\text{Ans}(p, \llbracket \textit{which students cheated} \rrbracket, w) \ \& \ C(p)] [\text{John knows } p \text{ in } w]$

Note that the variable C is a free variable, to be assigned a value by context. It restricts the possible answers that the adverb quantifies over. Comparing (18b) to our target representation (17b), the value for C must be (19), restricting the propositions quantified over to true Hamblin answers.

- (19) $\lambda p. p(w)$

The question is how we can make sure that the value for C amounts to that restriction. Lahiri (1991) resorted to presupposition

accommodation to derive this (just like Berman). Lahiri (2002) observes that presupposition accommodation is problematic (for general reasons as well as for reasons specific to QVE). He suggests that lexical properties of the embedding verb are (at least partially) responsible. We will come back to this point when it becomes relevant (section 4.3).

Let us point out the feature of Lahiri's analysis that is important to us, which he shares with Berman. The embedding verb in a QVE structure is (and has to be) proposition embedding. Otherwise we cannot derive the appropriate domain of quantification (propositional answers to the embedded question for Lahiri, individual answers for Berman). While this looks like a desirable feature of an analysis of QVE in view of the *wonder* data in (8), we will see below that it is actually a problem.

2.2 Quantifying over subquestions

2.2.1 Data This subsection will show that there are cases in which the verb in a QVE structure must embed a semantic question. To show this, we have to present data that permit a QV reading in which the matrix verb can embed questions only (i.e. cannot embed propositions). (20) below is such an example.

- (20) Who will be admitted depends for the most part (exclusively) on this committee.
- (21) a. This committee is an important factor in deciding who will be admitted.
 b. For most people, it depends (exclusively) on this committee whether they will be admitted.

The sentence in (20) has a reading that is irrelevant for our purposes, paraphrased in (21a). Such readings are analysed by Lahiri (2002) as talking about the degree of dependence, and are not QVE in our sense. We should note that sentences like (20) have been noticed by Ginzburg (1995b), but the interpretation he describes seems to us to be the 'degree of dependence' one that we will not be concerned with.

The reading in (21a) can be excluded by adding *exclusively* to the sentence. We then only get the reading paraphrased in (21b). This is clearly a QV reading. At the same time, the subject clause of *depend on* cannot be a proposition (cf. (22)). Hence we cannot adopt either Berman's or Lahiri's analysis (attempts given in (23) and (24)). Apart from the problem of specifying an appropriate restriction to the quantification (uncertain material is bracketed), they would simply make no semantic sense.

(22) *That Joe will be/was admitted depends on this committee.

(23) # Most x [x is a person (and x will be admitted)]
 [that x will be admitted depends on this committee]

(24) # Most p [Ans(p , [[*who will be admitted*]], w) (& $p(w)$)]
 [p depends on this committee in w]

Unfortunately for us, there are not very many verbs that exclusively embed questions. Verbs that embed questions but not propositions include *ask*, *wonder*, *investigate* and the like, which do not appear to permit QVE; those verbs will be discussed in section 4.4. Other than *depend on*, we have found the verbs *decide* and *determine*, which seem to be used in a different sense when embedding a question than when embedding a proposition. Consider (25a). The sentence clearly has the QV reading paraphrased in (25b).²

- (25) a. The committee mostly decides which candidates will be admitted.
 b. For most candidates, the committee decides whether they will be admitted.

Interestingly, the paraphrase is in terms of a *whether*-question, just like in the example with *depend on* above. Note that proposition embedding *decide* is in fact odd with the generic tense used in the example. This is one indication of a semantic difference between proposition embedding *decide* vs. question embedding *decide*.

- (26) a. The committee decides who will be admitted.
 b. ?The committee decides that Fritz will be admitted.

Furthermore, paraphrases with propositions like the ones below, while perhaps not entirely ungrammatical, certainly do not capture the interpretation that (25a) intuitively has.

- (27) a. For most candidates, the committee decides that they will be admitted.
 b. For most candidates that will be admitted, the committee decides that they will be admitted.

We conclude that there are QVE in which the matrix verb embeds an interrogative. Neither Berman's nor Lahiri's analysis is able to account for these QV interpretations.

² For some speakers, the sentence requires stress on *the committee* for this reading to be available. We have noticed that a QV interpretation with predicates other than Berman's classical QV predicates *know*, *remember* etc. sometimes depends on a focus for the whole sentence outside of the embedded question. This point will come up again in section 4.4. We are not, however, in a position to explain this effect at the present time.

2.2.2 *Proposal* Let us sketch the intuitive idea behind our analysis of QVE—the formal details will be developed in the next section.

If the matrix verb in a QV structure is question embedding, we have a choice between a Bermanesque formalization like (29a) (where we quantify over individuals) and a more Lahirian approach like (29b) (in which we quantify over higher order objects—questions).

- (28) a. The committee mostly decides which candidates will be admitted.
 b. For most candidates, the committee decides whether they will be admitted.
- (29) a. Most x [x is a candidate]
 [this committee decides whether x will be admitted]
 b. Most Q [Q is a relevant subquestion of ‘which candidates will be admitted’]
 [the committee decides Q]

We will not pursue an analysis along the lines of (29a); besides problems with the compositional derivation of such a representation, it would not be able to cover some of the pertinent QV interpretations to be discussed in the next sections. Thus we propose that the adverb of quantity in a QV structure quantifies over semantic questions as indicated in (29b). For the salient interpretation of our example, the set of relevant subquestions has to be a set of *whether*-questions: one for each candidate, as indicated in (30). The sentence is true on this interpretation if the committee makes a decision on most of these *whether*-questions.

- (30) a. Which candidates will be admitted?
 b. {will Frank be admitted?, will Sue be admitted?, will Sally be admitted?}

Similarly, we suggest that the classical example in (31a) has a representation roughly like (31b). (31b) will be true if John can answer most questions in the set of relevant subquestions of ‘who cheated’. If we assume that the relevant subquestions are the *whether*-questions we can ask about each cheater, as indicated in (31c), then (31a) will be true if John can identify most cheaters—the desired truth conditions for the example.

- (31) a. John mostly knows who cheated.
 b. Most Q [Q is a relevant subquestion of ‘who cheated?’]
 [John knows Q]

- c. {did Sally cheat? did Frank cheat? did Sue cheat?}
 d. a knows Q in w iff a knows the answer to Q in w

Note that we assume that the embedding verb (here: *know*) combines with the subquestion in the same way as that verb normally combines with an embedded interrogative. In this case, to know a question means to know the answer to that question, as indicated informally in (31d) (see Karttunen 1977; Heim 1994 and Beck & Rullmann 1999 for relevant discussion).

Our basic intuition about what the set of relevant subquestions of a question is, is that each subquestion gets us closer to being able to answer the original question, and together the answers to all the subquestions completely answer the 'big' question (see Roberts 1996 for a similar notion of 'subquestion'). The set of relevant subquestions has to be a division of the 'big' question Q in the sense of (32) below.

- (32) A set S of questions is a division of a question Q into subquestions in w
 iff
 (i) Each $Q' \in S$ is a subquestion of Q .
 and (ii) the conjunction of the answers to all $Q' \in S$ provides an answer to Q in w .
 (where Q, Q' are of type $\langle s, \langle \langle s, t \rangle, t \rangle \rangle$)

(32) is a first step towards understanding how we divide a question into subquestions. The next section will be devoted to making this definition precise. We should stress, at this point, the intellectual debt to Lahiri's analysis. Just like Lahiri, we try to quantify the information provided by a complete answer to a question. The technical details will be quite different, but our system just like his relies on finding 'parts' of an answer to a question.

3 DIVIDING A QUESTION INTO SUBQUESTIONS

3.1 *Outlining the task ahead*

Our starting point is the assumption from section 2 that (33a) involves quantification over subquestions and has a logical form approximately like (33b):

- (33) a. John mostly knows who cheated.
 b. Most Q' [Q' is a relevant subquestion of 'who cheated?']
 [John knows Q']

We abbreviate that representation to (34) below. $\text{Part}(Q)(w)$ in the representation in (34) is a variable that ranges over sets of semantic questions. The value assigned to this variable needs to be, not just any old set of questions, but the set of relevant subquestions of the original question Q . We will assume that $\text{Part}(Q)(w)$ ranges over divisions of Q into subquestions in the sense of (35). The variable name includes the question Q and the world w to make transparent the dependency of the value assigned to the variable on those two things.

(34) Most Q' [$Q' \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$] [John knows Q' in w]

(35) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,

iff

(i) Each $Q' \in \text{Part}(Q)(w)$ is a subquestion of Q .

and (ii) the conjunction of the answers to all $Q' \in \text{Part}(Q)(w)$ provides an answer to Q in w .

In what follows we will clarify the notions of answer and of subquestion involved here. Both are empirical issues and will be addressed in sections 3.2 and 3.3 respectively. Even when we have been more formal about this, many sets will count as divisions into relevant subquestions for a given question. We suggest that the choice between those sets corresponds to determining the contextually relevant division into subquestions, and varies with the context. We will see examples of such variability in section 3.3. $\text{Part}(Q)(w)$ in our formulas is a free variable ranging over divisions of a question into subquestions, and will be assigned a value by context. It is obvious that our semantics is conceptually parallel to Schwarzschild's (1996) context dependent semantics of plural predication (more on the parallel in section 4.1). Section 3.4 adds an important constraint to this pragmatic flexibility: the division into subquestions has to be minimal in the sense that no proper subset of questions may already completely answer the original question.

The most important empirical outcome of this section is, in a nutshell, that QVE exhibits more flexibility than either Berman's or Lahiri's original theories would lead one to expect (an observation also made in Williams 2000). We will see that quantification over subquestions is well-suited to capture this.

3.2 Answerhood

The purpose of this subsection is to clarify what notion of answer is involved in our definition (35) repeated here:

- (36) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,
iff
(i) Each $Q' \in \text{Part}(Q)(w)$ is a subquestion of Q .
and (ii) the conjunction of the answers to all $Q' \in \text{Part}(Q)(w)$ provides an answer to Q in w .

We will have to make a concrete assumption regarding clause (i) and the definition of subquestion in order to proceed. It seems safe to assume that a *whether*-question derived from a proposition in the Hamblin denotation is a subquestion (cf. section 2). We will make the assumption in (37) and limit ourselves to such subquestions in this section. Our formal definition of subquestion in section 3.3 will derive that (37) holds.

- (37) Q' is a subquestion of Q if $\exists p[p \in Q(w)$ and $Q' = \text{whether}(p)$]
(38) a. $\text{whether}(p) = \lambda w \lambda p'. p' = p \vee p' = \text{non } p$
b. $\text{non } p = \lambda w. \sim p(w)$

On to answerhood. Out of all the notions of answerhood that have been discussed in the literature (e.g. Groenendijk & Stokhof 1984; Lahiri 1991; Heim 1994; Dayal 1996) the ones that we will make use of in this section are Heim's (1994) notions of a weakly exhaustive answer and a strongly exhaustive answer, which we call *Ans-wk* and *Ans-strg* respectively (in Heim's terminology they are *answer1* and *answer2*). The definitions are given below.

- (39) a. $\text{Ans-wk}(Q)(w) = \lambda w'. \forall p[Q(w)(p) \& p(w) \rightarrow p(w')]$
 $= \lambda w'. w' \in \cap \{p : Q(w)(p) \& p(w)\}$
b. $\text{Ans-strg}(Q)(w) = \lambda w'. \text{Ans-wk}(Q)(w') = \text{Ans-wk}(Q)(w)$

Ans-wk corresponds to the intuitive notion of a complete answer—the conjunction of all true Hamblin answers. *Ans-strg* is the strongly exhaustive answer: the complete answer plus the information that that really is the complete answer to the question (this is, in fact, the denotation that Groenendijk & Stokhof 1982, 1984 assign to the question). To give a quick illustration, consider the question in (40a) in the situation described in (40b). *Ans-wk* will be the proposition in (40c) and *Ans-strg* will be the proposition in (40d).

- (40) a. Who cheated?
b. Anna, Bill and Cecilia cheated. David and Elaine did not cheat. Nobody else is relevant in the context of the question.

- c. Anna, Bill and Cecilia cheated.
- d. Anna, Bill and Cecilia cheated and nobody else cheated.
(i.e. 'Anna cheated', 'Bill cheated' and 'Cecilia cheated' are all the true answers to the question 'who cheated?')

Both notions of answerhood turn out to be relevant for our QVE data. Consider (41a). There has been some discussion about whether the QVE interpretation of this example is (41b) or (41c) (e.g. already in Berman 1991).

- (41) a. John mostly found out who cheated.
- b. For most people who cheated, John found out that they cheated.
- c. For most people, John found out if they cheated.

The two interpretations are distinguished by the two scenarios given below.

- (42) scenario1: John has 7 students: Ashley, Brittany, Cody, Dustin, Elaine, Flora, and Gwendolyn. Elaine, Flora and Gwendolyn cheated, the others didn't. John found out that Flora and Gwendolyn cheated. Of the others, he does not know whether or not they cheated.
- (43) scenario2: The same situation. John found out that Ashley, Brittany and Cody didn't cheat and that Gwendolyn did. He does not know about Dustin, Flora and Elaine.

(41b) would be true in scenario1 and false in scenario2. (41c) would be false in scenario1 and true in scenario2. We have asked several informants about their intuitions and have gotten rather mixed results. Some people judge the sentence true in scenario1 and are reluctant about scenario2, one informant judged the sentence true in scenario2 and was reluctant about scenario1 and some people accept both.

Our analysis of (41a), remember, looks as follows:

- (44) a. John mostly found out who cheated.
- b. Most Q' [$Q' \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$]
 $\llbracket \text{John found out } Q' \text{ in } w \rrbracket$

How does this relate to the two paraphrases in (41b) and (41c)? It turns out that the two paraphrases correspond to two choices for $\text{Part}(Q)(w)$. If we formalize clause (ii) of the definition of division into subquestions with Ans-wk , we obtain an interpretation that amounts to (41b). If we choose Ans-strg instead, we obtain an interpretation that amounts to (41c).

- (45) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,
 iff
 (i) Each $Q' \in \text{Part}(Q)(w)$ is a subquestion of Q .
 and (ii) either a. $\cap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\}$
 $=\text{Ans-wk}(Q)(w)$
 or: b. $\cap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\}$
 $=\text{Ans-strg}(Q)(w)$

The first option means that answering all subquestions in $\text{Part}(Q)(w)$ provides information equivalent to Ans-wk —a complete list of cheaters. For this it is sufficient to choose $\text{Part}(Q)(w)$ as in (46a): answering all questions in (46a) will provide you with a complete list of cheaters. The second option means that answering all subquestions in $\text{Part}(Q)(w)$ provides information equivalent to the strongly exhaustive answer to Q : a complete list of cheaters plus the information that nobody else cheated, i.e. that everyone else did not cheat. For this it is necessary to choose $\text{Part}(Q)(w)$ as in (46b). Answering all the questions in (46b) will amount to a strongly exhaustive answer to Q .

- (46) a. $\text{PART1}(Q)(w) = \{\text{did Elaine cheat? did Flora cheat? did Gwendolyn cheat?}\}$
 b. $\text{PART2}(Q)(w) = \{\text{did Ashley cheat?, did Brittany cheat?, did Cody cheat?, did Dustin cheat?, did Elaine cheat? did Flora cheat? did Gwendolyn cheat?}\}$

For John to have found out about most questions in (46a) means that he knows of most cheaters that they cheated; for him to have found out about most questions in (46b) means that he knows of most people whether they cheated. On our analysis, the variability in interpretation between (41b) and (41c) is thus variation in the choice between Ans-wk and Ans-strg .

The issue of what counts as completely answering a question is a familiar one in the semantics of *wh*-questions, discussed extensively under the term exhaustivity (e.g. Groenendijk & Stokhof 1982, 1984; Berman 1991; Lahiri 1991; Heim 1994; Beck & Rullmann 1999). We adopt Beck & Rullmann's position that both notions of answerhood are in principle available, so both Ans-wk and Ans-strg can in principle count as complete answers to a question. Pragmatic as well as semantic considerations favour one notion of answer over the other, and there also seems to be a certain variability across speakers. See Beck & Rullmann for discussion of the general point. For our purposes in this paper, we have rediscovered a familiar underdeterminacy in a different

semantic context. We will assume that in QVE data, also, both notions of answerhood are in principle available. Therefore, we predict both a 'know that' and a 'know if' interpretation to be available.

Despite some uncertainty regarding the interpretation of individual examples, we think that the general picture definitely requires both an Ans-wk version and an Ans-strg version. While there is some variation between speakers, there can be no doubt that the majority of speakers accepts what we term an Ans-wk QVE interpretation for standard examples like (41a). At the same time, the *decide* example from section 2, repeated below, is most saliently interpreted with Ans-strg:

- (47) a. This committee mostly decides which candidates will be accepted.
 b. For most candidates, the committee decides if they will be accepted.

If 1–10 are the candidates, then our formalization in (48a) requires $\text{Part}(Q)(w)$ as in (48b) to get the salient interpretation. Answering each question in $\text{Part}(Q)(w)$ will provide Ans-strg to the original question.

- (48) a. Most Q' [$Q' \in \text{Part}(\llbracket \textit{which candidates will be accepted} \rrbracket)(w)$]
 [the committee decides Q' in w]
 b. $\text{Part}(\llbracket \textit{which candidates will be accepted} \rrbracket)(w) =$
 {will 1 be accepted?, will 2 be accepted?, ...will 10 be
 accepted?}

The Ans-wk example involved a proposition embedding verb, the Ans-strg example a question embedding verb. Does it follow from the type of the verb which interpretation we get? We don't think so. Remember that even the standard example (41a) is potentially ambiguous. Moreover, (49) below sketches the case of a question embedding verb with Ans-wk QVE (we owe this example to Irene Heim, personal communication).

- (49) On Monday we mostly decide who won't be accepted. On
 Wednesday we mostly decide who will be accepted.

Imagine we are discussing graduate admissions at the University of Somesville, ME. There are on average around 100 applicants, and about 10 will be admitted. On Monday we typically exclude about 60 people from consideration, and might also select the top one or two candidates that will be admitted. On Wednesday, we select the other eight or nine

successful candidates from the remaining 40. This state of affairs can truthfully be described by (49). Note that this is only possible if we choose an Ans-wk QVE interpretation for both embedded questions. The Ans-strg interpretations would make the two questions identical.

We conclude that both an Ans-wk and an Ans-strg version of $\text{Part}(Q)(w)$ are needed. The choice of a particular $\text{Part}(Q)$ is semantically underdetermined and must be affected by context. We will not speculate on what determines the choice between the two options in each example.

Let us briefly examine what Berman's and Lahiri's theories could say about the two options that for us boil down to Ans-wk and Ans-strg.

Berman would have to say (in view of the pair of *decide* data) that the complement clause is a *whether*-question. The difference between the Ans-wk and the Ans-strg case would have to lie in the restriction on *most*. The two options are given in (50b) and (50c). It is not clear how (50a) could be derived—note that the original Berman theory would have to be substantially changed in several respects (presupposition accommodation, role of *wh*-phrase, interpretation of complement clause).

- (50) a. Most x [candidate(x) & $R(x)$][the committee decides on whether x will be admitted]
 b. $R = \{x : x \text{ will be admitted}\}$
 c. $R = D$

Lahiri counts atomic parts of complete answers to a question, and for the Ans-strg interpretation would need to count atomic parts of Ans-strg instead of (as in his theory) Ans-wk. This, we believe, would require the denotation of the question to contain negative as well as positive instances. So we would have two sets of propositions that could alternatively be the relevant parts of the complete answer to a question—one with and one without negative instances. It is not clear to us how this could be done in a principled way.

We conclude that both theories would have to undergo substantial revisions. It is beyond the scope of this paper to work those out.

3.3 Subquestions

The purpose of this subsection is to determine what counts as a subquestion to a given question, i.e. to acquire a better understanding of clause (i) of our definition of $\text{Part}(Q)$ repeated below.

- (51) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,
iff
(i) Each $Q' \in \text{Part}(Q)(w)$ is a subquestion of Q .
and (ii) either a. $\cap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\}$
 $=\text{Ans-wk}(Q)(w)$
or: b. $\cap\{\text{Ans-strg}(Q')(w) : Q' \in \text{Part}(Q)(w)\}$
 $=\text{Ans-strg}(Q)(w)$

Intuitively, we want to say that Q' is a subquestion of Q if an answer to Q' provides a partial answer to Q . So far, all examples considered in this paper involved subquestions that were *whether*-questions corresponding to Hamblin answers. It is important to note that in these cases, we essentially count the same things as Berman and Lahiri, although disguised as a different type of semantic object. If all QVE data followed this pattern, we could leave it at that. However, the empirical picture is more complex, demanding greater flexibility; in our framework, the flexibility is in choosing subquestions, and we will see that this approach can handle variability fairly easily.

One type of example that shows that empirically, subquestions are not limited to Hamblin members are data with conjoined predicates inside the question:

- (52) Luise knows partly/for the most part which students took Semantics III and want to attend Acquisition of Semantics.

Let's assume that the set of true Hamblin answers is as in (53):

- (53) {that A took SIII and wants to attend AcqS, that B took SIII and wants to attend AcqS, that C took SIII and wants to attend AcqS}

Our semantic analysis for the example is given in (54); under the assumption that the *whether*-questions derived from (53) are the relevant subquestions, Luise has to know about two out of A , B , C that they took SIII and want to attend AcqS. This is the same prediction that Berman and Lahiri make (cf. (55a) and (55b)).

- (54) Most Q' [$Q' \in \text{Part}(\llbracket\text{which students took SIII and want to attend AcqS}\rrbracket)(w)$]
[Luise knows Q' in w]

- (55) a. Most x [student x and x took SIII and wants to attend AcqS]
 [Luise knows that x took SIII and wants to attend AcqS]
 b. Most p [Ans(p , [[*which students took SIII and want to attend AcqS*]], w) & $p(w)$]
 [Luise knows p in w]

While this is a possible interpretation of (52), it is not the only one. We think that the question also makes available the set of subquestions given in (56), and can be judged true if Luise knows the answer to most of those (or, with *partly*, some of those).

- (56) {Did A take SIII?, Did B take SIII?, Did C take SIII?, Does A want to attend AcqS?, Does B want to attend AcqS?, Does C want to attend AcqS?}

For example, the sentence can be judged true if Luise knows that A took SIII and wants to attend AcqS, that B took SIII and that C wants to attend AcqS. Note that she does not have to know about the majority of students in this case (and similarly with *partly*, she need not be fully informed about any one student). Neither the Berman analysis in (55a) nor the Lahiri analysis in (55b) predicts that this is possible. For us, the consequence of the example is that the members of the set in (56) have to count as subquestions of ‘which students took SIII and want to attend AcqS?’ in addition to the *whether*-questions corresponding to Hamblin propositions. We have to come up with a definition of subquestion that is liberal enough to allow (56) as Part([[which students took SIII and want to attend AcqS?]])(w).

Remember that the intuition behind the notion of subquestion is that an answer to the subquestion provides a partial answer to the original question. Let us examine (57) and (58) in the light of this intuition.

- (57) Which students took SIII and want to attend AcqS?

- (58) Did A take SIII?

The possible answers to (58) are (59):

- (59) {that A took SIII, that A didn’t take SIII}

So does an answer to (58) provide an answer to (57)? Well, it depends. If we know that A didn’t take SIII, then we know that A is

not among the students that took SIII and want to attend AcqS. Thus we can infer a partial answer to (57) from the answer to (58). On the other hand, if we know that A took SIII, then she might or might not be among the students who took SIII and want to attend AcqS. In that case, the answer to (58) does not tell us anything about (57).

Remember that (52) on the interpretation in which (56) is the required division into subquestions shows us that (58) must be able to count as a subquestion of (57). Thus it seems that what is required of a legitimate subquestion is that it is possible that the answer to the subquestion provides a partial answer to the original question. We therefore suggest the formalization of subquestion given in (60).

- (60) Q' is a subquestion of Q iff
 $\exists w' \exists p [\text{Ans-strg}(Q')(w') \rightarrow p \& p \text{ is a partial answer to } Q]$

The notion of partial answer that we make use of here is taken from Groenendijk & Stokhof (1984). A proposition is a partial answer to a question if it eliminates some uncertainty regarding the strongly exhaustive answer to the question. That's what (61) says: the Ans-strg to Q in world w^* is incompatible with p , for some w^* .

- (61) A proposition $p_{\langle s, t \rangle}$ is a partial answer to a question $Q_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle}$
iff $\exists w^* [\text{Ans-strg}(Q)(w^*) \cap p = \emptyset]$

Note that with this definition of subquestion, many things could count as a subquestion to a given question. Consequently, as long as all the subquestions together provide an answer to the original question, we can carve up the original question in more ways than one. Our example above shows that this is necessary; this is also the conclusion arrived at by Williams (2000), further pursued by Lahiri (2002) (we will turn to the type of data that inspired Williams below).

Another type of example in which subquestions are intuitively possible that do not match with Hamblin answers are questions that contain a plural NP (beside the *wh*-phrase), and that NP receives a distributive reading inside the question. An example is (62b) below (the context in (62a) is provided to ensure a distributive interpretation of the plural NP).

- (62) a. The UConn colloquium schedule for next semester consists of Arboreta St. Nome (a generative semanticist whose work is on innateness in semantics), Bonnie ('Big') Blue Bumble (a computational linguist working on information extraction based on statistical methods) and Cecilia Richardena McLambda (a

hard core Montegovian). Luise is amazed at this combination. Given the way the department selects speakers, several people must have voted for all three candidates. Of course none of them wants to admit this now. However, Luise is very persistent:

- b. Luise has found out for the most part who voted for *A*, *B* and *C*.

The semantics of the question is indicated in (63a) and the scenario we will assume in (63b).

- (63) a. for which x : x voted for each of *ABC*
 b. Scenario: 1–5 voted for each of *ABC*.

Given this, the true Hamblin answers are the set in (64).

- (64) {1 voted for *ABC*, 2 voted for *ABC*, 3 voted for *ABC*, 4 voted for *ABC*, 5 voted for *ABC*}

A Berman semantics, a Lahiri semantics, and our semantics with the default Hamblin *whether*-questions all predict that Luise has to have found out of the majority of 1–5 that they voted for *ABC*. Once more, this is a possible interpretation of (62b), but not the only one. Our semantics is indicated in (65). We think that the example allows several choices for $\text{Part}(Q)(w)$, which are given in (66).

- (65) Most Q' [$Q' \in \text{Part}(\llbracket \textit{who voted for ABC} \rrbracket)(w)$]
 [Luise has found out Q' in w]

- (66) a. {Did 1 vote for *ABC*?, Did 2 vote for *ABC*?, ... Did 5 vote for *ABC*?}
 b. {Did 1 vote for *A*?, Did 2 vote for *A*?, ... Did 5 vote for *A*?,
 Did 1 vote for *B*?, Did 2 vote for *B*?, ... Did 5 vote for *B*?,
 Did 1 vote for *C*?, Did 2 vote for *C*?, ... Did 5 vote for *C*?}
 c. {who voted for *A*? who voted for *B*?, who voted for *C*?}

(62b) can be judged true if Luise knows the answer to most of the questions in (66b) or (66c). Thus we observe a greater flexibility than an original Berman or Lahiri analysis leads us to expect. Quantification over subquestions predicts (66b) and (66c) as well as (66a) as long as the members of the sets in (66b) and (66c) count as subquestions of 'who voted for all of *ABC*?'. And this is indeed the case under definition (60) as the reader may verify.

A final case that we want to discuss in support of a subquestion analysis and definition (60) is that of cumulative readings inside a

question. This is an example type that Williams brings up in order to argue for more flexibility in the account of QVE. Consider (67).

(67) Luise knows for the most part which books these professors recommended.

The embedded question is compatible with a situation in which the professors recommended different books. Srivastav (1992); Krifka (1992) argue that this is due to a cumulative interpretation inside the question (rather than a pair-list effect). Let us focus on that reading, and assume that the scenario is as indicated in (68).

(68) 1 recommends book *A*, 2 recommends book *B*, 3 recommends books *C*, *D* and *E*.

The complete true semantic answer to the question in this set-up is (69), the question denotation is as indicated in (70).

(69) 1 + 2 + 3 recommended $A + B + C + D + E$.

(70) for which x , x a book: x was recommended by one of these professors

Williams observes that such questions can give rise to more than one QV reading. There is a reading that can be paraphrased as in (71a), and that is the expected one. However, there is also a less expected reading paraphrased in (71b).

- (71) a. For most y , y a book recommended by one of 1 + 2 + 3: Luise knows that y is a book recommended by one of 1 + 2 + 3.
 b. For most x , x one of 1 + 2 + 3, Luise knows which book(s) x recommended.

In our terms, the second reading requires the set of relevant subquestions to be as in (72):

(72) {which book(s) did 1 recommend?, which book(s) did 2 recommend?, which book(s) did 3 recommend?}

(73) 1 recommended A & 2 recommended B & 3 recommended $C + D + E$

(67) can be judged true if Luise knows the answer to most of the questions in (72). Interestingly, the conjunction of the answers to these subquestions (namely the proposition corresponding to (73)) is not itself the answer to the original question (namely (69))—it implies the answer to the original question. Thus we ought to revise our definition of Part(Q) as indicated in (74):

- (74) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,
 iff
 (i) Each Q' in $\text{Part}(Q)(w)$ is a subquestion of Q .
 and (ii) either a. $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\} \implies \text{Ans-wk}(Q)(w)$
 or: b. $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\} \implies \text{Ans-strg}(Q)(w)$

We conclude that subquestions do not always correspond to Hamblin answers—they seem to be able to look more deeply inside the question.

Next, we will check a prediction we make about ‘larger’ subquestions. We expect that it should be possible to lump together several Hamblin answers. This is borne out; consider (75b) in the context (75a):

- (75) a. I organize the graduate first year orientation at UConn, and I have found that over the last couple of years, the interest of both the new students and the older students in this event has been declining. I want to know why so few students show up, and I have already established that nationality is the relevant factor. In trying to figure out which nationalities are affected,
 b. I have now mostly found out which students attended the orientation.

Assume the scenario given in (76). (75b) can be judged true if I have found out that the French and the Spanish students attended, but I don’t know about the Swiss.

- (76) Scenario: student = {1, ..., 9}
 French: 1, 2
 American: 3, 4
 Spanish: 5
 Swiss: 6–9
 attended: French, Spanish and Swiss

The context makes salient a division into subquestions as indicated in (77), where we look at non-atomic subquestions.

- (77) {did the French students attend?, did the American students attend?, did the Spanish students attend?, did the Swiss students attend?}

The set of questions in (77) is a legitimate set of subquestions given our definitions, as the reader can easily verify. Thus we expect this behaviour. A final example for this sort of phenomenon is given in (78). The sentence can be judged true if Luise is informed about most dialects rather than most individual speakers.³

- (78) Luise asked judgments from 17 speakers from 5 different regions. She has now mostly found out which speakers accept her data.

Before we proceed to subsection 3.4, we take a moment to discuss how the data in this section might be handled by our theoretical predecessors.

The fact that Berman quantifies over individuals makes it very hard to see how his theory could derive the 'sub-proposition' reading with conjoined VPs (example (52)). We do not see how that theory could find the right kind of object to quantify over. It seems that a theory that handles QVE in terms of partial information is better equipped to deal with these data.

As far as Lahiri's theory is concerned, the facts discovered here would imply for him that the algebra of answers that forms the domain of quantification for the adverb is not determined strictly semantically. A more flexible definition of that algebra must be found that is based on a very weak notion of partial answer to the original question; cf. also the remarks in Lahiri (2002), chapter 4. It is well beyond the scope of this paper to develop a theory of how this could be implemented.

To summarize the main outcome of this subsection: the QVE data discussed here show that the domain of quantification for the adverb is not uniquely determined by semantics. There is more than one way to carve up the logical space introduced by the original question. Context plays a role in determining which division is chosen. A subquestion analysis is capable of handling this flexibility.

3.4 *Restricting possible divisions into subquestions*

It is time to tidy up a bit. In 3.3 we have suggested a fairly liberal definition of subquestion and of division of a question into subquestions, and we have put forth several sets of data that show that such a liberal analysis is required. This subsection is devoted to

³ An alternative analysis of our 'lumping' data might be possible in which the *wh*-phrase ranges over kinds instead of individuals, as an anonymous referee points out to us. Hence we do not regard these data as strong evidence in favour of our analysis over others. However, we do automatically make the correct prediction that such interpretations should exist.

restrictions on possible divisions into subquestions: despite our new-found freedom, there are data that we want to and have to exclude. The discussion will lead to our last revision of the definition of division into subquestions, which includes a non-overlap condition on subquestions (3.4.1). In 3.4.2 we discuss the application of our analysis to questions that are known to disallow QV readings.

3.4.1 *A non-overlap condition on subquestions* Let us begin by considering an example that is problematic for us at present. (79b) is a subquestion (in the sense of (60)) of (79a).

- (79) a. Did Amanda snore loudly?
 b. Did Amanda snore?

This is because a negative answer to (79b) implies a negative answer to (79a). In that way the example is completely parallel to the example with the VP conjunction in (52) above. Yet, (80a) cannot be understood as in (80b) and be considered true by virtue of (80c).⁴

- (80) a. #Luise partly knows whether Amanda snored loudly.
 b. Some Q' [$Q' \in \text{Part}(\llbracket \textit{whether Amanda snored loudly} \rrbracket)(w)$]
 [Luise knows Q' in w]
 c. Luise knows that Amanda snored.

Indeed, (80a) is not an acceptable sentence. We do not at present predict this. $\text{Part}(Q)(w)$ for this example could look like (81), which is possible according to what we have said so far.

- (81) {did Amanda snore?, did Amanda snore loudly?}

However, there is something wrong with (81) as a $\text{Part}(Q)(w)$ that is not a problem for any of the possible QVE data discussed so far: The two questions in (81) are not independent, meaning that an answer to one of them implies the answer to the other. Our example indicates that we need to add a non-overlap condition to our definition of $\text{Part}(Q)(w)$. This is done in (82): there must be no redundancy, in the sense that a proper subset of $\text{Part}(Q)(w)$ already entails the complete answer to Q .⁵

⁴ This contrasts with (i), which could be judged true in the same situation:

(i) Luise knows to some extent whether Amanda snored loudly.

(i) is an example of a graded verb, cf. Lahiri (2002), as mentioned already in section 2. Thus it is not pertinent to the discussion of QVE proper.

⁵ As the attentive reader no doubt noticed, such a clause is needed as soon as we replace the identity requirement in clause (ii) with an entailment requirement. Otherwise any superset of our target division into subquestions would be a legitimate value of $\text{Part}(Q)(w)$. Example (80) shows that the non-overlap condition would be needed even if we had not replaced identity in clause (ii) with entailment.

- (82) A set $\text{Part}(Q)(w)$, of questions Q' is a division of Q into subquestions in w ,
 iff
 (i) Each Q' in $\text{Part}(Q)(w)$ is a subquestion of Q .
 and (ii) either a. $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\} \Rightarrow \text{Ans-wk}(Q)(w)$
 and there is no set \wp , $\wp \subset \text{Part}(Q)(w)$
 such that $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \wp\} \Rightarrow \text{Ans-wk}(Q)(w)$
 or: b. $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \text{Part}(Q)(w)\} \Rightarrow \text{Ans-strg}(Q)(w)$
 and there is no set \wp , $\wp \subset \text{Part}(Q)(w)$
 such that $\bigcap\{\text{Ans-wk}(Q')(w) : Q' \in \wp\} \Rightarrow \text{Ans-strg}(Q)(w)$

We exclude example (80a) as soon as we assume that a part-whole modifier like *partly*, *for the most part* etc. requires its restrictor set $\text{Part}(Q)(w)$ to have at least two members (i.e. only a plurality can have proper parts). We will make this assumption throughout the paper. Thus to summarize our analysis: to get a QV interpretation for an embedded question, the question must have at least two independent subquestions that together answer the original question.

3.4.2 *Questions that do not permit QV interpretations* The condition just stated has other effects besides excluding (80a). There are questions that do not permit QVE. *Whether*-questions can be a case in point, as in (83).

(83) #Jill partly/mostly knows whether Sam cheated.

We correctly predict the unavailability of QVE in (83) since the embedded question does not have any subquestions other than the question itself. This is the case because it is impossible to give a genuinely partial answer to 'Did Sam cheat?'.⁶

Another type of question that does not permit QVE is singular *which*-questions (cf. Berman 1991); consider e.g. (84).

⁶ We might expect a QV interpretation to be possible in (ia) since (ib) and (ic) will be genuine subquestions of the embedded *whether*-question:

- (i) a. Jill partly knows whether Sam and Rene cheated.
 b. Did Sam cheat?
 c. Did Rene cheat?

Our judgments agree with this prediction. Similarly, Berman (1991) reports that *whether*-questions like (ia) can have a QV reading paraphrased in (iib).

(84) #Jill partly/mostly knows which boy cheated.

Again, our task would be to show that the embedded question does not have two distinct proper subquestions. Is it possible to partially answer 'Which boy cheated'? A characteristic specific to singular *which*-questions is that they presuppose that there is exactly one true answer to the question (see, for example, Dayal 1996 and Rullmann & Beck 1998 for recent discussion). So if the boys are Sam, Aires and Rene, (84) carries a presupposition that exactly one of Sam, Aires and Rene cheated. The uniqueness presupposition for a singular *which*-question Q can be put as in (85).

(85) for any w : $\text{card}(\{p : Q(p)(w) \ \& \ p(w)\}) = 1$

Now suppose we choose the Ans-wk definition of $\text{Part}(Q)(w)$, and suppose furthermore that the subquestions for our example are the *whether*-questions derived from the members of the Hamblin denotation (nothing else is really possible in this case). This means that $\text{Part}(Q)(w)$ is a singleton set, i.e. $\text{Part}(Q)(w)$ is as in (86) (where x stands for the actual cheater).

(86) {did x cheat?}

But we required that there be two distinct members of $\text{Part}(Q)(w)$ —so we predict that this will not work.

Are we done? Unfortunately not. We need to see what happens if we choose the Ans-strg definition of $\text{Part}(Q)(w)$. Now we assume the $\text{Part}(Q)(w)$ in (87):

(87) {did Sam cheat?, did Aires cheat?, did Rene cheat?}

This meets all our requirements, Hence we predict that (88a) allows a QV reading involving Ans-strg and could be true by virtue of (88b).

- (88) a. Luise partly knows which boy cheated.
 b. Luise knows that Aires didn't cheat.

We are not sure that this is completely impossible, but it does not seem very plausible either. We do not know why this is so implausible.

- (ii) a. The principal mostly knows whether students cheated.
 b. Most x [student(x)] [the principal knows whether x cheated]

While QV readings in *whether*-questions that are somehow 'plural' seem possible to most people we have consulted, variation between speakers has prevented us from pursuing the issue too deeply. The same holds for singular *which*-questions containing a plural NP.

Perhaps there is a way in which Ans-wk is more fundamental than Ans-strg, and we have neglected this in our analysis.

It is worth pointing out that the restrictions on QVE really cannot be captured in terms of restrictions on the number of the wh-phrase: even a plural *which*-phrase disallows QVE when it is combined with a genuinely collective predicate.⁷ (89) is a case in point.

(89) ?# Luise mostly knows which girls outnumber the boys.

The only way to save this example is to assume that there are several relevant subgroups of the girls whose numbers we are comparing with the number of boys. As long as there is only one relevant set of girls in the context, it is not possible to give a genuinely partial answer to ‘Which girls outnumber the boys?’.

4 FURTHER ISSUES WITH QVE

The last section laid out our basic theory of QVE. The purpose of this section is to tie up some loose ends that arise in connection with that basic analysis. We first discuss the compositional derivation of the semantic representations we have argued for (section 4.1). Then we address the issue of the question embedding predicates. Section 4.2 discusses multiple embeddings. Section 4.3 discusses predicates that do not make reference to the true answers to the embedded question (*certain* and *agree*), which force us to make some revisions. In section 4.4 we return to *wonder*-type predicates which are resistant to QVE. Finally we briefly introduce our perspective on pair/list and multiple questions in section 4.5.

4.1 Compositional interpretation of part/whole modifiers

We have concentrated on, and will limit our analysis to, data that involve part/whole modifiers as the adverb of quantification. These include *partly*, *for the most part*, *without exception* and (for many speakers of English) *mostly*. They are identified by Lahiri (2002) as the core cases of QVE. We exclude degree modifiers like *to some extent*, which seem to be doing something different semantically (see Lahiri 2002 for discussion). Also excluded were regular adverbs of quantification like

⁷ Apparent exceptions to this claim, which have been noted in Williams (2000) and Schwarz (1993) as well as Lahiri (2002) seem to involve subdistributivity in the sense of Brisson (1998).

- (i) a. John knows for the most part which soldiers surrounded the fort.
- b. For most x , x a soldier that participated in surrounding the fort, John knows that x participated in surrounding the fort.

sometimes, often etc, which do not reliably give rise to QVE (compare once more Lahiri (2002)).

Ideally, an independently motivated semantics of part/whole modifiers should straightforwardly extend to their use in QV interpretations with questions. Let's look at some examples of part/whole modifiers that don't involve questions. We find data in which the modifier is associated with a plural NP or with a mass NP, or with other NPs that refer to entities with a plausible part/whole structure.

- (90) a. The students have finished, for the most part.
 b. The bottles are partly green and partly brown.
 c. The bottles are green, without exception.

- (91) a. The milk is partly gone.
 b. For the most part, the wine is red.
 c. For the most part, the wall is black.

Note that there is some variability in what parts of an entity we are counting for the purposes of the adverb. In (91b) we could be talking about most bottles, or about most litres (pints, gallons) of wine. (90a) is naturally taken to mean that most individual students have finished. However, if you imagine a context in which there are salient groups of students (say, classes), then it is also possible to count groups instead of individuals. Context has to provide us with the relevant way of dividing the entity referred to into parts. The adverb then quantifies over those parts.

We will mostly concentrate on plurals, for simplicity. We suggest the following semantics for (90a). The analysis is based on Schwarzschild's (1996) analysis of distributivity.

- (92) a. The students have finished, for the most part.
 b. Most x [$x \leq \llbracket \text{the students} \rrbracket$ & $x \in \text{Cov}$] [x has finished]

(92b) says that most relevant parts of the group denoted by 'the students' have finished. The representation contains a free variable Cov ranging over covers which divides our group into the relevant subgroups. Its value is assigned by context.

- (93) Cov is a cover of P iff
 Cov is a set of subsets of P
 Every member of P belongs to some set in Cov
 {} is not in Cov

(91b) is analogous. Here, Cov must divide the mass entity denoted by 'the wine' into countable subparts (compare e.g. Gillon 1992). Again, context has to determine the unit relevant for the quantification.

- (94) a. The wine is, for the most part, red.
 b. Most x [$x \leq \llbracket \textit{the wine} \rrbracket$ & $x \in \text{Cov}$] [x is red]

We propose to associate structures with part/whole modifiers with the translation in (95) (we will remain silent on details of semantic composition below this level). Note that the parts of A are of the same semantic type as A .

- (95) [$A_{\langle e \rangle}$ [for the most part [$B_{\langle e, t \rangle}$]]] \rightarrow
 Most x [$x \leq A$ & $\text{Cov}(x)$] [$B(x)$]
- (96) [[the students] [for the most part [have finished]]] \rightarrow
 Most x [$x \leq \llbracket \textit{the students} \rrbracket$ & $x \in \text{Cov}$] [x has finished]

Let us make one harmless change to our Schwarzschildian analysis before we relate it to the question cases. We will assume that the free cover variable ranges over covers of the group whose parts we are quantifying over.⁸ Moreover, let us note the dependence of the value of Cov by giving the variable the parameter A —hence $\text{Cov}(A)$. Then (95) and (96) can equivalently be phrased as in (97) and (98).

- (97) [$A_{\langle e \rangle}$ [for the most part [$B_{\langle e, t \rangle}$]]] \rightarrow
 Most x [$x \in \text{Cov}(A)$] [$B(x)$]
- (98) [[the students] [for the most part [have finished]]] \rightarrow
 Most x [$x \in \text{Cov}(\llbracket \textit{the students} \rrbracket)$] [x has finished]

The compositional derivation with NPs and with questions can now easily be seen to be quite parallel. Like Lahiri, we propose to raise the embedded interrogative out of its complement position to associate it with the adverb.

- (99) John mostly knows who cheated.
- (100)a. [[who cheated] [mostly [John knows t_Q]]]
 b. Most Q' [$Q' \in \text{Part}(\llbracket \textit{who cheated} \rrbracket)(w)$] [John knows Q' in w]
- (101) [$Q_{\langle s, \langle \langle s, t \rangle, t \rangle \rangle}^*$ [for the most part [$B_{\langle \langle s, \langle \langle s, t \rangle, t \rangle \rangle, t \rangle}$]]] \rightarrow
 Most Q' [$Q' \in \text{Part}(Q^*)(w)$] [$B(Q')(w)$]

The only difference between (97) and (101) is that the notion of relevant part of the entity we are looking at has changed from subgroups

⁸ This is a slight departure from Schwarzschild, who assumes that the cover variable ranges over covers of the universe of discourse. The change is made for convenience.

to subquestions. Just as in the case of individuals, the parts of the associate of the part/whole modifier are of the same semantic type as the associate.

Thus our proposal amounts to the suggestion that questions, like entities of type $\langle e \rangle$, may be perceived to have a part/whole structure. The structure is given by informativity, and can be detected by a part/whole modifier. This is what happens in QVE.

By comparison to Berman and Lahiri, it is interesting to note that (i) the parallel to ordinary part/whole modifiers is probably most straightforward on our approach (even though Lahiri's analysis is specifically in terms of a part/whole structure, too), and (ii) that so far we have not needed any extra mechanisms to find the right restriction for the adverb—in particular, presupposition accommodation as used by Berman and by Lahiri (1991). The data in subsection 4.3 will tarnish this pretty picture somewhat, unfortunately. First, however, we will find some confirmation in section 4.2.

4.2 *Multiple embeddings and presuppositions*

Consider the sentence in (102B) in the context of (102A). We have complicated our regular QV structure by an extra layer of embedding. The sentence has a reading that can be paraphrased as: for most x , John is certain that Mary knows whether x cheated.⁹

(102)A: Is anybody here certain that Mary knows who cheated?

B: Well, John, for the most part, is.

Interestingly, John does not have to have any beliefs about who cheated himself—that is, he might have a belief that someone cheated, but there need not be any particular individual about whose cheating John has an opinion. This is predicted by our analysis of (102).

⁹ We should note that the availability of such readings is subject to some variation, both crosslinguistically and across speakers. Most English speakers seem to accept it.

We expect the reading to be acceptable in so far as association with a part/whole modifier is possible across a sentence boundary. I.e. (ii) should be about as grammatical as (i) on the relevant reading. Perhaps this can be tied to the variation in acceptability we observe with (ii).

- (i)
 - a. John is, for the most part, certain that the students have finished.
 - b. Most x [x a student] [John is certain that x has finished]
 - c. [[the students] [for the most part [John is certain that t have finished]]]
- (ii)
 - a. John is, for the most part, certain that Mary knows who cheated.
 - b. Most Q [$Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$] [John is certain in w that Mary knows Q]
 - c. [[who cheated] [for the most part [John is certain that Mary knows t]]]

Derivation of the relevant semantic representations involves raising across a sentence boundary, which is not always possible and may well bring restrictions with it.

- (103)a. Most Q [$Q \in \text{Part}(\llbracket \textit{who cheated} \rrbracket)(w)$
 [John is certain in w that Mary knows Q]
 b. For most relevant subquestions of ‘who cheated’, John is
 certain that Mary knows the answer to that subquestion.

Let us examine the predictions of Berman’s and Lahiri’s theories. Berman’s analysis will have to look roughly as in (104):

- (104) Most x [...] [John is certain that Mary knows that x cheated]

The question is what exactly goes into the restrictive clause. For Berman, that has to include the presuppositions of the nuclear scope, ‘John is certain that Mary knows that x cheated’. We will assume (105), with Karttunen (1973) and Heim (1992).

- (105) Where V is a propositional attitude verb, ‘ $x V p$ ’ presupposes that x believes the presuppositions of p .

Now, ‘Mary knows that x cheated’ presupposes that x cheated. Therefore, according to (105) ‘John is certain that Mary knows that x cheated’ presupposes that John believes that x cheated. Given Berman’s analysis as it stands, therefore, the restriction in (104) has to include at least the material indicated in (106) by this reasoning (plus possibly other presuppositions or entailments, which are irrelevant here).

- (106) Most x [John believes that x cheated]
 [John is certain that Mary knows that x cheated]

This is inappropriate as the representation of the QV reading of (102): we noted above that John does not have to have a belief about who cheated. Lahiri’s (1991) theory¹⁰ encounters the same problem, by the same reasoning.

- (107) Most p [Ans(p , $\llbracket \textit{who cheated} \rrbracket, w$) & John believes p in w]
 [John is certain in w that Mary knows p]

Let us reexamine why we do not make a similar prediction. The first difference between our proposal and the Berman/Lahiri proposal is that the verb *know* combines with a question, not a proposition. What are the presuppositions of (108a)? Let us rephrase it as in (108b).

- (108)a. Mary knows who was fired.

¹⁰ We are less certain about the predictions of Lahiri (2002). In particular we find it hard to tell how his proposal in terms of lexical selection should work in this case.

- b. Mary knows the complete, true answer to the question ‘who was fired?’

(109) seems a reasonable suggestion for the presuppositions of (108). Thus we will assume (110) about question embedding *know*.

(109) The question ‘who was fired?’ has a complete true answer.

(110) ‘*x* knows *Q*’ presupposes that *Q* has a complete true answer.

By what we know about presupposition projection in propositional attitude contexts, i.e. (105), we conclude (111).

(111) ‘John is certain that Mary knows *Q*’ presupposes that John believes that *Q* has a complete true answer.

According to this reasoning, it is clear that the presuppositions of the nuclear scope are much weaker on our analysis, due to the fact that *know* combines with a semantic question.

The question remains how the presuppositions of the nuclear scope project from here. In contrast to Berman and to Lahiri (1991), we are not committed to any particular view on presupposition accommodation for the purposes of our analysis of QVE. According to recent literature on presupposition projection (in particular van der Sandt (1993); von Stechow (1994); Beaver (1995)), several possibilities exist: We might not accommodate at all. Alternatively, either the whole representation in (103a) presupposes (112), or we accommodate locally (in Berman’s terminology; this would be intermediate accommodation according to van der Sandt) and end up with (113).

(112) For all *Q'* s.t. *Q'* is a relevant subquestion of *who cheated*: *Q'* has a complete true answer.

(113) Most *Q'* [*Q'* is a relevant subquestion of *who cheated* and John believes *Q'* has a complete true answer]
[John is certain that Mary knows *Q'*]

The three possibilities are intuitively extremely hard to distinguish in our data, and we need not take a stance. What is crucial is that we end up with weaker presuppositions of the nuclear scope, due to the fact that *know* combines with a semantic question rather than a proposition. From there, we could presumably go with whatever ultimately proves to be the right approach to presupposition accommodation.

We conclude that presuppositions do not project in the way expected under a Berman/Lahiri analysis, in which the embedding verb combines with a proposition. This supports our view that the embedding verb combines with a question.

4.3 *agree on and certain*

Consider (114a). According to what we have said so far, the interpretation of (114a) would be represented as in (114b) (analogous to (115a,b)).

(114)a. For the most part, Mary and John agree on who cheated.

- b. Most Q [$Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$]
[Mary and John agree on Q in w]

(115)a. For the most part, John knows who cheated.

- b. Most Q [$Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$][John knows Q in w]

This is inappropriate. Imagine that in fact, Sue and Bill cheated, and Cecilia, Penelope and Brian did not. If Mary and John agree that Cecilia and Penelope cheated and disagree about Brian (and they have no beliefs about Sue and Bill), the sentence can be true even though Mary and John's beliefs do not correspond at all to the actual cheaters. Mary and John have to mostly agree on what they perceive to be the relevant subquestions (i.e. the ones they believe to deliver part of the answer to the question 'who cheated?'), not on the actual relevant subquestions (i.e. the ones whose answers are in fact part of the answer to the question 'who cheated?'). In our framework, Q has to be a member of $\text{Part}(\text{who cheated})$, not in the actual world w , but in Mary and John's belief worlds.

- (116) Most Q [$\forall w' [\text{Bel}(w)(\text{Mary})(w') \vee \text{Bel}(w)(\text{John})(w') \rightarrow$
 $Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w')]$]
[Mary and John agree on Q in w]

So, most subquestions that one of Mary and John considers relevant, they agree on the answer to. The reader can verify that (117b) is similarly inadequate as a semantic representation of the QV reading of (117a), and that (117c) is the representation we should be aiming for.

(117)a. For the most part, Mary is certain about who cheated.

- b. Most Q [$Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$]
[Mary is certain in w about Q]
- c. Most Q [$\forall w' [w'$ is compatible with what Mary considers likely/possible in $w \rightarrow Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w')$]
[Mary is certain in w about Q]
- d. For most Q such that Mary considers it likely that Q is a relevant subquestion to 'who cheated?', Mary is certain about Q .

The problem posed by these data arises because, unlike the vast majority of question embedding predicates, *agree* and *certain* do not care about the true answers to the embedded questions. They care about possible answers that the subject bears some propositional attitude like belief towards. The simplified semantic analyses of *agree* and *certain* below illustrate this:¹¹ answerhood is evaluated, not relative to the actual world, but relative to the subject's belief worlds or the like. This contrasts with *know*.

- (118)a. Mary and John agree on who cheated.
 b. $\exists p$ [Mary believes_w [$\lambda w'. p = \text{Ans-wk}(\llbracket \text{who cheated} \rrbracket)(w')$] & John believes_w [$\lambda w'. p = \text{Ans-wk}(\llbracket \text{who cheated} \rrbracket)(w')$]]
- (119)a. Mary is certain about who cheated.
 b. $\exists p$ [Mary is certain_w [$\lambda w'. p = \text{Ans-wk}(\llbracket \text{who cheated} \rrbracket)(w')$]]
- (120)a. Mary knows who cheated.
 b. Mary knows_w Ans-wk/Ans-strg($\llbracket \text{who cheated} \rrbracket$)(w)

For Lahiri, this implies that the propositions that the adverb quantifies over are not the true answers, but possible answers (believed by the subject to be true answers).

- (121)a. Mary knows, for the most part, who cheated.
 b. Most p [Ans($p, \llbracket \text{who cheated} \rrbracket, w$) & $C(p)$]
 [Mary knows p in w]
 c. $C = \lambda p. p(w)$
- (122)a. Mary is certain, for the most part, who cheated.
 b. Most p [Ans($p, \llbracket \text{who cheated} \rrbracket, w$) & $C(p)$]
 [Mary is certain about p in w]
 c. $C = \lambda p. \text{Mary considers } p \text{ likely/possible in } w$

Thus there is more to say about the value of C than we have so far. Lahiri provides the following example in order to show that the variable C must be assigned a value in part by contextual considerations. Imagine a situation in which John gives a response to 'which students came to the party?', indicating that for part of his answer he has good evidence, but most of the answer he gave was conjecture. (123b,c) capture this.

- (123)a. John mostly conjectured (about) which students came to the party.

¹¹ For more discussion of the semantics of these verbs see Lahiri (2002), Beck & Rullmann (1999) and Sharvit (to appear).

- b. Most p [Ans(p , [[*which students came to the party*]], w) & $C(p)$]
 [John conjectured about p in w]
 c. $C = \lambda p$. John gave p as an answer to Q in w

We conclude that we similarly need to provide room for linguistic and non-linguistic context to select a relevant set of possible answers, and cannot limit ourselves to true answers as we have done so far.

More concretely, for us, the implication is that we quantify over subquestions the answers to which together imply, not the true answer, but the answer believed to be true by the subject (the answer given by the subject, etc.). Thus the set Part(Q) has to be chosen relative to a world (worlds) other than the actual one.

We can accommodate these data if we revise our assumptions about the logical form of QV from (124a) to (124b).

- (124)a. Most Q [$Q \in \text{Part}(Q^*)(w)$] [$P(w)(Q)$]
 b. Most Q [$\forall w' [C(w)(w') \rightarrow Q \in \text{Part}(Q^*)(w')]$] [$P(w)(Q)$]

C is a relation between two possible worlds—an accessibility relation. Our logical form amounts to the suggestion that there is (or can be) a hidden modal element in the semantics of QV. Some values for C that we have seen so far are given in (125). If the value in (125b) is chosen for C in (124b), for example, then we quantify over subquestions Q that Mary believes to be relevant (i.e. subquestions that Mary believes to provide part of the answer to the original question Q^*). This is what we need.

- (125)a. $C = \lambda w1. \lambda w2. w2 = w1$
 b. $C = \lambda w1. \lambda w2. \text{Bel}(w1)(\text{Mary})(w2)$
 c. $C = \lambda w1. \lambda w2. w2$ is compatible with what John gave as an answer to Q in $w1$

The question remains how the value of C is determined. It is clear that the semantic properties of the question-embedding predicate play a crucial role (*know* v. *agree on*). The problem is discussed in Lahiri (2002), who suggests that the value of C is constrained lexically by the embedding predicate (in addition to possible contextually contributed constraints). Thus Lahiri (2002) departs from the analysis in Lahiri (1991), where the value of C was determined by presupposition accommodation. Lahiri (2002) refers to the behaviour of *tell* as motivation for this change: the combination of *tell* with a proposition is not factive, hence there is no way to predict in terms of presupposition accommodation that C in (126) is constrained to true propositions.

- (126)a. Mary told us, for the most part, who cheated.
 b. Most p [$\text{Ans}(p, \llbracket \text{who cheated} \rrbracket, w) \ \& \ C(p)$]
 [Mary told us p in w]
 c. $C = \lambda p.p(w)$

Technically, the lexical selection idea is implemented by giving the interrogative CP an index C . The embedding predicate semantically selects the CP and constrains the index C . An example for such a constraint is given in (127). Lahiri's technical solution can be implemented into our system as well as into his own. Translated into our framework, the relevant structure and interpretation look as in (128a). The constraint on C would now be (128b).

$$(127) \ C \subseteq \lambda p.p(w)$$

- (128)a. $[[Q_C^*] \text{ [for the most part } [P]]] \rightarrow$
 Most- $Q \ [\forall w' [C(w)(w') \rightarrow Q \in \text{Part}(Q_C^*(w'))]] \ [P(w)(Q)]$
 b. $C \subseteq \lambda w'.w' = w$

It is thus straightforward to translate Lahiri's lexical selection analysis to our framework. Note that it is particularly clear under our analysis why the restriction C in the case of *tell* should be to parts of the actual true answer: we unambiguously combine *tell* with a semantic question, and in this context (i.e. when it takes a question-complement), *tell* does care about the true answer to its complement (that is to say, it is veridical in the sense of Lahiri (2002) and Sharvit (to appear)).

We should add, however, that the status and implications of Lahiri's idea are not entirely clear to us, and that our analysis does nothing to further our understanding of what is going on here. Moreover, the step of including a hidden intensional element is unparalleled in the standard semantics of part/whole modifiers (cf. section 4.1). Our analysis has nothing illuminating to say about why this should be possible.

In conclusion, we do not feel that the phenomenon has received a complete analysis as yet. We have merely recast Lahiri's analysis in our framework. We will ignore the hidden modal in our semantic representations where it is not relevant (i.e. where the accessibility relation is $\lambda w \lambda w'.w' = w$ and we are concerned with the actually true answer).

Before we move on, we will take the time to make a couple of further observations about QV readings with *agree*. First, note that similar to the *know-if* and *know-that* ambiguity discussed in section 3, *agree* is compatible with both an *agree-if* and an *agree-that* interpretation. This is captured under our analysis by the choice between *Ans-wk* and

Ans-strg, which in this example is (roughly) a choice between what is the weakly exhaustive answer in Mary and Joe's belief worlds and what is the strongly exhaustive answer in their belief worlds.

- (129)a. Mary and Joe mostly agree on who failed.
 b. For most x , Mary or Joe believes that x failed: Mary and Joe agree that x failed.
 c. For most x , Mary and Joe agree on whether x failed.

A final interesting example is (130a), where the matrix clause is negated. The sentence is odd in the situation described in (130b). According to Lahiri's semantics, given in (130c), it should be fine. It seems that what is missing from (130c) is that both John and Mary have some opinion on the potential cheaters. Let's assume that structures with *agree* have some kind of an entailment to that effect. Our subquestion analysis, given in (130d), can be supplemented with such an entailment to yield (130e), given an appropriate theory of presupposition projection.

- (130)a. For the most part, John and Mary do not agree on who cheated.
 b. Situation: John thinks that Bill and Sally cheated and that Sam did not. Mary has no idea about who cheated or did not cheat.
 c. Most p [$\text{Ans}(p, \llbracket \textit{who cheated} \rrbracket, w) \ \& \ C(p)$
 $\llbracket \text{John and Mary do not both believe } p \text{ in } w \rrbracket$
 $C = \lambda p. \text{ John or Mary believes } p$
 d. Most Q [$\forall w' [\text{Bel}_w(\text{Mary})(w') \vee \text{Bel}_w(\text{John})(w') \rightarrow Q \in$
 $\text{Part}(\llbracket \textit{who cheated} \rrbracket)(w')]$
 $\llbracket \text{Mary and John do not agree on } Q \text{ in } w \rrbracket$
 e. Most Q [$\forall w' [\text{Bel}_w(\text{Mary})(w') \vee \text{Bel}_w(\text{John})(w') \rightarrow Q \in$
 $\text{Part}(\llbracket \textit{who cheated} \rrbracket)(w')]$ & Mary and John have an
 opinion on Q in w
 $\llbracket \text{Mary and John do not agree on } Q \text{ in } w \rrbracket$

This effect suggests that there seems to be a place for some form of presupposition accommodation, after all. Note that the required additional restriction can straightforwardly be added on an approach in which it restricts a variable ranging over questions, but not on an approach in which we would need to restrict a variable ranging over propositions.

The predicate *agree* has been a prominent predicate in the analysis of QVE ever since its behaviour provided motivation for Lahiri to

depart from Berman's analysis.¹² We conclude that a subquestion analysis naturally accounts for its properties in QVE, once the analysis acknowledges the role of the question embedding predicate in selecting the relevant subquestions.

4.4 *ask* and *wonder*

In this subsection, we return to the observation that not all question embedding predicates seem to be able to license QVE. Remember (131) from section 2.

- (131)a. # Sue mostly wonders what she got for her birthday.
 b. ? For most things that Sue got for her birthday, Sue wonders that/if she got them for her birthday.

It is straightforward under our assumptions to assign a meaningful semantic representation to (131) that represents a QV reading:

- (132)a. Most $Q [\forall w' [C(w)(w') \rightarrow Q \in \text{Part}(\llbracket \textit{what she got} \rrbracket)(w')]]$
 [Sue wonders Q in w]
 b. For most relevant subquestions of 'what Sue got for her birthday', Sue wonders about that subquestion.
 c. {Did Sue get the ice axe for her birthday?,
 Did Sue get the #3 quadcam for her birthday?,
 Did Sue get 'The 50 best jam recipes' for her birthday?}

In the example, Sue could for instance wonder about most questions in the set in (132c). Thus on our analysis we expect such a reading to be available, and its absence in (131) appears to be a problem. Lahiri and Berman predicted an absence of a QV reading with predicates that embed questions only, for semantic reasons (cf. section 2). Hence for them the behaviour of (131) is expected.

The way we have presented the relevant data so far, then, is this: One group of exclusively question embedding verbs (*wonder*, *ask*, *inquire* etc) does not permit QVE, supports Berman and Lahiri and is a problem

¹² The informed reader might miss another predicate in our discussion that provided important motivation for Lahiri's theory: *surprise*. As is well known, *surprise* permits QVE, but doesn't take *whether*-questions:

- (i) a. For the most part, I was surprised who showed up.
 b. *I was surprised whether Sally showed up.

We suggest that in (ia), quantification is over *wh*-questions and not yes/no questions (e.g. $\text{Part}(\llbracket \textit{who showed up} \rrbracket)(w) = \{\text{which French student showed up?}, \text{which tall student showed up}, \dots\}$).

- (ii) Most $Q [Q \in \text{Part}(\llbracket \textit{who showed up} \rrbracket)(w)]$ [I was surprised Q in w]

Thus, while *surprise* does not provide further motivation of our analysis in terms of subquestions, it is easily compatible with that analysis.

for us. Another group of exclusively question embedding verbs (*depend on, decide* etc.) permits QVE, supports our analysis and is a problem for Berman and Lahiri. This generalization is not, in fact, quite accurate.

We concur that a QV reading is impossible in (131). However, it is possible to modify data with *wonder, ask* etc. in such a way as to make QV interpretations possible. We provide a few examples below (we owe (134) once more to Irene Heim (p.c)). Informal paraphrases of the intended readings are given in (b) and our analysis in (c) (the salient reading of these examples is one in which PART(Q) is based on the actual Ans-strg; assume default subquestions).

- (133)a. A: Has John found out which students cheated?
 B: No. For the most part, he is still wondering.
- b. For most x , John is still wondering whether x cheated.
- c. Most Q [$Q \in \text{Part}(\llbracket \text{which students cheated} \rrbracket)(w)$]
 [John wonders about Q in w]
- (134)a. A: Did the police give you guys any trouble last night?
 B: No. For the most part, they didn't even ASK who was under 21.
- b. For most x , they didn't even ask whether x was under 21.
- c. Most-Q [$Q \in \text{Part}(\llbracket \text{who was under 21} \rrbracket)(w)$]
 [they did not ask Q in w]
- (135)a. For the most part, Mary knows and John is still wondering about who cheated.
- b. For most x , Mary knows and John is still wondering whether x cheated.
- c. Most-Q [$Q \in \text{Part}(\llbracket \text{who cheated} \rrbracket)(w)$]
 [Mary knows Q in w and John is still wondering about Q in w]

The trick used to improve these examples is to somehow remove the focus from the embedded question. When the question becomes more 'topical', a QV reading is much easier to get. It should be noted that some such effect can perhaps also be detected with *decide*, but not with the original *know*-class verbs or with *depend on*. Here it seems that a QV reading is possible even when the question is in focus.

- (136)a. A: And what did Inspector Jury find out?
 B: Jury found out, for the most part, who was present at Smith's party.
- b. For most x : x was present at Smith's party, Jury found out that x was present at Smith's party.

The first conclusion we draw from these observations is that contrary to first appearances, *wonder*-type verbs do permit QV interpretations—just like we would expect them to. This is an important conclusion in that it provides further support of our analysis of QVE in terms of subquestions. A better understanding of the facts with *wonder*-type verbs thus supports our theory.

The next question is, of course, why these verbs require special circumstances to permit QVE while *know* etc. do not. We would like to offer the following speculation—with the understanding that at present, it is indeed a speculation.

A question may fail to have a (complete, true) answer. Imagine that there was no contextually established set of strawberries. Then the question in (137a) must be in some sense a presupposition failure, as must (137b).

- (137)a. Who ate the strawberries?
 b. Mary knows, for the most part, who ate the strawberries.

For the adverb in a QV structure to have a well-defined domain of quantification the question must have a complete, true answer (in the case where the actual Part(Q) is chosen – this follows from the definition of division of a question into subquestions). The constraints on the availability of QVE that we observed suggest that this fact has to somehow be established in order for a QV reading to be available. One way to establish the existence of a well-defined domain of quantification is via the presuppositions of the embedding verb; we noted (110), repeated below.

(110) 'x knows Q' presupposes that Q has a complete true answer.

Other verbs that behave like *know* w.r.t. QVE (e.g. *tell*, *forget*, *remember*) plausibly have the same presupposition: they all make reference to the complete true answer to the question in their semantics. The predicates *certain* and *agree on* seem to have presuppositions in terms of propositional attitudes of the subjects. We make suggestions in (138a–b) and (139a–b). (138c–e) and (139c–d) are provided to test our claims. Importantly, the QV readings of these predicates involve the answer to the embedded question in the subjects' belief worlds, whose existence is guaranteed by the presuppositions we suggest these predicates give rise to.

- (138)a. Mary is certain who ate the strawberries.
 b. 'x is certain Q' presupposes that x believes that Q has a complete true answer.

- c. Mary is certain who ate the strawberries, but there were no strawberries.
 - d. # Mary is certain who ate the strawberries, but she doesn't believe that there were strawberries.
 - e. Mary mistakenly thinks that her dad bought a basket of strawberries. When she cannot find strawberries anywhere, she concludes that somebody ate the strawberries. She is certain about who it was.
- (139)a. Mary and Joe agree on who ate the strawberries.
- b. 'x and y agree on Q' presupposes that x and y believe that Q has a complete true answer.
 - c. Mary and Joe agree on who ate the strawberries, but there were no strawberries.
 - d. # Mary and Joe agree on who ate the strawberries, but they don't/ Mary doesn't believe that there were any strawberries.

Note that *wonder* and *ask*, on the other hand, do not appear to have presuppositions about the actual true answers. (140a) seems coherent, in contrast to (140b) which requires the typical metalinguistic effort associated with negation of presuppositions.

- (140)a. Mary isn't wondering who ate the strawberries because there were no strawberries.
- b. ?? Mary doesn't know who ate the strawberries because there were no strawberries.

Question embedding *wonder* does seem to have a presupposition in terms of the belief of the subject, hence the oddity of *Mary is wondering who ate the strawberries, but she doesn't believe that there were strawberries*.

However, all examples for QVE with *wonder*-type verbs that we have found require a division of the original question into subquestions that together provide the actual answer to the question. The existence of that answer is not guaranteed by the presuppositions of *wonder*. Thus in the case of *wonder*, the QV structure of itself is not enough to establish the existence of a domain of quantification for the adverb. One could see this as a problem of determining the value of C in (132a).

It is still possible that the larger context establishes the domain of the adverb. Note that the contexts in (133) and (135) do that quite transparently, when the same question also occurs embedded under *find out* and *know*, respectively. What about (134)?

If the question is 'topical' that means that it is somehow part of the conversational background. We hypothesize that in this case, the

common ground implies that it has a complete true answer. Hence, the discourse background establishes that a well-defined domain of quantification exists.

To summarize our theory of question embedding predicates in QV structures: all predicates that can embed a question should permit QVE. A constraint is introduced by the requirement that the adverb must have an established, well-defined domain of quantification. If a QV structure is considered out of the blue, only the QV structure itself can establish the existence of the domain of quantification. This works out well for predicates that presuppose that the embedded question has a complete true answer. This subsumes the *know*-class, but it also includes *depend on*. Not included are *wonder*-type predicates. Here factors external to the QV structure have to establish the existence of the domain of quantification in order for a QV reading to be available. Hence the topic effect.

4.5 *Pair-list and multiple questions*

A last issue we want to comment on briefly is that of (potentially) higher order questions like the pair/list question in (141a) and the multiple question in (141b). Interestingly, when embedded in a QV structure like (142a) and (143a), they permit several QV readings. At least the ones paraphrased in (142b,c) and (143b,c) are possible (the reader is referred in particular to Preuss 2001 for discussion).

- (141)a. Who did everyone invite?
 b. Who invited which politicians?
- (142)a. Luise mostly knows who everyone invited.
 b. For most x , Luise knows who x invited.
 c. For most x, y , x invited y : Luise knows that x invited y .
- (143)a. Luise mostly knows who invited which politicians.
 b. For most x , Luise knows which politicians x invited.
 c. For most x, y , x invited y : Luise knows that x invited y .

There has been much discussion on the semantics of multiple and pair/list questions (e.g. Groenendijk & Stokhof 1984; Engdahl 1986; Higginbotham 1991; Chierchia 1993; Dayal 1996; Preuss 2001; Lahiri 2002). We would like to point out that it is fairly obvious how our theory can account for the behaviour of QVE with these data, quite independently of one's theory of their exact semantics. We will assume that the true, complete answer (in the sense of Ans-wk) to (141a) is as

in (144): the conjunction of the answers to all questions ‘who did x invite?’, where x is in the domain of *everyone*.

- (144)a. Context: Miriam invited Mona, Maribel and Min; Laura invited Lisa; Katrin invited Kerstin.
 b. λw . Miriam invited Mona in w & Miriam invited Maribel in w & Miriam invited Min in w & Laura invited Lisa in w & Katrin invited Kerstin in w
 c. $\cap\{\text{Ans-wk}(Q') : x \in \text{dom}(\llbracket\textit{everyone}\rrbracket)\}$,
 where Q' is identical to Q except x replaces *everyone*

The Ans-strg version is analogous; both are motivated by the semantics of question embedding structures like (145). The resulting propositions amount to the knowledge Luise has to have (or the proposition that was unexpected for her) in order for (145) to be true.

(145) Luise knows (was surprised at) who everyone invited.

A more formal definition of an answer to a pair/list question will depend on the semantics associated with the question. We believe that independently of that, theories will have to agree on (144) as the output of that definition, i.e. the proposition that constitutes the complete, true answer.

Given this, any question will count as a subquestion of (141a) whose answer goes towards providing the information in (144). (146) below is our semantic representation of the QV reading of (142a).

(146) Most $Q [Q \in \text{Part}(\llbracket\textit{who everyone invited}\rrbracket)(w)]$
 [Luise knows Q in w]

Both the set in (147a) and the set in (147b) will be legitimate divisions of the pair/list question into subquestions, and assigned as the value of $\text{Part}(Q)(w)$ will yield the two readings in (142b,c).

- (147)a. {Who did Miriam invite?, Who did Laura invite?, Who did Katrin invite?}
 b. {Did Miriam invite Mona?; Did Miriam invite Maribel?; Did Miriam invite Min?; Did Laura invite Lisa?; Did Katrin invite Kerstin?}

The multiple question can receive an analogous treatment. We conclude that our theory can handle QVE with higher order questions straightforwardly.

5 PLURALITIES OF QUESTIONS

Our analysis of QVE amounts to the idea that a question has, or can have, inherent parts. This makes a question a plural object, in a sense. The parts amount to 'chunks' of information, all of which are required to answer the question. This part/whole structure is why part/whole modifiers can combine with questions.

An obvious consequence of our theory is that we should be able to detect the part/whole structure of questions in other areas besides part/whole modification, just like part/whole modifiers are not the only indicator of a part/whole structure in the reference of NPs. This section explores that consequence. In section 5.1 we provide our perspective on the cumulativity effects with questions discovered by Lahiri (2002). Section 5.2 is concerned with question embedding predicates, first discussed by Schwarz (1993), that seem to require a plurality, in some sense.

Before we proceed, we should once more acknowledge our intellectual debt to Lahiri's work. On his analysis questions were also associated with a part/whole structure based on informational content, which was derived from part-answers. There are thus many similarities in our further predictions and expectations. There are, however, also sufficient differences to merit explicit discussion.

5.1 *Cumulative readings with questions*

Lahiri (2002) observes that embedded questions can permit readings that are strongly reminiscent of so-called cumulative (also semi-distributive or co-distributive) readings with NPs (cf. Scha (1981); the term cumulative is Sternefeld's (1998) usage. See also Krifka (1986); Schwarzschild (1996); Sauerland (1998); Winter (2000); Beck & Sauerland (2000)). (148) can be true in the situation sketched in (149).

(148) The witnesses remembered which Klansmen had been present.

(149) $w_1 \rightarrow K_1$
 $w_2 \rightarrow K_2$
 ...
 $w_n \rightarrow K_m$
 (where ' $x \rightarrow y$ ' indicates ' x remembered that y had been present')

Crucially, the sentence can be true if each witness remembers part of the answer to 'which clansmen were present?', and each part

of the answer to ‘which clansmen were present?’ was remembered by some witness. It is not necessary that each witness remembered which Klansmen had been present—their memories jointly provide the complete answer to the question. This is quite parallel to the cumulative reading of (150a) described in (150c) and illustrated in (150b).

- (150)a. The two women married Joe and Alex.
 b. $w1 \rightarrow \text{Joe} \quad w2 \rightarrow \text{Alex}$
 (where ‘ $x \rightarrow y$ ’ indicates ‘ x married y ’)
 c. $\forall x \in 2W: \exists y \in J\&A: x \text{ married } y \ \&$
 $\forall y \in J\&A: \exists x \in 2W: x \text{ married } y$

The interesting aspect of this reading is that neither woman married both men, nor was there a group marriage. Rather, each group member contributed towards the relation holding between the two groups. This reading is standardly captured by pluralizing the relation involved (*marry* in (150)). We will use (151) as the definition of cumulation (see references above for various possibilities).

$$(151) A \text{ **}R B \text{ iff } \forall x \in A: \exists y \in B: xRy \ \& \ \forall y \in B: \exists x \in A: xRy$$

The logical form of (150a) is then (152).

$$(152) \langle 2W, J\&A \rangle \in \text{**} \lambda y \lambda x. x \text{ married } y$$

Before we proceed to analyse the question case, we note that cumulative readings depend on contextually salient subgroups in the same way as Schwarzschild’s distributive interpretations (see Beck 2000a, 2001 for discussion). (153a) can be true by virtue of the fact that the girls outnumber the women and the boys outnumber the men—a cumulative reading between subgroups, rather than individuals. Thus cumulation needs to contain the same contextually filled cover variables as distribution (cf. section 4.1). The definition is revised accordingly in (154).

- (153)a. The girls and the boys outnumber the women and the men.
 b. $\forall x \in \text{Cov}(\llbracket \text{the girls\&the boys} \rrbracket): \exists y \in \text{Cov}(\llbracket \text{the women\&the men} \rrbracket): x \text{ outnumber } y \ \&$
 $\forall y \in \text{Cov}(\llbracket \text{the women\&the men} \rrbracket): \exists x \in \text{Cov}(\llbracket \text{the girls\&the boys} \rrbracket): x \text{ outnumber } y$

$$(154) A \text{ **}R B \text{ iff } \forall x \in \text{Cov}(A): \exists y \in \text{Cov}(B): xRy \ \& \ \forall y \in \text{Cov}(B): \exists x \in \text{Cov}(A): xRy$$

Back to questions and cumulative readings. We expect a similar reading to arise between a subject NP and an embedded question if (i) the question is a plurality, and (ii) cumulation is possible with objects other than individuals. This is what we suggest. The definition of cumulation with questions and the analysis of example (148) from above are given below. The parallel to ordinary cumulation is obvious.

$$(155) A \text{ **}V_w Q \text{ iff } \forall x \in \text{Cov}(A): \exists Q' \in \text{Part}(Q)(w): x V_w Q' \ \& \\ \forall Q' \in \text{Part}(Q)(w): \exists x \in \text{Cov}(A): x V_w Q'$$

$$(156) \langle \llbracket \text{the witnesses} \rrbracket, \llbracket \text{which Klansmen had been present} \rrbracket \rangle \in \\ \text{**}\lambda Q \lambda x. x \text{ remembered}_w Q$$

- (157)a. $\forall x \in \text{Cov}(\llbracket \text{the witnesses} \rrbracket): \exists Q' \in \text{Part}(Q)(w):$
 $x \text{ remembered}_w Q' \ \&$
 $\forall Q' \in \text{Part}(Q)(w): \exists x \in \text{Cov}(\llbracket \text{the witnesses} \rrbracket):$
 $x \text{ remembered}_w Q'$
 (where $Q = \llbracket \text{which Klansmen had been present} \rrbracket$)
- b. Each witness remembered (the answer to) a relevant subquestion, and (the answer to) each relevant subquestion was remembered by a witness.
- c. {Was K1 present?, Was K2 present?, . . . Was Kn present?}

Thus we share with Lahiri the idea that a part/whole structure is associated with the question that can be detected by cumulation. We differ from Lahiri, once more, in that the relevant parts for us are questions rather than propositions. Lahiri's logical form of the relevant reading of (148) is given in (158). The relevant part/whole structure is one of propositions, parallel to his analysis of QVE.

$$(158) \text{ All } p \quad [\text{Ans}(p, Q, w) \ \& \ p(w)] \\ [\langle \llbracket \text{the witnesses} \rrbracket, p \rangle \in \text{**}[\lambda p \lambda x. x \text{ remembered}_w p]]$$

In order to completely understand (158) we ought to know how to cumulate a relation between an individual and a proposition and how to construct a cover of a propositions. At this point we must refer the reader to Lahiri (2002)—reporting the analysis in full formal detail would be too much. Suffice it to say that the witnesses cumulatively know a proposition p if their knowledge jointly implies p .

Lahiri's theory has several interesting consequences which he discusses in Lahiri (2002: chapter 4). The one consequence that we will focus on, however, is obvious from the logical form in (158): cumulative readings arise via cumulation of a relation between an

individual and a proposition for Lahiri, vs. cumulation of a relation between an individual and a question for us. In contrast to Lahiri, we therefore expect that cumulative readings are possible with exclusively question embedding verbs. This is borne out: (159a) has a reading made true by the situation sketched in (159b). This is the relevant cumulative reading, distinct from the more expected distributive reading in (159c). (160) is parallel.

- (159)a. Which criminals will be convicted depends (exclusively) on these witnesses.
- b. The testimony of witness1 determines whether criminal1 will be convicted, the testimony of witness2 determines whether criminal2 will be convicted,...
- c. For each witness x : which criminals will be convicted depends (exclusively) on x .

- (160)a. Which candidates will be admitted is decided by these references.
- b. Reference1 decides whether candidate1 will be admitted, reference2 decides whether candidate2 will be admitted,...
- c. For each reference x : x decides which candidates will be admitted.

We observe the topic effect familiar from section 4 with *ask* and *wonder*: while cumulative readings are impossible out of the blue (as Lahiri observes, cf. (161)), they improve greatly if the embedded question is 'topical' in the sense of section 4.4 (example in (162)).

(161)The witnesses wondered which Klansmen had been present.

- (162)a. The lawyers knew and the witnesses wondered which criminals were convicted.
- b. L1 knew and W1 wondered whether C1 was convicted, L2 knew and W2 wondered whether C2 was convicted,...

Lahiri himself reports that a cumulative reading seems possible for (163) and anticipates the need for pluralities of questions.

(163)The bystanders wondered which thugs beat up the men.

Beyond confirmation of the subquestion idea itself, we can also confirm our hypotheses as to what counts as a subquestion. We expect the same flexibility effects with cumulation that we discovered with QVE. This seems correct. Some indication is given by the data in (164).

- (164)a. These students told me which books those professors recommended.
b. My colleagues remembered which students had taken Semantics III and want to attend Acquisition of Semantics.

This confirms our decision in section 3 on what the relevant parts of a question are: we find that the same definition covers parts of questions as they play a role in cumulative readings with questions.

As expected, no cumulative readings are possible with questions that don't have non-trivial subquestions: *whether*-questions and singular *which*-questions. Only a distributive reading is possible.

- (165)a. The witnesses knew which Klansman had been present.
b. Each witness knew which Klansman had been present.
- (166)a. The witnesses knew whether McGregor had been present.
b. Each witness knew whether McGregor had been present.

Finally, we would like to point out that the theory of plurality dependent *different* proposed in Beck (2000b) fits well with our discussion. All of (167) permit a reading in which the reading of the *different* NP seems to depend on the *which*-phrase. Beck (2000b) argues that such readings are based on a cumulative interpretation of the predicate. Our LFs are given in (169); they fit this generalization. Conversely, the availability of a reading in which plurality dependent *different* takes its semantic clue from a question confirms the idea that questions can act as semantic pluralities.

- (167)a. Different witnesses remembered which clansmen had been present.
b. Different committees decide which candidates will be admitted.
c. Different policemen wondered which clansmen had been present.
- (168)a. The witness who remembered that clansman1 had been present was different from the witness who remembered that clansman2 had been present, etc.
b. The committee that decides whether candidate1 will be admitted is different from the committee that decides whether candidate2 will be admitted, etc.
c. The policeman who wondered whether clansman1 had been present is different from the policeman who wondered whether clansman2 had been present, etc.

- (169)a. $\exists X$: witnesses(X) & X are different from each other &
 $\langle X, \llbracket \text{which clansmen had been present} \rrbracket \rangle \in \text{**}\lambda Q\lambda x.x$
 remembered Q
- b. $\exists X$: committees(X) & X are different from each other &
 $\langle X, \llbracket \text{which candidates will be admitted} \rrbracket \rangle \in \text{**}\lambda Q\lambda x.x$
 decide Q
- c. $\exists X$: policemen(X) & X are different from each other &
 $\langle X, \llbracket \text{which clansmen had been present} \rrbracket \rangle \in \text{**}\lambda Q\lambda x.x$
 wondered Q

We conclude that cumulative readings with questions are a promising domain to which to apply our theory of part/whole structures of questions.

We should note that this section does not contribute a detailed comparison to Lahiri's theory of these readings, and that we have not attempted to cover all data that he considers, in the interest of space. The reader is referred to Lahiri (2002) for more detailed discussion.

5.2 Schwarz: Rattling off questions

There are predicates that can only apply to pluralities of individuals, e.g. *gather* in (170):

- (170)a. The children gathered.
 b. # Jonas gathered.

Similarly, if our theory is on the right track, we might expect to find predicates that require pluralities of questions. Data discovered by Schwarz (1993) may fall into that category. He notes that while a certain set of verbs like *rattle off* and *list* can in principle embed interrogatives, only a subset of interrogatives are well-formed as a complement of these verbs. Strikingly, the ones that are impossible are the ones that don't permit QVE: *whether*-questions and singular *which*-questions.

- (171)a. Ida rattled off which countries border the Mediterranean.
 b. # Ida rattled off which country borders Scotland.
 c. # Ida rattled off whether England borders Scotland.
- (172)a. Diane listed which students had passed.
 b. # Diane listed which student had passed.
 c. # Diane listed whether John had passed.

There is a clear intuition that only things that are lists or pluralities can be rattled off, and similarly for *list*.

- (173)a. Princess Waldburga listed her titles.
b. # Sigrid listed her title.

We speculate that the interrogative complements of these verbs need to be plural objects in our sense: questions that have a part/whole structure. Singular *which*-questions and *whether*-questions do not make available the relevant structure, as we know from QVE.

We take this to be further confirmation of our idea of plural questions. A detailed lexical semantic analysis of the embedding verbs will have to show if the parallel stands up to closer scrutiny. Compare Schwarz (1993) for a much more careful discussion.

6 CONCLUSION

We suggest that when a part/whole modifier is associated with a question, as is the case in QVE, the modifier quantifies over 'parts' of the question that are themselves questions. We have developed a theory of how a question can be divided into such parts. The basic idea is that a set of questions is a division of a given question into subquestions if each member of the set gets us closer to answering the original question, together the answers of all the members completely answer the original question, and no proper subset does the same. Compared to Lahiri's theory (our immediate theoretical predecessor), more divisions into parts are possible. Thus the parts of a question are determined to a lesser extent by semantics. We have provided empirical arguments for the ensuing flexibility. The most immediate argument for our theory, however, remains the fact that quantification over (sub-) questions is motivated by QVE involving exclusively question embedding predicates (*depend on*, *decide*, and under the right circumstances, *ask*, *wonder* etc.). Our theory suggests a closer similarity of questions and plurals than previous research has indicated. We have pointed out some prima facie promising consequences. Future research will have to show how useful the connection turns out to be.

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