

# The Meaning and Use of Negative Polar Interrogatives

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## 1 Introduction

Standard semantic treatments of interrogative sentences predict positive and negative closed interrogatives such as those in (1a) and (2a) to be equivalent. Groenendijk and Stokhof (1997) dub the standard view the “Hamblin Picture” (after Hamblin 1958). On this approach, (i) an answer to a question is a proposition, (ii) the possible answers to a question partition the space of logical possibilities and (iii) to know the meaning of a question is to know which propositions count as direct answers to that question. At first glance, this prediction appears correct; the same propositions count as direct answers to both types of closed interrogative, as shown by the possible answers to (1a) and (2a) below.

- (1) a. A: Is Jane coming?  
b. B: Yes, she is. (= Jane is coming.)  
c. B: No, she isn't. (= Jane is not coming.)
- (2) a. A: Isn't Jane coming?  
b. B: Yes, (of course) she is. (= Jane is coming.)  
c. B: No, she isn't. (= Jane is not coming.)

Further inspection, however, reveals that negative interrogative (NI) questions differ from positive interrogative (PI) questions in at least two important respects.<sup>1</sup> First, NI questions convey a backgrounded attitude on the part of the speaker toward the

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<sup>1</sup>By *negative interrogative* I mean an interrogative sentence with a negated, proposed auxiliary verb, as in (2a). I thus exclude from consideration interrogatives such as (i).

- (i) Is Jane not coming?

(i) and (2a) share a number of the divergent pragmatic and semantic properties discussed below, but (i) also permits a neutral question interpretation, which (2a) does not.

proposition expressed by a positive answer (Ladd 1981, Büring and Gunlogson 2000, Han 2002, van Rooy and Šafářová 2003, Romero and Han 2004, Reese 2006). (3b), for example, is a felicitous continuation of (3a), which entails that the speaker has no prior beliefs regarding the issue raised by the question.

- (3) a. I have no beliefs on the matter. I just want to know...  
 b. Did the President read the August 6 PDB?  
 c. #Didn't the President read the August 6 PDB?

(3c), on the other hand, is marked, because it conveys a prior belief toward the issue raised by the question that conflicts with (3a), namely that the president read (or ought to have read) the PDB. The example in (4), adapted from Gunlogson (2003), provides further illustration.

- (4) Aren't you a communist?

(4) is infelicitous in a context that requires neutrality on the part of the speaker, for example at a hearing of some sort.

The second respect in which the two question types differ is that NI questions display an ambiguity that PI questions do not (Ladd 1981, Büring and Gunlogson 2000, Huddleston and Pullum 2002, Romero and Han 2004). The available readings can be disambiguated by including a polarity sensitive lexical item. NI questions that contain a positively-oriented polarity sensitive item, as in (5), are biased toward positive answers. Ladd (1981) dubs this interpretation the *outside-negation* reading. NI questions that contain a negatively-oriented polarity sensitive item, as in (6), on the other hand, are biased toward negative answers, Ladd's *inside-negation* reading.

- (5) a. Didn't Kim read the report *too*?  
 b. Aren't there *some* vegetarian restaraunts around here?  
 (6) a. Didn't Kim read the report *either*?  
 b. Aren't there *any* vegetarian restaraunts around here?

Ladd (1981) and Romero and Han (2004) treat the ambiguity as a genuine scope ambiguity involving negation, hence the outside-/inside-negation nomenclature. I argue for an alternative analysis of the ambiguity in section 2.3.2.

In principle, these differences are amenable to either a pragmatic or semantic explanation. The pragmatic stance assumes that negation in NIS serves a pragmatic function rather than a truth-functional one (cf. Groenendijk and Stokhof 1997, van Rooy and Šafářová 2003). In fact, as Groenendijk and Stokhof (1997) point out, the predicted equivalence between positive and negative closed interrogatives paves the way for a pragmatic analysis, since it frees the negation to play a role distinct from its truth functional one. The semantic approach, on the other hand, assumes that PIS and NIS do not ask the same question, i.e., they have distinct denotations. This approach is advocated by Romero and Han (2004). Their proposal is discussed in detail in section 2. While semantic approaches seem tailored to account for Ladd's ambiguity, which on the surface has the properties of a scope ambiguity, they must still account for the judgements in (1) and (2), especially if one maintains the Hamblin picture for the semantics of interrogatives.

The paper is organized as follows. Section 2 introduces and evaluates a semantic solution to the puzzle of negative interrogatives, namely Romero and Han (2004). A number of problems with their analysis are discussed and the following sections introduce data that demonstrate various restrictions on the discourse roles played by outside- and inside-negation questions. Section 3 provides evidence that outside-negation is not ordinary, descriptive negation. Examples pertaining to the available discourse functions of negative interrogatives are introduced. Section 4 discusses data showing that outside-negation NIs are in part *assertions*. Section 5 introduces some formal tools and provides an analysis of negative interrogatives in dialogue using Segmented Discourse Representation Theory (Asher and Lascarides 2003). Section 6 provides some concluding remarks and directions for future research.

## 2 A Semantic Approach to Negative Questions

Romero and Han (2004) presents an analysis of negative interrogative questions that assumes an underlying semantic distinction between NIs and PIs. NI questions, they argue, contain an implicit operator VERUM whose use implicates a backgrounded speaker attitude and which interacts with negation to produce the “inside-negation” and “outside-negation” readings. Section 2.1 provides a brief introduction to Romero and Han’s analysis and sections 2.2 and 2.3 offer a critical evaluation.

### 2.1 Basics of the VERUM Approach

Romero and Han (2004)’s analysis begins from the observation that NI questions and questions containing the epistemic adverb *really* exhibit similar epistemic biases. (7a), for example, requires for any felicitous use that the speaker hold a prior attitude toward the proposition that Jane is not coming.

- (7) a. Is Jane *really* coming?  
b. Isn’t Jane coming?

As already noted, (7b) requires a similar backgrounded attitude by the speaker toward the proposition that Jane *is* coming.

Romero and Han (2004) define the semantic contribution of *really* through the operator VERUM as in (8).  $Epi_x(w)$  are the epistemic alternatives for  $x$  in  $w$ ;  $Conv_x(w')$  are the worlds where the *conversational goals* of  $x$  in  $w'$  are met, the default goal being to accumulate information about the state of the world (cf. Stalnaker 1978 and Roberts 1996).  $CG_{w''}$  is the set of propositions representing the shared beliefs of the discourse participants in  $w''$ , i.e. the common ground (Stalnaker 1978).

$$(8) \quad [[\text{VERUM}]]^{g[x/i]} = \lambda p_{\langle s,t \rangle} \lambda w. \forall w' \in Epi_x(w) [\forall w'' \in Conv_x(w') [p \in CG_{w''}]]$$

In words, VERUM  $\phi$  is true at a world  $w$  iff some anaphorically determined discourse participant  $x$  (normally either the speaker or the addressee) is certain that in all of the worlds in which the conversational goals of  $x$  are met the proposition  $\phi$  is part of the common ground, a meaning Romero and Han gloss as FOR-SURE-CG <sub>$x$</sub>  $\phi$ . They

assume that in negative interrogative questions, the preposed, negated auxiliary verb introduces VERUM into the logical form of the question.

### 2.1.1 VERUM and the Speaker's Backgrounded Attitude

According to the lexical entry in (8), VERUM is an epistemic modal operator that embeds a "meta-conversational" modal statement, i.e., a modal statement that refers to the conversation goals of the discourse participants rather than to the state of the world. The use of meta-conversational moves, or speech acts, is governed by the principle in (9).

(9) **Principle of Economy:**

Do not use a meta-conversational move unless necessary (to resolve epistemic conflicts or to ensure Quality) (Romero and Han 2004, p. 629).

Quality refers to the second part of Grice's Maxim of Quality: do not say that for which you lack adequate evidence (Grice 1975). For Romero and Han, adequate evidence is at least indirect evidence.

Romero and Han derive the backgrounded speaker attitude discussed in Section 1, which they treat as a conversational implicature, through (9). NIS are meta-conversational moves by definition given the inclusion of  $\text{Conv}_x$  in (8). Assuming that discourse participants are cooperative and obey (9), it follows either that the speaker holds some belief  $\phi$  which is inconsistent with the addressee's beliefs or believes  $\phi$  but lacks sufficient evidence to assert it, i.e., the speaker wishes to avoid a violation of Quality.

### 2.1.2 Ladd's Ambiguity

Romero and Han's analysis of NI questions provides an intuitive account of the outside-/inside-negation ambiguity. Once the logical form of NIS includes VERUM, Ladd's ambiguity can be reduced to a matter of syntactic scope. The outside-negation reading of NI questions results when negation outscopes VERUM. The logical form and resulting partition are shown in (10a) and (10b) respectively.

- (10) a.  $[[ [_{\text{CP}} \text{Q not } [ \text{VERUM } [_{\text{IP}} \text{Jane is coming } ] ] ] ] ] =$   
 b.  $\{ \text{FOR-SURE-CG}_x \text{ Jane is coming, } \neg \text{FOR-SURE-CG}_x \text{ Jane is coming } \}$

The question in this case addresses  $x$ 's degree of certainty about whether or not the proposition that *Jane is coming* is in the common ground, hence the positive bias noted in section 1.

The inside-negation reading results when VERUM outscopes negation, as shown in (11a). In this case, the question addresses  $x$ 's degree of certainty about whether or not the proposition that Jane is *not* coming is in the common ground, as indicated by the partition in (11b).

- (11) a.  $[[ [_{\text{CP}} \text{Q VERUM } [ \text{not } [_{\text{IP}} \text{Jane is coming } ] ] ] ] ] =$   
 b.  $\{ \text{FOR-SURE-CG}_x \neg \text{Jane is coming, } \neg \text{FOR-SURE-CG}_x \neg \text{Jane is coming } \}$

The partition in (11b) captures the intuition from section 1 that inside-negation NIs are negatively biased, i.e. the question is “about” the proposition that Jane is not coming.

## 2.2 Evaluation of the VERUM Approach

To summarize the previous section, Romero and Han (2004) maintain a semantic distinction between negative interrogative questions and positive interrogative questions: NI questions contain the operator VERUM in their logical form. Including VERUM results in a conversational implicature equivalent to the backgrounded speaker attitude noted in section 1 and provides an account of Ladd’s Ambiguity. Romero and Han (2004) provide the most detailed analysis of NIs in the literature and merits serious consideration. Section 2.2 provides an in-depth evaluation of the approach, identifying a number of problematic aspects, the most serious of which addresses the validity of the semantic approach.

### 2.2.1 The Backgrounded Speaker Attitude

Romero and Han (2004)’s analysis of the backgrounded speaker attitude rests on a problematic empirical generalization. They claim that NI questions “*necessarily carry the epistemic implicature* that the speaker believed or expected that the positive answer is true” (emphasis added) (p. 610). Although NI questions always convey *some* backgrounded attitude on the part of the speaker, this attitude is not always epistemic. The examples in (12) from Huddleston and Pullum (2002) are counter-examples.

- (12) a. Aren’t you ashamed of yourselves?  
b. Don’t you like it?

(12a) conveys a *deontic* attitude rather than an epistemic one: the speaker feels that the addressees *ought* to be ashamed of themselves. (12b) conveys what Huddleston and Pullum call a *desiderative* attitude: the speaker *wants* the positive answer to be true. The existence of non-epistemic background attitudes is problematic for Romero and Han’s account because the derivation of the background attitude is based on the presence of VERUM in NIs, which is an epistemic operator, and (9), which refers exclusively to epistemic concepts.

### 2.2.2 Ladd’s Ambiguity and Answer Patterns

A more fundamental problem arises from the assumption that PIs and NIs have distinct denotations. As I argued in the introduction, any attempt to give a semantic treatment of the phenomena associated with negative interrogative questions and which assumes a semantics for interrogative sentences consistent with the Hamblin picture must account for the apparent equivalence of positive and negative questions established in (1) and (2). This requirement is problematic for Romero and Han (2004). Direct answers to NI questions like (13b) do not correspond to the propositions contained in the partitions given in (10b) and (11b) on either an outside-negation or an inside-negation reading, as shown in (14) and (15).

- (13) a. A: Sue just cancelled, so now no syntacticians are coming.

- b. B: Isn't Jane coming (too/either)?
- (14) A: Yes. (But she doesn't do syntax anymore.)
- a. = Jane is coming
- b.  $\approx$  FOR-SURE-CG<sub>x</sub> Jane is coming
- c.  $\neq$  FOR-SURE-CG<sub>x</sub>  $\neg$  Jane is coming
- (15) A: No.
- a. =  $\neg$ Jane is coming
- b.  $\neq$   $\neg$  FOR-SURE-CG<sub>x</sub> Jane is coming
- c.  $\neq$   $\neg$  FOR-SURE-CG<sub>x</sub>  $\neg$  Jane is coming

Rather, a simple positive answer to either type of negative question intuitively conveys the proposition that Jane is coming. This result is congruent with the positive cell of the partition in (10b), but it is inconsistent with the prediction for inside-negation NIS shown in (14c). Simple negative answers are even more problematic (15). Such responses intuitively convey that Jane is not coming, not that the respondent is uncertain that Jane is coming (15b), nor that he is uncertain that she is not coming (15c).

Romero (2005) counters these observations by suggesting that VERUM contributes expressive content to the interpretation of an utterance (Kratzer 1999, Potts 2005b) and, as a result, that negative answers do not negate FOR-SURE-CG<sub>x</sub> $\phi$  but rather the embedded proposition  $\phi$ . Along the same lines, positive answers affirm  $\phi$  rather than FOR-SURE-CG<sub>x</sub> $\phi$ . Romero (2005) does not provide an implementation of her proposal and problems arise when one attempts to fit it into existing accounts of expressive meaning. Both Kratzer (1999) and Potts (2005b), for example, assume that the computation of expressive content is independent of the computation of descriptive content (or at-issue entailment in Potts' terminology). It is pivotal to Romero and Han (2004)'s account of Ladd's ambiguity, however, that the semantic contributions of VERUM and negation interact. If VERUM is truly an expressive item, this possibility is excluded, as the two lexical items contribute to distinct dimensions of semantic interpretation.

For example, the assertion that negative answers negate the proposition embedded in the scope of VERUM, rather than the VERUM statement itself means that a negative answer to an outside-negation NI would have descriptive content  $\neg\phi$  and expressive content FOR-SURE-CG<sub>x</sub> $\phi$  where  $x$  is resolved to the speaker.<sup>2</sup> The approach fares no better with respect to inside-negation negative questions. In this case, the proposition in the scope of the VERUM operator is  $\neg\phi$  and the VERUM statement itself is FOR-SURE-CG<sub>x</sub> $\neg\phi$ . So if a *no* answer negates the embedded proposition, as Romero (2005) claims, then it should convey  $\phi$  rather than  $\neg\phi$ . In short, the "expressive content" solution to the problematic pattern of answers in (14) and (15) must destroy Romero and Han (2004)'s account of Ladd's ambiguity in order to save it. Ladd's ambiguity is argued to be a scope ambiguity between negation and VERUM, but it is a fundamental aspect of expressive meaning (at least as normally understood) that it is "scopeless" (Potts 2005b, p. 42); i.e., it is compositionally independent of at-issue content, and as a result, cannot enter into scope relations with negation.

<sup>2</sup>The VERUM statement, contributing expressive content, is of the wrong semantic type in Potts (2005b)'s framework, for example, to interact with the negation.

## 2.3 VERUM's Last Stand

### 2.3.1 The Distribution of Polarity Sensitive Items.

A final argument in favor of the VERUM approach according to Romero and Han (2004) and Romero (2005) is its account of the distribution of polarity sensitive items in negative interrogative questions. Positive polarity items (PPIS) only occur in outside-negation NI questions and negative polarity items (NPIS) only occur in inside-negation NI questions. Romero and Han (2004) follow Linebarger (1987) in assuming that NPIS are licensed at logical form in the immediate scope of negation. Consequently, no logical operator may intervene between an NPI and the licensing negative element. PPIS are not licensed in the immediate scope of negation.

Romero and Han (2004) use Linebarger's analysis to account for the distribution of polarity items in negative questions. Given the logical form in (16a), the NPI *either* is licensed because it is in the immediate scope of negation; VERUM does not intervene between the negation and the polarity item. The PPI *too* is not licensed in (16a) because it is in the immediate scope of the negation.

- (16) a. [ Q VERUM [  $\neg$  Jane is coming {either/\*too} ] ]  
 b. [ Q  $\neg$  [ VERUM Jane is coming {\*either/too} ] ]

The situation is reversed for outside-negation NI questions. Given the logical form in (16b), the negative polarity item *either* is not licensed because it is not in the immediate scope of negation; VERUM intervenes between it and the negation. The positive polarity item *too* is licensed for this very reason: it is not in the immediate scope of the negation.

These observations, however, are not a “knock down” argument in favor of the VERUM approach. The immediate scope constraint is not uncontroversial. Not all negative polarity items are subject to the intervention effects noted by Linebarger (1987). In (17) for example, *any* is licensed despite the fact that the epistemic operator *certain* intervenes between it and the negation. The example is parallel to the examples in (18), which Romero and Han (2004) use to motivate the immediate scope constraint.

- (17) It is not certain [ that there are *any* vegetarian restaurants around here ].  
 (18) a. \*It is not certain [ that Jane is coming *either* ].  
 b. It is not certain [ that Jane is coming *too* ].

The immediate scope constraint does not account for the difference in grammaticality between (17) and (18a). Linebarger (1987)'s syntactic licensing account of NPIS is used to argue for the logical forms in (10) and (11), but it is far from clear that the syntactic approach is correct. von Stechow (1999), for example, provides a semantic licensing account that addresses many of the concerns cited in Linebarger (1987).

On a related point, it has long been noted that (at least some) negative polarity items are licensed in questions independently of the presence of a negative element as shown in (19) (cf. Ladusaw 1979, Krifka 1995, van Rooy 2003, inter alia).

- (19) a. Are there *any* vegetarian restaurants around here?  
 b. Did John *lift a finger* to help Mary?

The real challenge then is to explain the presence of PPIS in questions containing a negative element. Section 2.3.2 pursues one solution to this problem. Interestingly, this solution is alluded to by Romero (2005); viz. that in outside-negation negative interrogative questions negation functions metalinguistically. Section 2.3.2 briefly addresses how this assumption accounts for the distribution of polarity items in NIS.

### 2.3.2 Outside-negation as Metalinguistic Negation

Horn (1989) notes that metalinguistic negation is neither “an active trigger of NPIS nor a passive countertrigger or inhibitor of PPIS.”<sup>3</sup> Assuming that outside-negation is metalinguistic, therefore, accounts for the presence of PPIS in outside-negation NIS and explains why NPIS force an inside-negation reading. The sentences in (20) – (22) (from Horn 1989) motivate the generalization regarding the licensing properties of metalinguistic negation.

- (20) a. The Sox have *already* clinched the pennant.  
 b. The Sox haven't *already* clinched the pennant.
- (21) a. Chlamydia is not sometimes misdiagnosed, it is frequently misdiagnosed.  
 b. #Chlamydia is not ever misdiagnosed, it is frequently misdiagnosed.
- (22) Chris didn't manage to solve {some/\*any} of the problems, he managed to solve all of them.

In (20b), the positive polarity item *already* falls within the scope of negation and as a result is ungrammatical. (20b), however, can be used as a *denial* of the assertion in (20a). In this case, it would normally be spoken with a fall-rise intonational contour (Lieberman and Sag 1974, Horn 1989, Walker 1996, inter alia). Metalinguistic negation can also target the potential implicatures of previous utterances as demonstrated by (21) and (22). The instance of (22) that includes the PPI *some* objects to the potential scalar implicature of an utterance like *Chris managed to solve some of the problems* that Chris did not solve all of the problems. NPIS cannot be used in this way, as shown by the ungrammaticality of *ever* and *any* in (21b) and (22) respectively. Assuming that outside-negation NIS contain metalinguistic negation accounts for the distribution of polarity items in negative questions, since metalinguistic negation neither licenses NPIS nor anti-licenses PPIS.

I adopt an analysis of metalinguistic negation below that is similar to that suggested in Potts (2005a) and which provides a unified treatment of descriptive and metalinguistic negation. What distinguishes descriptive from metalinguistic negation, on this analysis, is what aspect of the meaning of an utterance negation targets, where the meaning of an utterance is an *n*-tuple of propositions. Nonetheless, both descriptive and metalinguistic negation are truth-functional operators. There is no important semantic difference, then, between “outside” and “inside” negation. Rather, what is at issue is whether negation targets the core meaning of an utterance or some secondary meaning. I provide more details in Sect. 5. First, I provide additional evidence that

<sup>3</sup>See Geurts (1998) for critical comments on Horn's position.



outside-negation NIS share the characteristic discourse function of utterances containing metalinguistic negation, i.e. *denials*.

### 3 Evidence for the Metalinguistic Approach

#### 3.1 Discourse Function

Metalinguistic negation, according to Horn (1989), is a “device for objecting to an utterance on any grounds whatever, including the conventional and conversational implicata it potentially induces, its morphology, its style or register, or its phonetic realization” (p. 363). As I already indicated, I do not assume with Horn that there is any essential difference between metalinguistic and ordinary, truth-functional negation. In this respect, when I speak of uses of metalinguistic negation, I am really concerned with the illocutionary act of *denial* or *correction*. Following van der Sandt and Maier (2003), denials object to and remove information that has been previously entered into the discourse record. It is necessary to move to the illocutionary level because denials need not contain an instance of negation. (23b), for example, corrects the assertion in (23a): assuming that Jane is a student, (23b) entails the negation of (23a).

Outside-negation NIS pattern with positive statements used as denials, as shown in (23) – (26). (23c), is a less forceful denial of (23a) than (23b), but is a denial regardless, since it puts into dispute the assertion in (23a).<sup>4</sup>

- (23) a. A: None of the students turned in their assignment.  
 b. B: Jane turned in her assignment.  
 c. B: Didn't Jane turn in her assignment?

Inside-negation NIS cannot be used for this purpose, but some care is required in verifying this. (23c) on an inside-negation reading *is* a felicitous response to (23a). However, it is not a denial or correction of (23a), rather it is what is referred to in literature on dialogue acts as a CHECK move (Carletta et al. 1997). CHECK moves ask for confirmation of information that the speaker has reason to believe given the discourse context. (23c), for example, checks the entailment of (23a) that Jane is not coming.

The denial reading of a negative question can be coerced by including certain “priming” phrases which indicate that what follows challenges the assertion of the previous utterance on some grounds. In (24), for example, *B* prefaces his turn with *That's not true*, which introduces a reasonable expectation that the utterance that follows will provide counterevidence or correct *A*'s assertion in (24a).

- (24) a. A: All of the students submitted a paper to *L&P*.  
 b. B: That's not true.  
 c. B: Some of them submitted to *LI*.  
 d. B: Didn't {*some/#any*} of them submit to *LI*?

(24c) and the outside-negation reading of (24d) are felicitous as challenges to the entailment in (24a) that no student submitted their paper to *LI*. The inside-negation reading

<sup>4</sup>The intonational contours of (23b) and (23c) share certain features, for example the presence of an L\*+H nuclear pitch accent on *Jane*. I return to these similarities below.

of (24d) is not.

The examples in (25) are analagous to those in (23), except that the denials in (25c) and the outside-negation reading of (25d) object to (25a) on the basis of what is perceived to be a false presupposition of *manage*, viz. that it was not easy for Nicholas to prove the theorem.

- (25) a. A: Nicholas managed to prove the theorem.  
 b. B: I wouldn't say he [managed]<sub>F</sub> to prove the theorem.  
 c. B: It was *rather* easy for him.  
 d. B: Wasn't it {*rather*/#*at all*} easy for him?

(25b) indicates that *B* intends to object to *A*'s utterance on some grounds, in this case its presupposition. If we include the PPI *rather*, forcing an outside-negation reading, (25d) is a felicitous objection to (25a). If we include the NPI *at all* instead, forcing an inside-negation reading, (25d) is no longer felicitous. Note that without the prime (25b), the inside-negation reading of (25d) is allowed. In this case, it asks for confirmation that it was not easy to prove the theorem.

(26c) and (26d) object to a potential implicature of (26a), viz. that not all of the packages have arrived. Again, the prime in (26b) indicates that the following utterance rejects (26a) for some reason.

- (26) a. A: Some of the packages have arrived already.  
 b. B: Well...That's not quite right.  
 c. B: All of the packages have arrived *already*.  
 d. B: Haven't all of the packages arrived {*already*/#*yet*}?

As in the previous examples, forcing an inside-negation reading of (26d) by including an NPI – in this case *yet* – produces an infelicitous result. The inside-negation reading of (26d), however, is felicitous as an attempt to ground new information – viz. the implicature that not all of the packages have arrived – that contradicts a previously held assumption.

### 3.2 Prosody

The prosodic characteristics of outside-negation NIS also point toward a metalinguistic use. One prosodic property mentioned above is the “fall-rise” intonational contour characteristic of utterances containing a metalinguistic negation (Lieberman and Sag 1974, Horn 1989, Walker 1996) and the occurrence of an L\*+H nuclear pitch accent, which has been analyzed as conveying a lack of speaker commitment (Pierrehumbert and Hirschberg 1990) or contentiousness (Steedman 2003).

Besides intonational contour, Swerts and Kraemer (to appear) found that metalinguistic negation tends to be prosodically marked, the functional explanation being that it is important that disagreements about the content of the common ground be recognized by addressees. Thus, one might find higher mean pitch, greater pitch range, higher mean intensity or increased duration on the nuclear pitch accent in outside-negation questions. These features might be taken as paralinguistic cues indicating increased speaker involvement and have been shown to affect the interpretation of intonational contours (Hirschberg and Ward 1992). Preliminary investigation suggests

that outside-negation NIs are more prosodically marked than inside-negation NIs in the ways mentioned above. Outside-negation NIs tend to be louder and have an increased pitch range compared to inside-negation NIs. These investigations, however, are preliminary and a more systematic study of these prosodic features needs to be carried out.

None the less, the foregoing sections have accrued a reasonable amount of evidence that outside-negation NIs contain metalinguistic negation. First, this assumption accounts for the distribution of polarity sensitive items in outside- and inside-negation NIs. Second, outside-negation NIs share the discourse function of positive statements used as denials, i.e. utterances targeting a previous utterance based on its truth-conditional content, its presuppositions or potential implicatures. Finally, outside-negation NIs share many prosodic characteristics with metalinguistic negation. Section 4 introduces a final argument for this analysis based on the co-occurrence of outside-negation NIs with the discourse markers *after all* and *yet* that emphasizes their similarity to assertions. If outside-negation NIs can be used as denials, a subtype of assertion, then we should expect them to have some of the distributional properties of assertions. At the same time, inside-negation NIs should lack these properties. As shown in Sect.4, these predictions are borne out.

## 4 Two Speech Acts in One

Given the discussion in section 3, the expectation arises that outside-negation negative questions share at least some of the properties of assertions. For example, the outside-negation NI in (23c) and the assertion in (23b) are both possible denials of the truth-conditional content of (23a), so both utterances should be in some sense incompatible or inconsistent with (23a). It is obvious that (23a) and (23b) are inconsistent, assuming that Jane is a student, given their propositional content. But interrogative sentences do not denote a proposition, but rather a partition of the context set. It is unclear, therefore, how (23c) can be *inconsistent* with (23b).

In section 1, I noted that outside-negation NI questions are positively biased: the speaker expects a positive answer to the question. I argue in the current section that this positive bias is an assertion of the positive answer and that outside-negation NI questions are *both* questions *and* assertions.<sup>5</sup> This accounts for the overlap in discourse function between utterances like (23b) and (23c): both *assert* that Jane turned in her assignment. (23c) in addition asks a question. The discourse function of that question is addressed in Sect. 5.

Sadock (1971, 1974) proposes several tests for the illocutionary force of an utterance that appeal to co-occurrence restrictions between certain discourse markers and illocutionary forces. The sentence initial discourse markers *after all* and *yet* co-occur with assertions but not genuine, information-seeking questions. For example, *after all* can be prefixed to assertions but not to genuine questions, as shown in (27a) and (27b).

(27) It's fine if you don't finish the article today.

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<sup>5</sup>Asher and Reese (2005) make the same argument for negatively biased questions containing a strong NPI.

- a. After all, your adviser is out of the country.
- b. #After all, is your adviser out of the country?

Utterances prefixed with *yet*, on the other hand, can follow assertions, cf. (28b), but not questions, as in (29b).

- (28) a. John is always late for work.
- b. Yet, he continues to be promoted.
- (29) a. Is John always late for work?
- b. #Yet, he continues to be promoted.

According to these tests, outside-negation NIS are assertions, while inside-negation NIS are not. Note that (30b) can be preceded by *after all* when it contains the PPI *too*, but not when it contains the NPI *either*. Either version of (30b) is felicitous in the discourse context established in (30) if *after all* is left off.

- (30) a. A: Sue can't attend, so there'll be no syntacticians there.
- b. B: What do you mean? After all, isn't Jane coming {too/\*either}?

(31b) can follow (31a) when it contains *too*, but not when it contains *either*.

- (31) a. A: Isn't Jane coming {too/\*either}?
- b. A: Yet, Mary claims there will be no syntacticians there.

Again, if *yet* is left off of (31b), then either the outside- or inside-negation reading of (31a) is available. Given these tests, I maintain that an assertion is present in outside-negation NIS which licenses the discourse markers *after all* and *yet* in the contexts established in (30) and (31).

Outside- and inside negation negative questions, however, are still questions: they can be answered with *yes* or *no* and they co-occur with discourse markers such as *tell me* and *by any chance* which co-occur with genuine questions (Sadock 1974).

- (32) Tell me, isn't Jane coming {too/either}?

Outside-negation negative questions, consequently, are *both* questions and assertions, as demonstrated by the discourse in (33). *Tell me* requires (33a) to be a question.

- (33) a. A: Tell me, isn't Jane coming too?
- b. A: Yet, Mary claims there will be no syntacticians there.

At the same time, the *yet* prefixed to the assertion in (33b) requires (33a) to be an assertion. As a result, in order for the the typing constraints of *tell me* and *yet* to be satisfied in (33), the negative interrogative in (33a) must be simultaneously typed as an *assertion* and *question*: that is the type associated with (33a) is complex (Asher and Pustejovsky 2004).

## 5 Negative Questions in Discourse and Dialogue

Section 5 provides a formal analysis of how negative interrogative questions contribute to the semantics of a dialogue within Segmented Discourse Representation Theory (SDRT; Asher and Lascarides 2003). SDRT is a dynamic semantic theory of the rhetorical connections between utterances in a discourse or dialogue built on top of Discourse Representation Theory (DRT; Kamp and Reyle 1993). Some details of these formalisms are given in section 5.1. Section 5.1.1 specifically addresses DRT and section 5.1.2 addresses SDRT.

As shown in section 3 inside- and outside-negation negative interrogative questions have distinct discourse functions. Section 5.2.1 discusses how the discourse function of inside-negation NI questions is computed in SDRT. In section 3.1, inside-negation NIs were argued to be CHECK questions (Carletta et al. 1997), i.e., questions that ask for confirmation of some information entailed in the discourse context. Outside-negation NI questions challenge a previous utterance (or the presupposition or implicature of a previous utterance). In addition, section 4 showed that there is an assertion associated with outside-negation NI questions. This assertion affects the role that outside-negation NIs play in dialogue. Section 5.2.2 attempts to derive this assertion from the formal properties of outside-negation NIs and addresses its contribution to discourse logical form.

### 5.1 Formal Preliminaries

#### 5.1.1 DRT Syntax and Semantics

In the analysis presented section 5.2, discourse representation structures, or DRSS, are used to represent the logical forms of individual clauses rather than of whole discourses. The syntax of DRSS is given below (Asher and Lascarides 2003):

**Definition 1** (Syntax of  $L_{DRT}$ ). A discourse representation structure, or DRS,  $K$  is an ordered pair consisting of a set  $U_K$  of *discourse referents* (the universe of  $K$ ) and a list of conditions  $C_K$ . The language  $L_{DRT}$  is defined recursively as follows:

$$K := \langle U, \phi \rangle | K^\cap \gamma$$

where  $K^\cap \gamma$  is the DRS that results from appending  $\gamma$  to  $K$ 's list of DRS conditions.

The set of DRS conditions is recursively defined as follows, where  $P$  is an  $n$ -ary relation symbol,  $x_1, \dots, x_n$  discourse referents and  $K_1$  and  $K_2$  DRSS:

$$\gamma := P(x_1, \dots, x_n) | \neg K | K_1 \Rightarrow K_2 | \Box K | \Diamond K$$

The logical operators have their usual interpretation.  $L_{DRT}$  is extended to  $L_{DRT}^+$  with an interrogative operator '?':

$$L_{DRT}^+ = L_{DRT} \cup \{?K | K \in L_{DRT}\}$$

I use a short-hand notation below to represent DRSS, writing the universe  $U$  and conditions  $C$  between square brackets and separated by a colon.

DRSs are interpreted as relations between input and output world-assignment pairs (van Eijck and Kamp 1997). The semantics for closed interrogatives is given in (34a), which simplifies the definition in Asher and Lascarides (2003). (34a) is a dynamic extension of the analysis in Karttunen (1977).

- (34) a.  $(w, f) \llbracket ?K \rrbracket_M = \{ \llbracket p \rrbracket_M : \exists w' \exists g(w, f) \llbracket \vee p \rrbracket_M(w, g) \wedge (p = \wedge K \vee p = \wedge \neg K) \}$ ,  
where  $p$  is a propositional term.
- b.  $(w, f) \llbracket \vee p \rrbracket_M(w, g)$  iff  $\langle (w, f), (w, g) \rangle \in \llbracket p \rrbracket_M^{w, f}$

The denotation of a closed interrogative with respect to a world  $w$  and an assignment function  $f$ , according to (34a), is the singleton set consisting of the true answer.

Finally, I define a function *core-proposition* that applies to a DRS and returns the *core proposition*, i.e., the DRS stripped of any markers of sentence mood, viz ‘?’. The core proposition corresponds to the *sentence radicals* of Stenius (1967).

**Definition 2** (Core Proposition). For  $K \in L_{DRT}^+$ , if  $K \in L_{DRT}$ ,  $core-proposition(K) = \wedge K$ ; otherwise  $K$  is of the form  $?K'$  and  $core-proposition(?K') = \wedge K'$ . ( $\wedge$  indicates a *propositional term*.)

The *core-proposition* function will apply to an interrogative sentence such as *Is Jane coming?*, returning a propositional term  $\wedge Jane\ is\ coming$ .

### 5.1.2 SDRT Syntax and Semantics

SDRT is an extension of DRT that takes into account the rhetorical connections between utterances in a discourse or dialogue and the ways these connections add to the truth-conditional content. The additional vocabulary of SDRT includes a set of speech act discourse referents  $\pi_1, \dots, \pi_n$  and relation symbols  $R_1, \dots, R_n$  that reflect the rhetorical connection between utterances. Each speech act referent  $\pi$  labels a token of some DRS  $K$  or larger discourse constituent. The well-formed SDRT formulae are defined formally below.

**Definition 3** (Syntax of  $L_{SDRT}$ ). The well-formed SDRS formulae of  $L_{SDRT}$  are given recursively as follows:

$$\phi := \psi \mid R(\pi, \pi') \mid \phi \wedge_D \phi' \mid \neg \phi$$

where  $\pi$  and  $\pi'$  are labels,  $R$  is a binary discourse relation symbol,  $\psi \in L_{DRT}$ , and  $\phi, \phi' \in L_{SDRT}$ .  $\wedge_D$  is dynamic conjunction.

Segmented discourse representation structures, or SDRSS, are tuples  $\langle A, \mathcal{F} \rangle$  consisting of a set of labels  $A$  and a function  $\mathcal{F}$  from  $A$  to SDRS-formulae. By convention, the formula labeled by  $\pi$ , i.e.  $\mathcal{F}(\pi)$ , is written  $K_\pi$ . For the purposes of dialogue, discourse structures may also contain a function  $Ag$  from the set of labels  $A$  to the set of conversational participants.  $Ag(\pi)$  returns the agent responsible for the speech act or utterance labeled by  $\pi$ , i.e. the speaker.

Like DRSs, SDRS formulae are interpreted as relations between input and output world-assignment pairs. The exact interpretation of an SDRS formula  $R(\pi_1, \pi_2)$  depends on the properties of the relation  $R$ . For example, if  $R$  is a *veridical* relation,

$R(\alpha, \beta)$  entails  $K_\alpha$  and  $K_\beta$ . *Narration* and *Result* are veridical relations. If  $R$  is *divergent*, on the other hand,  $R(\alpha, \beta)$  entails  $\neg K_\alpha$  and  $K_\beta$ . *Correction* and *Counterevidence* are examples of divergent relations and play a pivotal role in the analysis of negative interrogative questions in section 5.2.1 and 5.2.2. Divergent relations dispute the content or appropriateness of some prior discourse segment and consequently have a nonmonotonic affect on the updating of an SDRS: assume that  $R(\alpha, \beta)$  where  $R$  is veridical. If  $R'$  is divergent and  $R'(\beta, \gamma)$ , it follows that both  $K_\beta$  and  $\neg K_\beta$ . In this case,  $R(\alpha, \beta)$  is replaced in the SDRS for the discourse with  $Dis(R)(\alpha, \beta)$ , which indicates that the relation  $R$  between  $\alpha$  and  $\beta$  is disputed.

Discourse logical forms, or SDRSS, are constructed by a glue logic that utilizes a non-monotonic conditional operator  $>$  (Asher and Morreau 1991). The general schema for glue logic axioms is given in (35), where “some stuff” represents limited information about  $\alpha$ ,  $\beta$  and  $\lambda$  that is transferred to the glue logic from lexical and compositional semantics, domain knowledge and information about the beliefs and goals of the discourse participants (Asher and Lascarides 2003).

$$(35) \quad (?(\alpha, \beta, \lambda) \wedge \text{“some stuff”}) > R(\alpha, \beta, \lambda)$$

In words, (35) states that if the discourse segment  $\lambda$  contains the information that  $\beta$  is to be attached to  $\alpha$  and “some stuff” holds of  $\alpha$ ,  $\beta$  and possibly  $\lambda$ , then normally  $\beta$  is attached to  $\alpha$  with the rhetorical relation  $R$ . These axioms are defeasible: the inference to  $R$  may be blocked by an axiom with a more specific antecedent or if two default rules apply, neither of which is more specific than the other.

### 5.1.3 Intonation and Meaning

The semantic contribution of intonation plays a critical role in the following analysis. Following Ladd (1980), and more recently Potts (2005a), I assume the existence of an “intonational lexicon”. A consequence of this assumption is that intonational tunes, or parts of a tunes depending on the granularity of the analysis, carry specific meanings. The semantic contribution of these intonational “words” is introduced into the discourse logical form, I assume, through axioms of the glue logic. An advantage of this approach is that more specific information can override default interpretations, accounting for the contextual variability of intonational meaning.

One important aspect of the intonational contour of utterances is the final pitch movement, i.e., whether or not an utterance ends in a final rise. *Yes/no* questions in English are typically associated with a final rise. I follow previous analyses in treating boundary tones as conveying speaker and hearer attitudes toward a proposition in a discourse or dialog. Steedman (2003) and Gunlogson (2003), for example, analyze final pitch movements as conveying “ownership” of the proposition, i.e. speaker vs. hearer; Šafářová (2005) analyzes a final rise as contributing a modal expression similar to Veltman (1996)’s  $\diamond$  operator; Marandin et al. (2005) analyze final pitch movements in French as indicators of the speaker’s estimation of the compatibility of his or her commitments with those of the addressee.

The exact phonetic realization of the final rise is not important for present purposes; I follow Pierrehumbert and Hirschberg (1990) and Steedman (2000) and assume that a H% boundary tone marks a final rise. Building on previous analyses, H% is an

alyzed as an indicator of the speaker’s lack of commitment to the core proposition of an utterance. The semantic contribution of H% is introduced by the glue logic axiom in (36).

$$(36) \quad (?(\alpha, \beta, \lambda) \wedge [H\%](\beta)) \rightarrow \\ \exists \gamma (?(\alpha, \gamma, \lambda) \wedge [\neg \text{committed}(\text{Ag}(\beta), \text{core-proposition}(K_\beta))](\gamma))$$

Since (36) uses  $\rightarrow$  instead of  $>$  it is a “hard” constraint, i.e., it cannot be overridden. As stated, the axiom requires that there be some constituent  $\gamma$  with the required content. If there is no such constituent, I assume that one is accommodated.

Nuclear pitch accents make a separate semantic contribution to interpretation. We focus on the L\*+H nuclear pitch accent, since this tone is typical of outside-negation NIS. The L\*+H tone is characterized by a low pitch target for much of the stressed syllable with a rapid rise toward the end, possibly continuing onto the adjacent, unstressed syllable (Pierrehumbert and Hirschberg 1990). It is often a marker of a divergent speech act, such as *Correction* or *Counterevidence* (Walker 1996). I therefore assume that L\*+H introduces the “soft” constraint in (37), which provides information to the glue logic for inferring *Counterevidence* (see Sect. 5.2.2).

$$(37) \quad (?(\alpha, \beta, \lambda) \wedge [L^*+H](\beta)) > (\text{core-proposition}(K_\beta) > \neg K_\alpha)$$

This description of the L\*+H tone is consistent with Steedman (2003)’s treatment of the L\*+H nuclear pitch accent as marking a non-agreed, or contentious, theme. In other words, this tone conveys that the speaker believes that there is information already in the discourse record that he or she does not take to be settled, perhaps because they believe it to be false. Although probably too simplistic, the information in (37) goes some way toward capturing Steedman’s analysis.

## 5.2 Negative Questions in Context

With this formal machinery in place, we can address the use of negative questions in context, focusing on how their rhetorical effect is computed in SDRT. First, we discuss how the question in (38b) is interpreted in the discourse context set up by (38a) on its inside-negation reading.

- (38) a. A: No syntacticians are coming to the meeting. ( $\pi_1$ )  
b. B: Isn’t Jane coming? ( $\pi_2$ )

We then discuss the interpretation of the same question on its outside negation reading, showing how the constraints introduced by intonational features determine the role the question plays relative to (38a).

### 5.2.1 Inside-Negation Questions

In section 3.1, I argued that inside-negation NI questions are CHECK moves, i.e., questions that ask the addressee to confirm information that follows, either directly or indirectly, from the discourse context. In (38), A’s utterance entails that Jane is not coming, assuming that it is common knowledge between A and B that Jane is a syntactician. As



a result, *B*'s question cannot be a simple request for information since *A* has already answered it.

The inside-negation reading of (38b) is intonationally unmarked relative to the outside-negation reading. While closed interrogatives typically have a final rise in English, there are no prosodic cues that the negation in (38b) is functioning in any way other than truth-functionally. Given the glue logic axiom in (36), then, (38b) conveys that:

$$\neg \text{committed}(Ag(\pi_2), \text{core-proposition}(K_{\pi_2}))$$

where,

$$\text{core-proposition}(K_{\pi_2}) = \wedge [x : \text{jane}(x), \neg [ : \text{come}(x) ]]$$

The information that *B* is not committed to the proposition that Jane is *not* coming is consistent with the default goal of asking a question, viz. to know an answer to the question. However, since the discourse context already entails an answer to the question, (38b) can not be a simple request for information. *B* does not convey any contentiousness, for example through the use of a L\*+H nuclear pitch accent, so *A* can reasonably infer that *B*'s intent is for *A* to *confirm* the proposition that Jane is not coming. Foregoing many formal details, I capture this relationship in SDRT with the relation *Confirmation*, which holds between an assertion  $\alpha$  and question  $\beta$  just in case  $K_\alpha$  entails (or presupposes or implicates) *core-proposition*( $K_\beta$ ). The semantics of *Confirmation*, furthermore, requires that for any  $\gamma$  such that  $QAP(\beta, \gamma)$ ,<sup>6</sup>  $K_\gamma$  (defeasibly) entail *core-proposition*( $K_\beta$ ).

In section 1, I noted that inside-negation NIS are biased toward negative answers. This intuition is captured here through the semantics of *Confirmation*: a positive answer to (38b), i.e., that Jane is coming, does not defeasibly entail the core proposition of the question, i.e., that Jane is not coming. At the same time, it allows for indirect answers such as that in (39).

(39) She has the flu.

Answers to confirmation questions repeat the content of the left argument of the *Confirmation* relation or provide additional evidence for it, as in (39).

Negation plays no special role in these cases. Positive interrogatives can just as easily be used as confirmation questions when there is contextual evidence for a particular proposition. (40) is adapted from Gunlogson (2003).

(40) a. [A enters *B*'s windowless office wearing a dripping wet rain coat.]  
b. B: Is it raining outside?

The context given in (40a) provides evidence that it is raining and (40b) is a request to confirm this information.

Confirmation questions can also target the presuppositions of an utterance, as shown in (41). The presupposition that there is a king of France entails that France is not a republic (or equivalently that France is a monarchy).

(41) a. A: The king of France is bald.

<sup>6</sup>QAP stands for the relation *Question-Answer Pair*.

- b. B: Isn't France a republic?
- c. B: Is France a monarchy?

Hence, both (41b) and (41c) can be used to ask for confirmation of the presupposition associated with the use of the definite description *the king of France* in (41a).<sup>7</sup>

### 5.2.2 Outside-Negation Questions

Section 3 argued that outside-negation NI questions can be used to object to the truth-conditional content, presuppositions or implicatures of a prior assertion. It was argued on that basis that the negation in outside-negation questions is metalinguistic, which I take to mean that it applies to some aspect of meaning other than the meaning of the interrogative clause itself. As a consequence, the negation is not part of the core proposition.

$$\text{core-proposition}(K_{\pi_2}) = \wedge [x : \text{jane}(x), \text{come}(x)]$$

The glue logic axiom in (36) introduces new content into the discourse logical form, viz. the rather weak assertion that the speaker is not committed to the core proposition of the utterance and that this information attaches to the discourse context with some underspecified rhetorical relation, as shown in (42).

$$(42) \quad \exists \gamma (?(\pi_1, \gamma, \pi) \wedge [\neg \text{committed}(\text{Ag}(\pi_2), \wedge [x : \text{jane}(x), \text{come}(x)])](\gamma))$$

If this information is not already in the discourse context it may simply be accommodated and attached with a relation such as *Background*. Our contention is that it is this novel discourse constituent which the negation targets, resulting in:

$$\text{committed}(\text{Ag}(\pi_2), \wedge [x : \text{jane}(x), \text{come}(x)])$$

Thus *B* conveys that he is committed to the proposition that Jane is coming. If “the point of an assertive is to get the audience to form, or to attend to, the belief that the speaker is committed to a certain belief” (Clark 1996, p. 134), then in uttering (38b) *B asserts* that Jane is coming. The evidence for this assertion was reviewed in section 4. The assertion plays a pivotal role in computing the overall discourse function of (38b). For example, it short-circuits the default goal of a question – to know an answer – since the speaker has conveyed that they are already committed to one.

This new assertion, labeled  $\pi'$  and instantiating  $\gamma$  in (42), must play some rhetorical role in the dialogue. Intonational and contextual information assist in computing this discourse function. The L\*+H nuclear pitch accent contributes the information in (43) to the glue logic.

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<sup>7</sup>Confirmation questions pattern with certain uses of rising declaratives, as shown in (i) (Gunlogson 2003).

- (i) a. A: The king of France is bald.
- b. B: France is a monarchy?
- c. B: France isn't a republic?

There is thus reason to believe that final rising intonation plays an important role in the computation of the discourse function of inside-negation NIs, though the important information may be conveyed by the use of interrogative syntax itself.

$$(43) \quad (?(\pi_1, \pi_2, \pi) \wedge [L^*+H](\pi_2)) > \text{core-proposition}(K_{\pi_2}) > \neg K_{\pi_1}$$

The core proposition of  $\pi_2$  – that Jane is coming – is the same proposition asserted by  $\pi'$ . I assume, in this case, that the glue logic has access to the information that  $K_{\pi'} > \neg K_{\pi_1}$ . The glue logic axiom for inferring *Counterevidence* is given in (44).

$$(44) \quad (?(\alpha, \beta, \lambda) \wedge K_{\beta} > \neg K_{\alpha}) > \text{Counterevidence}(\alpha, \beta, \lambda)$$

Since the antecedent of (44) is satisfied,  $\text{Counterevidence}(\pi_1, \pi', \pi)$  is inferred. In other words, by conveying that they are committed to the proposition that Jane *is* coming, *B* provides counterevidence to the assertion by *A* in (38a).

Section 4 demonstrated that in addition to an assertion outside-negation NIs like (38b) are also questions. It remains to compute the discourse function of the question labeled by  $\pi_2$ . Again, given the assertion of counterevidence in  $\pi'$ , it cannot be a genuine information-seeking question. Following Mackenzie (1979), and recent work reported in Maudet et al. (2004), I analyze the question asked by  $\pi_2$  as an “evidence question”, or challenge.<sup>8</sup> In other words, the question *B* asks is what evidence is there for the assertion in (38a). Evidence questions are defined using the SDRT relation  $\text{Evidence}_Q$  as in (45).

$$(45) \quad \text{Evidence}_Q(\alpha, \beta) \text{ iff } \beta \text{ is a question and any answer to } \beta \text{ provides evidence for } \alpha. \\ \text{(So if } \text{Evidence}_Q(\alpha, \beta) \text{ and } \text{QAP}(\beta, \gamma), \text{ then } \text{Evidence}(\alpha, \gamma).)$$

The evidence question interacts with the assertion of counterevidence to produce a very particular rhetorical effect. Not only does it explain the positive bias inherent to outside-negation questions – the speaker *asserts* his commitment to a positive answer, but it also provides some insight into the pattern of answers to outside-negation questions, as discussed in Reese (2006). The dialogue in (38) is repeated in (46) with short negative and positive answers.

- (46) a. A: No syntacticians are coming to the meeting. ( $\pi_1$ )  
 b. B: Isn't Jane coming? ( $\pi_2$ )  
 c. A: No./#Yes. ( $\pi_3$ )

A simple *yes* is marked as an answer to (46b), while a simple *no* is not. These observations follow from the semantics of the SDRS constructed for (46). The assertion derived from the outside-negation question in (46b) is that Jane *is coming*. This proposition is presented as counterevidence to (46a), which means that it defeasibly entails that at least one syntactician is coming. This follows, if Jane is a syntactician.

A simple *no*, which conveys that Jane is not coming, answers the evidence question, thus providing evidence for *A*'s original assertion. At the same time, it *corrects* *B*'s assertion that Jane is coming. Recall from the discussion of divergent relations that this results in the replacement of  $\text{Counterevidence}(\pi_1, \pi')$  in the SDRS with  $\text{Dis}(\text{Counterevidence})(\pi_1, \pi')$ , indicating that *B*'s assertion of counterevidence is disputed by *A*. The resulting SDRS is coherent.

<sup>8</sup>On the analysis presented here, the use of an outside-negation NI exemplified in (38) is not a *challenge* in the sense of Mackenzie (1979) or Maudet et al. (2004) since uttering (38b) affects *B*'s commitments.

Short positive answers are infelicitous because the proposition they convey is unable to dispute *B*'s counterevidence: both the positive answer and the counterevidence convey the same proposition, i.e., that Jane is coming. Given the definition in (45), the proposition that Jane is coming would have to count as both *Evidence* and *Counterevidence* to the proposition that no syntacticians are coming, which is impossible given the semantics of these relations. More elaborate positive answers may be felicitous. (47), from Reese (2006), for example, gives a positive answer, conveying that Jane is coming, but attacks *B*'s counterevidence claim by correcting the implicature (or assumption) that Jane is a syntactician.

(47) Yes, but she no longer does syntax.

## 6 Concluding Remarks

The current proposal maintains the “Hamblin Picture” of the meaning of interrogatives; positive and negative closed interrogatives are assumed to be semantically equivalent. The special characteristics of negative interrogatives discussed in section 1, for example the negative and positive bias of inside- and outside-negation interrogatives respectively, were accounted for with respect to how discourse function is computed given the intentions of participants in a discourse or dialogue, in effect, providing a pragmatic account of the peculiar properties of negative questions. *Confirmation* questions, for example, favor a positive answer in contexts where there is evidence *for* a proposition *p* and a negative answer in contexts where there is evidence *against* the proposition *p*. This followed from the semantics of *Confirmation*, not the semantics of the question itself.

At the same time, the current proposal relies heavily on a difference in logical form between inside- and outside-negation interrogatives. In this respect, the analysis aligns, at least in its account of Ladd's ambiguity, with the semantic account of Romero and Han (2004). The outside/inside-negation ambiguity results from a difference in logical form. This difference, however, is not a matter of syntactic scope. Rather it concerns the interpretation of the negation. Specifically, I argued that negation in outside-negation NIS has a metalinguistic function, which I take to mean that it negates a dimension of meaning other than the at-issue, or descriptive, meaning. The distinction was critical to the analysis to the extent that it relied on the *core-proposition* function, which applies to *logical forms*, defined in section 5.1.1. This function played a role in the computation of the semantic contribution of intonation, which also played an important role in the analysis. However, even given this distinction in logical form and intonation, the questions asked by inside- and outside-negation closed interrogatives are equivalent, the scope of the negation not affecting the interpretation of the question. The present approach, by integrating pragmatic and intonational information, is able to provide a relatively straight-forward account of the meaning of negative closed interrogatives.

There are many issues that will have to be left for future work: formalizing the reasoning about intentions and beliefs that was left implicit in sections 5.2.1 and 5.2.2, for example. In addition, there is the possibility of bridging this work with recent work on rising declarative questions (Gunlogson 2003, Šafářová 2005), the biasing affect of

NPIs in questions (van Rooy 2003, Guerzoni 2004, Asher and Reese 2005), bias in *wh*-questions and the role of intonation and prosody on the interpretation of tag questions.

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