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Bias in Questions

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Bias in Questions

by

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For my mom and dad.

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Bias in Questions

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This dissertation investigates three interrogative sentence types that are each associated with a particular speaker bias. In asking one of these questions, the speaker invariably conveys a prior expectation, or belief, that a specific answer to the question is the true one. These sentence types include reversed-polarity tag questions, negative polar questions, and questions containing a strong negative polarity item or a constituent that is emphatically focused. For each of these three question types, I address the two questions: (1) What kind of meaning is bias; and (2) what grammatical feature, if any, is the bias to be linked to?

In answer to the first question, I argue that bias is an assertion (rather than, for example, a conversational implicature). As a result, biased questions can be

thought of as a type of indirect speech act (Searle 1975). Following Asher and Lascarides (2001), I model biased questions as instances of a complex speech act type ASSERTION • QUESTION. On this analysis, biased questions are *simultaneously* assertions and questions. I provide evidence, for this claim, showing these question types share distributional properties of *both* assertions and questions.

With regard to the second question, I argue that intonation, in addition to syntax and compositional and lexical semantics, plays a key role in linking the use of the kind of interrogative sentence described above to an assertion. Indeed, one of the benefits to studying biased questions is that they provide a case study of the interaction of intonation and discourse function. I begin to develop an analysis of intonation within the theory of discourse provided by Asher and Lascarides (2003) which builds on the work of Pierrehumbert and Hirschberg (1990) and Steedman (2000, 2003), amongst others. Specifically, I argue that intonation provides information about the speaker’s cognitive state, i.e. about his or her beliefs and intentions. Thus intonation contributes information that can be used to compute the rhetorical contribution of an utterance to a discourse or dialogue. On this model, intonation indirectly contributes to the determination of the discourse function of an utterance.

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Chapter 1

Introduction

1.1 Bias in Questions

Interrogative sentences, e.g. those characterized in English by subject-auxiliary inversion, are associated with questions. Semantically, questions are defined by their possible answers (cf. Hamblin 1958). The denotation of an interrogative sentence on this view is a set of propositions, viz. those that count as direct answers to the question. This set is arrived at compositionally from the words that make up the sentence and how they are put together. As a pragmatic concept, the typical question is an *inquiry*. According to Huddleston and Pullum (2002), “to make a (genuine) inquiry is to ask a question to which one does not know the answer with the aim of obtaining the answer from the addressee” (p. 866). A similar idea is found in Searle (1969). However, not all questions are inquiries in this sense. For example, it is not normally true of exam questions that the speaker does not know the answer. Rather, the speaker knows the answer and wants to know whether or not the addressee knows it. Other questions do not expect an answer at all, e.g. those asked for purely expository purposes. In any case, there is some relation between the syntax and semantics of an interrogative sentence, certain pragmatic

factors, and the discourse function of an utterance. At least, this is the conventional wisdom.

The examples in (1), found on the internet, are interrogative, as is evident from the subject-auxiliary inversion. However, there is something “unquestionlike” about these examples, though it is difficult to say exactly how without assuming a good deal of prior analysis.

- (1) a. Isn't it rather ironic that, on a day which is supposed to honor the working person, the only people who actually get the day off to celebrate AREN'T WORKING CLASS?!
- b. Somebody tried to kill me, and did Joe Lieberman lift a finger?

Intuitively, their use conveys a *speaker bias*, i.e. a belief or expectation that a particular answer to the question is the true one. In (1a), for example, the speaker believes that it is ironic that the only people who do not have to work on Labor Day are not working class. Similarly, in (1b) the speaker believes that Joe Lieberman didn't lift a finger. In other words, the speaker already knows the answer to the question. Yet, these questions are unlike exam questions: the speaker does not want to know whether the addressee knows the answer. Rather, he or she appears to be *telling* the addressee something and requesting some type of feedback.

So what is one to make of such examples? There are two possible approaches given the conventional wisdom (as described above). First, one might assume that the meaning of the questions in (1) is marked in some sense, yielding a particular speaker bias. On this approach, there is something about the *form* of the question, the presence of a particular lexical item or syntactic construction, that interjects the bias. Alternatively, one might argue that it is simply a fact about the context in which the question is used that produces bias.

Recent analyses of rhetorical questions adopt the latter kind of approach,

arguing that their defining property is that they are uninformative or redundant. Both Rohde (2006) and Caponigro and Sprouse (2007), for instance, argue that a question is interpreted as a rhetorical question if, and only if, the speaker and addressee mutually believe the answer to the question; that is, both the speaker and addressee believe it, each believes that the other believes it, and so on. The interpretation of an interrogative sentence as a rhetorical question, then, is a function of the discourse context, specifically of the content of the common ground. As a result, these analyses tend to minimize the role of linguistic form in the interpretation of biased questions.

The alternative is to derive bias in some way from the literal meaning of an interrogative sentence. There is often still a pragmatic component to these approaches. For example, Krifka (1995) and Guerzoni (2004), *inter alia*, argue that the denotation of strong negative polarity items like *lift a finger* or *bat an eye*, in conjunction with certain pragmatic constraints, is responsible for the negative bias inherent to examples like (1b). On Krifka’s approach, for instance, (1b) conversationally implicates that the speaker believes that Joe Lieberman did essentially nothing. For Guerzoni, the “live answers” to (1b) given the presuppositions of the NPI are reduced to a singleton set containing just the proposition that Joe Lieberman did nothing. On these approaches the meaning of certain interrogative sentences is the primary source of speaker bias.

There is arguably something to be said for both accounts, but the question remains how exactly to characterize speaker bias. Is it a pragmatic presupposition (cf. Stalnaker 1974), as Rohde (2006) and Caponigro and Sprouse (2007) would have it? Or is it a conversational implicature (Krifka 1995, van Rooy 2003, Romero and Han 2004), or semantic presupposition (Guerzoni 2004)?

1.2 Bias as Indirect Assertion

The current thesis argues that the speaker bias described in the previous section is an *assertion*. As such, the use of a biased question issues in a *commitment* on the part of the speaker. On this account, the current proposal stands in opposition to the those in Krifka (1995) or Romero and Han (2004), to name two, which analyze particular biases as conversational implicatures. Because implicatures can be felicitously canceled by the speaker, they arguably do not express a speaker commitment. Furthermore, the current proposal differs from those in Rohde (2006) and Caponigro and Sprouse (2007) in that it does not necessarily assume that this assertion is uninformative nor that the “rhetorical” nature of biased questions can be judged solely on the basis of extra-linguistic context, e.g., the content of the common ground.

The assertion conveyed by a biased question is – at least in principle – inferable from the literal meaning of the question, world knowledge and the assumption that one’s interlocutors are rational and cooperative (cf. Grice 1975), though this inference need not be calculated on-line. The current analysis, then, falls squarely within the analysis of conventionalized *indirect speech acts* proposed by Searle (1975). Biased questions are still questions, however, in both the semantic and pragmatic sense. This much follows from the default association of certain goals with the use of interrogative sentences and the assumption, just noted, that the indirect assertion associated with a biased question is derived, in part, from the literal meaning of the interrogative. It is important to note that the proposition that is asserted by a biased question is semantically an answer to the literal question. This is not a problem in the discourse based framework I adopt below. In this framework, the meaning of a question, or of any utterance for that matter, goes beyond its mere compositional semantics. This modeled via the semantic consequences of the rhetorical relation that connects an utterance to the antecedent discourse context

(Asher and Lascarides 1998b, 2003).

Evidence that biased questions have a complex discourse function comes from examples like (2) (taken from the web). Intuitively, the use of *ask* in (2) indicates that the underlined clause should be understood as a question. The addressee's response, however, expresses *agreement* with the reported speech act. One cannot agree with a question or request, however. Given these observations, the underlined clause must be understood as *both* a question and an assertion. More generally, (2) provides evidence that negative polar questions like (1a) are grammatically associated with a complex speech type composed of both a question and an assertion.

- (2) I asked him whether democracy wasn't more important than toiletry. "You're absolutely right," he said, after much thought. "I'll ask them to get you a roll also."

Following Sadock (1971, 1974), I rely on distributional facts similar to those in (2) throughout the dissertation to argue in favor of the position that certain interrogative sentences are grammatically associated with a complex speech act type **ASSERTION • QUESTION**.

A second focus of the dissertation is the relationship between linguistic form and bias. How are biased questions formally marked and how is their interpretation linked to the presence of an assertion? Each of the major levels of linguistic analysis are potentially relevant in this regard, including:

- clausal syntax and semantics,
- lexical semantics, and
- intonation

Intonation, I argue, is especially important to understanding bias. On the analysis below, inferring that a question conveys an indirect assertion requires that one infer

that the speaker has certain goals behind his or her utterance, specifically the goals that one normally associates with an assertion. Intonation, I argue, plays a central role in inferring these goals.

Building on previous research, I assume that intonation provides important information about the speaker’s cognitive state. For example, whether an utterance ends with rising or falling pitch signals some relationship between the speaker and the propositional content of her utterance (Gussenhoven 1984, Gunlogson 2003, Nilsenová 2006). The placement of the nuclear pitch accent provides information about the discourse status of some bit of information, distinguishing given from new information e.g. (Steedman 2000), in addition to introducing salient alternatives (Rooth 1992, *inter alia*). This information is very rich, but at the same time semantically underspecified. As a result, a particular intonation contour might be associated with a range of discourse functions depending on the available linguistic and contextual evidence.

The present account of intonational meaning is integrated with a “glue logic” responsible for computing the rhetorical contribution of an utterance to a dialogue. As a result, the information about the speaker’s cognitive state contributed by intonation (as described above) indirectly affects the rhetorical contribution of an utterance to a conversation by providing the interpreter limited access to the speaker’s cognitive state, i.e. his beliefs and intentions. In some cases, the meaning of an interrogative coupled with a particular intonation allow the interpreter to infer that the speaker has goals consistent with those of an assertion.

1.3 Organization of the Dissertation

The dissertation is organized as follows. Chapter 2 introduces the formal background for Chapters 3, 4 and 5. I introduce discourse representation structures (Kamp and Reyle 1993) for describing the logical form of individual sentences in a discourse

and provide a dynamic semantic interpretation. In addition, I briefly discuss the semantics of polar questions. Since the analyses I propose are rooted in the discourse function of utterances, I introduce a framework for describing the structure and interpretation of multi-sentence discourse and dialogue. Segmented Discourse Representation Theory (Asher and Lascarides 2003) is a dynamic semantic theory of discourse structure that posits rhetorical relations between utterances and larger segments of discourse. Inferring that a particular discourse relation relates two discourse segments has semantic consequences. As a result, the interpretation of a discourse goes beyond the mere conjunction of the utterances that make it up. Two features of SDRT that play an important role in the current analyses are its logics for inferring which relation links two discourse segments and for reasoning about the cognitive state of a discourse participant based on his contribution to the discourse. These two components interact, as a result information about a speaker’s beliefs and intentions influences the rhetorical contribution of an utterance.

The next three chapters are case studies of particular interrogative constructions. I focus on polar questions throughout the thesis. Chapter 3 discusses the interpretation of reversed-polarity tag questions. The analysis in this chapter acts as a kind of “proof of concept” for the analyses which follow in Chapters 4 and 5, as the complex discourse function of tag questions is mirrored by a similarly complex syntax and compositional semantics. I argue that the declarative main clause of a tag question is asserted and that the reduced interrogative tag itself denotes a full polar question. These facts can be modeled either by assuming that tag questions perform two distinct illocutionary acts or by assigning them a complex speech act type following Asher and Lascarides (2001). I argue that both possibilities are open and that the affect on interpretation is minimal (though non-null). Furthermore, I argue that the discourse functions associated with tag questions and noted by most descriptive grammars are a reflex of the rhetorical relation connecting the tag to

the main clause. This relation is inferred on the basis of the relationship between the compositional semantic meaning of the main clause and the tag and from information about the speaker’s cognitive state contributed by intonation. Finally, I discuss readings of tag questions that do not assert the main sentence. I argue that this reading follows from a specific lexical semantic feature of the main sentence.

Chapter 4 addresses the interpretation of interrogative sentences containing a negated auxiliary verb (like the web-example in (1a)). These questions have a number of properties that set them apart from positive polar questions. I provide some background on these properties and argue for a new characterization of an ambiguity noted in Ladd (1981). Specifically, I argue that so-called outside-negation negative questions are an instance of a conventionalized indirect assertion based on the overlapping distributional properties of negative questions and prototypical assertions. So-called inside-negation negative questions, on the other hand, are simple questions, but are restricted to a specific discourse function given their semantic equivalence with positive polar questions.

Chapter 5 addresses questions that convey a negative bias. Following the discussion in Chapters 3 and 4, I argue that this bias is an indirect assertion. A good portion of the chapter is devoted to isolating the grammatical feature responsible for this bias. While this particular bias has received the most attention from semanticists of any of the biases discussed in the dissertation, previous research tends to focus on examples like (1b) that contain strong NPIS. While the presence of a strong NPI is a sufficient condition for a question to convey a negative bias, it is not a necessary condition. I argue based on an examination of a wide range of cases that the formal correlate of negative bias is a particular intonation contour. I provide an interpretation for this contour (building on the discussion in Chapter 3 and previous research by Steedman 2000) and show how the information it contributes is used to infer that the speaker intends to assert a certain proposition.

Chapter 6 summarizes the findings of the dissertation and suggests avenues for future research.

Chapter 2

Formal Preliminaries

2.1 Introduction

The current chapter introduces the formal background necessary to follow the analysis of biased questions presented in the chapters that follow. Briefly, §2.2 introduces Discourse Representation Theory (DRT: Kamp and Reyle 1993), while §§2.3 and 2.4 introduce Segmented Discourse Representation Theory (SDRT: Asher and Lascarides 2003). §2.5 discusses the analysis of indirect speech acts presented in Asher and Lascarides (2001). Recall that the central claim of the thesis is that (at least some) biased questions are indirect assertions. Taken together, then, this chapter provides a formal framework for talking about the meaning of an utterance in a discourse or dialogue. Readers who are already familiar with DRT and SDRT can safely skip this chapter.

2.2 Discourse Representation Theory

The ensuing chapters contain very little discussion of the compositional semantics of individual sentences, as my primary concern are the relations *between* utterances and their semantic consequences. Nonetheless, the theory of discourse assumed

throughout the thesis assumes *some* formal framework for talking about the logical form and meaning of sentences. The current section therefore introduces Discourse Representation Theory (DRT: Kamp and Reyle 1993) as the formal framework to fill this role. The choice of DRT is inessential (any formalism that can be given a dynamic semantic interpretation will do) and in the ensuing chapters I often use simplified logical formula and lambda terms to describe the meaning of various expressions.

A discourse representation structure, or DRS, K is an ordered pair of a set of discourse referents U_K for individuals, objects and events and a set of conditions C_K stating n -ary predications over discourse referents. DRSS are built up recursively as follows (Asher and Lascarides 2003):

$$K := \langle U, \emptyset \rangle \mid K^\cap \gamma$$

$K^\cap \gamma$ is the DRS that results from appending the condition γ to K 's list of conditions. DRS conditions are formed according to the following rules:

- If P is an n -ary relation symbol and x_1, \dots, x_n are discourse referents, then $P(x_1, \dots, x_n)$ is a DRS condition.
- If K is a DRS, then $\neg K$ is a DRS condition.
- If K_1 and K_2 are DRSS, then $K_1 \Rightarrow K_2$ is a DRS condition.

Discourse referents for individuals are introduced by indefinite NPs, definite descriptions, proper names and other referring expressions, expanding the set of objects that can be referred to via pronouns and other anaphoric devices (Heim 1982, Kamp and Reyle 1993). In addition, verbs and tense introduce discourse referents for eventualities and times respectively. The DRS in (1b) represents the logical form for the sentence in (1a). It includes an individual discourse referent x , a referent e_1 for an eventuality and referents t and *now* for times. The conditions

in C_K state that x refers to Max, that e_1 is an event of x falling that holds at the time t before the utterance time.¹

(1)	a.	Max fell.	<table> <tr> <td>x</td> <td>e_1</td> <td>t</td> <td>now</td> </tr> </table>	x	e_1	t	now
x	e_1	t	now				
	b.		<table> <tr> <td>$max(x)$</td> </tr> <tr> <td>$fall(e_1, x)$</td> </tr> <tr> <td>$holds(e_1, t)$</td> </tr> <tr> <td>$t \prec now$</td> </tr> </table>	$max(x)$	$fall(e_1, x)$	$holds(e_1, t)$	$t \prec now$
$max(x)$							
$fall(e_1, x)$							
$holds(e_1, t)$							
$t \prec now$							

DRSS are interpreted as relations between input and output states consisting of a possible world w and a partial assignment function f from the set of discourse referents to the domain D_M of a first-order model M (van Eijck and Kamp 1997). The full relational interpretation is stated relative to a model $M = \langle D_M, W_M, I_M \rangle$, where D_M is the domain of M , W_M is a set of possible worlds, and I_M is an interpretation function mapping n -ary predicate symbols to n -ary relations over D_M at a world w .

On the relational interpretation DRSS are understood as actions on contexts. According to the first bullet below, for instance, a DRS changes the input context by extending the domain of the assignment function to include additional discourse referents.

- $(w, f) \Vdash \langle U, \emptyset \rangle_M (w'g)$ iff $w = w'$, $f \subseteq g$ and $dom(g) = dom(f) \cup U$
- $(w, f) \Vdash [K^\cap \gamma]_M (w', g)$ iff there is a pair (w'', h) such that $(w, f) \Vdash [K]_M (w'', h)$ and $(w'', h) \Vdash [\gamma]_M (w', g)$

¹I fore-go the details of how the logical form in (1b) is constructed compositionally from the syntactic representation associated with (1a), as it does not bear directly on the primary concerns of the thesis. I refer the reader to Zeevat (1989) or Asher (1993) for examples of compositional approaches.

This is the only way that DRSS change input contexts, at least on the limited semantics presented here. DRS conditions, in particular, are tests on contexts, since they do not change the input context in any way, but rather check to see that certain conditions hold of certain discourse referents.

- $(w, f) \llbracket P(x_1, \dots, x_n) \rrbracket_M(w', g)$ iff $(w, f) = (w', g)$ and $\langle f(x_1), \dots, f(x_n) \rangle \in I_M(P)(w)$
- $(w, f) \llbracket \neg K \rrbracket_M(w', g)$ iff $(w, f) = (w', g)$ and there is no (w'', h) such that $(w, f) \llbracket K \rrbracket_M(w'', h)$
- $(w, f) \llbracket K_1 \Rightarrow K_2 \rrbracket_M(w', g)$ iff $(w, f) = (w', g)$ and every (w'', h) such that $(w, f) \llbracket K_1 \rrbracket_M(w'', h)$ there is a (w''', k) such that $(w'', h) \llbracket K_2 \rrbracket_M(w''', k)$

On this kind of relational interpretation, $(w, f) \llbracket (1b) \rrbracket_M(w, g)$ holds just in case $f \subseteq g$, $\text{dom}(g) = \text{dom}(f) \cup \{x, e_1, t, \text{now}\}$ and $\langle g(x) \rangle \in I_M(\text{max})(w)$, $\langle g(e_1), g(x) \rangle \in I_M(\text{fall})(w)$, etc.

In order to talk about the meaning of interrogative sentences, I add an operator ‘?’ to the core DRT language that applies to a DRS to yield the logical form of a polar question.² Some care is required in specifying which DRSS this function can apply to. For example, it is not immediately apparent that a DRS prefixed with ‘?’ ever occurs in the scope of negation, as it is not clear what the negation of a question expresses. On the other hand, it is possible for a question to occur in the consequent of a conditional as in (2).

(2) If Mary comes to the party, will John leave?

I leave this issue aside for now and assume that ‘?’ always has wide scope over any

²One can generalize the syntax to cover constituent questions by assuming that ‘?’ applies to lambda expressions $\lambda x_1 \dots \lambda x_n P(x_1, \dots, x_n)$ for $n \geq 0$, where $P(x_1, \dots, x_n)$ is a DRS whose universe may be empty or contain discourse referents other than $x_1 \dots x_n$. (See Asher and Lascarides 2003, who follow Groenendijk and Stokhof 1984.) Polar questions are covered by the case where $n = 0$.

logical operators. So for any DRS K formed according to the definitions above, I assume that $?K$ is also a DRS. This is obviously a gross simplification. I refer the reader to Krifka (2001, 2004) and Asher (to appear) for more nuanced discussions of embedded speech acts.

I assume the general picture of interrogative semantics outlined in Hamblin (1958). On this view, (i) an answer to a question is a proposition, (ii) to know the meaning of a question is to know which propositions count as direct answers to it, and (iii) the possible answers to a question form an exhaustive set of mutually exclusive possibilities. The first two assumptions are more or less standard now in formal semantics. However, it is still a matter of debate whether or not the direct answers to a question need to be mutually exclusive and exhaustive. Hamblin himself provides the non-exhaustive analysis of constituent questions sketched in (3b) (Hamblin 1973). On this analysis, the answers to (3a) are all propositions of the form x *walks*, for x in the domain of entities. For example, if the domain contains just the individuals John and Mary, then (3b) is the set of propositions that John walks and that Mary walks. These propositions are not mutually exclusive. It is possible that *both* John and Mary walk.

- (3) a. $\llbracket \text{Who walks?} \rrbracket(w)$
 b. $= \{p : \exists x \in D_M. p = \llbracket \text{walks} \rrbracket_M(x) \wedge x \text{ is human} \}$
 c. $= \lambda w' [\lambda x [\text{walks}'(x, w)] = \lambda x [\text{walks}'(x, w')]]$

Groenendijk and Stokhof (1984), alternatively, assume the exhaustive interpretation of *wh*-interrogatives sketched in (3c). On this analysis, the extension of (3a) at w is the proposition consisting of those worlds w' that agree with w on the extension of the predicate *walks*. Thus if $I_M(\text{walks})(w) = \{\text{john}\}$, the answer to (3a) according to (3c) is the proposition that John and *no one else* walks. The intension of (3a) on this analysis (given our toy domain) includes in addition the propositions

that Mary and no one else walks, that Mary and John and no one else walks and that nobody walks.

Since this thesis focuses on polar questions, the issue of whether one should adopt an exhaustive or non-exhaustive interpretation does not arise. The answer sets to polar questions are always exhaustive, assuming that the only direct answers to polar questions are those conveyed by *yes* and *no*. Following Hamblin (1973), for example, the denotation of (4a) is the set in of propositions in (4b), where the domain D_{yn} includes the identity function on propositions, $\lambda\phi.\phi$, and the negation function, $\lambda\phi\lambda w.\neg\phi(w)$.

- (4) a. $\llbracket \text{Did Max fall?} \rrbracket_M(w)$
 b. $= \{p : \exists f \in D_{yn}. p = f(\lambda w.fell'(m, w))\}$
 $= \{p : p = \lambda w.fell'(m, w) \vee p = \lambda w.\neg fell'(m, w)\}$

Given that the semantics in (4b) quantifies only over just these two functions, it follows that the answers to (4a) are mutually exclusive and exhaustive. If the proposition that Max fell is true at a world w , then the proposition that he did not fall is false at that same world. Furthermore, every world is included in one of these two propositions. The same observation applies to the account in Groenendijk and Stokhof (1984).

Below I assume a Hamblin-style semantics for closed interrogative sentences. Specifically, I adopt the semantics in (5). This definition modifies the analysis in Asher and Lascarides (1998b), who assume following Karttunen (1977) that the denotation of a question contains just the *true* answers.

- (5) $(w, f)\llbracket ?K \rrbracket_M = \{\llbracket p \rrbracket_M : p = \wedge K \vee p = \wedge \neg K\}$

$\wedge K$ and p are propositional terms. As such, they denote dynamic propositions,

i.e. sets of pairs of world-assignment pairs:

$$\llbracket \wedge \phi \rrbracket_M^{w,f} = \{ \langle (w, g), (w', h) \rangle : w = w', g \supseteq f, \text{ and } (w, g) \llbracket \phi \rrbracket_M (w', h) \}$$

Answerhood is defined simply as set-membership. Following Asher and Lascarides (2003), $Answer(K, p)$ holds just the proposition p is contained in the denotation of the question K :

$$(w, f) \llbracket Answer(K, p) \rrbracket_M (w', g) \text{ iff } (w, f) = (w', g) \text{ and } \llbracket p \rrbracket_M^{w,f} \in \llbracket K \rrbracket_M^{w,f}$$

Finally, I make occasional use of function *core-proposition* which applies to a DRS K and returns the underlying propositional content. The core, or underlying, proposition of an utterance is the proposition expressed by the DRS for that utterance with any markers of sentence mood removed. Thus the core proposition is the semantic correlate, in some sense, to the sentence radicals in Stenius (1967). For example, the underlying, or core, proposition of the polar questions *Is Mary coming?* is the proposition that Mary is coming. Formally, if K has the form $?K'$, then $core-proposition(K) = \wedge K'$, otherwise $core-proposition(K) = K$.

2.3 Segmented Discourse Representation Theory

Segmented Discourse Representation Theory (SDRT: Asher 1993, Asher and Lascarides 2003) is an extension of DRT that takes into account the rhetorical relations that hold between utterances and their semantic consequences. Asher and Lascarides (2003) argue that including discourse relations is useful for capturing a number of important generalizations about the interpretation of multi-sentence discourse and dialogue. In particular, it has been used to capture constraints on individual and abstract entity anaphora that standard DRT fails to account for. In addition, discourse relations have been useful in accounts of presupposition and

bridging (Asher and Lascarides 1998a,c) and in modelling the temporal structure of texts (Lascarides and Asher 1993). Additionally, SDRT provides an alternative model of speech acts on which discourse relations are conceived of as relational speech act types (Asher and Lascarides 2001, 2003).

Segmented discourse representation structures, or SDRSs, are relational structures that encode the rhetorical connections between discourse segments. Discourse segments may be single clauses or larger, multi-utterance spans of conversation. SDRSs also impose a hierarchical structure on discourse and dialogue (which I describe in more detail below). Formally, a SDRS is a triple $\langle A, \mathcal{F}, LAST \rangle$, where:

- A is a set of labels;
- \mathcal{F} is a function from A to the set of well-formed SDRS-formulae; and
- $LAST$ is a distinguished label in A for the last clause added to the discourse.

A includes labels for DRSS (as described in §2.2), in addition to labels for multi-sentence spans. The labels in A are associated with *tokens* of logical forms. Thus each utterance in a discourse introduces a labeled DRS. This label can be thought of as a discourse referent for a particular speech act.

The well-formed SDRS formulae include labeled DRSS, in addition to formulae of the form $R(\alpha, \beta)$, where R is a rhetorical relation and α and β are labels in A , and the dynamic conjunction and negation of SDRS formulae. The discourse in (6) from Asher (1993) illustrates many of the important features of SDRSs.

- (6)
- a. (π_1) John had a lovely evening last night.
 - b. (π_2) He had a great meal.
 - c. (π_3) He ate salmon.
 - d. (π_4) He devoured lots of cheese.
 - e. (π_5) He then won a dancing competition.

Intuitively, (6b) and (6e) *elaborate* the eventuality described in (6a). That is, they provide additional details about John’s evening. In addition, (6e) forms a narrative segment with (6b), i.e. John had a great meal and *then* he won a dancing competition. (6c) and (6d) elaborate the great meal and form a second narrative segment.

The SDRS $\langle A, \mathcal{F}, LAST \rangle$ for the discourse in (6) is shown below.

- $A = \{\pi_0, \pi_1, \pi_2, \pi_3, \pi_4, \pi_5, \pi_6, \pi_7\}$
- $\mathcal{F}(\pi_1) = K_{\pi_1}$
 $\mathcal{F}(\pi_2) = K_{\pi_2}$
 $\mathcal{F}(\pi_3) = K_{\pi_3}$
 $\mathcal{F}(\pi_4) = K_{\pi_4}$
 $\mathcal{F}(\pi_5) = K_{\pi_5}$
 $\mathcal{F}(\pi_0) = Elaboration(\pi_1, \pi_6)$
 $\mathcal{F}(\pi_6) = Narration(\pi_2, \pi_5) \wedge Elaboration(\pi_2, \pi_7)$
 $\mathcal{F}(\pi_7) = Narration(\pi_3, \pi_4)$
- $LAST = \pi_5$

Note that π_6 and π_7 label discourse segments that span more than one clause. π_7 , for example, labels the narrative segment formed by π_3 and π_4 and which elaborates the eventuality introduced in π_2 . Similarly, the label π_0 spans the entire discourse.

SDRSS are visualized as a directed acyclic graphs, where the labels in A provide the nodes and the rhetorical connections between labels introduce labeled edges between nodes. If an SDRS contains the sub-formula $R(\alpha, \beta)$, the corresponding graph contains an edge from the node α to the node β labeled R . Coordinating discourse relations like *Narration* introduce horizontal edges, while subordinating relations introduce vertical edges. The graph representation of (6) is shown in Figure 2.1. The formula corresponding to the top most label in the SDRS for (6), which

is omitted in the graph, is $Elaboration(\pi_1, \pi_6)$. Since *Elaboration* is a subordinating relation, the graph contains a vertical edge from π_1 to π_6 labeled *Elaboration*.

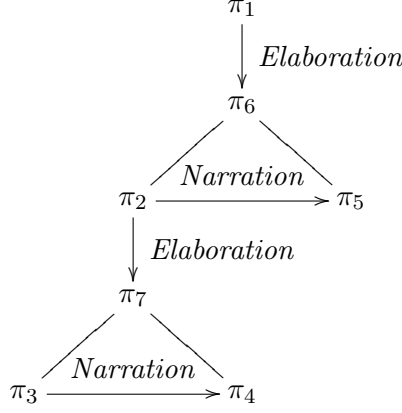


Figure 2.1: SDRS graph for the discourse in (6).

While building the SDRS for a particular discourse, only those labels in A on the right-frontier of the current graph are available for the attachment of new information. Formally, the available labels in an SDRS include *LAST* and any node that outscopes it. A label γ immediately outscopes α iff $\mathcal{F}(\gamma)$ includes as a conjunct $R(\alpha, \delta)$ or $R(\delta, \alpha)$ for some R and δ , or if there is a λ such that $\mathcal{F}(\lambda)$ includes $R(\gamma, \alpha)$ and R is subordinating. The available labels in an SDRS, then, are those in the transitive closure of the immediately outscopes relation on *LAST*. In Figure 2.1, the right frontier includes π_5 , i.e. *LAST*, π_6 and π_1 .

In addition to constraining where new information can attach, the right-frontier constraint is useful in stating generalizations about anaphoric accessibility that are not easily captured in standard DRT. Specifically, it is assumed that only discourse referents introduced in available discourse segments (and which are DRT accessible within those segments) are accessible for the resolution of anaphoric dependencies. As a result, the sentence in (7) can not be used to elaborate on the salmon, as its discourse referent is introduced in π_3 , which is not in the set of

available labels.

(7) #It was a beautiful pink.

While this example demonstrates the utility of the structures posited by SDRT; the *interpretation* of these structures is also interesting for linguistic perspective, as the semantic consequences of discourse relations may provide information about the temporal structure of a text, amongst other things. SDRSs are interpreted as relations between input and output world-assignment pairs. Therefore one can simply build their interpretation on top of the existing relational semantics for DRSS from §2.2. Consider the SDRS for (6) above. This SDRS is satisfied relative to an input state (w, f) just in case there is an output state (w, g) such that:

$$(w, f) \llbracket K_{\pi_0} \rrbracket_M(w, g) \text{ iff } (w, f) \llbracket \textit{Elaboration}(\pi_1, \pi_6) \rrbracket_M(w, g)$$

In other words, the truth conditions for the entire discourse follow from unpacking the truth conditions for the unique label in A that outscopes all other labels. By convention, K_π specifies the SDRS formula corresponding to $\mathcal{F}(\pi)$.

The interpretation of a formula of the form $R(\pi_1, \pi_2)$ depends on the properties of the relation R . For example, for veridical discourse relations:³

$$R(\alpha, \beta) \Rightarrow (K_\alpha \wedge K_\beta)$$

Therefore, K_{π_0} is satisfiable with respect to the input context (w, f) just in case there is a way to extend the assignment function f with the discourse referents introduced in π_1 and π_6 that satisfies all of the necessary conditions, in addition to

³*Elaboration, Narration, Explanation, Parallel, Contrast, Background, Result, Evidence* are all veridical relations.

satisfying the condition imposed by the discourse relation *Elaboration*:

$$(w, f) \llbracket K_{\pi_1} \wedge K_{\pi_6} \wedge \phi_{Elaboration(\pi_1, \pi_6)} \rrbracket_M (w, g)$$

The semantic contribution of a discourse relation is introduced by a meaning postulate associated with that relation. Schematically, these meaning postulates have the form $\phi_{R(\alpha, \beta)} \Rightarrow conditions(\alpha, \beta)$, where $conditions(\alpha, \beta)$ expresses conditions on K_α and K_β , or on discourse referents introduced therein. To provide a concrete example, *Elaboration* imposes temporal constraints on the eventualities described in the discourse segments that it relates. Specifically, if β elaborates α then the main eventuality described in β is temporally included in (or a part of) the eventuality described in α .

- **Temporal Consequence of Elaboration:**

$$\phi_{Elaboration(\alpha, \beta)} \Rightarrow Part-of(e_\beta, e_\alpha)$$

The consequence of inferring that *Elaboration* links π_6 to π_1 in the SDRS for (6) is that the meal described in π_2 and the dancing competition in π_5 must both occur during the interval denoted by “last night” in π_1 . Thus inferring that a certain relation links two discourse segments can fill in information about the temporal structure of a discourse.

Not all discourse relations are veridical of course. For example, *Alternation* and *Consequence*, which mirror the logical connectives \vee and \Rightarrow respectively, do not entail the content of the discourse segments that they relate. Another class of non-veridical discourse relations which are of particular use in the ensuing chapters are *divergent* relations, which include *Correction* and *Counterevidence*. These relations dispute the content or appropriateness of a prior discourse segment. Thus if R is divergent, $R(\alpha, \beta)$ entails $\neg K_\alpha$ and K_β .

Consider the discourse in (8) (from Asher and Lascarides 2003). B ’s turn in

(8b) corrects A 's assertion that Max owns several classic cars. A 's response in (8c) provides counterevidence to B 's correction (and elaborates the original assertion in (8a)).

- (8) a. (π_1) A: Max owns several classic cars.
 b. (π_2) B: No he doesn't.
 c. (π_3) A: He owns two 1967 Alfa spiders.

The SDRS for (8) (at least on an intuitive understanding) is given below:

- $A = \{\pi_0, \pi_1, \pi_2, \pi_3\}$
- $\mathcal{F}(\pi_0) = \textit{Correction}(\pi_1, \pi_2) \wedge \textit{Counterevidence}(\pi_2, \pi_3) \wedge \textit{Elaboration}(\pi_1, \pi_3)$
 $\mathcal{F}(\pi_1) = K_{\pi_1}$
 $\mathcal{F}(\pi_2) = K_{\pi_2}$
 $\mathcal{F}(\pi_3) = K_{\pi_3}$
- $LAST = \pi_3$

Given the semantics of divergent relations, however, this SDRS is inconsistent, since $\textit{Correction}(\pi_1, \pi_2)$ entails K_{π_2} and $\textit{Counterevidence}(\pi_2, \pi_3)$ entails $\neg K_{\pi_2}$. To alleviate this problem divergent relations must have a nonmonotonic affect on SDRS update. In order to maintain consistency, $\textit{Correction}(\pi_1, \pi_2)$ above is replaced with $\textit{Dis}(\textit{Correction})(\pi_1, \pi_2)$ when the SDRS is updated with π_3 . $\textit{Dis}(R)(\alpha, \beta)$ indicates that $R(\alpha, \beta)$, which was part of the input SDRS, is now in dispute. In particular, $\textit{Dis}(R)(\alpha, \beta)$ entails that the speaker of β believes $R(\alpha, \beta)$, but $\neg R(\alpha, \beta)$ is entailed by the discourse.

Finally, SDRT makes use of a separate logic for computing the rhetorical relations between utterances based on information from syntax and compositional and lexical semantics. This “glue logic” contains axioms for inferring that particular

discourse relations link two discourse segments. Since each discourse segment is assigned a unique label, these axioms exploit information about labels provided by descriptions of the SDRS assembled so far and of the new discourse constituent β which is to be linked to the available discourse constituent α . These descriptions specify discourse structures in terms of which segments are related to which other segments, and by stating in which larger segment that information is found. Thus, a binary discourse relation R that relates α and β is represented in the description language as a three place predicate symbol $R(\alpha, \beta, \lambda)$ conveying that the constituent labeled by β stands in the relation R to α and that this information is contained within the larger discourse segment labeled λ .

The axioms of the glue logic exploit standard propositional logic connectives and a weak conditional operator $>$ that serves to represent defeasible rules about discourse structure. The general form of these rules follows the schema in (9).

$$(9) \quad (?(\alpha, \beta, \lambda) \wedge Info(\alpha, \beta, \lambda)) > R(\alpha, \beta, \lambda)$$

(9) says that if β attaches to α with some underspecified relation $?$ in the larger discourse segment λ and certain information about α , β and λ holds, then normally β attaches to α in λ with R . These conditionals support a defeasible form of modus ponens. As a result, when the left hand side of (an instance of) (9) holds, one can defeasibly infer $R(\alpha, \beta, \lambda)$.⁴ Additional information, however, may block this inference.

⁴Asher and Lascarides (2003) give a complete specification of the glue logic, in particular of the defeasible consequence relation $\vdash\sim$. Defeasible modus ponens is represented using $\vdash\sim$ as follows:

$$(i) \quad A > B, A \vdash\sim B, \text{ but } A > B, A, \neg B \not\vdash\sim B$$

2.4 The Logic of Cognitive Modelling

Computing discourse relations in dialogue often requires reasoning about the beliefs and intentions of discourse participants. This kind of information is also useful in computing conversational implicatures. For these reasons, SDRT includes a separate logic of cognitive modelling that interacts in a limited fashion with the glue logic to yield inferences about the speaker’s beliefs and intentions as revealed by his contribution to the conversation. This logic is shallow in the sense that it is not a full logic of propositional attitudes. As such, the model is rather course-grained. As Asher and Lascarides (2003) state, the logic of cognitive modelling is silent on “how people resolve conflicting desires, how they decide which intentions have the maximum utility, and most importantly how beliefs and intentions change as agents perform actions and change the world (p. 376)”. However, they argue that it is sufficient for reasoning in a restricted way about beliefs and intentions based on an agents utterances in specific discourse. In this section, I provide a quick overview of cognitive modelling and refer the reader to chapter 9 of Asher and Lascarides (2003) for the full details. I only introduce concepts below that play a central role in the discussions in chapters 3–5.

The logic itself includes expressions from the glue logic – labels, propositional connectives and the weak conditional operator $>$, in addition to a set of modal operators for beliefs and intentions, $\mathcal{B}_A, \mathcal{B}_B, \dots, \mathcal{I}_A, \mathcal{I}_B, \dots$, where A and B are agents. Belief is understood as epistemic necessity and given a standard interpretation relative to an accessibility relation $R_{\mathcal{B}_A}$ over worlds:

- $\llbracket \mathcal{B}_A \phi \rrbracket_M(w) = 1$ iff for all w' such that $w R_{\mathcal{B}_A} w'$, $\llbracket \phi \rrbracket_M(w') = 1$

The language also contains functions S and H that map labels to agents. Intuitively, $S(\alpha)$ is the speaker of α and $H(\alpha)$ is the addressee, or hearer.

Defaults modelling rationality and cooperativity and axioms associating spe-

cific goals with utterances of a particular linguistic form can be stated in this logic. The latter, specifically, encode Sadock and Zwicky’s (1985) notion of *sentence type*, i.e. a “coincidence of grammatical structure and conversational use (p. 155)”. These goals are also known as speech-act related goals, or SARGs.

The default SARG of an utterance is stated in **Default Schema**, though a number of more specific axioms exist which I discuss further below. In plain English, **Default Schema** says that the SARG of an utterance is that the addressee believe its rhetorical contribution to the discourse.

- **Default Schema:**

Suppose $Info(\tau) \wedge Done(Say(\beta)) \vdash R(\alpha, \beta, \lambda)$.

Then: $Info(\tau) \wedge Done(Say(\beta)) \vdash SARG(\beta, \mathcal{B}_{H(\beta)}(R(\alpha, \beta, \lambda)))$.

It is useful to consider a concrete example like (10a) to illustrate this concept. Intuitively, π_2 explains why Max fell. This is modeled in SDRT by assuming that the relation *Explanation* links π_2 to π_1 as shown in (10b). This information is inferred based on lexical semantic information available to the glue logic: to put it coarsely, “pushing” events cause “falling” events. According to **Default Schema**, then, π_2 ’s SARG is that $H(\pi_2)$ believe that John’s pushing Max *explains* Max’s falling, i.e. $Explanation(\pi_1, \pi_2, \pi)$.

- (10) a. (π_1) Max fell. (π_2) John pushed him.
 b. $\pi : Explanation(\pi_1, \pi_2)$

When R is a veridical relation and λ occurs in a veridical segment of the discourse – i.e. $\mathcal{F}(\lambda)$ must be true in order for the discourse as a whole to be true – it is possible to derive a more specific goal, viz. that the addressee believe the proposition p_β conveyed by the speaker’s utterance.⁵ This new SARG follows from

⁵ p_β is a propositional term that is linked to K_β in the logic of information content by constraints on admissible models. These constraints guarantee that K_β and p_β are satisfied in the same worlds.

Default Schema and the closure of belief under logical consequence. For example, because *Explanation* is a veridical relation, the SARG of π_2 in (10a) is that the addressee believe that John pushed Max.

Veridical relations are associated with assertions, in so far as assertions are characterized by commitment. Furthermore, assertions are associated with declarative (or equivalently, indicative) sentences. As a result, the more specific SARG is codified by a separate axiom called **Indicative Related Goals**.

- **Indicative Related Goals (IRG):**

Suppose $Info(\tau) \wedge Done(Say(\beta)) \vdash R(\alpha, \beta, \lambda)$.

Then: $Info(\tau) \wedge Done(Say(\beta)) \wedge veridical(R, \lambda) \vdash SARG(\beta, \mathcal{B}_{H(\beta)}(p_\beta))$.

Thus declarative sentences that attach with a veridical relation and within a veridical segment of the discourse are by default associated with the SARG that the addressee believe the proposition conveyed by the sentence.

The SARG of a question is that the speaker believe an answer to it. This is captured by the default **Question Related Goals**. $Sanswer(\alpha, p)$ is a predicate in the logic of cognitive modelling that indicates that p is an answer to the question labeled by α . *Sanswer* is thus appropriately linked to the predicate *Answer* from the logic of information content (defined in §2.2). **QRG** states that if the proposition p is an answer to the question labeled α , then the SARG of α is that the speaker of α believe p .

- **Question Related Goals (QRG):**

$Sanswer(\alpha, p) > SARG(\alpha, \mathcal{B}_{S(\alpha)}p)$

It is important that axioms like **QRG** and **IRG** are formulated as defaults, since these goals can be overridden by conflicting information. For example, it is not always the case that the SARG of a question is that the speaker wants to know an answer. Take a question on an exam or quiz show. In these cases, it is clearly

not a goal of the speaker that he believe the answer p . Presumably, he already believes p and wants to know if the addressee believes p . In order to block the incorrect SARG in these cases, a more specific axiom **Known Answers** is introduced, blocking the consequence of **QRG** when the speaker believes a particular answer p to his question.

- **Known Answers:**

$$(\text{Answer}(\alpha, p) \wedge \mathcal{B}_{S(\alpha)}p) > \neg\text{SARG}(\alpha, \mathcal{B}_{S(\alpha)}p)$$

One class of questions where **Known Answers** is useful are questions that can be answered with varying degrees of precision. *Where*-questions, for example, can be answered at the “street” level, the “city” level, the “state” level, etc. But in many cases where such questions are used it is obvious that the speaker believes certain answers to the question already. As a result, **Known Answers** blocks the SARG that the speaker believe those particular answers. In the context in (11), for instance, (11b) is a reasonable answer, whereas (11c) is somewhat marked.

- (11) [A and B are on Congress Avenue in downtown Austin]
- a. A: (Excuse me.) Where is Waterloo Records?
 - b. B: It’s on Sixth and Lamar.
 - c. #B: It’s in Austin, Texas.

B can reasonably assume that A believes that he is in Austin and may further assume that A believes that Waterloo Records is in Austin given that it is a salient Austin landmark. This information blocks as a SARG for (11a) that A believe that Waterloo Records is in Austin. The city-level answer is too coarse-grained, in other words. What A wants to know is a particular address. In another context, the city-level answer may be perfectly reasonable. For example, if B is standing in the middle of Times Square in New York City wearing a Waterloo Records T-shirt.

SARGs are properties of utterances. Sometimes it is useful, however, to talk directly about the intentions of agents. To this end, cognitive modelling includes axioms that relate SARGs to intentions. For example, the axiom below states that if the SARG of an utterance α is ϕ , then normally the speaker of α intends to see to that ϕ . (δ is the *stit*, or “see to it that” operator. It takes a formula to an action term.)

- **SARGs to Intentions:** $\text{SARG}(\alpha, \phi) > \mathcal{I}_{S(\alpha)}(\delta\phi)$

In addition to the axioms above which reveal the goals and intentions behind utterances, cognitive modelling includes axioms that provide information about an agent’s beliefs. Two axioms are relevant here: **Sincerity** and **Competence**. These axioms considered together capture much of the reasoning encoded in Grice’s Maxim of Quality: try to make your contribution one that is true (Grice 1975). **Sincerity** states that an utterance β is sincere only if $S(\beta)$ believes its intended rhetorical contribution (as encoded by the relation R with which it attaches to the prior discourse). For example, if $S(\pi_2)$ in (10a) sincerely utters π_2 , then normally one infers that he believes that $\text{Explanation}(\pi_1, \pi_2, \pi)$. **Sincerity** reflects the speaker’s beliefs about the content of the discourse and only indirectly his beliefs about the world.

- **Sincerity:** $R(\alpha, \beta, \lambda) > \mathcal{B}_{S(\beta)}R(\alpha, \beta, \lambda)$

Asher and Lascarides (2003) argue that the formulation of sincerity above is more sophisticated than other formulations since it takes into account rhetorical relations. Perrault (1990), for example, assumes that β is a sincere assertion if $S(\beta)$ believes p_β . Asher and Lascarides note that this formulation of sincerity sometimes produces unintuitive results. Consider the dialogue in (12). Given the semantics of *why*-questions and the axioms of the glue logic it follows that B ’s answer in (12b) explains why B was late.

- (12) a. (π_1) A: Why are you late?
 b. (π_2) B: I ran out of gas.

Now suppose that B did in fact run out of gas but was late because he had a secret rendezvous with A 's spouse. An account of sincerity that does not take into account rhetorical relations predicts that B is sincere when he asserts π_2 , since B does in fact believe that he ran out of gas. He does not believe however that this is the reason why he was late. It is not clear in this case that we want to characterize π_2 as a sincere assertion. Certainly there is an element of subterfuge to it. The axiom **Sincerity** above predicts that B 's utterance is sincere only if he believes that running out of gas caused him to be late.⁶

Competence encodes the assumption that speakers are competent with respect to the information they contribute to a discourse. That is, if A contributes some information to a discourse and A believes this information and has evidence for it (à la Grice), then normally B adds A 's contribution to their own beliefs.

- **Competence:** $\mathcal{B}_A\phi > \mathcal{B}_B\phi$

Sincerity and **Competence** interact to accomplish the SARG specified by **Default Schema** (or **IRG** if R is veridical), i.e. the goal that one's conversational partner add the information one contributes to their own set of beliefs (at least for the purposes of the conversation at hand). If A sincerely contributes some information to a conversation and B considers A competent with respect to that information, then normally B adds that information to his or her own beliefs.⁷

⁶This type of example was suggested to me by David Beaver, p.c. Asher and Lascarides (2003) discuss a similar case on page 397.

⁷I make use of two more axioms from cognitive modelling in chapter 3. I mention them here for convenience and refer the reader to Asher and Lascarides (2003) for more details. First, the axiom **Rationality of Action** encodes the assumption that actions are normally performed intentionally.

- **Rationality of Action:** $Done(a) > \mathcal{I}_{S(a)}(a)$

Second, **Intentions and Defaults** states that the non-accidental, nonmonotonic, consequences

2.5 Indirect Speech Acts in SDRT

In §2.4, I described a version of the “literal force hypothesis” (Levinson 1983), i.e. the idea that there is a one-to-one correspondence between linguistic form and discourse function. That is, the major sentence types of a language are associated with specific illocutionary forces: declaratives with assertions, interrogatives with questions, imperatives with requests, etc. The literal force hypothesis was modeled via the axioms associating SARGs with sentence types, i.e. **IRG**, **QRG** and **RRG** for requests.

Exceptions to the literal force hypothesis, however, are all too common. The interrogative in (13a), for example, intuitively performs a request. Searle (1975) argues that this and similar examples carry in addition to their literal force an inferred, or indirect force. He proposes an analysis of indirect speech acts (ISAs) in which this indirect force is inferred based on mutually believed background information, including both linguistic and non-linguistic information, and general principles of rationality and cooperativity, for example as provided by Grice (1975). It is not the aim of the current section to argue convincingly for a specific analysis of ISAs. (That is a thesis topic in itself.) Rather, I introduce here the analysis and formalism in Asher and Lascarides (2001), which is in many respects a formal implementation of Searle’s analysis, so that it may be applied in the analysis of biased questions below.

There are two aspects to ISAs that are interesting in the context of this thesis. First, both the literal force and the indirect force are accessible in the discourse. In of one’s intentions are also intended.

- **Intentions and Defaults:**

If $\Gamma, Done(a), \phi \vdash \psi$, and $\Gamma, \phi \not\vdash \psi$, then $\Gamma \vdash \sim(\mathcal{I}_A(a) \wedge \mathcal{B}_A(\phi)) > \mathcal{I}_A(\delta\psi)$.

It is important that $\psi \notin \Gamma \cup \{\phi\}$ in order to guarantee that performing a is essential for inferring ψ . As Asher and Lascarides (2003) note, this axiom is too simple to model how intentions really work (Bratman 1990, Cohen and Levesque 1990), but it is sufficient for the simple model of cognition required by SDRT for predicting the content of a dialogue.

(13), for example, (13a) is clearly intended as a request (as evident from the felicity of preverbal *please*). Yet the literal force is still available, as demonstrated by the fact that *B* answers the question in (13b). In other words, (13a) is simultaneously a question and a request.

- (13) a. A: Can you *please* pass the salt?
 b. B: Yes, I can. [uttered as *B* passes the salt.]

Second, some ISAs have distributional properties of the indirectly conveyed force, e.g. preverbal *please* in (13a). This discourse marker occurs in the preverbal position of imperative sentences as in (14a), but not in interrogative sentences used with only their literal force (14b).

- (14) a. Please pass the salt.
 b. #Is Mary please coming?

Not all ISAs share these distributional properties, leading some to posit a degree of conventionalization for certain types of indirect speech act (Searle 1975, Morgan 1978). (15a) and (15b), for instance, both occur felicitously with *please*, whereas (15c) and (15d), which have a similar semantic content to (15a) and (15b), do not.

- (15) a. Can you please pass the salt?
 b. Could you please pass the salt?
 c. #Are you able to please pass the salt?
 d. #Do you have the physical ability to please pass the salt?

Morgan (1978) maintains that the reasoning that links the sentences in (15a) and (15b) to a request has been “short-circuited” (see also Horn and Bayer 1984). That is, the implicature is no longer calculated online, the interpretation of (15a) as a

request being available as a matter of linguistic convention. This conventionalization blocks the use of (15c) and (15d) as indirect requests.

Asher and Lascarides (2001) propose modelling conventionalized ISAs with complex types, a formal mechanism that has proven useful in lexical semantics for analyzing the kind of copredications shown in (16) (Asher and Pustejovsky 2004, Asher 2007). In (16b), for example, two properties are predicated of the book: having a purple cover and being intelligible. These properties apply to different sorts of objects. Having a purple cover, for instance, is a property of physical objects, while being intelligible is a property of informational objects.

- (16) a. Lunch was delicious, but took forever.
 b. The book has a purple cover and is the most intelligible introduction
 to category theory.

(16b) shows that books are both physical and informational objects, leading lexical semanticists to assign them a complex type $\text{PHYS-OBJ} \bullet \text{INF-OBJ}$. Formal mechanisms are provided that allow the component types of a complex type to be manipulated appropriately.⁸

Physical objects and informational objects are in some sense metaphysically incompatible, as it is not clear what it means to be *both* an abstract entity and a concrete object. In most common sense ontologies it is assumed that $\text{PHYS-OBJ} \sqcap \text{INF-OBJ} = \perp$. Similar observations apply to indirect speech acts. Questions and requests denote incompatible semantic objects, say a set of propositions and an action respectively (Asher and Lascarides 2003). On the basis of this similarity, Asher and Lascarides (2001) argue that complex types are useful for modelling ISAs as well. For example, note that the dialogue in (13) contains a copredication. Preverbal *please* requires (13a) to be a request, while the answer in (13b) requires

⁸One still needs to provide a model for these complex types. See Asher (2007) for a thorough discussion of this issue.

it to be a question.

The grammar can exploit both of the constituent types of (13a) in computing its rhetorical contribution to the discourse. This is accomplished through a rule of **Dot Exploitation**. In particular, if it holds in the glue logic that $?(α, β, λ)$ and $β$ is assigned a complex type $t_1 \bullet t_2$, then new speech act discourse referents $γ_1$ and $γ_2$ of type t_1 and t_2 respectively are introduced. These new discourse referents are related to the original speech act referent $β$ by a relation *O-Elab*, or “dot elaboration”. In the case of (13a), **Dot Exploitation** introduces two new speech act discourse referents of type QUESTION and REQUEST. The first is available for the answer in (13b) to attach to via the relation *QAP* (Question-Answer Pair). The second is available to satisfy the selectional restrictions of *please*.

On the theory of ISAs argued for in Asher and Lascarides (2001), an utterance $β$ is interpreted as an ISA when one can infer from the literal meaning of $β$, background information, including linguistic and non-linguistic information, and principles of rational and cooperative behavior that the speaker associates a SARG $φ$ with $β$ that is not associated with $β$ by the axioms **IRG**, **QRG** or **RRG**. In this sense, Asher and Lascarides follow the proposal in Searle (1975) closely. These assumptions are encoded formally in **Inferring Dot Types**. \mathcal{R} consists of the axioms of cognitive modelling discussed in §2.4 (and others) and information about world knowledge. \mathcal{C} consists of conventionalized linguistic knowledge, including the axioms of SDRT’s glue logic. These two sets of axioms provide Searle’s non-linguistic and linguistic background information respectively.

- **Inferring Dot Types:**

Suppose for some $γ$ that:

- (a) $\mathcal{R}, \mathcal{C}, ?(α, β, λ), Info(λ, β) \vdash_{\text{SARG}} (β, φ);$
- (b) $β : t_1, \neg(Info(β) > \text{SARG } (β, φ));$

(c) $\gamma : t_2, (Info(\gamma) > \text{SARG } (\gamma, \phi))$.

Then:

(d) $\beta : t_1 \bullet t_2$

Paraphrasing, **Inferring Dot Types** states that if an agent can infer from the literal meaning of an utterance and from principles of rational and cooperative behavior that the speaker has a particular goal in uttering a sentence (see (a)) which is not the goal normally associated with that sentence (see (b)) but which is associated with a distinct sentence type (see (c)), then that agent can infer that the speaker intends to convey an ISA (see (d)).

Furthermore, similar Gricean-style reasoning must link the constituent types of the complex type with some rhetorical relation. This requirement is formalized in **Coherence Constraint on Complex Types** (Asher and Lascarides 2001).

- **Coherence Constraint on Complex Speech Act Types:**

Suppose that:

- $?(\alpha, \beta, \lambda)$
- $\beta : t_1 \bullet t_2$
- $O\text{-Elab}(\beta, \gamma_1) \wedge O\text{-Elab}(\beta, \gamma_2)$
- $\gamma_1 : t_1 \wedge \gamma_2 : t_2$

Then:

$$\mathcal{R}, \mathcal{C}, ?(\alpha, \gamma_1, \lambda), ?(\gamma_1, \gamma_2, \lambda'), Info(\gamma_1, \gamma_2) \vdash R(\gamma_1, \gamma_2, \lambda'),$$

where λ' labels an SDRS that results from attaching γ_1 to α in the SDRS labeled by λ .

In short, if β is an instance of a complex speech act type $t_1 \bullet t_2$, then the new labels introduced by **Dot Exploitation**, γ_1 and γ_2 must be linked by a discourse relation R .

With this background information in place, we can move on to the core of the thesis. Chapter 3 addresses the interpretation of English tag questions, paying particular attention to the role of intonation in determining discourse function.

Chapter 3

Bias in Tag Questions

3.1 Introduction

The current chapter has two goals. First, I argue that English tag questions are complex speech acts consisting of both an assertion and a question. This may seem obvious. After all, tag questions are syntactically mixed sentence types, composed of a declarative *anchor* paratactically related to a reduced interrogative clause, or *tag* (Huddleston and Pullum 2002). As such, a similar complexity might be expected at the speech act level. Quirk et al. (1985), for example, maintain that the meanings of tag questions “like their forms, involve a statement and a question; each of them, that is, asserts something, then invites the listener’s response to it ” (p. 811). However, many investigators are reluctant to associate an outright assertion with tag questions, opting instead to view tags as illocutionary force indicating devices mapping a declarative clause to a polar question and relegating the proposition conveyed by the anchor to some lesser role (Oehrle 1987, Culicover 1992, Bender and Flickinger 1998). I provide evidence for the former position following the strategy utilized in Sadock (1971, 1974), showing that tag questions have distributional properties of both assertions and questions.

Second, I develop an analysis of the association of final intonation on the tag with discourse function. Many previous proposals make unrealistic assumptions about the role of intonation in interpretation. For example, Oehrle (1987) and Kay (2002), in effect, treat intonation contours as *functions* from propositions to illocutionary acts. These analyses, I argue, are both conceptually and empirically unmotivated, the association of intonation with discourse function being more complex than these authors assume. The interpretation of intonation is highly context dependent and a range of discourse functions may be associated with any particular tune. Any formal analysis should reflect this.

Briefly, I argue that the interpretation of a tag question depends on the rhetorical relation that links the tag to the anchor. SDRT (introduced in Chapter 2) is an ideal framework on this account, as it provides a logic for inferring these relations on the basis of lexical and compositional semantics, information about the cognitive states of discourse participants and context. Intonation, I argue, conveys information about the speaker’s beliefs. This information indirectly contributes to the inference that a specific discourse relation links the anchor and the tag. Furthermore, since this inference is defeasible, it can be overridden or blocked by additional information.

Before continuing, it’s useful to provide some background on the relationship between intonation and interpretation alluded to above. This relationship forms part of most descriptions of tag questions (Quirk et al. 1985, Huddleston and Pullum 2002), in addition to being the focus of many formal analyses (Millar and Brown 1979, Rando 1980). The example in (1a) (from the web) is illustrative. Intuitively, this tag question *weakly* asserts that *bupkes* is Yiddish and asks for *confirmation* of this proposition from the addressee. On this reading, (1a) would normally be pronounced with final rising intonation on the tag.¹

¹The example is from a post on a “blog” titled *The post in which I use Yiddish*.

- (1) a. You know folks I got bupkes. (Bupkes is Yiddish, isn't it?)
 b. He also gave me a stick of nicotine gum, which I thought was very odd as he knows I don't smoke. But then again, chewing gum isn't smoking, is it?

The example in (1b) (again taken from the internet) illustrates a second reading. In this case, the tag question asserts the content of the anchor and asks for *acknowledgment* from the addressee that the assertion has been “taken up”. The tag in this case is naturally read with falling intonation. The speaker's commitment to the anchor in (1b) is stronger than in (1a), as little or no uncertainty about the truth of the anchor is conveyed. (Indeed, it would be surprising if the speaker was anything but certain that chewing gum isn't smoking.)

Both of these readings have a complex discourse function: they assert something and ask for a response from the addressee (as Quirk et al. 1985 describe). There is a third reading, however, which is not biased in this way. (2) (again taken from the web) does not assert, either weakly or strongly, that Lorraine doesn't have a beehive hairdo. In fact, given the discourse context it is apparent that Lorraine has many of the properties that might lead one to expect that she *does* have a beehive. (2) is roughly equivalent, then, to the polar question *Does Lorraine have a beehive hairdo too?* The expression *I just gotta ask* is a clear marker of this neutrality.

- (2) Wait, I just gotta ask - Lorraine doesn't have a beehive hairdo too, does she??

Neutral readings of tag questions are associated with a negative anchor and a weak rhythmic break between the anchor and tag (Ladd 1981, McCawley 1988, Huddleston and Pullum 2002). Furthermore, as I argue below the negation in the anchor receives a marked interpretation, a key component, I argue, in allowing the neutral

reading. The examples in (1) and (2), then, suggest interesting correlations between linguistic form, especially intonation, and interpretation. It is the overarching goal of this chapter to investigate these correlations in detail, focusing in particular on how intonation aligns with discourse function as modeled by the rhetorical connection of an utterance to the antecedent discourse.

§3.2 provides background information on the form and function of tag questions, largely via a discussion of previous analyses. In §3.3, I investigate discourse function more thoroughly, arguing in §3.3.1 that (at least some) tag questions are complex speech acts. In §3.3.2, I take a closer look at the fine-grained interpretations of tag questions discussed above, paying particular attention to the aspects of linguistic form that are correlated with these readings. In addition, I discuss a small corpus study that mitigates against adopting the kind of “functional” analysis of intonation mentioned above. Specifically, I show that there is not a one-to-one correspondence between final intonation and discourse function.

§3.4 develops a formal model of how confirmation, acknowledgement and neutral readings of tag questions are calculated. I posit two SDRT discourse relations, *Acknowledgement_q* and *Confirmation_q*, to model these readings. Neutral readings arise when tags attach within a dialogue with a discourse relation pertinent to an information-seeking question, e.g. *Q-Elab*, *Elaboration_q*, etc. I argue that intonation, particularly rising intonation, contributes information to SDRT’s logic of cognitive modelling, thus providing information about the speaker’s beliefs and intentions. Recognizing these beliefs and intentions is central to recovering the communicative goals of the speaker. In particular, this reasoning is key (at least in dialogic contexts) to inferring how the content of an utterance is rhetorically related to the antecedent dialogue. Tag questions are a conventionalized means of managing the content of the common ground by either requiring feedback from the hearer that the communicative goal of the anchor has been achieved, settling the content of the

common ground with respect to the anchor, or by requesting additional evidence for the anchor if the speaker is uncertain of its truth. Since intonation contours are often assumed to convey information about the relationship between the speaker or hearer, the content of an utterance, and the common ground (Gussenhoven 1984, Steedman 2000, a.o.), they serve an important role in recovering speaker intentions.

3.2 The Linguistic Form of Tag Questions

In this section, I discuss the important grammatical features of tag questions. §3.2.1 provides some background on the syntax and semantics of tag questions and §3.2.2 addresses their intonational properties.

3.2.1 Syntax and Semantics

Reversed polarity tag questions consist of a full declarative sentence, the anchor, in a paratactic relation with a reduced interrogative clause, the tag.² The tag itself consists of an auxiliary verb followed by a personal pronoun. The structure of tag questions is shown schematically in (3), where XP is a predicate of some type, i.e. a verb phrase, adjective phrase, etc.

- (3) [NP Aux (XP)], [Aux Pro]

Early analyses attempted to derive the tag from the anchor via a series of syntactic transformations. For example, the tag in (4) can be derived by (i)

²There are two varieties of tag question in English: the reversed-polarity tag question and the constant polarity tag question. The latter are distinguished by the fact that the polarity of both the anchor and the tag is positive, as in (i).

- (i) Julie is here, is she?

I focus in this chapter solely on reversed polarity tag questions. Constant polarity tag questions are rare in spoken American English. In 36 tag questions culled from the Santa Barbara Corpus of Spoken American English, there were no instances of constant polarity tag questions.

reversing the polarity of the anchor, (ii) forming an interrogative from the result and (iii) eliding the verb phrase and pronominalizing the subject NP. An example of this procedure is shown in (4) (following Huddleston and Pullum 2002).

- (4) Jane is coming, isn't she?
- a. Jane is coming. (anchor)
 - b. Jane isn't coming. (reverse polarity)
 - c. isn't Jane coming? (form interrogative)
 - d. isn't she? (reduce)

Transformational analyses face a number of problems, however. For instance, applying the rules in (4) to the anchor in (5a) (from Huddleston and Pullum 2002) produces an incorrect tag. The problem is that the “polarity” of the anchor is not a purely syntactic property (one that is read off from the form of the auxiliary). Intuitively, determiners like *few* and the adverbs like *hardly* are semantically negative. As a result, the tag should have a positive auxiliary.

- (5) a. Few of them liked it, did they?
 b. It's hardly fair, is it?

The examples in (6) (from Oehrle 1987) show that a purely syntactic process of pronominalization is insufficient in determining the form of the pronoun in the tag. Instead, the pronoun is selected based on pragmatic information about the intended referent. For example, in (6a) both *she* and *he* are possible depending on whether the addressee's cousin is female or male. Likewise, (6c) can take *he* or *she* (rather than *it*) when the noun phrase *the ham sandwich* is used to *refer* to the person who ordered the ham sandwich (following Nunberg 1977).

- (6) a. Your cousin left, didn't she/he.

- b. IBM uses too much silicon, don't they/doesn't it.
- c. The ham sandwich in Booth 2 is attracting a lot of attention, isn't it/she/he.

Given the existence of these cases, it is now standardly assumed that tags have a separate derivational history from anchors. Restrictions on the form of the tag are captured by stating specific syntactic, semantic and pragmatic *constraints* (rather than transformations). For example, the pronoun in the tag needs to be *coreferential* with the matrix subject of the anchor (as shown by the examples in (6)). This is a pragmatic constraint. Similarly, the auxiliary verbs in the anchor and tag need to be compatible. Normally, this means that the auxiliary used in the tag is the same as the one in the anchor (and the appropriate form of *do* if the anchor contains no auxiliary). Oehrle (1987) argues that these constraints can be captured simply by requiring that the proposition conveyed by the anchor be an element of the denotation of the tag (where the tag is interpreted as a full interrogative clause). In other words, the anchor needs to be able to count as an answer to the tag. I leave these issues aside as I am mostly concerned with the interpretation of tag questions rather than with the nuances of their form.

A more pressing issue (given the goals of the current chapter) is the interpretation of tag questions and their associated pragmatic function. There are two schools of thought on this issue. On the analyses proposed by Culicover (1992) and Oehrle (1987) tag questions denote polar questions, i.e. a set of propositions. Oehrle (1987), for example, assumes that the denotation of a tag question is obtained by applying the denotation of the tag to the denotation of XP in (3). Culicover treats tags as functions from propositions to polar questions. In effect, tags are illocutionary force indicating devices (IFIDs), applying to a proposition to yield a question.

This type of analysis must account for the intuition that reversed-polarity tag questions normally convey some degree of belief in the anchor. Oehrle, for example,

assumes that the proposition expressed by the anchor is *conventionally* implicated. This is a strong assumption; conventional implicatures are noncancelable and thus issue in commitments. In addition, conventional implicature is a controversial class of meaning.

The second school of thought on the interpretation of tag questions is the one quoted in §3.1 from Quirk et al. (1985). On this view, the anchor denotes a proposition, which the speaker asserts, and the tag denotes a polar question, whose meaning is recovered by the mechanism for interpreting verb phrase ellipsis and which the speaker asks. Advocates of this position include Sadock (1974) and Ladd (1981).

Kay (2002) provides a recent analysis in this vein. One of the interesting aspects his analysis is his account of the association of intonation with particular discourse functions (as discussed in §3.1). Kay (like Oehrle 1987 and Culicover 1992), in effect, treats tags as IFIDs, as their primary interpretive effect is the application of a illocutionary force operator to the proposition ϕ denoted by the anchor. Specifically, rising tags introduce a force F_3 that applies to ϕ yielding $F_3(\phi)$. Falling intonation introduces the illocutionary force F_4 .³ The anchor is still asserted, however. The force of the tag question as whole is a *set* containing the assertion of ϕ and one of $F_3(\phi)$ or $F_4(\phi)$ depending on whether the tag ends in rising or falling intonation.

What is notable about Kay’s analysis is the one-to-one association of final intonation with illocutionary force. This assumption is common to many descriptions of the association of final tune with the interpretation of tag questions (as alluded to in the introduction). Oehrle (1987), for example, assumes that intonation contours are *functions* from propositions to speech acts. I argue in §3.3.2 that this is an unrealistic model of intonational meaning. Otherwise, I agree with Kay and others

³ F_3 and F_4 correspond roughly to requests for confirmation and requests for acknowledgement respectively.

that tag questions are complex speech acts (based on the arguments from Sadock 1974 presented in §3.3.1). However, I argue that the interpretations associated with intonation are the result of the rhetorical relation linking the tag to the anchor. This relation is computed based on the compositional semantics of the anchor and the tag and from the information provided by intonation about the speaker’s cognitive state. But there is no direct link on such a model between intonation and discourse function.

3.2.2 Intonation

As noted in the introduction and the previous section, intonation has an important role in determining the discourse function of a tag question. Rising tags are normally requests for confirmation; falling tags are requests for acknowledgement. Others have noted a dependence on prosodic phrasing and interpretation. McCawley (1988) and Huddleston and Pullum (2002), for example, observe that neutral requests for information are associated with a weak juncture between the anchor and the tag. Similarly, Ladd (1981) claims that the strength of this juncture affects the interpretation of negation in the anchor. Given the importance of intonation in understanding tag questions, I provide a brief introduction to the Tones and Break Indices (ToBI) labeling scheme (Beckman and Elam 1997) to facilitate the discussion below.⁴

Intonational patterns are acoustically changes in pitch, the physical correlate of which are modulations in fundamental frequency F_0 . ToBI provides an abstract, phonological representation of these changes based on the analysis of intonation in Pierrehumbert (1980) and Beckman and Pierrehumbert (1986). Intonation contours in ToBI are sequences of intonational events (i.e. F_0 peaks, falls, etc.) modeled with abstract high (H) and low (L) tonal targets. These tones are arranged according

⁴Chapter 12 of Kadmon (2001) provides a thorough introduction to intonation for those interested in semantics and pragmatics.

Pitch accents	L*, H*, L+H*, L*+H, H*+!H
Phrase accents	L-, H-
Boundary tones	L%, H%

Table 3.1: The elements of intonation contours in the ToBI annotation scheme (Beckman and Elam 1997).

to a simple grammar. An *intonational phrase*, for example, contains at least one *intermediate phrase* followed by one of the two *boundary tones* L% or H%. Intermediate phrases in turn consist of one or more *pitch accents* followed by one of the two *phrase accents* L- or H-. The complete inventory of tonal elements in ToBI is shown in Table 3.1.

Pitch accents have received the most attention from formal semanticists. The last pitch accent in an intermediate phrase, the nuclear pitch accent, marks focus in English. Furthermore, the choice of pitch accent has been argued to mark the discourse status of the expression it is aligned with. L accents, for instance, are said to mark old information (Steedman 2000, Kadmon 2001). In the representation of an intonation contour pitch accents are marked with asterisks and are distinguished phonologically from other tones by the fact that they are aligned with stressed syllables. In addition to the simple accents H and L, there are two bitonal accents L+H. Both of these tones are phonetically realized as a rise from a low pitch to a high pitch. The two accents L*+H and L+H* are distinguished by the timing of the pitch peak. For the L+H* accent the F₀ peak is aligned with the stressed syllable. The L*+H accent, on the other hand, represents a low target aligned with the stressed syllable followed by a rise to an F₀ peak. This peak may itself occur in the stressed syllable for long syllables or on later syllables. For example, in the pitch track in Figure 3.1 (taken from the ToBI training materials) the low tone occurs on

the first syllable of *rigamarole*, the stressed syllable, and the F_0 peak (annotated HiF0) occurs on the third syllable.⁵

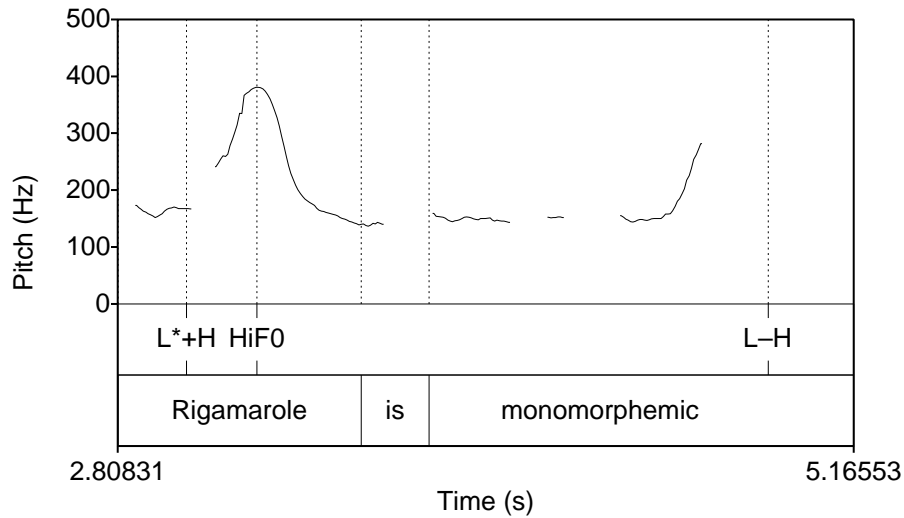


Figure 3.1: Pitch track demonstrating the L*+H pitch accent.

Rising and falling intonation are represented by sequences of phrase accent and boundary tone. Phrase accents occur sometime after the last pitch accent in an intermediate phrase and “fill up” the space up to the boundary tone (Kadmon 2001). In Figure 3.1, for example, the L- phrase accent is evident from the rapid fall after the F_0 peak and level low pitch until the H% boundary tone. The sequences L-H% and H-H% are both phonetically realized as a rise, specifically, a low rise versus a high rise. L-L% represents a fall. The H-L% sequence is realized as a high plateau.

Given the abstract ToBI representations and their phonetic realizations, the unique tonal element associated with final rising intonation is an H% boundary

⁵The L*+H L-H% intonation contour in Figure 3.1, incidentally, is an instance of what Liberman and Sag (1974) call the *contradiction contour*, which plays an important role in the analysis in Chapter 5.

tone. Any tune ending with a L% is phonetically realized as a non-rising contour. Gunlogson (2003) (following Gussenhoven 1984) argues for an alternative analysis, defining final tunes in terms of the direction of the pitch contour from the nuclear pitch accent to the end of the intonational phrase. A rising contour corresponds to non-falling pitch from the nuclear pitch accent to the end of the intonational phrase. Gunlogson thus assumes a three-way distinction between rises, non-rises and fall-rises. An H* L-H% tune on her analysis is an instance of the fall-rise contour. Similarly, a L* H-L% tune is an instance of the rising contour. Consequently, there is no unique tonal element correlated with rising intonation. I refrain from taking a principled stance on these issues in the remainder of the thesis. For convenience, I follow Steedman (2000, 2003) and others in assuming that final rises correspond to tunes ending with an H% boundary tone.

As I mentioned at the outset of this section, prosodic phrasing has also been argued to affect the interpretation of tag questions. Prosodic phrasing is marked by the distribution of phrase accents and boundary tones in a tune. The difference between full intonational phrases and intermediate phrases is related to the degree of juncture at the phrase boundary. Weaker junctures correspond to intermediate phrase boundaries. Intuitively, tag questions can be pronounced with varying degrees of juncture between the anchor and the tag. Along these lines, Ladd (1981) distinguishes *nuclear* tags (which he annotates by placing a forward-slash (/) between the anchor and tag) from *postnuclear* tags (which he annotates with an equal sign (=)).

Nuclear tags, according to Ladd, “have a separate nucleus or nuclear pitch accent, generally preceded in the rhythm of the sentence by a noticeable pause or intonational boundary ” (p. 167). Postnuclear tags, on the other hand, “have no separate nucleus, the pitch contour on the tag merely continuing the nuclear contour begun at the preceding nucleus in the main sentence; generally, too, there

is noticeably less of a pause or boundary before the tag ” (p. 167). Ladd goes on to argue that this distinction is correlated with an interpretive difference, though he is vague on the details of this effect. One clear reflex of the nuclear/postnuclear distinction, however, is the ability of postnuclear tags to admit a neutral question reading, which is absent for nuclear tags. McCawley (1988) and Huddleston and Pullum (2002) make the same observation.

The description of postnuclear tags provided by Ladd suggests (within the ToBI framework) the *absence* of a phrase accent or a boundary tone between the anchor and the tag, in addition to the absence of a pitch accent on the auxiliary in the tag. This is shown schematically in (7b). Nuclear tag questions, on the other hand, are distinguished by a prosodic boundary at the juncture between the anchor and the tag, represented here as either a full intonational phrase or an intermediate phrase boundary. The schematic ToBI description of nuclear tag questions is shown in (7a).⁶

- (7) a. JULIE isn't here , is she ?
 T* T-(T%) T* T-T%
- b. JULIE isn't here, is she ?
 T* T-T%

The representation of postnuclear tags in (7b) is somewhat unintuitive. It is difficult in my estimation *not* to perceive a pitch accent on the auxiliary verb in the tag, and most descriptions, Quirk et al. (1985) e.g., assume a pitch accent there. What Ladd might have in mind is the existence of a *postnuclear* pitch on the tag's auxiliary verb, as shown in (8a). The existence of postnuclear pitch accents, however, is controversial and, furthermore, ruled out by the grammar of tunes in ToBI. Alternatively, the perceived pitch accent on the auxiliary verb might be a reflex of aligning the phrase accent with a lexically stressed syllable (Ladd 1996,

⁶Here and throughout the thesis I mark nuclear pitch accents by highlighting the accented lexical item in SMALL CAPS. Optional elements are written between parentheses.

p. 215-216), as shown in (8b).

- (8) a. JULIE isn't here, is she ?
 T* T* T-T%
- b. JULIE isn't here, is she ?
 T* T- T%

In the absence of instrumental and experimental studies, it is impossible to decide between these options. However, I do not believe that one *must* decide in order to address the interpretation of tag questions. It is sufficient to note that neutral readings of tag questions (and some biased readings as well) have a weaker boundary between the anchor and the tag than do nuclear tag questions.⁷ Therefore, for the purposes of the discussion below, I recast the nuclear/postnuclear distinction in terms of intonational phrasing as follows: nuclear tag questions have an intonational phrase boundary between the anchor and the tag, while postnuclear tag questions have an intermediate phrase boundary between the anchor and the tag. These descriptions are shown schematically in (9a) and (9b) respectively.

- (9) a. JULIE isn't here , is she ?
 T* T-T% T* T-T%
- b. JULIE isn't here , is she ?
 T* T- T* T-T%

I develop an analysis below in which these prosodic differences conspire with syntax and semantics to yield two speech act discourse referents or a single referent which is assigned a complex speech act type. This is, in effect, a way of capturing the observation that intonational phrasing influences discourse segmentation. In either case, however, computing the discourse function of the tag relative to the anchor proceeds in a similar fashion.

⁷Also, the interpretations available to nuclear tag questions are a subset of those available to postnuclear tag questions. One can side step the issue then, and provide only analyses of postnuclear tag questions (which would carry over naturally to nuclear tag questions).

3.3 Tag Questions and Discourse Function

§3.2.1 introduced two issues regarding the interpretation of tag questions. The first was related to the status of the anchor: given the presence of both declarative and interrogative syntax and the normal mapping of these to interpretation, what and how many discourse functions do tag questions serve? Are they questions, as Oehrle (1987) and Culicover (1992) assume, or both, as Ladd (1981) and Quirk et al. (1985) maintain? The second issue concerned the kinds of responses expected by tag questions and how these readings are correlated with the phonological descriptions in §3.2.2. §3.3.1 addresses the first issue; §3.3.2 covers the second.

3.3.1 Sentence Type and Discourse Function

I follow Sadock (1974) in my answer to the first of these questions. He argues based on a number of diagnostics for illocutionary force that tag questions are both assertions and questions. These diagnostics are predicated on the assumption that certain discourse markers select utterances with specific illocutionary forces. The sentence initial parenthetical expression *after all*, for example, occurs with sentences that convey an assertion, but not with those that convey a neutral question. Thus (10b) is felicitous, whereas (10c) is not.

- (10) a. A: It's o.k. if you don't finish writing the paper today.
 b. A: After all, your adviser is out of the country.
 c. #A: After all, is your adviser out of the country?

Similarly, the discourse markers *by any chance* and *tell me* co-occur with questions, but not assertions, as illustrated by the examples in (11) and (12).

- (11) a. #John, by any chance, owns a car.
 b. Does John, by any chance, own a car?

- (12) Tell me, {#John owns a car. / does John own a car? }

I elaborate on Sadock’s observations and assume that *tell me* and *by any chance* distinguish between different types of question. Specifically, *tell me*, as a request for a response, is consistent with a very general notion of questionhood, viz. one that encompasses both biased and neutral readings. *By any chance*, on the other hand, as an expression of epistemic uncertainty occurs only with information-seeking questions. In this sense, it is very much like *I just gotta ask* as it occurs in (2).

Nuclear Tag Questions.

Applying these diagnostics to rising and falling nuclear tag questions supports Ladd’s (1981) contention that they are “double-barreled” speech acts (see also Quirk et al. 1985). That is, nuclear tag questions are both assertions and questions. The felicity of *after all* in (13) and (14) provides evidence that the anchors in (13b) and (14b) are asserted.⁸

- (13) a. A: The conference should be exceptional this year.
b. A: After all, Jane is coming, / isn’t she.
- (14) a. A: The conference might be sub-par this year.
b. A: After all, Jane isn’t coming, / is she.

(15a), on the other hand, shows that nuclear tag questions are still questions, while (15b) shows that they are not *neutral* questions, since they fail the *by any chance* test.

⁸In constructed examples, I adopt the orthographic convention of indicating a final fall with a period (.) and a final rise with a question mark (?). The same convention is adopted in the transcriptions of the SBCSAE.

- (15) a. Tell me, Jane {is/isn't} coming, / {isn't/is} she.
 b. #Jane {is/isn't} coming, by any chance, / {isn't/is} she.

The observation that nuclear tag questions are not neutral questions is expected given the implications of the diagnostics in (13) and (14). If the speaker *asserts* the proposition conveyed by the anchor, it follows that the tag cannot be a neutral request for information. This inference is captured in SDRT's shallow logic of cognitive modelling by the blocking of **Question Related Goals** by the more specific default in **Known Answers** (described in Chapter 2). If the speaker sincerely asserts the anchor, then normally they believe the proposition conveyed by the assertion. Since this proposition is an answer to the tag, the normal goal of a question, i.e. to know an answer, is blocked and the question has some other discourse function (as described in §3.3.2).

Postnuclear Tag Questions.

These tests yield a more nuanced set of observations with respect to postnuclear tag questions. Covering the simplest case first, postnuclear tag questions with a positive anchor have the same range of discourse functions as nuclear tag questions according to Sadock's diagnostics. They are both assertions (16) and *tell me* questions (17), but not neutral questions (18).

- (16) a. A: Why is Nicholas so sure the conference will be dull?
 b. A: After all, Jane is coming=isn't she?
- (17) Tell me, Jane {is/isn't} coming={isn't/is} she?
- (18) #Jane is coming, by any chance=isn't she?

The data with respect to postnuclear tag questions with a *negative* anchor are more complex. There appears to be an ambiguity in the interpretation of the

negation. The two readings are disambiguated by the inclusion of a polarity-sensitive lexical item in the anchor. Assume, without argument for now, that the negative element in an anchor that contains an NPI receives a standard, truth-functional interpretation. On this reading, postnuclear tag questions are biased in the same way as nuclear tag questions. That is, they are assertions and questions (though not neutral questions), as established in (19b), (17) and (20a).

- (19) a. A: Pascal's not coming, so why is Nicholas so sure the conference will be a success?
 b. A: After all, Julie isn't coming *either* = is she?
 c. #A: After all, Julie isn't coming *too* = is she?
- (20) a. #Jane isn't coming *either*, by any chance = is she?
 b. Jane isn't coming *too*, by any chance = is she?

When the anchor includes a PPI, the negation receives a “non-standard” interpretation. On this reading, postnuclear tag questions are no longer biased questions, but rather neutral, information-seeking questions as established in (20b). That this really is a neutral question is supported by the fact that the anchor in these cases no longer passes the assertion diagnostics, as shown in (19c).⁹

⁹The correlation between the type of polarity item in the anchor and the interpretation of the negation is a more subtle matter than the discussion above lets on. In particular, while PPIs in negative anchors *always* appear to coerce a neutral interpretation, some NPIS also appear to be consistent with this reading. Strong NPIS such as *lift a finger*, *budge an inch*, etc. only occur in biased tag questions, while weak NPIS like *any* or *ever* occur in both neutral and biased tag questions. The examples in (i) – (vi) (from the web) illustrate this ambiguity. The examples in (i), which contain the positively sensitive determiner *some*, are neutral questions. The examples in (ii), which contain the negatively sensitive *any*, are biased.

- (i) a. Yo momma doesn't have some kind of learning disability does she? Cause I didn't mean to come down so hard on her.
 b. She doesn't have some weird disease does she? Is it just from being outdoors?
- (ii) a. Man, she doesn't pull any punches, does she?
 b. Gee, Manniston doesn't accept any responsibility for anything does she?

Ladd (1981) notes that the licensing of polarity items in nuclear tag questions is predictable from the morpho-syntactic and semantic properties of the anchor alone: negative polarity items are licensed in negative anchors and positive polarity items are licensed in positive anchors (and never vice versa). The same observation holds of positive-anchor postnuclear tag questions: PPIs are licensed and NPIS are not. As was just shown above, however, the expected distribution of polarity-sensitive lexical items in negative-anchor postnuclear tag questions breaks down and both NPIS and PPIs are felicitous. It is not simply the case that both NPIS and PPIs are licensed, however, but that both occur in negative anchors of postnuclear tag questions with a concomitant difference in interpretation.

Previous descriptions are vague on what this interpretive difference is. Ladd (1981), McCawley (1988) and Huddleston and Pullum (2002) note that the neutral use of a tag question requires postnuclear prosody and a negative anchor. Sadock's

The tag questions with *any* in (iii) and (iv), however, are neutral questions (an interpretation supported by the fact that they receive relatively neutral responses).

- (iii) a. She doesn't owe you any money does she?
b. Well, no.
- (iv) a. A: She doesn't have any cats, does she?
b. B: None that I know of, Nardo. But just to be safe, we won't be calling her to cat-sit you guys, okay?

The weak NPI *ever* has a similar distribution. The tag questions in (v) have a natural biased reading (especially (vb), which has no plausible neutral reading supposing that the speaker really believes that Adam is a "he" and is familiar with basic reproductive biology). The examples in (vi), on the other hand, have neutral readings (at least according to my intuitions).

- (v) a. Diehl hasn't ever missed a start, has he? The guy is NEVER hurt (knock on wood).
b. Adam hasn't ever been pregnant, has he?
- (vi) a. Crookshanks hasn't ever eyed Hedwig or Pigwidgeon has he? If not, that might support the Arnold-isn't-all-he-appears theory....
b. Joe O'Cearuill from Arsenal hasn't ever declared for Ireland has he?

It is interesting to note that interrogative sentences that contain *any* and *ever* are also ambiguous between biased and neutral interpretations which are correlated with an intonational difference (see Chapter 5)

diagnostics as applied above verify these observations, but little or no discussion of the semantics of the negation in the neutral reading is offered. Ladd (1981) suggests that postnuclear prosody affects the scope of negation. Neutral tag questions, Ladd states, involve an “outside-negation” semantics, that is the negation is in some sense outside of the proposition expressed by the anchor. McCawley (1988) also assigns the negation in neutral tag questions a special status. Specifically, he argues that it is “fake negation”, i.e. an “instance of *n’t* that doesn’t count as negative for the purposes of syntactic rules that are sensitive to negation (p. 571).” He offers no description of the semantics of “fake negation”, if it has a semantics at all. Neither of these admittedly vague proposals explains why “outside-negation” or “fake negation” allows a neutral reading.

I assume an analysis below in the spirit of Ladd’s, on which the negation in neutral postnuclear tag questions is “outside” of the proposition in which it occurs. This analysis is based on the similarities between Ladd’s description of outside-negation and Horn’s (1989) description of so-called meta-linguistic negation as “in the clause but not of it ” (p. 397). In fact, Ladd’s outside-negation has a number of important properties in common with metalinguistic negation. First, Horn (1989) notes that metalinguistic negation neither licenses negative polarity items nor prohibits positive polarity items. The version of (21) (from Horn 1989) that includes the positively-sensitive determiner *some* is only felicitous when understood as a denial or correction of the implicature associated with (21) that Chris did not manage to solve *all* of the problems, as the continuation makes clear.

- (21) Chris didn’t manage to solve {some/#any} of the problems, he managed to solve all of them.

The version of (21) including *any* sounds contradictory, whereas the alternative does not, suggesting that the negation in (21) is outside of the proposition expressed by

the first clause (if the first clause conveys a proposition at all): rather than *asserting* that Chris did *not* manage to solve some of the problems, the first half of (21) conveys that it is in some sense “incorrect” to *assert* that Chris solved some of the problems. The negation, then, does not form part of the material targeted for denial.

A second property of meta-linguistic negation is its inability to incorporate prefixally (Horn 1989). For our purposes, this means that it is insufficient that the anchor simply count as negative for a neutral reading to be possible. Rather, the anchor must contain the right kind of negative element. For example, the negative adverb *never* in (22) does not license PPIS. Neither can it be understood as a neutral question, despite the fact that the anchor counts as negative as evidenced by the form of the tag in (22).

(22) Brian never ate {any/#some} vegetables, did he?

Given these similarities, I assume that outside-negation is metalinguistic. Furthermore, I assume that the metalinguistic negation of a proposition ϕ , $\sim \phi$, is equivalent to descriptive negation taking wide scope over an assertion operator, i.e. $\neg \text{Assert}(\phi)$. This analysis is standard in three-valued logics with metalinguistic negation and assertion operators (see Bochvar 1981 and also Beaver and Krahmer 2001). Note that this assumption directly captures the fact that the anchor of the postnuclear tag question in (19c) is not asserted, as this is precisely what metalinguistic negation conveys.

3.3.2 Kinds of Questions

§3.3.1 drew a broad distinction between biased questions, i.e. those that assert some proposition, and neutral questions. Sadock’s diagnostics established that nuclear tag questions and some postnuclear tag questions consist of both an *assertion* and a *question*, and are therefore biased on the characterization of bias adopted throughout

the thesis. The remaining postnuclear tag questions do not involve an assertion and are therefore neutral. In the current section, I discuss biased and neutral readings in more detail, drawing a distinction *within* the class of biased tag questions correlated with final tune and based on the speaker's degree of belief in the anchor and his intention in asking the question associated with the tag.

Two Kinds of Biased Tag Question

Tag questions convey a varying strength of bias depending on the direction of the pitch contour on the tag. Falling intonation over the tag conveys a strong bias toward the proposition expressed by the anchor, as in (1b). Rising intonation, on the other hand, normally conveys some doubt or uncertainty on part of the speaker regarding the truth of the anchor and, as a result, is associated with a weak bias, as in (1a). Furthermore, the questions associated with falling and rising tag questions have distinct discourse functions related to the strength of bias. As described in the introduction, falling intonation tag questions ask for *acknowledgement* of the anchor from the addressee, while rising intonation tag questions ask for *confirmation* (Rando 1980, Huddleston and Pullum 2002, *inter alia*).

Huddleston and Pullum (2002) note that acknowledgement readings are common when the anchor is uncontroversial given world knowledge and the contents of the common ground. For instance, the tag questions in (23) and (24) (from the Santa Barbara Corpus of Spoken English) provide the speaker's evaluation of or commentary on a situation, and are therefore unlikely to be objected to by the addressee. In (23), for example, the interlocutors are responding to a loud noise in the environment. From (23a) and (23b) it is clear that both interlocutors heard the noise. The tag in (23c), therefore, simply seeks acknowledgement of the speaker's evaluation of the proximity of the noise to her house, which it receives in (23e).

(23) a. DAN: ...What the hell is that.

- b. JENNIFER: ... I don't know.
- c. ENV: [RUMBLING NOISE]
- d. JENNIFER: ... That sounds like it was right in front of my house, doesn't it.
- e. DAN: ..Yeah, it does.

The examples in (24) provide additional illustration. In each case, the anchor offers the speaker's evaluation of some relevant situation or state of affairs.

- (24)
- a. It's a royal mess, isn't it.
 - b. I mean he was a pretty wild guy, wasn't he.
 - c. I don't know the half of it, do I.
 - d. ... Well that's interesting, isn't it.

It would be odd for an addressee to reply to any of the tag questions in (24) with a short answer that disconfirms the anchor. If the addressee wanted to object to the speaker's evaluation, an indirect response is required, e.g., *Well, its not THAT messy.*

While the main rhetorical function of a falling tag is for the addressee to acknowledge the truth of the anchor, other, more subtle contextual inferences, are often discernible. For example, the falling tag in (25a) (from Huddleston and Pullum 2002) can convey an implicit request for an explanation.

- (25)
- a. You're up early this morning, aren't you.
 - b. I was right all along, wasn't I.

Likewise, (25b) is not only a request for the addressee to acknowledge the truth of the anchor, but for him or her to accept a proposition that they did not previously accept. I leave these added implicatures aside below and instead focus on the core

discourse function of falling tags, viz. request for acknowledgment.

In the formal analysis developed in §3.4, acknowledgment questions result when the tag is related to the anchor with the SDRT relation *Acknowledgement_q*. This relation is defined in terms of the relation *Acknowledgement*, discussed in Asher and Lascarides (2003). An utterance acknowledges another if it indicates that the communicative goal of the utterance it targets has been accepted or achieved. Acknowledgement questions are similar: *Acknowledgement_q* relates two discourse segments α and β just in case the answer to β entails that the communicative goal of α has been accepted or achieved. The normal communicative goal of an assertion is belief transfer, i.e. that the addressee add the proposition conveyed by the assertion to his or her own set of beliefs.

Tag questions with rising intonation are also biased toward the truth of the anchor. However, it is a weaker bias, as some doubt or uncertainty is expressed. Consider the constructed dialogue in (26).

- (26) a. A: Can Julie do it for us?
 b. B: Julie isn't here, / is she?
 c. A: She snuck in this morning.

B answers (26a) by asserting that Julie is not present, but the final rise yields only a weak assertion. Intuitively, the tag is a request for confirmation: the speaker has a hunch that Julie is not in and requests evidence for or against this hunch. (27) provides another example from the SBCSAE. Note that Fran's turn in (27a) suggests that her building is not new, contrary to a prior belief held by Sean. His tag question in (27c), then, is naturally understood as a request for confirmation of this belief, in the face of apparent counterevidence.

- (27) a. FRAN: ...the neighborhood's probably the same, since it's a district

and they won't let em tear anything down.

- b. FRAN: You could find your way around except that –
- c. SEAN: Your building's new. Isn't it?
- d. FRAN: No. My building's old.

On the basis of the examples in (26) and (27), I model confirmation questions as requests for evidence (or counterevidence). On this reading, the anchor is only weakly asserted, often because there is contextual evidence against it, and answers to the tag are expected to add weight (or subtract weight as the case may be) to the weakly asserted proposition. The response in (26c), for example, provides evidence *against* the anchor, as does Fran's response in (27d). I define an SDRT relation *Confirmation_q* in §3.4.2 that attempts to capture these intuitions.

This discussion might appear to suggest a one-to-one mapping between final tone and the discourse function of tags. As already mentioned, this assumption forms part of many descriptions and analyses of tag questions. Oehrle (1987) and Kay (2002), for example, both assume some version of it. However, there is ample reason to doubt that such a strict correlation exists. The ineffability of intonational meaning, in particular, is reason enough to consider such a clear correlation between intonation and interpretation to be untenable. Rising intonation on a declarative, for instance, may indicate that the utterance is intended as a question (Gunlogson 2003) or that the speaker is uncertain about the truth of the proposition expressed by the declarative (Šafářová 2005). It may also function as an indicator of politeness (Brown and Levinson 1978) or a marker of “non-finality” (Pierrehumbert and Hirschberg 1990). The main point is that the exact interpretive contribution of an intonation contour is highly context dependent.

Furthermore, there is empirical evidence that shows that it is incorrect to assume that rising intonation is always correlated with requests for confirmation. Table 3.2 reports the results of a small corpus study of reversed-polarity tag ques-

	<i>acknowledgment</i>	<i>confirmation</i>	<i>neutral</i>	TOTAL
fall:	15	1	0	16
rise:	9	10	1	20
TOTAL	24	11	1	36

Table 3.2: The association of final tune and discourse function in English (reversed polarity) tag questions.

tions in spontaneous speech. 36 tag questions in total were extracted from parts II and IV of the Santa Barbara Corpus of Spoken American English (Du Bois et al. 2003, Du Bois and Englebretson 2005). Of these, 20 have final rising intonation. Of these 20, only half were clearly requests for confirmation. Nearly as many are categorized as acknowledgement questions, while one was a neutral tag question. This data mitigates against an analysis that treats intonation as a function from a semantic object to a specific illocutionary act, as Oehrle (1987) and Kay (2002) assume. On the other hand, there does appear to be a correlation between falling intonation and the use of tags as requests for acknowledgment. 15 out of 16 falling intonation tag questions in the corpus were acknowledgement questions.

How are we to make sense of the data in Table 3.2? I believe that much of it can be explained by assuming that falling intonation is the unmarked member of an opposition in a closed system. Following Gunlogson (2003), I distinguish rising from non-rising intonation. I assume that final rises contribute information about the speaker’s cognitive state (as discussed in more detail below), while non-rising intonation contributes no information beyond that normally conveyed by the utterance it is associated with. I show in §3.4.1 that the acknowledgement reading of tag questions follows from the compositional semantics of the anchor and tag and the axioms

of cognitive modelling. No further information about the speaker's cognitive state is necessary. In §3.4.2, I show how the information contributed by rising intonation *blocks* the inference that the tag is related to the anchor with *Acknowledgement_q*. Thus falling intonation tag questions are requests for acknowledgement because of the semantics of the anchor and tag. Rising intonation contributes additional information, leading to additional implicatures about the discourse function of the tag.

Note that while rising intonation tag questions are not normally requests for confirmation, requests for confirmation are normally rising intonation tag questions. I take this as evidence that information flows from the speaker's intentions to linguistic form, rather than vice versa. That is, if the speaker wants to convey a confirmation question, then he should use rising intonation. However, he may still convey an acknowledgement question with rising intonation, if he has some reason for doing so, e.g. for the sake of politeness. Again, more details about this analysis are provided in §3.4.

Neutral Tag Questions

As I argued in §3.3.1, tag questions sometimes function as neutral requests for information. The dialogue in (28) provides the kind of discourse context where a neutral reading is natural. (29) is a naturally occurring dialogue from the SBCSAE. Julie's turn in (29c) is intuitively an neutral request for information.

- (28) a. A: We need someone who has consulted for us before.
 b. B: Julie isn't here = is she?
- (29) a. JULIE: And I sent in the Arab papers to be transferred to my name.
 They haven't been transferred since nineteen-seventy-seven. I don't
 know how many owners she's had. But it hasn't –

- b. GARY: Wow.
- c. JULIE: You don't remember the name of the people you bought her from. Do you?
- d. GARY: No, but then that's not unusual.

While tag questions like (28) and (29) are neutral questions, there is often a subtle contextual bias toward the positive answer. As Huddleston and Pullum (2002) note, this subtle positive bias often has an “emotive” feel to it. For instance, the examples in (30) are neutral in so far as the speaker does not commit himself to a particular answer, yet convey a *fear* that the positive answer is true. Ladd (1981) makes the same observation when he describes (31) as having a “worried anti-nuke” reading.¹⁰

- (30) a. It isn't raining again, = is it?
- b. It isn't my turn already, = is it?
- (31) They haven't restarted TMI already = have they?

This emotive bias does not always convey a *fear* that the positive answer is true, as in (28b), so an analysis must allow a range of speaker attitudes toward the positive answer. The existence of this attitude is consistent with the current analysis of neutral tag questions as containing metalinguistic negation in the anchor: conveying that one is not asserting ϕ at the very least introduces ϕ as a topic under discussion or suggests that ϕ is salient in some sense.

¹⁰Three Mile Island, or TMI, is a nuclear powerplant in Pennsylvania that suffered a partial core meltdown in 1979.

3.4 Computing Discourse Function

In the current section, I provide an analysis of English tag questions as outlined above. Recall that I assume that the interpretations of tag questions correlated with final intonation are best captured in terms of the rhetorical relation that links the tag to the anchor. The discourse segment π associated with a nuclear tag question, for instance, consists of two sub-segments π_a and π_t for the anchor and tag respectively. The task at hand is to compute the relation R that links π_t to π_a based on the grammatical features of both the anchor and tag, especially intonation. Postnuclear tag questions, I assume, introduce a single label π that is assigned a complex speech act type $\text{ASSERTION} \bullet \text{QUESTION}$. Computing the rhetorical connection between the assertion and the question proceeds in the same way as with nuclear tag questions.

I begin by discussing acknowledgment questions. I argue that these can be understood on basis of the semantics of tag questions alone, once a precise definition of acknowledgement questions is provided. I then proceed to show how the contribution of a final rise blocks the default inference to acknowledgment. Finally, I discuss how the neutral reading of tag questions is calculated.

3.4.1 Acknowledgement Questions

As discussed in §3.3.2, falling intonation nuclear tag questions and postnuclear tag questions that do not contain a metalinguistic negation are by default understood as requests for acknowledgement. On this reading, the expected answer to the tag entails that the addressee has adopted the communicative goal, or SARG , of the anchor. Acknowledgement questions result when the discourse relation Acknowledgement_q links the label associated with the tag to the label associated with the anchor. The glue logic axiom used to infer Acknowledgement_q is provided in (32). This axiom also models the semantics of the relation.

(32) **Axiom on Acknowledgement Questions:**

$$(?(\alpha, \beta, \lambda) \wedge \text{SARG}(\alpha, \phi) \wedge \text{Answer}(\beta, p) \wedge (\mathcal{B}_{H(\alpha)}(p) > \mathcal{B}_{H(\alpha)}\phi)) > \\ \text{Acknowledgement}_q(\alpha, \beta, \lambda)$$

(32) states that if a question β attaches to α within the discourse segment λ and the answer to β defeasibly entails the SARG ϕ of α , then normally β attaches to α with the relation Acknowledgement_q .

In the absence of information to the contrary, tags are interpreted as requests for acknowledgement, as the antecedent to (32) follows from the axioms of the logic of cognitive modelling and the compositional semantics of the anchor and tag alone. In particular, there is no need to appeal to extra-linguistic information. Furthermore, I assume that falling intonation contributes no information to interpretation.

To illustrate the mechanics of the analysis, I restrict my attention to tag questions occurring in veridical discourse contexts. Thus, if τ is the SDRS for the discourse at the point where the tag is interpreted, and K_a is the content of the anchor, then τ entails K_a . The constructed dialogue in (33) provides an example of the kind of discourse context I have in mind.

- (33) a. A: (π_0) Don't worry about the meeting.
b. A: (π_1) After all, Jane will be there, / (π_2) won't she.

I assume here that (33b) is a nuclear tag question (though as I argue below this assumption is not essential). As a result, syntactic, semantic and phonological information indicate the presence of two speech act referents π_1 and π_2 for the anchor and tag respectively. π_1 attaches to π_0 with a veridical relation, viz. *Explanation**.¹¹ In other words, π_1 explains why *A* wants to see to it that the addressee (call her *B*) not worry about the outcome of the meeting, viz. because Jane will be there (thus

¹¹ *Explanation** is a “meta-talk” relation, which relates α and β if β explains why $S(\alpha)$ has the SARG of α (Asher and Lascarides 2003).

ensuring success). Furthermore, I assume that π_1 occurs within a veridical segment of the discourse. That is, the smallest discourse segment that contains π_1 is not an argument to a nonveridical discourse relation like *Consequence* or *Alternation*.

With these background assumptions in place, what needs to be established is that the instance of **Axiom on Acknowledgement Questions** in (34) follows from the meaning of the tag question (as discussed in §3.2.1).

- (34) a. $(?(\pi_1, \pi_2, \pi) \wedge$
 b. $\text{SARG}(\pi_1, \mathcal{B}_B(p_{\pi_1})) \wedge$
 c. $\text{Answer}(\pi_2, p_{\pi_1}) \wedge$
 d. $(\mathcal{B}_B(p_{\pi_1}) > \mathcal{B}_B \mathcal{B}_B(p_{\pi_1}))) >$
 e. $\text{Acknowledgement}_Q(\pi_1, \pi_2, \pi)$

(34) follows from (32) by substituting π_1 , π_2 and π for α , β and λ respectively, and substituting $\mathcal{B}_B(p_{\pi_1})$ and p_{π_1} for ϕ and p respectively. In plain English, suppose that:

- the tag (labeled π_2) attaches to the anchor (labeled π_1) with some unspecified discourse relation [(34a)];
- the speech act related goal of π_1 is that B believe the proposition it conveys, i.e. p_{π_1} [(34b)];
- the proposition p_{π_1} is an answer to π_2 [(34c)]; and
- believing the answer to π_2 defeasibly entails believing that the SARG of π_1 has been achieved [(34d)].

Then it defeasibly follows that:

- the tag is related to the anchor with Acknowledgement_q [(34e)].

Establishing the validity of (34) is a straightforward task. (34a), for example, follows from the anaphoric dependence between the tag and the anchor described in §3.2.1. The tag must attach to *LAST*, i.e. the anchor, given SDRT’s assumptions about anaphoric accessibility. (34b) is the SARG associated with declarative sentences by the axiom **Indicative Related Goals**. Simply put, declarative sentences that attach to the discourse context with a right-veridical relation, such as *Explanation**, normally have as a goal that the addressee believe the proposition conveyed by that sentence.

(34c) follows from the meaning of the anchor and tag as described in §3.2.1. That is, given how the anaphoric elements of the tag are resolved, the anchor will by definition be an answer to the tag. One can go a step further and note that *B* (the interpreter) can infer that *A* believes that p_{π_1} is the true answer to π_2 . First, since *A* asserts π_1 , *B* infers from **Sincerity** that $\mathcal{B}_A(p_{\pi_1})$. Second, since the interpretation of tag questions is a matter of linguistic competence, it is mutually believed by *A* and *B* that $\text{Answer}(\pi_2, p_{\pi_1})$. As a result, *B* believes that *A* believes that p_{π_1} is the true answer to π_2 . This is important because we are trying to show that *B* can infer that *A* believes the antecedent to the instance of **Axiom on Acknowledgement Questions** in (34).

Finally, (34d) is simply a theorem of the logic of cognitive modelling. The belief operators $\mathcal{B}_A, \mathcal{B}_B, \dots$ are, at least, K45 modalities. The formula in (34d) is an instance of the 4 axiom (positive introspection): if an agent believes that ϕ is the case, then they believe that they believe ϕ is the case.

In the absence of more specific information, then, *B* infers that π_2 is linked to π_1 with Acknowledgement_q . No deep reasoning about cognitive states was required – each of the inferences above being based on the form of *A*’s utterances and the assumption that the linguistic competence required to compute the denotation of the anchor and tag is mutually believed by *A* and *B*. Nor was any situation specific

information or general world knowledge necessary.

The derivation proceeds in a similar fashion for postnuclear falling intonation tag questions. In these cases, I assume that the label associated with the tag question as a whole, say π_1 , is assigned a complex speech act type $\text{ASSERTION} \bullet \text{QUESTION}$ by the grammar. It is assumed that glue logic formula of the form $?(\pi_0, \pi_1, \pi)$ require π_1 to have a simple type. Because π_1 is assigned a complex type, a type clash emerges. This clash is resolved with the rule **Dot Exploitation**, which introduces two new labels linked back the original label π_1 via the relation *O-Elab* , or “dot elaboration”:

$$O\text{-Elab}(\pi_1, \pi_a) \wedge O\text{-Elab}(\pi_1, \pi_t)$$

π_a : ASSERTION provides the contribution of the anchor and π_t : QUESTION provides the contribution of the tag. The coherence constraint on complex types (see Chapter 2) requires that a rhetorical link between π_a and π_t be computed. The same reasoning that was used to infer Acknowledgement_q in the case of nuclear tag questions applies in the postnuclear case, as well.

This account of the interpretation of falling intonation tag questions captures their strong bias. Because Acknowledgement_q links π_1 to π_2 in (33b), an answer that is inconsistent with the proposition conveyed by the anchor does not count as an answer to the tag, in the extended discourse based sense of answerhood, despite the fact that this proposition is *semantically* an answer. This follows because such an answer does not entail that the SARG of the anchor has been achieved. This does not imply that a positive response is impossible, but it will have to correct A ’s belief that the anchor is true.

3.4.2 Confirmation Questions

The previous section argues that tags are by default linked to anchors with the relation Acknowledgement_q . I now show how the meaning contribution of rising

intonation blocks this interpretation. Furthermore, rising intonation on the tag results in a weak assertion of the anchor. This weak assertion is necessary, I argue, for interpreting tag questions as requests for confirmation.

Final Rise Blocks *Acknowledgment_q*

In order to show that rising intonation blocks the default inference that tags are related to their anchors with the relation *Acknowledgment_q*, I must first say what information rising intonation contributes to the interpretation of an utterance. I propose here a modification of the analysis of final rises in Nilsenová (2006) (see also Šafářová 2005). Nilsenová argues that final rises contribute an expression of epistemic uncertainty, an idea she formalizes using the diamond operator from Veltman’s update semantics (Veltman 1996). On this analysis, final rises contribute a propositional operator to the interpretation of an utterance. In other words, the expression of epistemic uncertainty contributed by rises is part of the semantic content of the utterance. While I agree with Nilsenová that final rises express uncertainty, I disagree with her on where this information should be incorporated. I assume that intonation contributes information about the speaker’s attitude toward some proposition and its relation to the common ground with respect to the present situation, rather than about the state of the world. This analysis is based on Faller’s (2006) analysis of the evidential system in Cuzco Quechua. She argues that evidential morphemes provide information about the speaker’s cognitive state, rather than about semantic content. This analysis closely resembles Vanderveken’s (1990) suggestion that intonation provides information about the strength of the sincerity condition associated with a given illocutionary act. Thus, rising intonation contributes information to the logic of cognitive modelling, as encoded by the the sincerity axiom in (35).¹²

¹²Recall from chapter 2 that the core proposition of an utterance is that proposition which remains after removing any indicators of sentence mood.

(35) **Sincerity (Final Rise):**

$$\text{RISE}(\alpha) > \mathcal{B}_{S(\alpha)}(\Diamond \text{core_proposition}(p_\alpha))$$

Sincerity (Final Rise) states that if an utterance α has rising intonation, then $S(\alpha)$ normally believes that the proposition p_α is epistemically possible. $\Diamond\phi$ is true at a world w iff ϕ is true in at least one of the speaker's belief alternatives:

- $\llbracket \Diamond\phi \rrbracket^{M,f}(w) = 1$ iff there is a w' such that $wR_\Diamond w'$, $\llbracket \phi \rrbracket^{M,f}(w') = 1$

With these assumptions in place, it is possible to show that rising intonation blocks the default interpretation of the tag. Consider the nuclear tag question in (36). The anchor provides an answer to the *wh*-question in (36a). As a result, the right-veridical relation *QAP* (Question-Answer Pair) relates π_1 to π_0 .

- (36) a. B: (π_0) Who is available to review this article?
b. A: (π_1) Jane is available, / (π_2) isn't she?

(37) shows the SDRS for the dialogue in (36) at the point where the rhetorical contribution of the tag needs to be computed. (37) contains the information that the tag π_2 is related to the anchor π_1 , though exactly how they are related is left underspecified. In addition, (37) introduces a condition on the label π_2 , viz. that it has rising intonation. This information makes its contribution to the interpretation of the dialogue indirectly via cognitive modelling. Note that the core proposition of the tag π_2 is the negation of the DRS K_{π_1} of the anchor (or more precisely, an alphabetic variant of K_{π_1}).

$$(37) \quad \pi : \begin{array}{|l} \pi_0 \quad \pi_1 \quad \pi_2 \\ \hline \pi_0 : K_{\pi_0} \quad \pi_1 : K_{\pi_1} \\ QAP(\pi_0, \pi_1) \\ \pi_2 : Q(\neg K_{\pi_1}) \quad \text{RISE}(\pi_2) \\ ?(\pi_1, \pi_2) \end{array}$$

How does rising intonation on the tag in (36b) block the instance of **Axiom on Acknowledgement Questions** in (34). It is useful in answering this question to discuss the interpretation of the anchor and the tag separately. Lemma 3.4.1, for example, establishes *A*'s intention behind the anchor. This result follows directly from **IRG** and **SARGs to Intentions**. Most importantly, since $QAP(\pi_0, \pi_1)$ and $\text{veridical}(QAP)$, the SARG of π_1 is that the addressee believe the proposition p_{π_1} . (Γ contains the axioms of the logic of cognitive modelling.) In plain English, Lemma 3.4.1 establishes that *A* intends to see to it that *B* believe that Jane is available to review the article.

Lemma 3.4.1. $\Gamma, \text{Info}(\tau), \text{Done}(\text{Say}(\pi_1)) \vdash \mathcal{I}_A(\delta\mathcal{B}_B(p_{\pi_1}))$

Proof:

$$1. \text{SARG}(\pi_1, \mathcal{B}_B(p_{\pi_1})) \quad \text{IRG}$$

$$2. \mathcal{I}_A(\delta\mathcal{B}_B(p_{\pi_1})) \quad 1; \text{SARGs to Intentions}$$

□

Lemma 3.4.2 establishes that *A* intends to see to it that *B* believe that Jane is *not* available. This follows from the contribution of the final rise as assumed in **Sincerity (Final Rise)** and the fact that the consequences of one's intentions are also intended (as specified by **Intentions and Defaults** from Chapter 2). In

other words, a consequence of saying π_2 with rising intonation is that B believes that possibly not p_{π_1} . Therefore A intended for B to believe this.

Lemma 3.4.2. $\Gamma, \text{Info}(\tau), \text{Done}(\text{Say}(\pi_2)), \text{RISE}(\pi_2) \vdash \mathcal{I}_A(\delta\mathcal{B}_B(\Diamond\neg p_{\pi_1}))$

Proof

- | | |
|--|----------------------------|
| 1. $\mathcal{B}_A(\Diamond\neg p_{\pi_1})$ | Sincerity (Final Rise) |
| 2. $\mathcal{B}_B(\Diamond\neg p_{\pi_1})$ | 1; Competence |
| 3. $\mathcal{I}_A(\text{Say}(\pi_2)) > \mathcal{I}_A(\delta\mathcal{B}_B(\Diamond\neg p_{\pi_1}))$ | 2; Intentions and Defaults |
| 4. $\mathcal{I}_A(\text{Say}(\pi_2))$ | Rationality of Action |
| 5. $\mathcal{I}_A(\delta\mathcal{B}_B(\Diamond\neg p_{\pi_1}))$ | 3; 4; DMP |

□

Lemmas 3.4.1 and 3.4.2 are incompatible. Because the propositions p_{π_1} and $\Diamond\neg p_{\pi_1}$ are inconsistent, the speaker cannot rationally expect the addressee to include both in his or her set of beliefs. Inconsistent intentions are excluded formally by the axiom **Admissable Intentions** (Cohen and Levesque 1990), which states that an agent can not simultaneously intend two inconsistent actions.

- **Admissable Intentions:**

$$(\mathcal{I}_A(a) \wedge \mathcal{B}_A(\text{Done}(a) > \neg\text{Done}(b)) > \neg\mathcal{I}_A(b))$$

The effect of **Admissable Intentions** is to block the inferences in Lemmas 3.4.1 and 3.4.2. This blocking effect results from an inference pattern in the non-monotonic logic that underlies \vdash known as the Nixon Diamond (Reiter 1987, Asher and Morreau 1991). Nixon Diamond states that if the antecedents of two conflicting defaults hold and neither is more specific than the other, then the consequent of

neither default follows.¹³ Schematically:

$$A > B, C > \neg B, A, C \not\models B$$

$$A > B, C > \neg B, A, C \not\models \neg B$$

This appears to be the situation that holds with respect to 3.4.1 and 3.4.2. All of the premises of the two derivations hold, neither set of premises is more specific than the other and **Admissable Intentions** ensures that the consequences are inconsistent. So in the absence of more specific information one cannot infer that the speaker has either of the intentions derived above. Most importantly, if we cannot infer that the speaker intends for B to believe p_{π_1} then we cannot infer that (34b) holds. As a result, it does not immediately follow that the tag functions as a request for acknowledgement.

Having blocked the default interpretation of the tag, I now need to address how tags come to be interpreted as requests for confirmation. In addition, I need to explain how rising intonation tag questions can still be understood as acknowledgement questions. Recall from Table 3.2 that roughly half of rising intonation tag questions were interpreted in this way. The contribution of rising intonation plays an important role in both cases.

Rising Intonation, $Confirmation_q$, and Politeness

I begin by discussing the interpretation of tag questions as confirmation questions. In §3.3.2, I argued that confirmation questions weakly assert the proposition conveyed by the anchor. This weak assertion follows from the contribution to cognitive modelling of rising intonation. In the dialogue in (36), for example, B infers from the

¹³For example, from the premises that *Republicans are normally nonpacifists*, *Quakers are normally pacifists*, *Dick is a republican* and *Dick is a Quaker*, we cannot infer either that *Dick is a nonpacifist* or that *Dick is a pacifist*.

speaker's use of a final rise on the tag that $\mathcal{B}_{S(\pi_2)}(\Diamond \neg p_{\pi_1})$ via **Sincerity (Final Rise)**. Further scalar reasoning results in the implicature that $\mathcal{B}_{S(\pi_2)}(\neg \Box \neg p_{\pi_1})$, which is equivalent to $\mathcal{B}_{S(\pi_2)}(\Diamond p_{\pi_1})$. In other words, if the speaker believes only that it is *possible* that Jane is not available, then she is not *certain* that she is not available. Equivalently, the speaker believes that it is *possible* that Jane *is* available. It is this implicature, I argue, that produces the weak assertion of the anchor. So although the anchor yields a commitment to the proposition conveyed by the anchor (through the default alignment of declarative sentences with assertions), it is a weakened commitment.

This weak assertion is important for inferring *Confirmation_q*. The intuition is that the answer to a confirmation question should somehow affect the probability that the speaker assigns to some antecedent proposition, either by increasing or decreasing the probability that the anchor is true. In other words, an answer to a confirmation question should be in some sense *relevant* to the proposition to which the question is attached. A consequence of this analysis, is that the probability of the proposition to which a confirmation question is attached should never be 1 or 0, or at the very least the person seeking confirmation should not *present* it as if he were certain of its truth or falsity. If the speaker is certain that the targeted proposition is true, there is no reason to seek confirmation. Following Carnap (1950), I define a notion of relevance in a discourse τ :¹⁴

- *relevant_τ*(p_α, p_β) iff either $P_\tau(p_\alpha/p_\beta) > P_\tau(p_\alpha)$ or $P_\tau(p_\alpha/p_\beta) < P_\tau(p_\alpha)$.

In other words, p_β is relevant to p_α if the probability of p_α given p_β is either greater than or less than the prior probability of p_α . With this auxiliary notion in hand, I define the glue logic axiom for inferring *Confirmation_q* in (38).

(38) **Axiom on Confirmation Questions:**

¹⁴There other measures of relevance which may be useful to investigate, see van Rooy (2004) for a detailed discussion.

$$(?(\alpha, \beta, \lambda) \wedge \text{Answer}(\beta, p) \wedge \text{relevant}_\top(p_\alpha, p)) > \text{Confirmation}_q(\alpha, \beta, \lambda)$$

Since the anchor in (36b) in effect only asserts that it is *possible* that Jane is available (given the scalar reasoning described above), direct answers to the polar question denoted by the tag, viz. that Jane is available or that Jane is not available, will both affect the probability of the anchor, bumping it up to 1 or down to 0. The final rise plays a pivotal role in this inference. First, it blocks the default inference to *Acknowledgement*_q. Second, it produces a weak assertion of the anchor, which was crucial to inferring *Confirmation*_q. In sum, then, a rising intonation tag question weakly asserts the anchor – the speaker expects that the anchor is true but has some doubt – and asks the addressee for possible evidence or counterevidence.

However, not all rising intonation tag questions are requests for confirmation. Recall that nearly half of the rising tag questions in Table 3.2 were acknowledgement questions. How do we account for these uses? In discourse contexts where the speaker is in a position of authority the addressee may interpret rising intonation differently, e.g. as a negative politeness strategy. In the analysis of politeness in Brown and Levinson (1978), asserting a proposition ϕ is an intrinsically face threatening act (FTA), especially regarding negative face, as it forces the addressee to either accept or reject the assertion, thereby threatening the speaker’s positive face. In other words, an assertion imposes some future action on the addressee. This is why falling intonation tag questions can sometimes sound rude or even have the force of a command, as in (39).¹⁵

(39) You will be at the lecture, won’t you.

Acknowledgement questions as analyzed above are no more than an imposition upon the addressee by the speaker to accept the proposition conveyed by the anchor. Given this analysis, (39) commits the the addressee to a future action, viz. attending

¹⁵This example was brought to my attention by an audience member at Sinn und Bedeutung 11.

the lecture, thereby threatening his negative face, i.e. his desire not to be imposed upon (Brown and Levinson 1978).

As described above, by using rising intonation on the tag the speaker conveys only a weak belief in the truth of the anchor. Thus the speaker suggests that some of his belief alternatives are ϕ worlds and some are $\neg\phi$ worlds. As noted above, if it is reasonable to assume that the speaker is an authority with respect to ϕ , the addressee may interpret the weak assertion as a negative politeness strategy. For example, the speaker does not want to force the addressee to accept a proposition that he or she may not be prepared to accept. He therefore conveys that it is an open issue whether this proposition is true or false, thereby allowing the addressee to reject the proposition (if he wants) while minimizing the perceived loss of positive face to the speaker. The upshot of this discussion is that if the addressee interprets the rising intonation as a politeness strategy, he may assume that the speaker's intention in uttering the anchor is the one in Lemma 3.4.1. This in turn opens up the possibility that the tag is interpreted as a request for acknowledgement as described in 3.4.1.

Anecdotal evidence for this comes from an examination of a subset of the rising intonation tag questions from Table 3.2. 6 of the 12 rising tag questions from part II of the SBSCAE were categorized as acknowledgement questions. In five of these cases, the dialogue context is a sermon or lecture, i.e. a situation where the speaker occupies a position of authority. In the six rising tag questions classified as confirmation questions, this asymmetric power relationship is less evident. For example, three of the six cases involve task related dialogues in which the participants are acting cooperatively to achieve a common goal. A fourth case involves a face to face conversation in a family setting where the addressee is the speaker's father. Hence, the power structure is the reverse of that in the sermon and lecture contexts.

The analysis presented above improves on many existing analyses of the

correlation between final tune and the interpretation of tags. As mentioned in §3.3.2, most of these analyses assume a one-one mapping between final tune and discourse function. I argued above that this assumption is unrealistic. In the current section, I presented what I hope is a more realistic analysis on which rising intonation contributes default information about the speaker’s cognitive state. Depending on how the interpreter uses this information, rising intonation tag questions may be understood either as requests for acknowledgement or requests for confirmation.

3.4.3 Neutral Tag Questions

Finally, §3.3.2 discussed tag questions that have a neutral reading. That is, in uttering such a tag question the speaker does not commit herself (to any degree) to the proposition conveyed by the anchor. (40b) provides an illustrative example. *A* (on the intended reading) does not commit herself to the proposition that Jane is here in uttering (40b) as a response to (40a). Intuitively, (40b) attaches to (40a) with the relation *Q-Elab*. $Q\text{-Elab}(\alpha, \beta)$ holds just in case the answer γ to β elaborates a plan for achieving $S(\alpha)$ ’s SARG of α . *B*’s SARG in uttering π_0 is to know who is available to review the article, as specified by **QRG**, and both positive and negative answers to the tag question provide this information: a positive answer means Jane is available to review and a negative answer that she is not.

- (40) a. B: We need someone to review this article! (π_0) Who is available?
 b. A: (π_1) Jane isn’t here, = (π_2) is she?

§3.3.1 argued that neutral interpretations are only possible when the tag question has (i) postnuclear phrasing and (ii) a meta-linguistic negation operator in the anchor. How do these grammatical features conspire to admit the neutral reading? First, I assume that meta-linguistic negation is an illocutionary, rather than a propositional, operator. Specifically, I assume that it places a condition on

labels, much like rising intonation. I take metalinguistic negation to indicate that the speaker does not assert the proposition in its scope, as captured by the axiom in (41).

$$(41) \quad \text{METALINGUISTIC-NEGATION}(\alpha) > \neg(\alpha : \text{ASSERTION})$$

The axiom in (41) constrains how the speech act discourse referent to which it applies attaches to the antecedent discourse; specifically, it rules out attachment with a discourse relation that is pertinent to an assertion, i.e. any right-veridical relation. Relations associated with questions, for example *Q-Elab*, *Explanation_q*, etc., are not right-veridical and are therefore consistent with (41). Alternatively, one can think of the contribution of meta-linguistic negation in terms of cognitive modelling. If a discourse segment does not attach with a right-veridical relation then it does not necessarily follow that the speaker believes its propositional content. In the case of tag questions, this means that **Known Answers** will not block the **SARG** of questions from **QRG**, viz. that the speaker know an answer to his question.

What is the relationship between intonational phrasing and neutral interpretations; why can't nuclear tag questions have a neutral interpretation? The answer, I maintain, is related to the role of intonational phrasing in introducing discourse segments. Nuclear phrasing in tag questions forces two speech act discourse referents: one for the anchor and one for the tag. This segmentation is reinforced by the syntactic and semantic assumptions in §3.2. Postnuclear tag questions, on the other hand, are instantiations of the complex speech act type **ASSERTION • QUESTION**. The component types of the complex type are exploited whenever there is a type clash. The glue logic predication $?(\alpha, \beta, \lambda)$, for example, assumes that β has a simple type. In the absence of conflicting information, postnuclear tag questions are interpreted in the same way as nuclear tag questions, i.e. either as acknowledgement or confirmation questions. Neutral uses, however, arise when the anchor contains

a metalinguistic negation, which cancels the assertion per the constraint in (41). Thus, postnuclear phrasing and the presence of a metalinguistic negation operator conspire to admit the neutral reading exemplified by (40b).

3.5 Conclusion

The discussion above argued (i) that tag questions are complex speech acts and (ii) that the interpretation of tag questions follows from the rhetorical connection between tags and anchors. The first point is not new and I provided evidence for it following Sadock (1974). The second point, as far as I can tell, has not been articulated before (at least not precisely). Nonetheless, it is a particularly efficacious characterization, I believe, of the interpretation of tag questions, especially when presented within SDRT.

There are two reasons SDRT is useful in the analysis of tag questions. First, it provides a formal logic for inferring the rhetorical relations between utterances on the basis of their lexical and compositional semantics, the cognitive states of discourse participants and world knowledge. Second, these inferences are defeasible. Given these properties, it's possible to develop a linguistically realistic model of the contribution of intonation to interpretation. I do not claim to have developed a complete model here, but I believe that I have gone some way towards at least demonstrating the feasibility of such a model. The analysis of intonation proposed above does not state hard and fast correlations between certain intonation contours and specific discourse functions (contra the analyses in Oehrle 1987 or Kay 2002). Rather, I argued that rising intonation contributes information about the speaker's beliefs. This information in turn contributes information to the glue logic, *indirectly* determining the discourse function of a given utterance. Although there may be a "core" discourse function associated with rising intonation tags, e.g. requests for confirmation (which is the discourse function commonly assumed), distinct readings

are available (as demonstrated by the data presented in Table 3.2). It is crucial then that the inference that rising intonation tags function as requests for confirmation is defeasible rather than being a monotonic inference (as in the analysis mentioned previously).

In short, in the model of intonational meaning suggested here, the meaning of tunes provides information that (in a specific discourse context) contributes to an implicature that the utterance with which the tune is associated makes a specific rhetorical contribution to the dialogue. This implicature, given the nature of the glue logic, is context dependent (which is modeled by the defeasibility of the inference). Again, while the analysis is certainly not complete, it at least shows the feasibility of the approach. Furthermore, tag questions are an ideal place to develop and test theories of intonation, given the intuitive correlation between final tune and discourse function. However, as demonstrated by the data in Table 3.2, one must temper these intuitions with empirical data.

Chapter 4

Bias in Negative Polar Questions

4.1 Introduction

Negative polar questions (NPQs) like (1) are ambiguous between what Romero and Han (2004) refer to as ϕ and $\neg\phi$ readings (see also Ladd 1981). Briefly, On the ϕ reading, an NPQ is “about” the proposition that Jane is coming and on the $\neg\phi$ reading it is “about” the proposition that Jane is *not* coming.

- (1) Isn't Jane coming?

In addition to the $\phi/\neg\phi$ ambiguity, NPQs convey at least two other speaker biases. Both interpretations, for instance, convey a *positive bias* suggesting that the speaker holds a prior attitude toward the proposition that Jane *is* coming. Furthermore, the $\neg\phi$ -reading appears to require evidence in the discourse context against the proposition that Jane is coming, a *negative*, contextual bias.

One may look upon these facts as either pragmatic or semantic phenomena. van Rooy and Šafářová (2003), for example, provide a pragmatic account in which

the $\phi/\neg\phi$ -ambiguity and other biases are explained on the basis of the speaker's beliefs and preferences. Alternatively, Romero and Han (2004) provide a semantic account of NPQs. They introduce a covert modal operator into the logical form of NPQs which can have either wide or narrow scope relative to negation. The other biases are analyzed as conversational implicatures following from pragmatic principles given the semantic contribution of the operator. I argue in this chapter for an alternative, which is more pragmatic than semantic, yet posits a conventionalized semantic component to ϕ NPQs. Previous analyses have not, to my knowledge, acknowledged this meaning component. Specifically, I argue that ϕ NPQs are assigned a conventionalized complex speech act type **ASSERTION • QUESTION** by the grammar (Asher and Lascarides 2001, 2003). $\neg\phi$ NPQs, on the other hand, have the simple type **QUESTION**. The explanatory value of this assumption is two-fold. First, it accounts for the use of ϕ NPQs as *suggestions* and *denials*, types of **ASSERTION** (Vanderveken 1990). Second, it captures an asymmetry between the biases inherent to ϕ NPQs and $\neg\phi$ NPQs. This assumption is not only justified by its explanatory value, but by a number of supporting empirical observations.

The chapter is organized as follows. First, I discuss data that (i) illustrate the $\phi/\neg\phi$ ambiguity, (ii) establish contextual restrictions on the use of NPQs (Büring and Gunlogson 2000), and (iii) distinguish the positive bias of ϕ NPQs from the positive bias of $\neg\phi$ NPQs. The latter point is especially significant. Any attempt to derive the positive biases of ϕ and $\neg\phi$ NPQs via the same cognitive or linguistic mechanisms misses an important empirical point. Next, I provide a discussion of previous analyses of NPQs. Finally, I develop an analysis of the discourse function of NPQs in SDRT. The correct level of analysis of NPQs, I hope to show, is discourse logical form, rather than the logical form of individual clauses, or simple models of the speaker's beliefs and preferences. Computing the contribution of an utterance to discourse logical form is a pragmatic process, in so far as interpreters apply

extra-linguistic information (in addition to linguistic information) to understanding multi-sentence discourse and dialogue. The analysis below, therefore, is pragmatic. However, I posit a conventionalized semantic distinction between ϕ NPQs and $\neg\phi$ NPQs, as described above. $\neg\phi$ NPQs and positive polar questions, on the other hand, are equivalent, as predicted by most extant theories of the semantics of interrogative sentences (Hamblin 1973, Groenendijk and Stokhof 1984). The contextual distribution of $\neg\phi$ NPQs and PPQs is explained in terms of markedness, as van Rooy and Šafářová (2003) in effect argue.

4.2 Kinds of Bias in Negative Questions

4.2.1 A Quick Survey of the Terrain

Ladd (1981) illustrates the $\phi/\neg\phi$ ambiguity with the question in (2).

(2) Didn't he even vote for Reagan?

First, consider the context in (3). The intuition is that (3c) has a negative bias which may be broadly characterized as epistemic (though see below). The discourse context preceding (3c) suggests that Dick did not vote for Reagan, given his recent political disillusionment. At the same time, (3c) conveys a kind of contrast. One has the impression that *A* previously *believed* that Dick voted for Reagan (or assigned a high degree of likelihood to this proposition). Huddleston and Pullum (2002) refer to this as a positive *epistemic* bias, but note that it may also be deontic – relating to what the speaker feels *ought* to be the case given some system of norms – or bouletic – relating to the speaker's desires. It is possible, for example, though perhaps not very natural, to read (3c) as conveying that the speaker feels Dick *ought* to have voted for Reagan or that he *wanted* Dick to vote for Reagan.

- (3) [A and B are staunch Republicans.]
- a. A: What's Dick been up to these day's? I haven't seen him at the Club for ages.
 - b. B: He says he's disillusioned with two-party-politics; he's joined Common Cause, gave a lot of money to the Citizens' Party,...
 - c. A: Didn't he even vote for Reagan?
 - d. B: Not as far as I know.

As Huddleston and Pullum (2002) observe, these conflicting positive and negative biases convey a contrast between what *now* appears to be the case (given linguistic and situational evidence) and some prior speaker attitude toward a positive proposition (p. 884).

Next, consider the context in (4). The same surface string – shown in (4b) – conveys a positive epistemic bias: the speaker believes that John voted for Reagan without a concomitant negative bias, though there is reason to believe that it is unlikely that John voted for Reagan given the (bracketed) non-linguistic context.

- (4) [A and B are former left-wing activists discussing the recent activities of a colleague.]
- a. A: Did you hear John's decided to go to business school?
 - b. B: Yeah – I can't believe how much he's changed these days – didn't he even vote for Reagan?
 - c. A: That's what somebody told me.

Based on the observations in (3) and (4), Ladd (1981) argues that negative polar questions are syntactically ambiguous. In (3), for example, the negation is part of the descriptive content of the proposition being questioned. That is, the speaker is attempting to ground the information that Dick did *not* vote for Rea-

gan. Ladd dubs these inside-negation polar questions (INPQs). He refers to (4) as an outside-negation polar question (ONPQ), because the negation is “outside” of the proposition being checked, i.e. that John voted for Reagan. Ladd views the ambiguity as a genuine scope ambiguity involving negation, but does not provide any more detail. More recently, Romero and Han (2004) flesh out Ladd’s intuition, positing a hidden operator with respect to which negation can take either wide or narrow scope.

Much of the evidence for a syntactic ambiguity comes from the licensing of polarity-sensitive lexical items in negative questions. Ladd (1981) (and Borkin 1971 before him) observes that including an NPI in a NPQ forces an INPQ reading (5). Including a PPI forces the ONPQ reading (6). As a result, polarity items can be used to force a specific interpretation in a given context.

- (5) a. Didn’t Kim read the report *either*?
- b. Aren’t there *any* vegetarian restaurants around here?
- c. Aren’t you *at all* hungry?
- (6) a. Didn’t Kim read the report *too*?
- b. Aren’t there *some* vegetarian restaurants around here?
- c. Aren’t you *rather* hungry?

In German, the outside-negation/inside-negation distinction has a morpho-syntactic reflex (Büring and Gunlogson 2000). The sentential negation *nicht* and the indefinite article *ein* normally form an amalgamation *kein* (‘no’) (unless *ein* is stressed). Büring and Gunlogson argue that polar questions are the only context in which both *kein* and *nicht ein* occur. When *nicht ein* occurs the question receives an ONPQ interpretation (7a); when *kein* occurs the sentence receives an INPQ reading (7b).

- (7) a. Gibt es *nicht ein* vegetarisches Restaurant in dieser Ecke?
 gives EXPL not a vegetarian restaurant in this corner
- b. Gibt es *kein* vegetarisches Restaurant in dieser Ecke?
 gives EXPL no vegetarian restaurant in this corner

Furthermore, Buring and Gunlogson claim that *nicht ein* never occurs in declarative sentences (8).

- (8) Es gibt *kein* / **nicht ein* vegetarisches Restaurant in dieser Ecke.
 EXPL gives no / not a vegetarian restaurant in this corner

(5), (6) and (7) suggest that there are formal correlates of the outside-negation/inside-negation distinction and arguably mitigate against a purely pragmatic analysis of the ambiguity. This has not prevented people from attempting pragmatic analyses, however. van Rooy and Šafářová (2003), for example, provide a sophisticated pragmatic account of negative polar questions (see below). In the discussion below, I use polarity items to coerce INPQ and ONPQ readings in order to probe the formal properties of the various biases described above.

4.2.2 Contextual Bias

I mentioned above that inside-negation polar questions convey an implicit contrast between positive and negative biases (Huddleston and Pullum 2002). The negative bias in INPQs was described as epistemic, and was argued to contrast with a positive bias. However, I will now argue that this negative bias is best understood as a contextual restriction on the use of polar questions based on their surface syntactic form. Buring and Gunlogson (2000) catalog these restrictions in detail, classifying contexts in terms of the existence or non-existence of *compelling contextual evidence* for or against a proposition ϕ . Contextual evidence, according to Buring and Gunlogson, is information that is mutually available to the discourse participants either by virtue of forming part of the linguistic context or part of the immediate non-

linguistic situation. Evidence for ϕ is compelling if it is reasonable to infer from it that ϕ .

Büring and Gunlogson leave the notion of compelling contextual evidence rather vague. A natural characterization in an SDRT setting is to assume that there is compelling evidence for ϕ in a discourse context, understood as an SDRS τ , just in case τ together with set of reasonable background assumptions Γ defeasibly entails ϕ . In addition, one needs to include situational information in the discourse context, as direct or indirect perceptual evidence for ϕ is also compelling contextual evidence for ϕ (Büring and Gunlogson 2000).

With this notion compelling contextual evidence (or some other suitable alternative), one can characterize discourse contexts in terms of whether or not they are biased toward or against a proposition ϕ , or whether they are neutral with regard to ϕ , as follows:

- **Biased Contexts:**

A discourse context σ is *biased toward* a proposition ϕ iff there is compelling contextual evidence for ϕ ; σ is *biased against* ϕ iff there is compelling contextual evidence for $\neg\phi$.

- **Neutral Contexts:**

A context σ is *neutral* with respect to a proposition ϕ iff there is no compelling evidence in the discourse context either for or against ϕ .

The discourse context in (9), especially as given by *A*'s utterance in (9a), is neutral with respect to the proposition that Jane is coming. A discourse participant can infer many things from (9a), e.g. that George, Mary and Sue are all good syntacticians, but they will not normally infer that Jane is attending the workshop, nor that she is not attending. (9b) and (9c) show that PPQs and ONPQs are felicitous in neutral contexts, while (9d) suggests that INPQs are not.

- (9) a. A: Many good syntacticians are attending the workshop: George, Mary, Sue...
- b. B: Is Jane coming?
- c. B: Isn't Jane coming *too*?
- d. #B: Isn't Jane coming *either*?

One might argue that (9d) is infelicitous for other reasons, viz. that there is no suitable antecedent for the presupposition triggered by *either* that someone besides Jane is not coming. In other cases, the use of an INPQ might trigger an implicature that satisfies the required contextual bias. Consider (10), which to be felicitous requires one to assume that George, Mary and Sue are *not* MIT syntacticians and that *A*'s list is more or less exhaustive.

- (10) B: Aren't *any* of the MIT syntacticians coming?

The discourse context set up by (11a), a neutral information question, is immune to these objections. The INPQ in (11b) is clearly infelicitous in this context, whereas the ONPQ in (11c) is not. (11c) functions as a hedged (partial) answer to (11b), depending on one's semantics for *wh*-questions.

- (11) a. A: Who is coming to the workshop?
- b. #B: Aren't *any* of the MIT syntacticians coming?
- c. B: Aren't *some* of the MIT syntacticians coming?

The discourse context in (12) is biased *against* the proposition that Jane is coming, assuming that it is common knowledge that Jane is a syntactician. Both ONPQs (12c) and INPQs (12d) are felicitous, whereas PPQs (12b) are marked. One might argue that (12b) is relevant for some other reason. For example, although Jane is not a practicing syntactician, she is familiar enough with syntactic theory

to contribute, or perhaps *B* is simply changing the topic. (12c) and (12d), on the other hand, strongly suggest that Jane is a syntactician.

- (12) a. A: Sue isn't attending the workshop, so there will be no syntacticians there.
 b. ??B: Is Jane coming?
 c. B: Isn't Jane coming too?
 d. B: Isn't Jane coming either?

The infelicity of positive polar questions in contexts biased against a proposition is clearly evident in contexts like (13), where there is situational evidence against the relevant proposition. The context in (13) is biased *against* the proposition that it is raining given the evidence provided by the Hawaiian shirt and sunglasses.¹ The PPQ (13b) is infelicitous in the presence of such evidence, whereas the NPQ in (13c) is fine.

- (13) [A is sitting in a windowless office. *B* enters wearing a Hawaiian shirt and sunglasses.]
 a. A: Why are you wearing that?
 b. #A: Is it raining outside?
 c. A: Isn't it raining outside?

In (14), the context is biased *toward* the proposition that it is raining and the PPQ in (14a) is felicitous, while the NPQ in (14b) is not.

- (14) [A is sitting in a windowless office. *B* enters wearing a wet raincoat.]
 a. A: Is it raining?

¹For example, *B* has direct perceptual evidence that *A* is wearing sunglasses, and believes that normally if someone is wearing sunglasses, then it is not raining outside.

	INPQs	ONPQs	PPQs
biased against ϕ :	✓	✓	
neutral wrt ϕ :		✓	✓
biased toward ϕ :			✓

Table 4.1: The contextual distribution of polar questions.

b. #A: Isn't it raining?

Table 4.1 summarizes the preceding discussion. The point to stress is that the negative bias inherent to INPQs is not epistemic in the same way that the positive bias associated with NPQs is, i.e. related to the speaker's beliefs. Rather, this negative bias reflects characteristics of the discourse context and the observation that INPQs are only licensed in contexts containing negative evidence. In fact, it is a mistake to say that in these contexts the speaker *believes* that $\neg\phi$, for, as I argue below, it is precisely the point of an INPQ to confirm that $\neg\phi$ before adding it to one's beliefs.

Finally, inside-negation polar questions and positive polar questions appear to be in complementary distribution, i.e. they are never both felicitous in the same discourse context. ONPQs and PPQs are in overlapping distribution, since both occur in neutral contexts. These observations suggest that INPQs and PPQs are the same kind of beast, while ONPQs are distinct from both INPQs and PPQs. Indeed, it is precisely this fact that is most troublesome for previous approaches to NPQs. This is especially apparent when we come to discuss the analysis in Romero and Han (2004). I show in the next section that the positive biases of ONPQs and INPQs can be distinguished on the basis of certain linguistic tests.

4.2.3 Two Kinds of Positive Bias

Inside-negation and outside-negation polar questions each convey a positive bias. However, these positive biases need to be distinguished formally, a point which has not been appreciated in previous analyses. The positive biases diverge in two ways: (i) INPQs can have an epistemic, deontic or bouletic bias, while ONPQs are only epistemically biased, and (ii) the biases in INPQs and ONPQs are distinct kinds of meaning. Whereas the bias in INPQs is a arguably some type of implicature, the bias in ONPQs is an entailment, reflecting a speaker commitment which functions as a weak assertion.

As just noted, INPQs may have an epistemic, deontic or bouletic bias. Deontic and bouletic biases are common when the subject of the question is a second person pronoun or when certain predicates occur in the sentence, e.g. *ashamed*, *afraid*, and *like*, *enjoy*, etc. Huddleston and Pullum (2002) discuss the examples in (15). (15a) intuitively conveys that according to prevailing social norms, the addressees *ought* to be ashamed of themselves. (15b) conveys that the speaker *wants* the addressee to like it.

- (15) a. Aren't you ashamed of yourselves.
 b. Don't you like it.

The web example in (16) provides a clear example of an inside-negation polar question that carries a bouletic bias. Note that it includes the negative polarity item *at all*, which forces the INPQ reading. The bouletic bias is preferred in the context, as it provides the best explanation for Harry's disappointment. Having previously *believed* that Hermione enjoyed "it" in the face of countervailing evidence is hardly reason to be disappointed. At the very least, it is not as relevant as his having *wanted* her to enjoy it (and learning that she didn't).

- (16) a. “Didn’t you enjoy it at all, Hermione?” Harry asked, feeling a little disappointed.
- b. Hermione took a deep breath. “Well,” she said, shrugging. “I really don’t like to be up so high, but it was nice to spend the time with all of you.”²

Replacing *at all* with a positive polarity item, such as *rather*, as in (17), reduces the felicity of the discourse when continued with the description of Harry’s disappointment, as a bouletic bias appears to be ruled out on the ONPQ reading.³

- (17) # “Didn’t you *rather* enjoy it, Hermione?” Harry asked, feeling a little disappointed.

Furthermore, the positive biases of ONPQs and INPQs have distinct cognitive sources. Specifically, ONPQs by convention *assert* a positive proposition, while INPQs only *implicate* one. This fact can be established using Sadock’s diagnostics for illocutionary force, as in the discussion of tag questions from Chapter 3. Recall that Sadock’s diagnostics appeal to the co-occurrence restrictions that hold between certain discourse markers and illocutionary force. Sentence initial *after all*, for instance, occurs with assertions. Similarly, initial *tell me*, and the parenthetical expression *by any chance* co-occur with questions. I add here a second assertion diagnostic proposed by Sadock: sentence initial *yet*. Sadock (1974) notes that utterances prefixed with *yet* can *follow* assertions, as in (18b), but not true questions, as in (19b).

- (18) a. A: John is always late for work.

²<http://www.phoenixsong.net/fanfiction/story/4079/>

³An additional factor is that ONPQs *assert* a positive proposition. The oddity of (17), then, might be explained in terms of the oddity of asserting that *You rather enjoyed it*. Presumably, an addressee is aware of his or her own cognitive state, since she has direct access to them and the speaker does not.

- b. A: Yet, he continues to be promoted.
- (19)
- a. Is John always late for work?
 - b. #Yet, he continues to be promoted.

When applied to negative polar questions, Sadock's diagnostics show that ONPQs convey an assertion and a question, while inside-negation polar questions are simply questions. (20b), for instance, can be preceded by *after all* on the ONPQ reading (coerced by including the PPI *some*), but not on the INPQ reading (coerced by including the NPI *any*).

- (20)
- a. A: Sue isn't coming, so there'll be no syntacticians there.
 - b. B: What do you mean? After all, aren't {some/#any} of the MIT syntacticians coming?

Both readings of (20b) are felicitous in the discourse context established by (20a) if *after all* is omitted. Thus, it really is the presence of the discourse marker that produces the infelicity of the INPQ reading of (20b).

Similarly, the assertion in (21b) containing the discourse marker *yet* can follow the negative question in (21a) on the ONPQ interpretation, but not on the INPQ interpretation.

- (21)
- a. A: Aren't {some/#any} of the MIT syntacticians coming?
 - b. A: Yet, Mary claims there will be no syntacticians there.

As before, if *yet* is omitted from (21b), then either the ONPQ or INPQ reading are felicitous. Intuitively, *yet* signals a contrast between the utterance to which it is prefixed and some information in the prior discourse context. The data in (21) suggest that the prior expectation inherent to INPQs is unable to supply the necessary contrasting information, while the positive bias in ONPQs is.

One final piece of evidence comes from examples like (22), where an ONPQ appears as the complement to the parenthetical use of a speech-act verb like *suggest*.⁴ (22) is direct evidence that ONPQs can be used as *suggestions*, a type of assertion (Vanderveken 1990). INPQs do not felicitously occur in the same context.

(22) “Aren’t {some/#any} of the MIT syntacticians coming?”, suggested Mary.

The data in (20) – (22) provide evidence that ONPQs are associated with an assertion, licensing discourse markers like *after all* and *yet*. INPQs, on the other hand, do not convey an assertion. The results obtained through Sadock’s diagnostics are important, as they formally distinguish the positive epistemic bias in ONPQs from the positive epistemic bias in INPQs. This conclusion can be extended to the non-epistemic biases in inside-negation polar questions. *After all*, for example, does not felicitously occur with deontically biased (23b), even though it does occur felicitously with the paraphrase suggested by Huddleston and Pullum (2002) in (23c), which shows that in principle an assertion with the content of the purported bias(es) can serve the discourse function specified by *after all*.

- (23) a. A: I can’t believe you did that. You’re a horrible person!
 b. #A: After all, aren’t you ashamed of yourself.
 c. A: After all, you ought to be ashamed of yourself. (But apparently you aren’t).

The ONPQ reading of (23b) is infelicitous in the context provided, as well. However, the infelicity is unrelated to the formal nature of the bias. Rather, the proposition that you are ashamed of yourself does not support the evidential requirements of the discourse marker *after all*. The proposition that one is ashamed of himself does not

⁴This example is due to David Beaver, p.c.

provide evidence for the proposition that one is a horrible person. On the contrary, to the extent that it shows that one has a conscience, it provides evidence that one is *not* horrible, as shown in (24b).

- (24) a. A: Take it easy on yourself! You're not such a bad person.
 b. A: You did a horrible thing, but, after all, aren't you {rather /#at all } ashamed of yourself.

INPQs and ONPQs are still questions according to Sadock's diagnostics. Both ONPQs and INPQs can be responded to with a simple answer particle, i.e. *yes* or *no*, and both co-occur with the discourse marker *tell me*, which tests for questions (see the discussion in Chapter 3).

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

According to Sadock's tests, then, ONPQs are *both* questions *and* assertions. More to the point, they are *simultaneously* assertions and questions, as shown by examples like (26). *Tell me* requires its argument – the negative interrogative in (26a) – to be typed QUESTION, while *yet* in (26b) requires it to be typed ASSERTION.

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

(26) can not be explained by positing a simple ambiguity. That is, it is not sufficient to claim that ONPQs are sometimes assertions and sometimes questions. In order for the typing constraints of *tell me* and *yet* to be satisfied in (26), (26a) must be typed both ASSERTION and QUESTION. As with postnuclear tag questions, I assign ONPQs the complex speech act type ASSERTION • QUESTION. The grammar can then exploit both of these types in interpreting a discourse like (26).

4.3 A Decision-Theoretic Approach to NPQs

van Rooy and Šafářová (2003) develop an account of the use of polar questions in which the speaker's beliefs and preferences determine the form of the question. They provide a formalization of this analysis in a version Bayesian decision theory (Jeffrey 1965).⁵ Briefly, a speaker bases his or her polar question on the answer that has the highest estimated *utility* relative to his or her *beliefs* and *desires*. Beliefs are modeled by a probability function P and desires by a utility function U . Given a belief-desire state $\langle P, U \rangle$, the utility of an answer q is computed as follows:

$$UV(q) = EU(P_q, U) - EU(P, U),$$

where P_q is the probability function P conditioned on the proposition q (Jeffrey 1965), i.e. $P_q(w)$ is the probability of the world w given the proposition q . $EU(P, U)$ is the *expected utility* of the belief-desire state $\langle P, U \rangle$. The expected utility of a belief-desire state is calculated as follows:

$$EU(P, U) = \sum_{w \in W} P(w) \times U(w)$$

EU measures the degree to which an agent prefers to be in a particular belief-desire state $\langle P, U \rangle$.

The decision theoretic analysis is very general, as the utility of an answer q ultimately depends on the nature of the utility function U . There are numerous criteria by which an agent might judge information useful. van Rooy and Šafářová focus on two specific cases. First, the utility of a world w might depend on whether some goal proposition g is true in that world, i.e. $U(w) = 1$, iff $w \in g$, and 0 otherwise. In this case, the utility of an answer q amounts to how q influences the probability

⁵van Rooy and Šafářová (2003) discuss alternative questions, as well. I ignore these here, as it does not bear on our present concerns.

of the goal g , i.e., $P(g/q) - P(g)$. The answer q is useful to the extent that g is more or less likely given q .

The second case that van Rooy and Šafářová consider is related to the informativity of a proposition (see also Han 2002). If an agent simply wants to know what the world is like, $U(w) = \log P(w)$ (van Rooy 2004). Under this assumption, the utility of an answer q is equivalent to the reduction in *entropy* of the partition W due to learning q , i.e. $E(W) - E_q(W)$, where:

$$E(W) = - \sum_{w \in W} P(w) \times \log_2 P(w)$$

According to van Rooy and Šafářová (2003), in natural circumstances the reduction in entropy upon learning q reduces to the surprisal value of q , i.e. $\inf q = -\log_2 P(q)$ (Bar-Hillel and Carnap 1953). The important feature of this measure is that as the probability of a proposition *decreases* its surprisal value *increases*. The intuition is that if one considers a proposition q unlikely, learning that q is more informative than if one already assigns q a high probability.

Against this decision theoretic backdrop, van Rooy and Šafářová (2003) argue that whether an agent uses a PPQ or an NPQ depends on which answer has the highest expected utility for the speaker. Important to this analysis is the assumption that PPQs and NPQs are semantically equivalent. Positive polar questions are used when the utility of the positive answer is greater than the utility of the negative answer and vice versa for negative polar questions, as summarized in the bullets below.

- PPQs: $UV(q) > UV(\neg q)$
- NPQs: $UV(\neg q) > UV(q)$

Focusing our attention on utility as informativity, this assumption immediately derives the positive bias inherent to NPQs, since $\inf \neg q > \inf q$ just in case

$P(q) > P(\neg q)$, according to the speaker's probability function. However, the analysis also predicts that PPQs are negatively biased. van Rooy and Šafářová counter that negative statements are by default less informative than positive statements. Consider the roll of a fair die. The probability that it comes up 1 is $1/6$, while the probability that it does not come up 1, is $5/6$.⁶ Thus, negative statements are only used when the default assumption is over-ruled, triggering an implicature that the positive statement was/is considered by the speaker to be more likely than the negative one. The argument extends to positive polar questions, which are *by default* formulated in terms of the positive answer.

There are cases where utility *is* relevant for PPQs, viz. in situations where the speaker is reluctant to accept some new information q , perhaps because the probability the agent assigns to q is quite low. The important point with respect to grounding questions, van Rooy and Šafářová note, is that the utility of the positive proposition is calculated with respect to the speaker's belief-desire state before the new information has been grounded, i.e., utility is calculated relative to $\langle P, U \rangle$ rather than some subsequent belief-desire state. The mini-dialogue in (27) provides an example. A 's turn in (27a) biases the context toward the proposition that John was in Hawaii, i.e. there is compelling contextual evidence for this proposition in the terminology of the previous section.

- (27) a. A : John is back from Hawaii.
 b. B : Was John in Hawaii?

B formulates the polar question in (27b) with respect to his belief-desire state prior to updating it with the information in (27a), indicating that adding the information that John was in Hawaii to his set of beliefs would require significant revision because he previously assigned this proposition a low subjective probability. Thus A infers

⁶This reasoning, of course, does not hold for pairs of propositions such as *It is even* and *It is not even*.

that the speaker previously did not believe, or expect, that John was in Hawaii. *A* can reasonably be expected, then, to back up the assertion in (27a) with additional evidence.

Inside-negation polar questions are also grounding questions, according to van Rooy and Šafářová (2003). In their case, however, the new information is a negative proposition and the utility of each answer is still computed with respect to the agents initial belief-desire state, i.e. one that does not take this new information into account. (28), for example, can be uttered as a response to (27a), which provides evidence that John was not in Fiji (assuming that he can not be in two places at once).

(28) B: Didn't John go to Fiji?

As before, *B* uses an INPQ because the negative answer is more informative with respect to his initial belief-desire state $\langle P, U \rangle$ than the positive answer, i.e. the proposition that John was in Fiji is assigned a relatively high probability and the INPQ indicates that *B* is reluctant to ground the information in (27a) without additional evidence.

On van Rooy and Šafářová's 2003 analysis, it is meaningless to talk of inside-negation vs. outside-negation polar questions, as they throw this distinction away. For them, INPQs and ONPQs are formally, that is semantically and morpho-syntactically, indistinguishable. The difference, van Rooy and Šafářová argue, lies in which belief-desire state is used to compute the relative utility of the possible answers. Whereas, INPQs rely on a prior belief-desire state, ONPQs rely on the current belief desire state. The interpretation of (28) as an ONPQ conveys that the speaker still considers it more likely that John went to Fiji than that he did not, even in the presence of the counterevidence in (27a). To the extent that the proposition that John went to Hawaii implies that he did not go to Fiji, the use

of an ONPQ conveys that the agent does not accept the statement in (27a). The use of an ONPQ in a neutral context would suggest that the agent expects that the positive answer is the true one.

The decision theoretic analysis presented by van Rooy and Šafářová (2003) is appealing, but it raises several questions. First, its account of positive bias in NPQs is, mathematically speaking, rather weak. The requirement that $UV(\neg q) > UVq$ is equivalent to the requirement that $P(q) > .5$. In other words, an agent only needs to assign slightly more probability mass to the positive answer than to the negative one in order to felicitously use an NPQ. This hardly seems to model intuitions about the positive bias of negative questions. This complaint is not insurmountable, of course. For example, one might instead enforce the constraint that:

$$[UV(\neg q) - UV(q)] > d,$$

where d is some contextually supplied threshold for belief. Equivalently, $P(q) > d$, say .75, or whatever probability one needs to assign to a proposition to say that an agent believes it.

More problematic for the decision theoretic approach is the data from §4.2.3, which showed that the positive bias of ONPQs is asserted, while the positive bias of INPQs is not. This suggests, I argued, that the two positive biases need to be distinguished formally. van Rooy and Šafářová’s analysis does not do this, as far as I can tell, as the reasoning that leads to the positive bias is the same in both cases. In either case, bias appears to be a conversational implicature based on the form of the speaker’s utterance and other conversational principles, in this case a version of the Maxim of Quantity (Grice 1975).

A related point is that according to van Rooy and Šafářová there is no semantic or morpho-syntactic difference between outside-negation and inside-negation polar questions. This assumption butts up against the observations about the licensing

of polarity items presented briefly in (5) and (6), and the morpho-syntactic evidence from German in (7). With respect to the German data, van Rooy and Šafářová reject Büring and Gunlogson’s (2000) judgments. Regarding polarity items, van Rooy and Šafářová do not explain why PPIS force an ONPQ reading, while NPIS force an INPQ reading. Given that the difference between ONPQs and INPQs for van Rooy and Šafářová amounts to the choice of belief-desire state, it is difficult to see how they *could* provide an explanation. They might simply claim that polarity items of either stripe are licensed in interrogative sentences independent of any morpho-syntactic facts. NPIS, for example, are licensed in questions regardless of whether there is an overt marker of negation (Ladusaw 1979, Krifka 1995, van Rooy 2003). Even leaving the “licensing question” aside, some account of the disambiguating role of polarity items is called for. In the next section, I discuss an account of negative polar questions that addresses both the licensing of polarity items and their role in the outside-negation/inside-negation distinction.

4.4 A Semantic Approach to NPQs

Romero and Han (2004) present a semantic analysis of negative interrogative questions. They assume the existence of a hidden operator in NPQs that can take either wide or narrow scope with respect to negation. The outside-negation, or ϕ , reading results when this operator takes scope over negation – as in (29a)– and the inside-negation, or $\neg\phi$, reading results when the operator scopes under negation – as in (29b).

- (29) a. $[_{CP} Q \text{ not } [_{Op} [_{IP} \text{Jane is coming}]]]$
b. $[_{CP} Q [_{Op} [\text{not } [_{IP} \text{Jane is coming}]]]]$

Romero and Han argue that a positive epistemic bias follows as a conversational

implicature from the presence of this operator and pragmatic reasoning. §4.4.1 provides an overview of Romero and Han’s account and §4.4.2 provides an evaluation of this approach.

4.4.1 Basics of the VERUM Approach

The schematic logical forms in (29) illustrate the intuition behind the analysis in Romero and Han (2004). Negative polar questions contain a hidden operator that interacts with negation to yield a semantic ambiguity. On this analysis, NPQs are not equivalent to PPQs, as assumed on many accounts of interrogative semantics (Hamblin 1973, Groenendijk and Stokhof 1984). Based on the similarity of the bias in questions such as (30a) with that of NPQs, Romero and Han identify *Op* in (29) with the semantic operator introduced by the epistemic adverb *really*. In (30a), the speaker is reluctant to ground the information that Jane is coming due to a prior belief that she was *not* coming. The same observation holds of questions with polarity focus, as in (30b).

- (30) a. Is Jane *really* coming?
b. $[\text{IS}]_F$ Jane coming?

Following Höhle (1992), Romero and Han equate the semantic contribution of *really* with the operator VERUM, whose denotation is given in (31): $\text{Epi}_x(w)$ are the epistemic alternatives for the agent x in the world w . $\text{Conv}_x(w')$ are the worlds where the *conversational goals* of x in w' are met, the default goal being to accumulate information about the world (cf. Stalnaker 1978 and Roberts 1996). $\text{CG}_{w''}$ is the set of propositions representing the shared beliefs of the discourse participants in w'' , i.e. the common ground (Stalnaker 1978).

$$(31) \quad \llbracket \text{VERUM} \rrbracket^{g[x/i]} = \lambda p_{\langle s, t \rangle} \lambda w. \forall w' \in \text{Epi}_x(w) [\forall w'' \in \text{Conv}_x(w') [p \in \text{CG}_{w''}]]$$

In plain English, VERUM ϕ is true at a world w iff an anaphorically determined discourse participant x (normally the sum of the speaker and addressee) is certain that in all of the worlds in which the conversational goals of x are met the proposition ϕ is part of the common ground. Romero and Han (2004) gloss this meaning as FOR-SURE-CG $_x\phi$. They assume that preposed, negated auxiliaries introduce VERUM into the logical form of negative polar questions.

Once VERUM is introduced into the logical form of NPQs, Ladd's ambiguity (or equivalently the $\phi/\neg\phi$ ambiguity) is naturally analyzed as a scope ambiguity between VERUM and negation. The outside-negation reading results when negation outscopes VERUM. The logical form and resulting partition are shown in (32a) and (32b).

- (32) a. $\llbracket [\text{CP } Q \text{ not } [\text{VERUM } [\text{IP } \text{Jane is coming}]]] \rrbracket =$
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* should be added to the common ground, deriving the so-called ϕ reading. The inside-negation reading results when VERUM outscopes negation, as shown in (33a). 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 (33b).

- (33) a. $\llbracket [\text{CP } Q \text{ VERUM } [\text{not } [\text{IP } \text{Jane is coming}]]] \rrbracket =$
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 (33b) captures the intuition discussed in the introduction that inside-negation PQs are “about” the proposition that Jane is not coming.

Based on this account of Ladd’s ambiguity, Romero and Han (2004) claim an additional virtue for the VERUM approach, viz. that it accounts for the distribution of polarity items in NPQs. Recall that PPis only occur in ONPQs and NPis only occur in INPQs. Romero and Han, following Linebarger (1987), argue that NPis are licensed in the *immediate scope* of negation. Consequently, no logical operators can intervene between an NPI and its licenser. PPis, on the other hand, are not licensed in the immediate scope of negation.

The immediate scope constraint, Romero and Han argue, accounts straight-away for the distribution of polarity items in NPQs. In the INPQ logical form in (34a), for example, the NPI *either* and the PPI *too* are in the immediate scope of negation. As a result, the NPI is licensed, while the PPI is not. In the ONPQ logical form in (34a), on the other hand, VERUM intervenes between the NPI and the negation. As a result, it is not licensed.⁷

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

Romero and Han (2004) analyze the positive bias in NPQs as a conversational implicature derivable from the compositional semantic meaning of the question and pragmatic reasoning. According to (31), VERUM is an epistemic modal that embeds a “meta-conversational” modal, i.e., one that refers to the conversational goals of

⁷I leave further discussion of the licensing of polarity items in NPQs aside for the time being. See Reese (2006b) for some critical evaluation of Romero and Han’s (2004) approach. I note here, however, that the question of the licensing of NPis in NPQs is in some respects a non-issue, as NPis are licensed in questions regardless of the presence of a licensing negative element (Borkin 1971, Ladusaw 1979, Krifka 1995, a.o.). This not true of NPis like *either*, which have stricter licensing conditions than NPis like *any* and *ever* and idiomatic NPis like *lift a finger*. But again, this is a side issue, as all of these NPis coerce an outside-negation reading. What is more telling, I believe, is the association of PPis with ONPQs. I return to this issue below.

the discourse participants and the content of the common ground. Romero and Han assume that the felicitous use of a meta-conversational move is governed by the economy principle in (35).

(35) **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 here 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 (2004), adequate evidence must be at least indirect evidence. As NPQs are meta-conversational moves by definition – given the presence of VERUM at logical form, they are subject to the economy principle above. Assuming that the speaker is cooperative and obeys (35), it follows either that the he has a prior belief that ϕ which is inconsistent with the addressee's beliefs or believes ϕ but lacks evidence for it, i.e. the speaker is trying to avoid a violation of Quality.

This establishes the presence of an epistemic bias, but does not in itself determine the polarity of the bias. Romero and Han argue that the positive bias of NPQs follows from the intention behind the question, as determined by the cell of the partition introduced by the question that the speaker chooses to “pronounce”. Their computation of the polarity of the bias, therefore, is very much like the analysis proposed by van Rooy and Šafářová (2003). Since Romero and Han themselves note that van Rooy and Šafářová's account is consistent with their notion of “intent”, I fore-go a detailed discussion here. Romero and Han argue, however, that VERUM is still necessary in order to account for Ladd's ambiguity. In the next section, I show that while on the face of it the VERUM account provides a neat solution to Ladd's ambiguity, it faces certain empirical problems.

4.4.2 Evaluation of the VERUM Approach

Summarizing, Romero and Han (2004) assume a semantic distinction between NPQs and PPQs: NPQs contain a covert epistemic modal VERUM. VERUM questions conversationally implicate that the speaker has a positive epistemic bias and Ladd’s ambiguity is treated as a genuine scope ambiguity between VERUM and negation. Their analysis is perhaps the most detailed investigation of NPQs to date and merits serious consideration. Nonetheless, the analysis has several shortcomings. The current section provides a critical evaluation of the VERUM approach, arguing that there is little empirical support that NPQs mean what Romero and Han claim they mean.

The VERUM approach assumes that positive and negative polar questions have different compositional semantic meanings. That is, NPQs and PPQs are associated with distinct mathematical objects. Most theories of the semantics of interrogative sentences operate under the assumption that to know the meaning of a question is to know what propositions are complete answers to it (Hamblin 1958, a.o.). For example, since simple *yes* and *no* answers to (36a) convey the propositions that Jane is coming and that Jane is not coming respectively, the meaning of (36a) is taken to be the set of propositions in (37).

- (36) a. A: Is Jane coming?
 b. B: Yes, she is. (= Jane is coming.)
 c. B: No, she isn’t. (= Jane is not coming.)

$$(37) \quad \{\lambda w[\text{Jane is coming in } w], \lambda w[\neg \text{Jane is coming in } w]\}$$

Suppose that the speaker asks a question like (38a), which includes some type of weak epistemic necessity modal.⁸ Simple *yes* and *no* answers intuitively convey the

⁸The exact nature of the modal operator is not important for present purposes. What *is* important is that it occurs overtly in the interrogative sentence.

propositions in (38b) and (38c) respectively. Therefore, the meaning of (38a) is the set of propositions in (39).

- (38) a. Q: Is it certain that Jane is not coming?
 b. A: Yes. (= It is certain that Jane is not coming.)
 c. A: No. (= Is is not certain that Jane is not coming.)
- (39) $\{\lambda w[\Box \neg \text{Jane is coming in } w], \lambda w[\neg \Box \neg \text{Jane is coming in } w]\}$

Similar comments can be made about the question in (40a), in which a positive proposition occurs in the scope of the modal operator. The denotation of the question is shown in (41).

- (40) a. Q: Is it certain that Jane is coming?
 b. A: Yes. (= It is certain that Jane is coming.)
 c. A: No. (= Is is not certain that Jane is coming.)
- (41) $\{\lambda w[\Box \text{Jane is coming in } w], \lambda w[\neg \Box \text{Jane is coming in } w]\}$

The denotations in (39) and (41) are similar to the denotations that Romero and Han (2004) assign to INPQs and ONPQs respectively, simply replace \Box with FOR-SURE-CG_x.⁹ However, the direct answers to an NPQ like (42b) do not correspond in any sense to the partitions in (39) and (41). Rather, a simple positive answer to either an ONPQ or INPQ intuitively conveys the proposition that Jane is coming. This result is congruent with the positive cell of the partition in (32b),

⁹In Romero and Han's notation, \Box is assigned the denotation in (i).

$$(i) \quad \llbracket \Box \rrbracket^{g[x/i]} = \lambda p_{\langle s, t \rangle} \lambda w. \forall w' \in \text{Epi}_x(w) [p(w') = 1]$$

The difference between (i) and the definition for VERUM in (31), then, is that the latter embeds a further modal operator. Otherwise, both are at their core epistemic modals. Based on this similarity, I assume that the comparison that follows between the examples in (38) and (40) and Verum questions is a valid one.

but it is inconsistent with the positive cell for INPQs in (43c). Direct negative answers are even more problematic, as shown in (44). A negative response intuitively conveys that Jane is not coming, not that the respondent is uncertain that Jane is coming (44b), nor that he is uncertain that Jane is not coming (44c).

- (42) a. A: Sue just canceled, so now no syntacticians are coming.
b. B: Isn't Jane coming { too/either }?
- (43) A: Yes. (But she doesn't do syntax anymore.)
a. = Jane is coming
b. \approx FOR-SURE- CG_x Jane is coming
c. \neq FOR-SURE- $CG_{x\neg}$ Jane is coming
- (44) A: No.
a. = \neg Jane is coming
b. $\neq \neg$ FOR-SURE- CG_x Jane is coming
c. $\neq \neg$ FOR-SURE- $CG_{x\neg}$ Jane is coming

The data in (43a) and (44a) suggest that the meaning of an NPQ is more like the denotation in (37), then either (39) or (41). In other words, there is no evidence of a covert modal operator in negative questions. Positive and negative polar questions appear to be equivalent, as predicted by many existing analysis of the semantics of polar questions.

Further evidence for the equivalence of NPQs and PPQs comes from examples like those in (45). The web example in (45a) embeds a negative polar question in the scope of *wonder*. The resulting sentence is intuitively equivalent to the constructed variant in (45b) that embeds the corresponding positive polar question. Both examples in (45) state that the speaker wonders whether Kate is addicted to an unhealthy level of unrest.

- (45) a. Kate felt bored with Dan because he failed to “challenge” her. A little excitement is healthy in a relationship, but I wonder whether she *isn’t* addicted to an unhealthy level of unrest?
- b. Kate felt bored with Dan because he failed to “challenge” her. A little excitement is healthy in a relationship, but I wonder whether she *is* addicted to an unhealthy level of unrest?

These observations are unexpected if NPQs and PPQs denote distinct mathematical objects. Furthermore, coercing INPQ and ONPQ readings by including a polarity item does not influence these judgments.

- (46) Kate felt bored with Dan because he failed to “challenge” her. A little excitement is healthy in a relationship, but I wonder whether she isn’t {*at all/rather*} addicted to an unhealthy level of unrest?

Again, both versions of (46) are intuitively equivalent (modulo the meanings of *at all* and *rather*).

Romero (2005) responds to these criticisms by suggesting that VERUM contributes expressive rather than truth conditional content. Expressive content provides the speaker’s commentary on the truth conditional contribution of an utterance (Potts 2005). Because VERUM is an epistemic modal according to (31), it is helpful to consider recent work on epistemic modality in evaluating Romero’s proposed fix. What she appears to have in mind is related to the observation in (47) that the pre-jacent proposition in (47b), i.e., the proposition in the scope of the epistemic modal *must*, is offered as the answer to the question (47a), while the modal statement itself signals that the speaker’s estimation that the answer is right or indicates that he only has indirect evidence for it (von Stechow and Gillies 2007).

- (47) a. Why isn’t Louise coming to our meetings these days?

- b. She *must* be too busy with her dissertation.

Similarly, VERUM – as an epistemic modal itself – comments on the truth conditional content of an utterance, rather than contributing directly to truth conditions. As a result, according to Romero (2005), positive answers to VERUM questions *affirm* the prejacent, while negative answers *negate* the prejacent; VERUM comments on the answer, saying that it is certain given current conversational goals that the proposition in it’s scope should be added to the common ground. Romero provides no formal details. As a result, it is difficult to evaluate the proposed solution. This does not mean that a solution is impossible, but the onus is on Romero to provide one.

I note here a few obstacles that the proposed solution faces. First, the simple statement that positive answers affirm the prejacent, while negative answers negate the prejacent only applies, as stated, to ONPQs, where the prejacent is a positive proposition. It does not hold of INPQs, where the prejacent is negative. For example, if a positive answer *affirmed* the prejacent of an INPQ like (42b), a simple *yes* response would convey that Jane is *not* coming, while a negative answer would mean that she is. In her brief explanation, Romero (2005) seems to want to exclude negation from the prejacent of INPQs. However, I see no justification for this move. Indeed, central to the “scope account” of Ladd’s ambiguity is the position that negation in INPQs forms part of the descriptive content of the question. Relatedly, much of the research on expressive content notes that it does not semantically embed with respect to truth conditional operators (Potts 2005). It seems, then, that Romero’s (2005) assumption that VERUM is an expressive operator contradicts Romero and Han’s (2004) analysis of the inside-negation/outside-negation ambiguity as a genuine scope ambiguity. Again, this does not imply that a principled solution along the lines suggested by Romero (2005) is impossible, but any fully formed solution is going to be significantly different from the one in Romero and Han (2004).

Finally (and related to issues raised in the preceding paragraph), von Fintel and Gillies (2007) point to certain problems with the view that epistemic modals do not contribute to truth conditions, but rather comment on the at-issue core of an utterance. Specifically, they show that not only do epistemic modals felicitously embed, but that when they do so they contribute modalized truth conditions to interpretation. (48) (from von Fintel and Gillies 2007) does not mean that Bill thinks that there has been a mistake, but rather that Bill thinks that it is compatible with the evidence that there as been a mistake.

(48) Bill thinks that there might have been a mistake.

The tension between the examples in (47) and (48), von Fintel and Gillies argue, suggests that an analysis of epistemic modals other than the expressive content one is in order. To the extent that Romero (2005) bases her revised analysis of VERUM on the kind of data in (47), the data in (48) is equally problematic for her, as she explicitly assumes some kinship between VERUM and more familiar epistemic modals. Furthermore, I take (48) to suggest that even if VERUM *sometimes* commented on the prejacent proposition, as Romero (2005) suggests, it need not do so. For example, when embedded under a propositional attitude, as in (45a), it might contribute modalized truth conditions. However, intuitions about the meaning of (45a) suggest that this is not the case.

4.5 The Discourse Function of NPQs

§4.2.3 presented evidence based on the co-occurrence of certain discourse markers with specific speech acts that the positive epistemic bias endemic to outside-negation polar questions is an *assertion*, rather than a conversational implicature as van Rooy and Šafářová (2003) and Romero and Han (2004) would have it. The current section

provides additional support for this claim based on a closer examination of the discourse function of ONPQs. Romero and Han (2004) come close to recognizing the existence of the assertion that I argue for. They note, for example, that ONPQs are often used to *suggest* ϕ . However, they never note that *suggesting* ϕ is tantamount to *weakly asserting* ϕ (Vanderveken 1990, p. 172). In other words, *suggestions* are a type of *assertion*. Similarly, in what Romero and Han call “contradiction scenarios” ONPQs can be used as *denials*, another flavor of *assertion* (Vanderveken 1990, p. 170). Following Reese (2006b), I focus on the use of negative polar questions in “contradiction scenarios”, providing additional evidence for the claim that ONPQs convey an assertion. At the same time, I show that INPQs are not associated with an assertion.

Outside-negation polar questions pattern with positive assertions that *deny* an antecedent assertion, as shown by the example dialogues in (49) – (52). (49c), for example, is a weak, or indirect, denial of (49a).

- (49) 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?

It is impossible to use an INPQ for a similar purpose. Some care is required to establish this point, however. The INPQ reading of (49c) *is* a felicitous response to (49a), but it does not *deny* it. Rather, INPQs are generally grounding questions (see the discussion below). Intuitively, (49a) is inconsistent with *B*’s prior belief that Jane turned in her assignment. The INPQ is a request for additional evidence for the claim that Jane did *not* turn in her assignment before *A* revises his or her beliefs accordingly.

Denial readings can be coerced by including a “priming” phrase that indicates that the utterance that follows it challenges a previous assertion on some grounds.

In (50), for example, *B* prefaces his turn with *That's not true*, which introduces a reasonable expectation that the following utterance provides counterevidence or corrects the assertion in (50a).

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

Assuming that each student wrote exactly one paper and submitted it to exactly one journal, (50a) entails the negation of (50c) and *vice versa*. Given this inconsistency, (50c) corrects or denies (50a). Similarly, the ONPQ interpretation of (50d) can follow the priming expression in (50b) and, as a result, correct the entailment of (50a) that no student submitted their paper to *LI*. I take these observations as evidence that (50d) *asserts* a proposition that is inconsistent with the proposition asserted by (50a). Intuitively, this proposition is the same one asserted in (50c). The inside-negation reading of (50d) is not felicitous following (50b), despite the fact that it conveys a positive bias whose propositional content is similar to the proposition asserted by (50c). Thus, the positive biases of ONPQs and INPQs have distinct discourse functions.

Denials can also target the presuppositions and implicatures of an utterance. In (51), (51c) and the ONPQ reading of (51d) correct the presupposition triggered by the implicative verb *manage* in (51a) that it was difficult for Nicholas to prove the theorem. The priming expression in (51b) provides a useful cue that *B* objects to *A*'s use of *manage*.

- (51) a. A: Nicholas managed to prove the theorem.
 b. B: I wouldn't say he [managed]_F to prove the theorem.

- c. B: It was *rather* easy for him.
- d. B: Wasn't it {*rather/#at all*} easy for him?

As before, (51c) functions as a correction of (51a) because its propositional content is inconsistent with the presupposition triggered in (51a). The felicity of the ONPQ reading of (51d) again provides evidence that it asserts a proposition that is inconsistent with (51a)'s presupposition, viz. the proposition asserted by (51c). The INPQ reading of (51d), which is coerced by including the PPI *at all*, is infelicitous in the discourse context including (51b). If one omits (51b), the inside-negation reading of (51d) *is* permitted. However, as before, it seeks evidence for the presupposition that it was difficult for Nicholas to prove the theorem.

(52c) and (52d) object to a potential implicature of (52a), viz. that not all of the packages have arrived. Again, the priming expression in (52b) indicates that the utterance that follows it rejects (52a) on some grounds, viz. that there is a logically stronger, true proposition that the speaker could have asserted instead.

- (52) 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*}?

The argument here is the same as above. That both the simple assertion in (52c) and the ONPQ in (52d) can function in the discourse context as denials suggests that both share some propositional content that is inconsistent with the implicature associated with (52a). Forcing the INPQ reading of (52d) by including the NPI *yet* results in an infelicitous discourse. On the other hand, the INPQ *can* be used to help ground the implicature that not all of the packages arrived.

The examples in (50) – (52) also illuminate an as yet unresolved puzzle:

the role of polarity items in disambiguating inside-/outside-negation PQs. To recap briefly, ONPQs can be used to deny or correct an utterance based on false entailments, presuppositions or implicatures, echoing Horn’s (1989) description of *metalinguistic negation* as 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). This description matches the uses of ONPQs above, suggesting that perhaps the negation in ONPQs is metalinguistic. As discussed in the previous chapter, metalinguistic negation does not license NPIS, nor does it block the use of PPIS (Horn 1989). The assumption that outside-negation is metalinguistic negation, then, provides a plausible alternative to Romero and Han’s (2004) account of the distribution of polarity items in NPQs.

Additional evidence for this assumption comes from consideration of the intonational characteristics of assertions used as denials and ONPQs. The intonational tunes of (49b) and (49c), for example, share certain features. Impressionistically, both include an L*+H pitch accent on *Jane*. In addition, it is possible for both to end with final rising intonation, e.g. the sequence of L-H% of phrase accent and boundary tone. This contour – L*+H L-H% – corresponds to the “contradiction contour” of Liberman and Sag (1974) (see also Walker 1996). The tune is also typical of utterances containing metalinguistic negation (Horn 1989). More recently, Steedman (2000, 2003) analyzes this contour as conveying information to the effect that it is not the case that the hearer supposes ϕ , where for (49b) and (49c) ϕ is the proposition that Jane turned in her assignment (assuming that metalinguistic negation in (49c) does not form part of the propositional content of the question). Thus the meaning Steedman assigns to the tune is a plausible way for the speaker to remind the hearer of information that the speaker deems relevant to the discourse. A neutral assertion of (49b) and the INPQ interpretation of (49c), on the other

hand, intuitively to contain an H* pitch accent. Intonational information, therefore, again distinguishes ONPQs and INPQs, ONPQs having intonational characteristics typical of certain types of assertion.

I will not comment further on the interpretation of metalinguistic negation in ONPQs here, though further research is certainly needed. Rather, for the time being, I simply assume that (i) the negation in ONPQs plays a discourse function, signaling that the utterance acts as a denial or suggestion, and (ii) that the negation does not form part of the propositional content of the question. The next section provides an analysis in SDRT of the use of ONPQs and INPQs. Given the evidence in §4.2.3 and §4.5, I assume that ONPQs are assigned a complex speech act type `ASSERTION • QUESTION` by the grammar. This type assignment influences the role that ONPQs play in discourse and accounts for the fact that they pattern with assertions. INPQs, on the other hand, are typed `QUESTION`. The discussion below provides some evidence for this, showing that INPQs are more like PPQs than they are like ONPQs, another strike against theories like the `VERUM` approach that treat the ONPQ/INPQ distinction as a syntactic ambiguity.

4.6 NPQs and Discourse Logical Form

The current section examines the contribution of negative polar questions to the interpretation of discourses in which they occur. The discussion above argued for two central claims. First, outside-negation polar questions are assigned a complex speech act type `ASSERTION • QUESTION` by the grammar. Second, inside-negation polar questions and positive polar questions are semantically equivalent, contrary to analyses such as Romero and Han (2004).

4.6.1 Outside-negation Polar Questions

I discuss the use of ONPQs in “suggestion scenarios”, before addressing their use in “contradiction scenarios”. This choice is for purely expository purposes, as there is no essential difference in their use in each kind of context. For any ONPQ, the assertion component has some discourse function as determined by its rhetorical connection to the preceding discourse context. The nature of the discourse context, i.e. whether it is neutral or biased, constrains the type of discourse relation that is used, as described below. ONPQs, on this score, are like any other assertion.

Suggestion Scenarios

The discourse context in (53), in particular the context provided by (53a) – (53c), is neutral with respect to the proposition that Jane is coming. The discourse segments π_1 and π_2 elaborate the segment in π_0 by providing more information about which good syntacticians are attending the workshop. The SDRS for this part of (53) utilizes the relations *Elaboration* and *Continuation*. *Elaboration* is a subordinating relation, and links two discourse segments α and β just in case K_β describes in greater detail some part of K_α (Asher 1993, Asher and Lascarides 2003). *Continuation* is a weak coordinating relation that requires the segments it relates to be in the same relation to any segment that dominates them (Asher 1993). The intuition is that π_1 elaborates π_0 and π_2 continues that elaboration.

- (53) a. (π_0) A: Many good syntacticians are attending the workshop.
 b. (π_1) A: George is coming;
 c. (π_2) A: Mary is coming;
 d. (π_3) B: Isn’t Jane coming too?

The SDRS τ for the discourse through (53c) is:¹⁰

- $A = \{\pi_0, \pi_1, \pi_2, \pi', \pi''\}$
- $\mathcal{F}(\pi_0) = K_{\pi_0}, \mathcal{F}(\pi_1) = K_{\pi_1}, \mathcal{F}(\pi_2) = K_{\pi_2}$
 $\mathcal{F}(\pi') = \textit{Elaboration}(\pi_0, \pi'')$
 $\mathcal{F}(\pi'') = \textit{Continuation}(\pi_1, \pi_2)$
- $LAST = \pi_2$

A number of things follow from τ : that George and Mary are good syntacticians, that they are both attending the workshop, etc. It does *not* follow, however, that Jane is coming, so the context is neutral with respect to the proposition that Jane is coming. The next step is to update τ with the ONPQ in (53d) (labeled π_3).

I refer the reader to Asher and Lascarides (2003) for the gory details of SDRT update. For present purposes, it is sufficient to note that updating τ with π_3 consists of finding a suitable discourse segment within τ to attach π_3 to. This amounts to adding $?(\alpha, \pi_3, \lambda)$, for some α and λ , to the set of glue logic premises. However, because π_3 is assigned a complex speech act type this premise incurs a type clash, which is resolved by introducing two new speech act discourse referents: π_{3a} (π_3 *qua* assertion) and π_{3q} (π_3 *qua* question). Intuitively, π_{3a} weakly asserts that Jane is coming, continuing the elaboration of π_0 started by π_1 and π_2 , so τ is updated by conjoining $\textit{Continuation}(\pi_2, \pi_{3a})$ to the SDRS formula labeled π'' .

Next, the discourse contribution of π_{3q} is computed. π_{3q} must be rhetorically linked to π_{3a} in order to satisfy the coherence requirements on complex types (see Chapter 2). It is important to keep in mind in computing this connection that π_{3a} is only *weakly* asserted. Following the discussion of rising intonation tag questions in chapter 3, this means that A can infer that B believes that it is *possible* that Jane

¹⁰I what follows I enumerate speech act discourse referents that label utterances with sub-scripted numerals and those that are introduced in the SDRS construction process with super-scripted primes.

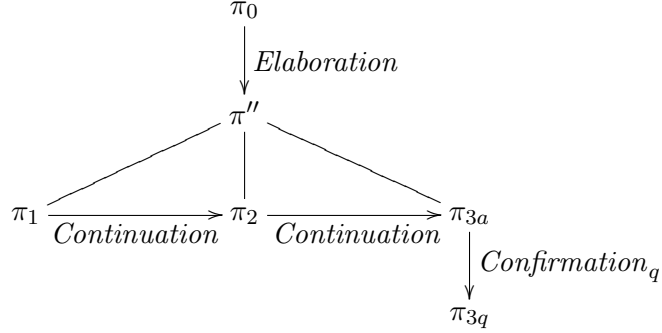


Figure 4.1: SDRS graph for dialogue (53).

is coming, i.e. $\mathcal{B}_B(\Diamond p_{\pi_{3a}})$, and is not *certain* that she is coming. If B was certain that that Jane was coming, he would have no reason not to use standard declarative syntax to make his assertion. The partition denoted by the question π_{3q} (as argued at length above) is just the set of propositions:

$$\{\lambda w[\text{Jane is coming in } w], \lambda w[\neg \text{Jane is coming } w]\}$$

The situation is reminiscent of the analysis of rising intonation tag questions from Chapter 3. Because B weakly asserts π_{3a} , it follows that he assigns it a probability less than 1. As a result, the direct answers to π_{3q} either increase or decrease the probability that B assigns to K_{3a} . Any direct answer to π_{3q} , therefore, is *relevant* to π_{3a} , as defined in Chapter 3, and the antecedent to the axiom for inferring Confirmation_q (repeated in (54)) is satisfied. By defeasible modus ponens, it follows that $\text{Confirmation}_q(\pi_{3a}, \pi_{3q})$. The final SDRS graph for (53) is shown in Figure 4.1.

(54) **Axiom on Confirmation Questions:**

$$(?(\alpha, \beta, \lambda) \wedge \text{Answer}(\beta, p) \wedge \text{relevant}_\tau(p_\alpha, p)) > \text{Confirmation}_q(\alpha, \beta, \lambda)$$

The discourse function of the ONPQ in (53d), given the graph in Figure 4.1, is equivalent to that of a rising intonation tag question, as can be seen by replacing (53d) in (53) with (55).

(55) B: Jane is coming too, isn't she?

This result follows on the present analysis from the assumption that ONPQs and tag questions are both instances of the complex speech act type $\text{ASSERTION} \bullet \text{QUESTION}$. Furthermore, the component types of (53d) and (55) have the same semantic content. It is not surprising, then, that they have equivalent discourse functions.

Contradiction Scenarios

The details of the use of ONPQs in “contradiction scenarios” has the same general outline as their use in “suggestion scenarios”, as described above. The primary difference is in the type of discourse relation that connects the associated assertion to the preceding discourse context. Specifically, given the incompatibility of the contextual bias and the assertion, it follows that the assertion attaches with a *divergent* discourse relation such as *Correction* or *Counterevidence* (Asher and Lascarides 2003). These discourse relations mark disputes in dialogue. Hence, divergent relations require the content of the segments they relate to be incompatible in some sense. For *Correction*, α and β must be inconsistent.¹¹ For *Counterevidence*, K_β must defeasibly entail that K_α is false, or less believable (Asher and Lascarides 2003).

Because divergent relations introduce disputes, updating an SDRS τ with one requires some revision of the information already contained in τ (as described in Chapter 2). In particular, if $R(\gamma, \alpha)$ holds, where R is right-veridical, and *Correction*(α, β) or *Counterevidence*(α, β) is subsequently added to the discourse

¹¹In addition, there are constraints on the focus-background structure of the discourse segments that are related by *Correction*. See Asher (1995) for details.

logical form, then $R(\gamma, \alpha)$ is replaced with $Dis(R)(\gamma, \alpha)$, indicating that the content $R(\gamma, \alpha)$ is disputed. $Dis(R)(\gamma, \alpha)$ entails that $S(\beta)$ believes $R(\gamma, \alpha)$, but $\neg R(\gamma, \alpha)$ is entailed by the discourse context (Asher and Lascarides 2003).

In the dialogue in (56), π_{1a} attaches to π_0 with *Counterevidence* – again implicating that Jane is a syntactician – and π_{1q} attaches to π_{1a} with *Confirmation_q*. In this context, *Confirmation_q* functions as a challenge to A to, colloquially speaking, “put up or shut up”. That is, A must either accept B ’s assertion, and revise his beliefs appropriately, or provide counterevidence to B ’s contribution.

- (56) a. (π_0) A : No syntacticians are attending the workshop.
 b. (π_1) B : Isn’t Jane coming?
 c. (π_2) B : No./#Yes.

Reese (2006a) notes that this analysis accounts naturally for the markedness of simple positive answers to (56b), as shown in (56c). Figure 4.2 shows the SDRS graph for a simple negative answer to the confirmation question. Most important about this SDRS is the fact that not only does the negative response answer the confirmation question, hence $QAP(\pi_{1q}, \pi_2)$, it also corrects B ’s assertion that Jane is coming, hence *Correction*(π_{1a}, π_2). As a result, *Counterevidence*(π_0, π_{1a}) is replaced with $Dis(Counterevidence)(\pi_0, \pi_{1a})$; A has provided counterevidence to B ’s counterevidence, meeting the challenge. More importantly, the SDRS is consistent.

The graph in figure 4.3, representing the SDRS for a simple positive response, is not consistent, providing a plausible account of the relative infelicity of the simple positive answer. The answer that Jane is coming answers the confirmation question and provides evidence for the weak assertion in π_{1a} . A cursory glance at Figure 4.3 reveals a problem, however. π_{1a} and π_2 convey the same proposition, viz. that Jane is coming. Yet this proposition, given the discourse logical form, is required to be both evidence and counterevidence to π_0 . Given the semantics of divergent relations

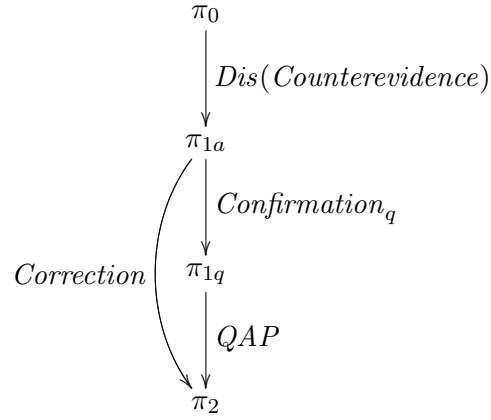


Figure 4.2: SDRS graph for dialogue (56): a simple negative response.

(and *Evidence*), this results in an inconsistent discourse logical form.

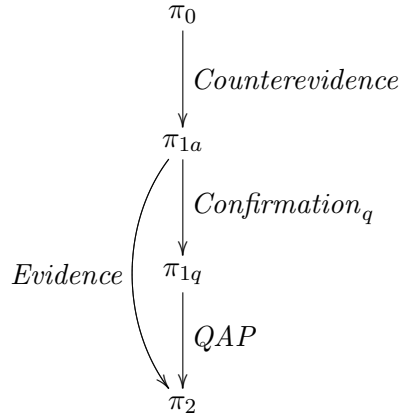


Figure 4.3: SDRS graph for dialogue (56): a simple positive response.

This does not mean that positive answers are ruled out *a priori*. They do require some extra content to be felicitous, however. Intuitively, what is needed is information that addresses the alleged counterevidence in π_{1a} . Either *A* must explicitly reject his previous assertion that no syntacticians are coming, as in (57a), or

offer information that disputes the counterevidence relation between π_0 and π_{1a} , but which is nonetheless consistent with the assertion that Jane is coming. For example, (57b) corrects the *implicature* associated with π_{1a} that Jane is a syntactician.

- (57) a. A: Yes. You're right. I forgot about Jane.
 b. A: Yes. But she doesn't do syntax anymore. She absolutely refuses to talk about weak islands.

4.6.2 Inside-negation Polar Questions

§4.2.3 and §4.5 established that inside negation polar questions, unlike outside-negation PQs, are not assigned a complex speech act type by the grammar. Rather, INPQs are questions, as predicted by the default alignment of linguistic form with discourse function. However, the range of discourse functions that INPQs play in a dialogue is rather narrowly constrained. Specifically, they appear to be confined to *grounding questions*. That is, they are requests by the speaker for evidence that would help him to *ground* information in the discourse or situational context. To ground information, following Clark (1996), is “to establish it as part of the common ground well enough for current purposes” (p. 221). Normally, the information targeted by the grounding question is inconsistent with a prior belief or expectation. Intuitively, the speaker holds off updating her epistemic state, or her model of the common ground, with the new information until the addressee provides additional evidence for it, or simply reaffirms it.

I model grounding questions with the SDRT relation *Evidence*, which relates two discourse segments α and β just in case β defeasibly entails α . Specifically, a grounding question β is related to an utterance that conveys information that is not yet grounded with the *Evidence_q*. Recall that when a relation of the form R_q links α to β , any answer to β must be linked to α with the relation R . The glue logic axiom for computing the discourse contribution of grounding questions is

given in (58). Recall from chapter 2 that the core proposition of a DRS K is the DRS K' obtained by removing any markers of sentence mood, e.g. interrogative or imperative operators.

(58) **Axiom on Grounding Questions:**

$$(?(\alpha, \beta, \lambda) \wedge \beta : \text{QUESTION} \wedge (K_\alpha > \text{core-proposition}(K_\beta))) > \\ \text{Evidence}_q(\alpha, \beta, \lambda)$$

In plain English, (58) states that if a question β attaches to α within the discourse context λ and K_α defeasibly entails the core propositional content of β , then normally β attaches to α with Evidence_q , i.e. β is an request for evidence supporting α .

The requirement that K_α entail the core propositional content of the question captures Buring and Gunlogson's (2000) observation that an INPQs are restricted to contexts that contain compelling contextual evidence for the underlying proposition associated with the INPQ. The constraint also permits the use of PPQs as grounding questions when there is contextual evidence for a positive proposition. There is an indirect relationship between the content of the ungrounded information and the form of the grounding question. Normally, new information ϕ contributed by an agent A entails the falsity of some proposition ψ which a second agent B believes to be true. To establish ϕ as part of the common ground, B requests additional evidence for $\neg\psi$.

Depending on how an agent conceptualizes the information that conflicts with the ungrounded information, either a positive or negative polar questions might be felicitous. Consider the examples in (59), in which the definite description *the king of France* presupposes the existence of an entity matching that description. If the presupposition is new to the hearer and, furthermore, she has a prior belief that conflicts with it, she may utter either (59b) or (59a). The content of the

presupposition defeasibly entails that France is not a republic *and* that France is a monarchy.¹² Presumably, if the belief that France is a republic is salient to the hearer, she will utter (59b); if the belief that France is not a monarchy is salient, she will utter (59c). In either case, the question attaches to (59a) with *Evidence_q*, as the intention behind *B*'s utterance is for *A* to provide information to help them ground the presupposition that France has a king.

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

(60) illustrates the contribution of the discourse relation *Evidence_q* in more detail. Given the INPQ in (59b), we can assume that *B* (mistakenly) believes that Britain is an *absolute* monarchy. (60a) entails that it is not, so *B* bases her polar question on the negative answer, viz. that Britain is *not* a monarchy. The negative answer is the one entailed by the discourse context and so represents the information that *B* is attempting to ground. **Axiom on Grounding Questions** is satisfied, so *A* infers that *B* intends *Evidence_q*(π_0, π_1). The answer in (60c) provides additional evidence for the presupposition introduced by the definite description, viz. that Britain, although a monarchy, is a *constitutional* monarchy. *B* acknowledges the answer with the response in (60d), successfully grounding the presupposition.

- (60) a. (π_0) A: The prime minister of Britain supports President Bush.
 b. (π_1) B: Isn't Britain a monarchy?
 c. (π_2) A: No./#Yes. [It's a *constitutional* monarchy *and* a representative democracy.]
 d. (π_3) B: Oh, I see.

¹²Note that these two propositions are not equivalent, as there are many forms of government that are neither monarchies nor republics.

The simple *yes* response to (60b) in (60c) is pragmatically marked, since it does not satisfy the semantic requirements of the discourse logical form. Specifically, if $Evidence_q(\pi_0, \pi_1)$ and $QAP(\pi_1, \pi_2)$, it follows that $Evidence(\pi_0, \pi_2)$, requiring that K_{π_2} defeasibly entail K_{π_0} , according to the semantics of *Evidence*. If π_2 conveys that Britain is a monarchy – as a simple *yes* response does, then the semantic requirements of *Evidence* are not met (assuming that the default interpretation of *monarchy* is an absolute monarchy. A simple positive answer *is* felicitous if continued with information that does, in fact, provide evidence for the original assertion, such as the bracketed material in (60c), which admits that Britain is a monarchy, but contrasts absolute monarchies with constitutional monarchies, which may also be democracies.

The VERUM account from Romero and Han (2004) and the revised VERUM account from Romero (2005) have problems dealing with the observations associated with the dialogue in (60b), especially with the markedness of simple positive answers. Most of these problems were discussed above and relate to the fact that the meaning that Romero and Han assign to INPQs does not match intuitions about what simple *yes* and *no* answers to INPQs convey. A simple *yes* on the VERUM account, for example, expresses the proposition that it is certain that the proposition that Britain is not a monarchy should be added to the common ground. If one reads *monarchy* here as *absolute* monarchy, there is nothing objectionable about this answer: *A* expresses with certainty that the presupposition should be grounded. But as I just demonstrated, a simple *yes* answer to (60b) is somewhat odd (and at the very least unhelpful). Furthermore, a negative answer on the VERUM reading conveys the proposition that it is *not* certain that the proposition that Britain is *not* a monarchy should be added to the common ground, which runs completely contrary intuitions. This answer should most certainly be marked in the discourse context. However, as I argued, simple negative answers are *unmarked*.

The revised VERUM account (if it were to be made somehow explicit) might fare better. But recall that on that account the meaning of an INPQ is basically equivalent to the meaning of the related PPQ, with the exception of some extra expressive content throw in for good measure. But once one accepts that INPQS and PPQs are equivalent, I see no reason to posit the existence of the alleged expressive content. This is especially true if one steps back and takes a discourse oriented view on the use of INPQs. On this view – specifically, on the SDRT view – utterances in a discourse must be rhetorically linked by (at least) one of a number of binary discourse relations that themselves contribute to the model-theoretic interpretation of the discourse. Thus the meaning of a question, or any utterance for that matter, goes beyond what is given by the compositional semantics of the clause itself. On the analysis of INPQs, and grounding question in general, presented here, this extra content is contributed by the relation *Evidence_q*. Thus while the partition given by the compositional semantics of (60b), for example, is just

$$\{\lambda w[\text{Britain is a monarchy in } w], \lambda w[\neg \text{Britain is a monarchy in } w]\},$$

the meaning, broadly construed, is closer to the question *Do you have evidence that Britain is not a monarchy?* On this paraphrase, the analysis presented here and that presented by Romero and Han (2004) are entirely compatible.¹³ On the SDRT analysis, however, there is no reason to complicate the compositional semantics of the INPQ, which is good, as there is very little empirical reason to do so. Instead, the extra content is introduced at discourse logical form rather than clausal logical form.

Finally, the current approach to INPQs is compatible in many ways with the decision-theoretic analysis of van Rooy and Šafářová (2003). First, van Rooy and Šafářová assume, as do I, that PPQs and INPQs are semantically equivalent.

¹³See the discussion in Romero and Han (2004) on pp. 644–646, e.g.

Second, they treat the positive bias inherent to INPQs as a conversational implicature. The NPQ is used because the negative answer has a higher utility than the positive answer, which – assuming that informativity is at stake – implies that the speaker considers the positive answer to be more likely. In the case of grounding questions, informativity is computed with respect to the speaker’s belief-desire state before updating it with new, controversial information. Intuitively, the speaker is reluctant to ground the new information as it would trigger a significant revision of the current belief-desire state.

These assumptions are consistent with the current approach, although in the SDRT setting that positive bias is derived via shallow pragmatic reasoning. Specifically, if A asserts ϕ and B has no reason to doubt ϕ , then B should add ϕ to his belief set.¹⁴ By asking the question $?\phi$, B implicates that he does not know whether or not ϕ (see the preparatory conditions on questions in Searle 1969). Given that ϕ has been asserted, it is reasonable to assume, then, that B believes (or suspects) that $\neg\phi$.

4.7 Conclusion

This chapter argued that outside-negation polar questions are assigned a complex speech act type `ASSERTION • QUESTION`, a fact which distinguishes them formally from both inside-negation polar questions and positive polar questions, which are assigned the speech act type `QUESTION`. Whereas the former assumption allows us to capture in a straightforward manner the ways in which ONPQs behave like assertions, i.e. their use as denials and suggestions, previous approaches fail on this account. The bias derived by van Rooy and Šafářová’s (2003) decision theoretic

¹⁴This reasoning is captured by the **Competence** axiom in SDRT’s logic of cognitive modelling (discussed in chapter 2 and repeated below) (Asher and Lascarides 2003).

- **Competence:** $\mathcal{B}_A\phi > \mathcal{B}_B\phi$

This default applies unless over-ridden by a more specific default.

analysis, for example, is too weak to play this role. While it provides information about the speaker's belief-desire state, it provides no information about his intention in using a biased question. Furthermore, it fails to distinguish the biases inherent to ONPQs from that conveyed by INPQs. Romero and Han's 2004 semantic account builds too much of the typical discourse function of NPQs into their semantics. The problem with this is that to all appearances INPQs, PPQs and the question component of ONPQs are semantically equivalent.

The analysis above overcomes these shortcomings by adopting a framework for the computation of discourse function, viz. SDRT. Pragmatic mechanisms are employed to model the restricted use of various polar question types. In this respect, my analysis is in the spirit of van Rooy and Šafářová (2003). In fact, the kind of decision-theoretic reasoning that they employ can be viewed as an implementation of the non-shallow version of SDRT's shallow logic of cognitive modelling (exactly the kind of deep reasoning that the shallow logic circumvents). However, it's necessary to employ a conventionalized linguistic distinction in ONPQs, which they eschew. This assumption, I believe, is justified based on the linguistic evidence, viz. the significant overlap in the distribution and discourse function between ONPQs and typical assertions.

Chapter 5

Negative Bias in Questions with Emphatic Focus

5.1 Introduction

The current chapter examines positive polar questions with an inherent negative bias. Typical examples of this kind of question are shown in (1). Questions like (1a), which contains a strong negative polarity item, have received the most attention in the semantic literature (cf. Borkin 1971, Krifka 1995, Abels 2003, van Rooy 2003, Guerzoni 2004, a.o.). However, this previous research focuses on the licensing of NPIS in interrogative sentences rather than on negative bias *per se*.¹

- (1) a. Did John *lift a finger* to help Mary?
 b. Has John EVER helped Mary?
 c. Did I TELL you that writing a dissertation would be easy?

¹There are some exceptions. See Abels (2003), Krifka (2003), Guerzoni (2004), and Asher and Reese (2005).

Because of this narrow focus on NPIS, related types of negatively biased polar question have been, to some extent, neglected. For example, while questions like (1b) that contain stressed domain wideners have received some attention in the context of NPI licensing in questions, questions like (1c) that have a marked intonation similar to the one in (1b) have received considerably less attention.² Furthermore, one seldom sees all of the question types in (1) subsumed under a single analysis.

This chapter has two goals, one related to the form of negatively-biased polar questions, the other to their discourse function. First, I argue that the bias in the questions in (1) has a common grammatical source related to intonation, rather than to any lexico-semantic properties of the question. I refer to these questions, therefore, as *emphatic focus questions*.³ Intuitively, the questions in (1) require the primary sentence stress to be marked with either an L* or L*+H pitch accent in order to be biased. With the exception of Borkin (1971) and Krifka (1995), the intonational properties of negatively-biased questions are rarely noted. On the other hand, many previous analyses normally do note some kind of emphatic meaning associated with the examples in (1). The second goal of the chapter is to provide evidence that emphatic focus questions are conventionalized indirect assertions. As in previous chapters, the primary evidence for this claim comes from Sadock’s assertion diagnostics, which should be familiar to the reader by now. These tests show that the distribution of emphatic focus questions overlaps with that of negative assertions.

The chapter is organized as follows. §5.2 discusses previous analyses of biased questions with strong NPIS. I focus in particular on the weak characterization of bias in Krifka (1995) and van Rooy (2003). Bias is weak on these analyses because (i)

²Sadock (1971) is an early exception. Han (2002) and Caponigro and Sprouse (2007) provide more recent discussions of “rhetorical questions”.

³In a similar vein, Sadock (1971) referred to the questions in (1) as *queclaratives* to indicate that (on his analysis) these questions possess an underlying declarative component, in addition to an interrogative one.

it is a conversational implicature, hence cancellable, and (ii) it does not settle the issue introduced by the question. §5.2.2 discusses strong analyses of negative bias for the sake of completeness. I do not discuss these analyses further, as they make the same predictions as weak analyses (modulo the strength of the bias).

§5.3 presents new data that is problematic for the very general pragmatic analyses in Krifka (1995) and van Rooy (2003). These counterexamples come in two varieties. First, I discuss questions with a similar semantic content to the questions in (1), but which do not exhibit a similar bias. Second, I discuss apparent lexical exceptions to the pragmatic analysis, which are unexpected on a pragmatic analysis. Both types of counterevidence mitigate against an analysis of bias as a conversational implicature on the standard Gricean assumption that implicatures are calculated on the basis of semantic content and general principles of rationality, rather than on linguistic form. At the same time, this discussion provides evidence from our assertion diagnostics that emphatic focus questions convey an indirect assertion.

§5.4 argues that the common grammatical source of the negative bias in (1) is the marked intonation contour normally associated with these questions. I discuss the interpretive contribution of intonation briefly, before linking it to a negative assertion within the logic of cognitive modelling in §5.5. The intonation based analysis of negative bias is able to account for many of the problematic examples introduced in §5.3.

5.2 Previous Approaches

5.2.1 Weak Characterizations of Negative Bias

Krifka (1995, 2003) and van Rooy (2003) provide a weak characterization of the negative bias endemic to questions with strong NPis like those in (2).

- (2) a. Did Larry drink *a drop* of whiskey?
 b. Did Fred contribute *a red cent* to the campaign?
 c. Did Mary *bat an eye* when you threatened her?

On their analysis, (2a) conversationally implicates – or presupposes following van Rooy (2003) – that Larry did not drink any *substantial* amount of whiskey and asks whether he drank the minimal amount of whiskey or none at all. The bias is *weak* because the question is open with respect to the minimal quantity of whiskey. However, because the question has such a low threshold for a positive answer – which entails only that Larry consumed some idiomatically small amount of whiskey – there is a further implicature that the speaker expects that Larry drank no whiskey at all.

Krifka (1995) and van Rooy (2003) compute the negative bias of interrogatives with strong NPis from the interaction of the compositional semantics of NPis and the pragmatic principle articulated in MIA below. Following Krifka (1995), the key ingredients of the analysis are that (i) minimizing NPis denote low scalar values and (ii) introduce a set of alternative expressions.⁴ The introduction of these alternatives is constrained by MIA, which requires that the speaker has reasons to invoke the alternatives. $\llbracket \alpha \rrbracket$ provides the denotation of the expression α , whereas $\text{alt}(\llbracket \alpha \rrbracket)$ provides the alternatives associated with α , similar to Rooth's (1992) distinction between the ordinary semantic value of an expression and its focus semantic value.

• **Motivated Introduction of Alternatives (MIA):**

If $U(\dots \alpha \dots)$ is uttered, where α introduces a set of alternatives $\text{alt}(\llbracket \alpha \rrbracket)$, then for all alternative utterances $U(\dots \alpha' \dots)$, where $\alpha' \in \text{alt}(\llbracket \alpha \rrbracket)$, the speaker must have reason (i) to introduce these alternatives, and (ii) not to utter

⁴These two assumptions play some role or another in most theories of negative bias in questions with strong NPis. (See Abels 2003 and Guerzoni 2004 for examples.) Accounts differ, however, with respect to how these assumptions are used in the derivation of negative bias.

them instead of the actual utterance (Krifka 2003).

MIA is a general pragmatic constraint, applying not only to NPIS but to any expression that introduces a set of alternatives, e.g. the intonational focus of a sentence.

In order to show how MIA conspires with the compositional semantics of NPIS to produce negative bias, let's examine a specific example in detail, viz. (2a). Krifka (1995) assumes that *drop* when used as an idiomatic NPI denotes a property of minimal quantities of liquid, i.e. quantities of liquid that have no proper parts. This meaning component is shown in (3a). Additionally, *drop* introduces the set of alternative expressions in (3b) (Krifka 1995, p. 237). Both Krifka (1995) and van Rooy (2003) assume that the ordinary semantic value of an NPI is not included in its alternative set. Consequently, the set of alternatives in (3b) consists of properties of non-minimal quantities of liquid.

- (3) a. $\llbracket \text{drop} \rrbracket = \lambda i \lambda x [\mathbf{liquid}_i(x) \wedge \neg \exists y [y \sqsubset_i x]]$, where $x \sqsubset y$ is the proper part-of relation.
- b. $\text{alt}(\llbracket \text{drop} \rrbracket)$ is a set satisfying the following conditions:
- (i) $\forall i \forall x [\mathbf{liquid}_i(x) \rightarrow \exists P [P \in \text{alt}(\llbracket \text{drop} \rrbracket) \wedge P_i(x)]]$
 - (ii) $\forall i \forall P \forall x [P \in \text{alt}(\llbracket \text{drop} \rrbracket) \wedge P_i(x) \rightarrow \mathbf{liquid}_i(x)]$
 - (iii) $\forall i \forall P \forall P' [P \in \text{alt}(\llbracket \text{drop} \rrbracket) \wedge P' \in \text{alt}(\llbracket \text{drop} \rrbracket) \wedge P \neq P' \rightarrow \neg \exists x [P_i(x) \wedge P'_i(x)]]$

Given the denotations in (3), the interrogative in (2a) has the ordinary semantic value in (4a), in addition to introducing the set of alternative questions in (4b), where $?$ is the function $\lambda \phi \lambda p [p = \lambda i \phi \vee p = \lambda i \neg \phi]$.

- (4) a. $\llbracket (2a) \rrbracket = ? \lambda i \exists x [\mathbf{drop}_i(x) \wedge \mathbf{drink}_i(\mathbf{1}, x)]$
- b. $\text{alt}(\llbracket (2a) \rrbracket) = \{ ? \lambda i \exists x [P_i(x) \wedge \mathbf{drink}_i(\mathbf{1}, x)] \mid P \in \text{alt}(\llbracket \text{drop} \rrbracket) \}$

As it stands, (4a) can be answered affirmatively if Larry drank any quantity of whiskey, say 12 ounces or more, assuming that every amount of liquid has a minimal part.

Before the addressee answers, however, she must accommodate the alternative questions in (4b) as stipulated by MIA. Specifically, for each alternative, the speaker (i) must have some reason to invoke it and (ii) some reason not to ask it instead of the actual question. With respect to the former requirement, Krifka argues that the speaker is aware that the alternatives are potentially relevant, for example, as sub-questions to the current question under discussion (Roberts 1996), or that the speaker is aware of being able to ask more or less inquisitive questions.

More interesting for the problem of negative bias are the speaker's motivations for not asking any of the alternatives in (4b). van Rooy (2003) argues that the speaker chooses not to ask any of the alternatives in (4b) because he already knows the answer to them. For van Rooy, this is a presupposition associated with strong NPis. But this assumption by itself does not yield a negative bias. Crucially, Krifka (1995, 2003) and van Rooy (2003) assume that in order for (2a) to be felicitously asked it must *not* already be settled. This requirement is related to general constraints on the assertability of a proposition in a given context. Following Stalnaker (1978), a proposition ϕ is assertable in a context c – taken to consist of a set of worlds or indices – iff $c \cap \phi \neq c$ and $c \cap \phi \neq \emptyset$. In other words, a proposition ϕ cannot be asserted in a context c if ϕ or its negation is already part of the common ground. It is natural to assume a similar constraint for polar questions: the question $? \phi$ cannot be felicitously asked in c if either ϕ or $\neg \phi$ is not assertable in c . It follows from this constraint that the alternative questions in (4b) are answered negatively, since a positive answer to any alternative entails a positive answer to the actual question (4a). If Larry drank any non-minimal quantity of whiskey, then he drank a minimal quantity of whiskey. Krifka (1995) notes that this follows from

the assumptions that if x drinks something, then he drinks every part of it and that every quantity of liquid has a minimal part. It does not follow, however, from the statement that Larry did not drink some non-minimal amount of whiskey that he did not drink the minimal amount.

On the weak analysis of negative bias, then, (2a) implicates that Larry did not drink any substantial amount of whiskey, but leaves the question open with respect to idiomatically small amounts of whiskey. This kind of pragmatic analysis is very general, applying to any lexical item that denotes an extreme scalar value and which is associated with a set of alternatives. Given the entailment relations between answers to any alternative question and answers to the actual question, either a positive or negative bias is possible. For example, Krifka and van Rooy's analysis applies equally to strong NPIS like *wild horses* or *in a million years* which denote maximal scalar values. As is evident in the Web examples in (5), such maximizing NPIS also yield a negative bias.

- (5) a. Could *wild horses* have drug them away from any testimony that might incriminate the Bush administration?
- b. Remember how you had to hit your bottom before you found your way to AA? Could *wild horses* have dragged you to a meeting before you were ready?
- c. Would he *in a million years* consider an extra man? I don't know many who would, so why should we consider another chick?

For instance, following Krifka (1995) one might assume that *in a million years* denotes "a time that is maximally distant in the future with respect to a given context" (p. 240), the alternatives times being those that are less remote. Krifka in addition assumes the following "inertia" principle: if ϕ holds at time t , then ϕ holds at all times later than t . It then follows that the alternative questions introduced

by (5c) must be answered negatively, since it is assumed that if the referent of the pronoun would consider a certain action at some time that is not maximally distant, he would consider that action at the maximally distant time, which entails a positive answer to the actual question. This does not hold for negative answers. The reasoning just sketched regarding (5c) parallels the reasoning with regard to (2a). This is to be expected, given that the grammatical ingredients are the same: an expression denoting a scalar value lying somewhere toward the ends of the scale and which introduces a set of alternatives.

A second important feature of weak analyses is that they yield a conversational implicature in the purest sense of the term, i.e. an inference that follows from the semantic content of an utterance and principles of rational and cooperative communication. As a result, it ought to be non-detachable, i.e. related to *content* rather than *linguistic form* (Grice 1975, Levinson 1983). In other words, an expression with a similar semantic content should give rise to the same implicature.

In §5.3, I argue that negative bias in questions with strong NPIS is not as general as the analyses in Krifka and van Rooy predict. First, there are strong, minimizing NPIS which do not invariably yield a negative bias. Second, there are strong NPIS for which one would expect a positive bias on a pragmatic account that instead yield a negative bias. Finally, PPIS that denote extreme scalar values are not biasing. Before addressing these issues in detail, however, I briefly discuss analyses that offer a strong characterization of bias.

5.2.2 Strong Characterizations of Negative Bias

Opposed to the weak characterizations of negative bias in Krifka (1995) and van Rooy (2003) are analyses that argue for a strong characterization of bias. Recall that weak characterizations are considered weak because the bias does not settle the issue raised by the question. This weakness is built into the analyses of Krifka

(1995) and van Rooy (2003) via the constraint that the actual question is not settled. Abels (2003) and Guerzoni (2004) provide strong characterizations of negative bias. On these analyses, biased questions are settled. Abels (2003), for example, assumes that questions with a strong NPI presuppose a negative answer. Similarly, Guerzoni (2004) provides an analysis on which the positive answer to a biased question is ruled out on pragmatic grounds, leaving only the negative answer as a live possibility. I discuss Guerzoni’s proposal below.

Abels (2003) and Guerzoni (2004) share a number of important premises with Krifka (1995) and van Rooy (2003). In particular, they derive bias from the lexical semantic properties of strong negative polarity items and appeal to a salient set of alternatives. The main difference lies in the presuppositions that they associate with strong NPIS. Specifically, they assume that strong NPIS introduce a covert *even* at logical form. As a result, sentences with strong NPIS share the presuppositions of sentences with an overt *even*. Guerzoni (2004) provides the lexical entry in (6), where the presupposition is given between the curly braces. (Following Rooth (1992), C is a subset of the focus semantic value of ϕ .)

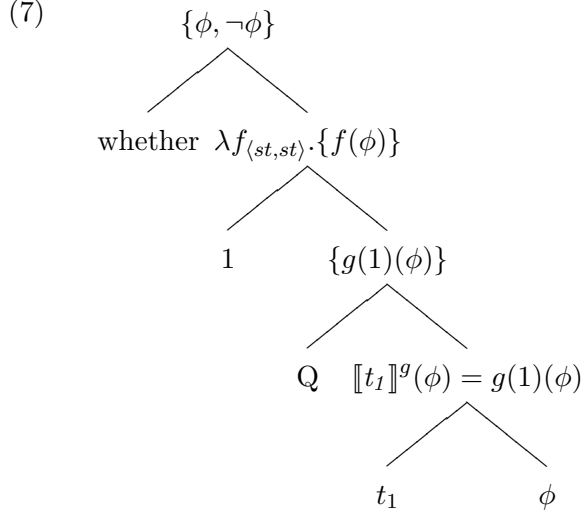
$$(6) \quad \llbracket \text{even}_C \rrbracket = \lambda\phi. \{ \forall \psi [(\psi \in C \wedge \psi \neq \phi) \rightarrow \psi >_P \phi] \} . \phi$$

According to (6), *even* is a partial identity function on propositions, which is defined just in case the proposition to which it is applied is less likely than any of the alternatives in C .⁵

Guerzoni’s (2004) derivation of negative bias relies on very specific assumptions about the logical form of interrogative sentences. These syntactic assumptions (and the resulting compositional semantics) are shown schematically in the tree in (7). Most importantly, Guerzoni assumes a covert *whether* that moves at logical form over the question morpheme Q leaving a trace. The question morpheme Q is

⁵Abels (2003) assumes in addition that all of the alternatives are true.

a simple a set formation operator, i.e. $\lambda x.\{x\}$.



Whether is analyzed as a generalized quantifier over functions of type $\langle\langle s, t \rangle, \langle s, t \rangle\rangle$, i.e. propositional modifiers. As shown in (8), there are two such functions, viz. those corresponding to the answer particles *yes* and *no*. The denotation associated with the logical form in (7) given (8) is the set of propositions $\{\phi, \neg\phi\}$.

$$(8) \quad \llbracket \text{whether} \rrbracket = \lambda f_{\langle\langle st, st \rangle, t \rangle} . \exists h_{\langle st, st \rangle} [(h = \lambda p.p \vee h = \lambda p.\neg p) \wedge f(h) = 1]$$

This set is the same as the one provided by analyses of the meaning of polar questions that do not posit the existence of a covert *wh*-word or movement (see Hamblin 1973, Groenendijk and Stokhof 1984, a.o.). However, this assumption is central to Guerzoni's derivation of negative bias. The denotation of (2a) on a straightforward application of her analysis (see the logical form in (9a)) is shown in (9b), where ϕ is the proposition that Larry drank the minimal amount of whiskey. The presupposition of *even* provided by the lexical entry in (6) states that ϕ is less likely than any alternative proposition in C , all of which state that Larry drank some non-minimal amount of whiskey. This presupposition is the same for both positive

and negative answers, since in both cases the same proposition occurs within the scope of *even*.

- (9) a. $\llbracket [\text{whether} [1 [Q [t_1 [\text{even}_C \phi]]]]] \rrbracket$
 b. $= \exists h. \{h(\llbracket \text{even}_C \rrbracket(\phi))\} = \{\llbracket \text{even}_C \rrbracket(\phi), \neg \llbracket \text{even}_C \rrbracket(\phi)\}$

This presupposition is problematic, however. Note that for all $\psi \in C$, $\psi \subseteq \phi$, i.e. all of the alternatives entail ϕ . It is impossible then for the presupposition of *even* to be satisfied. This follows from standard assumptions about how the probability of a proposition is computed. Specifically, if $P(\phi) = \sum_{w \in \phi} P(w)$ and $\psi \subseteq \phi$, then $P(\psi) \leq P(\phi)$, as there are at least as many if not more ϕ worlds than ψ worlds. Given the logical form in (9a), (2a) has no felicitous answer.

To capture this infelicity formally, Guerzoni (2004) restricts the denotation of an interrogative Q in a context c to those answers $q \in Q$ whose presuppositions are satisfied in c , which she writes as Q/c . Q/c consists of the answers that the speaker considers “live possibilities” in c . When the answers to Q share the same presuppositions — as is normally the case — Q/c is either Q or \emptyset . The previous paragraph establishes that for any input context c , $\llbracket (9a) \rrbracket / c = \emptyset$. In other words, there is no pragmatically felicitous answer to the question.

However, Guerzoni argues that (2a) is syntactically ambiguous. Specifically, she assumes that it is possible for the covert *even* introduced by the strong NPI to scope over the trace of *whether*, as in the logical form in (10a), in effect allowing one to quantify the answer particles *yes* and *no* into the scope of *even*. The resulting partition is shown in (10b).

- (10) a. $\llbracket [\text{whether} [1 [Q [\text{even}_C [t_1 \phi]]]]] \rrbracket$
 b. $= \exists h. \{\llbracket \text{even}_C \rrbracket(h(\phi))\} = \{\llbracket \text{even}_C \rrbracket(\phi), \llbracket \text{even}_C \rrbracket(\neg \phi)\}$

The positive and negative answers to (2a) given the logical form in (10a) have different presuppositions. The presupposition of the positive answer is the same as before and unsatisfiable for the same reasons. The negative answer, however, presupposes that the proposition that Larry did *not* drink the minimal amount is less likely than the proposition that he did *not* drink any substantial amount. The entailment relations between the alternatives in C and the assertion are reversed in this case and the presupposition is satisfied. As a result, for any input context c , $\llbracket(10a)\rrbracket/c = \{\llbracket\text{even}_C\rrbracket(\neg\phi)\}$. The question leaves a Hobson’s choice (as Hamblin 1973 puts it), which is to say that it leaves no choice at all. The only answer that is presented as a live possibility is the negative one. In effect, (2a) asserts that Larry didn’t drink even the minimal amount of whiskey.

Some of the data discussed in §5.3 suggest that biased questions are, in fact, negative assertions, providing some support for Guerzoni’s analysis. However, I do not discuss strong characterizations of negative bias any further below. There are two reasons for this. Most importantly, modulo the strength of the bias, the approaches in Krifka (1995), van Rooy (2003) and Guerzoni (2004) make very similar predictions, as both kinds of analysis rely on patterns of entailment between the same set of propositions. van Rooy (2003), for example, essentially associates a disjunctive presupposition with a question like (2a),⁶ which is resolved toward the negative disjunct given that the positive disjunct entails a positive answer to the actual question. Guerzoni, similarly, associates with each potential answer a distinct presupposition. The positive answer is ruled out because its presupposition is not satisfied, again because of the entailment relations that hold between the positive answer and the alternatives that it is associated with.

⁶Recall that van Rooy (2003) associates with a question that contains a strong NPI a set of alternative questions $\text{alt}(Q)$, which he assumes are all settled. In other words, for all $Q' \in \text{alt}(Q)$, where $Q' = \{q', \neg q'\}$, the speaker knows **either** q' **or** $\neg q'$.

Second, Krifka (1995) and van Rooy (2003) make fewer assumptions in their derivation of bias, in my opinion, and as a result provide a stronger analysis, in the sense that the assumptions they make are less controversial and are motivated independently of their analysis of negative bias. The two syntactic assumptions that Guerzoni requires for her analysis are especially worrisome. First, she assumes that *whether* undergoes movement and leaves a trace at logical form. This assumption allows her to quantify into the scope of the covert *even*, deriving a partition that has at least one felicitous answer. However, Guerzoni needs to assume some principle that prevents this movement from occurring non-locally. The question in (11a), for example, is potentially ambiguous if *whether* is allowed to move out of the complement of *say*, as in (11c). The logical form in (11c) has a the unintuitive interpretation on which a negative answer means that Sam said *that he does not know Italian*.

- (11) a. Did Sam say he knows Italian?
 b. [whether [1 [Q [t_1 [Sam say [he knows Italian]]]]]]
 c. [whether [1 [Q [Sam say [t_1 [he knows Italian]]]]]]

Second, allowing the covert *even* introduced by a strong NPI to scope over the trace of *whether* is arguably *ad hoc*, as *even* appears to be the only scope bearing element that can do so. Consider the question in (12a), for example, which contains the focus sensitive adverb *only*. The logical form in (12b) where *only* scopes over the trace of *whether* results in the partition in (12c). The positive answer on this reading asserts that no one other than Mary attended, whereas the negative answer asserts that no one other than Mary did *not* attend. This is not a possible interpretation of (12a). Guerzoni (2004) notes this fact, but argues that there is independent evidence that *even* has exceptional scope-taking capabilities.⁷

⁷The examples in (11a) and (12a) and the problems they pose for Guerzoni's account were brought to my attention by Bernhard Schwarz during a seminar at the University of Texas at

- (12) a. Did only $[Mary]_F$ attend?
 b. $\llbracket [\text{whether} [1 [Q [\text{only} [t_1 \text{ Mary attend }]]]]] \rrbracket$
 c. $= \{ \llbracket \text{only} \rrbracket (\text{Mary attend}), \llbracket \text{only} \rrbracket (\neg \text{Mary attend}) \}$

I do not have the space to address these issues in more detail here. But given that these issues do exist and that the weak and strong theories of negative bias converge on their predictions for the most part (and modulo the issue of strength), I limit my attention to the accounts of negative bias in Krifka (1995) and van Rooy (2003) in the discussion below.

5.3 Polarity Items and Bias

The current section provides a broad survey of the use of polarity items in positive polar questions with an eye towards evaluating the account of bias sketched above. In particular, I discuss negative and positive polarity items that denote both low and high scalar values and ask a series of questions about their use in polar questions. First, for a given polarity item, does its use in a polar question result in a bias? What is the nature of this bias? Specifically, is it the type of bias isolated by Sadock's diagnostics for assertion? If the question is biased, is the polarity of the bias correctly predicted by the so-called weak account sketched in the previous section? Finally, is the bias non-detachable? That is, are questions that differ with respect to their linguistic form, yet are similar with respect to semantic content, also biased. As alluded to at the end of previous section, such a detailed survey raises a number of problems for accounts of negative bias like those described above.

Austin.

5.3.1 Is Negative Bias Really an Implicature?

In the discussion so far, the only evidence for claiming that polar questions with a strong NPI are negatively biased has been native speaker intuition. Additional evidence for this bias, however, comes from Sadock's diagnostics, which should be familiar from the discussion in the previous chapters. Briefly, the sentence initial parenthetical expression *after all* co-occurs with assertions but not with neutral questions. Furthermore, utterances prefixed with *yet* can *follow* assertions, but not neutral questions. These tests reveal that questions with strong NPis do convey a negative bias, in so far as they are associated with a *negative assertion*.

(13b), for example, can be felicitously prefixed with *after all*. The felicity of (13c) in the same context provides indirect evidence that the propositional content of the bias in (13b) is the same as that asserted directly in (13c).

- (13) a. A: Why did John get the promotion?
 b. A: After all, does he lift a finger around the office?
 c. B: After all, he doesn't lift a finger around the office.

The same question can be followed by an utterance prefixed with *yet*, as shown in (14c), which also felicitously follows the negative assertion in (14b). Again, I take this fact as providing an indirect clue as to the content of the bias conveyed by (14a).

- (14) a. A: Does John lift a finger to help around the office?
 b. A: John doesn't lift a finger to help around the office?
 c. A: Yet, he continues to be rewarded with promotions.

Polar questions that contain a *maximizing* strong NPI also pass muster when it comes to Sadock's assertion tests, as shown by the constructed variants in (15) of the Web

example (5a).

- (15) a. The democrats' new "non-partisan" rhetoric is surely insincere. After all, could wild horses drag them away from testimony that might incriminate Bush?
- b. Could wild horses drag democrats away from testimony that might incriminate Bush? Yet, they still claim to be pursuing a non-partisan agenda.

However, these questions are not just assertions, as they pass Sadock's question diagnostics as well, as shown in (16) and (17). Recall that both of the parenthetical discourse markers *by any chance* and *tell me* select questions, but not assertions.

- (16) a. Does John, by any chance, lift a finger to help around the house?
- b. Tell me, does John lift a finger to help around the house?
- (17) a. Tell me, could wild horses drag them away from testimony that might incriminate Bush?
- b. Could wild horses, by any chance, drag them away from testimony that might incriminate Bush?

The diagnostics support the contention that negatively biased polar questions are *both* assertions and questions, like tag questions and outside-negation polar questions. Furthermore, even if one objects to my – and Sadock's – interpretation of these tests, they nonetheless establish that the bias present in tag questions and outside-negation polar questions is formally the same as the bias found in emphatic focus questions.

This observation is important in evaluating the weak analysis of negative

bias sketched in the previous section. As I argued in chapter four, positive polar questions and negative polar questions are semantically equivalent, a result that has consequences for the weak analysis. Specifically, given the semantic equivalence of positive and negative polar questions and the fact that conversational implicatures are calculated on the basis of semantic content rather than linguistic form, outside-negation polar questions like (18) are predicted to have an equivalent bias to their positive counterparts.

(18) Doesn't John lift a finger around the office?

van Rooy (2003) makes this observation himself. And while (18) does intuitively convey a negative bias, one needs to be careful in equating it with the negative bias conveyed by the questions in (2). Recall from the previous chapter that negative polar questions that contain an NPI are necessarily understood as inside-negation questions, the negative bias of which I described as a *contextual* bias. This bias is distinct from the one isolated by Sadock's diagnostics, as shown by the infelicity of the examples in (19) and (20).

(19) a. A: Why did John get the promotion?

b. #A: After all, doesn't he lift a finger around the office?

(20) a. A: Doesn't John lift a finger to help around the office?

b. #A: Yet, he continues to be rewarded with promotions.

(19) and (20) are *prima facie* counterevidence to analyses, like those advocated by Krifka (1995) and van Rooy (2003), that treat negative bias as a conversational implicature. Implicatures are based on semantic content rather than linguistic form. Yet, the results of Sadock's suggest that negative bias is sensitive to the form of the interrogative.

5.3.2 Exceptions to the Weak Account

There is a second set of potential counterexamples to weak accounts of negative bias. These are conceptually related to the kind of counterexamples discussed in the preceding subsection. As already mentioned, the essential ingredients of the accounts in Krifka (1995) and van Rooy (2003) are (i) a lexical item with an inherently scalar semantic value, in particular, one that falls either on the high or low end of the scale, and (ii) a set of alternative expressions introduced by that lexical item. Any lexical item meeting these criteria should have a biasing effect in a polar question. However, there are apparent exceptions.

Consider the question in (21), which contains the strong minimizer *at all*, but which does not appear to convey a negative bias.

- (21) Is John *at all* clever?

Even if one intuitively feels a slight bias in examples like (21), it appears to be qualitatively different from the strong negative bias in the examples discussed above, as confirmed by the assertion tests in (22) and (23).⁸

- (22) a. A: I can't believe that John was awarded the fellowship.
b. #A: After all, is he at all clever?
- (23) a. A: Is John at all clever?
b. #A: Yet, he was awarded the fellowship?

On the accounts discussed above, there is no reason that (21) should not convey a negative bias qualitatively similar to the one associated with (2a). Krifka

⁸The intuitions reported in (22) and (23) are rather subtle. (22b) and (23b) are meant to be read with a neutral intonation, specifically with the nuclear pitch accent falling on the predicate *clever* and with rising intonation. As I argue below, these same examples can be biased if the NPI is marked with an emphatic focus. I take these observations to be reasons for dissociating bias from the semantics of polarity items, a point which I discuss in more detail in §5.4.

(1995), for example, treats *at all* as a predicate modifier, assigning it the denotation in (24). He follows Lewis (1970) and Landman (1991) in assuming that indices include in addition to world and time parameters *standards of precision*, which affect the interpretation of vague predicates. Given indices i and j , $i \leq_s j$ states that the standard of precision associated with i is *stricter* than that associated with j . For a predicate P and indices i and j such that $i \leq_s j$, $P_i \subseteq P_j$. The idea is that predicates like **clever** are subject to stricter or looser requirements on their application. While John might not be considered clever at index i , he may be clever at some less strict index j . Thus, $i \leq_s j$ states that i is at least as strict as j with respect to its precision standard. Krifka provides the denotation for *at all* in (24a), on which it relaxes the standard of precision for the application of predicate.

$$(24) \quad \begin{array}{ll} \text{a.} & \llbracket \text{at all} \rrbracket = \lambda P \lambda i \lambda x \exists j [i \leq_s j \wedge P_j(x)] \\ \text{b.} & \text{alt}(\llbracket \text{at all} \rrbracket) = \{ \lambda P \lambda i \lambda x [P_i(x)] \mid \exists k [i \leq_s k \wedge P_i \subset P_k] \} \end{array}$$

The alternative set associated with *at all* is the set of predicate modifiers that evaluate P at non-maximal (as determined by \leq_s) standards of precision, as in (24b). Bear in mind that these “non-maximal” standards of precision are stricter than the maximal elements of the order induced by \leq . Because Krifka and van Rooy assume that the ordinary semantic value of an expression is not included in its alternative set, $\text{at all}(P)(x)$ is true only if $P(x)$ is true with respect to maximal – in the sense that the extension of the predicate is maximized – standards of precision, i.e. the most relaxed standards.

As before, in asking (21) it is assumed — if the speaker obeys MIA — that he has some reason not to ask any of the alternative questions, in which John’s cleverness is evaluated with respect to stricter precision standards than in the actual question. Still following van Rooy (2003), we assume that the reason for this is that the speaker already knows the answer to the question under these stricter

standards. Recall that if $i \leq_s j$, then $\mathbf{clever}_i \subseteq \mathbf{clever}_j$. It follows that the alternative questions must be answered negatively, for if John is clever with respect to a given precision standard, then he is clever with respect to all extensions of that standard. Thus an affirmative answer to any of the alternative questions entails an affirmative answer to the actual question, trivializing the actual question. Nothing in this brief discussion distinguishes (21) from (2a). Yet, Sadock's assertion diagnostics do appear to make a distinction between these two.

The upshot of the discussion is that not all strong minimizing NPIS appear to yield a negative bias in positive polar questions. This is problematic for a pragmatic approach like the Krifka and van Rooy's. One does not expect to see lexical exceptions on such an approach. There is good reason to believe that (21) presents a true lexical exception. Suppose that one responds to the problem introduced by (21) by claiming that predicate modifiers like *at all* do not produce a negative bias for some reason or another. Consider, then, the Web examples in (25), which contain the attenuating, high scalar NPIS *all that* and *all that many*, the former of which is a predicate modifier itself.

- (25) a. He may be smart - yes? But is he *all that* clever?
 b. But are there *all that many* players out there who still need to be told that if you have the English position, it is imperative that you not allow F/G to ally?

Intuitively, *all that* is semantically very similar to *at all*, the main difference being that whereas *at all* relaxes the precision standard under which the predicate is evaluated, *all that* strengthens it. Thus one might simply take the denotation in (24) and reverse the strictness relation between indices, resulting in the denotation in (26).

- (26) a. $\llbracket \text{all that} \rrbracket = \lambda P \lambda i \lambda x \exists j [i \geq_i j \wedge P_j(x)]$
 b. $\text{alt}(\llbracket \text{all that} \rrbracket) = \{\lambda P \lambda i \lambda x [P_i(x)] \mid \exists k [i \geq_s k \wedge P_i \supset P_k]\}$

All that applies to a predicate like **clever**, as in (25a), and returns a predicate that holds of an individual x at an index i iff x is clever with respect to some possibly stricter precision standard than the one associated with the index i . The alternatives introduced by *all that* consist of predicate modifiers that yield predicates evaluated under non-minimal precision standards, i.e., standards that are *less* strict than the one under which the actual utterance is evaluated.

Note that the rhetorical affect of *all that* is distinct from that associated with *at all*. While the former has an attenuating effect, the latter is emphatic (Israel 2001). In other words, the use of *all that* in a negative context yields a *weaker* assertion than any of the alternative assertions. Consider the example in (27).

- (27) John isn't all that clever.

That John is *not* clever under the strictest precision standard does not entail that he is not clever under any less strict standard. That John is *not* clever under a non-minimal precision standard, however, does entail that he is not clever under the strictest precision standard. Thus the alternative assertions all strictly entail the actual assertion. As a result, the actual assertion is the weakest assertion the speaker can make. This captures the attenuating effect that Israel (2001) notes for NPIS like *all that*.

Now consider the question in (25a). MIA requires that the alternative questions associated with (25a) be licensed appropriately. Specifically, the speaker must have some reason to ask the actual question rather than any of the possible alternatives. Using the same arguments from above, assume that they do not ask the

alternatives because they already know the answer to them. Furthermore, assume that the alternatives all receive a negative answer. It is presupposed, in this case, that for any non-minimal standard of precision, that the referent of the pronoun is not clever under that standard. This entails, however, that he is not clever under any stricter standard, including the strictest one, since the extension of a predicate under a precision standard *i* must be a superset of the extension under any stricter standard. As a result, we must assume that the alternatives are answered *affirmatively*, as only this assumption is consistent with the constraint on questionability imposed by Krifka and van Rooy. That John is clever with respect to every non-minimal standard of precision does not entail that he is clever with respect to the minimal, or strictest, standard. The question in (25a) should be *positively biased* on the MIA account then.

However, if (25a) is biased at all, it is negatively biased. This fact is already suggested by the semantic properties of the discourse marker *but*, which requires that the utterances it relates contrast along some dimension of interpretation. Consider the constructed discourses in (28). In (28a), the assertion that he might be smart is contrasted with the assertion that he is not clever. The contrast is good, because it is unexpected that someone is smart but not clever, as the properties of being smart and being clever are normally assumed to overlap significantly.

- (28) a. He may be smart, but he isn't clever.
 b. #He may be smart, but he is clever.

The mini-discourse in (28b), on the other hand, is semantically anomalous. Given that smartness and cleverness normally co-occur, it is not unexpected that someone be both smart and clever.

The observation that questions like (25a) are biased, and that this bias is *negative*, is borne out by running Sadock's diagnostics. (29), which is a naturally

occurring example from the Web, shows that questions with *all that* felicitously co-occur with *after all*. The bias associated with (29), however, is negative, i.e. the speaker suspects that it was not all that wrong of Hill to enliven the problem with a historical example.

- (29) After all, was it *all that* wrong of D.H. Hill to enliven a boring math problem with a historical example, a mere metaphore for how small a zero can get?

The existence of a negative bias is further supported by the constructed variant of (29) in (30). Note first of all that (30) establishes that questions with high attenuating NPIS like *all that* pass the second of Sadock's battery of assertion tests.

- (30) Was it all that wrong of him to enliven a boring math problem with a historical example? Yet, he's still lambasted for injecting ideology into a scientific discussion.

Second, the discourse marker *yet*, like *but*, requires some element of contrast between the utterances it relates. This contrast only exists in the given context if the question in (30) has a *negative* bias to the effect that what Hill did was *not* all that wrong. Furthermore, it is precisely the attenuating nature of this claim that contrasts with the strong negative reaction to the Hill's historical example. This contrast does not exist if (29) conveys the positive bias predicted by weak accounts, viz. that what Hill did was wrong under even the strictest criteria of wrongness. If this were the case, then the utterance containing *yet* could hardly be considered unexpected.

For completeness' sake, (31) shows the results of applying Sadock's question diagnostics to interrogative sentences containing high attenuating NPIS. Unsurprisingly, such sentences are still questions.

- (31) {Tell me, / I'm just want to know.} Was it all that wrong of him to enliven

a boring math problem with a historical example.

To summarize, there are unexpected lexical exceptions to the weak analysis which do not appear to apply to semantically similar expressions. Furthermore, the bias conveyed by these semantically similar expressions is not the one predicted on weak analyses; a negative bias is present where a positive bias is predicted. Given in addition the apparent detachability of negative bias, the situation looks grim for the account advocated by Krifka (1995), van Rooy (2003), etc.

5.3.3 Bias and Positive Polarity Items

There is another class of lexical exceptions to pragmatic accounts of bias: polar questions that contain strong *positive* polarity items. PPIS, like NPIS, often denote extreme scalar values, in addition to introducing a set of alternatives (Krifka 1995). The Web examples in (32), for instance, include PPIS that denote minimal values on a particular scale. One's "own shadow", for example, is the least frightening thing on the scale of frightening things. Similarly, *the drop of a hat* denotes a minimal provocation.

- (32) a. As a result of his excessively wary approach, the Cancer/Dog sometimes gives the impression of being painted into his own corner. Is he afraid of *his own shadow*? Is he a little paranoid? To tell you the truth, I think he is.
- b. I'd like to ask John Doe (with what looks to be a fake email): how many parents of that school district are opposing the curriculum? How many for? Did they even try to deal with the matter locally, or did they start a lawsuit *at the drop of a hat*?

The use of a minimizing PPI in an upward entailing context results in an emphatic assertion, as the resulting statement is stronger than any of the alternatives invoked by the polarity item. If a person instigates a law suit at the drop of a hat, i.e. given the minimal provocation, then presumably he will do so given an even greater provocation.

When applied to the question in (32b), the pragmatic analysis of Krifka (1995) and van Rooy (2003) predicts a *positive* bias. As with NPIS, assume that the actual question is not settled. The alternatives ask whether the law suit was instigated on the basis of a non-minimal provocation. As before, assume that the speaker does not ask any of the alternatives because he or she already knows the answer to them. It follows from the relationship between answers to the actual question and the answers to the alternatives that the alternatives must be answered affirmatively. If any of the alternative questions is settled negatively, then the actual question is settled, for if someone does not react to a non-minimal provocation, they presumably will not react to the minimal provocation.

However, neither of the questions in (32) are positively biased, as established by Sadock's diagnostics in (33).

- (33) a. Are you sure that John is the man to lead the expedition. #After all, is he afraid of his own shadow?
- b. Is John afraid of his own shadow? #Yet, Smith chose him to lead the expedition.

Minimizing PPIs appear to be an exception to the pragmatic reasoning sketched in §5.2.1. Furthermore, the negative polar question counterparts to the questions in (33) *are* positively biased according to Sadock's tests, as shown in (34).

- (34) a. Are you sure that John is the man to lead the expedition. After all,

isn't he afraid of his own shadow?

- b. Isn't John afraid of his own shadow? Yet, Smith chose him to lead the expedition.

As discussed earlier, the difference in behavior between the questions in (33) and those in (34) suggests that the presence, or absence, of bias in polar questions with polarity items is sensitive to linguistic form rather than semantic content. If true, then it is counterevidence to an analysis of bias as a conversational implicature.

To round out the discussion, the examples in (35) contain PPis denoting high scalar values. ((35b) is from the Web.)

- (35) a. Do *a great many* people object to Bush's domestic policy?
- b. And what of the universe? Is it *utterly* pointless? If its destiny is a cold grave in the recesses of outer space, the answer must be yes: it is pointless.

As with low scalar PPis, the weak analysis predicts a positive bias. Briefly, a negative answer to any of the alternatives to (35a) entails a negative answer to (35a) itself. The alternatives must receive affirmative answers, then, in order to avoid trivializing the actual question. As before, there is no evidence for the existence of this positive bias, as shown in (36).

- (36) a. Why does the MSM continue to pander to the White House? #After, all, do a great many people object to Bush's domestic policy?
- b. Do a great many people object to Bush's domestic policy? #Yet, the MSM continues to pander to the White House.

Once again, the positive bias does manifest itself in the negative polar question counterparts to the positive questions in (36), as shown in (37).

- (37) a. Why does the MSM continue to pander to the White House? After, all, don't a great many people object to Bush's domestic policy?
- b. Don't a great many people object to Bush's domestic policy? Yet, the MSM continues to pander to the White House.

Summarizing, a number of apparent counterexamples to purely pragmatic approaches to negative bias were introduced. Recall that on these approaches bias is, in effect, a conversational implicature. Because implicatures are inferences based on semantic content and principles of rationality, one does not expect arbitrary lexical exceptions. The examples above, however, provide evidence of such exceptions. First, positive polarity items do not convey an inherent bias, in spite of the fact that they possess the lexical semantic properties required by weak accounts. Second, even within the class of strong NPis exceptions exist, e.g. *a drop* vs. *at all*, both of which are low scalar, strong NPis. Finally, the bias associated with some PIs has the “wrong” polarity (as predicted by pragmatic accounts).

These kinds of exceptions are unexpected on a pragmatic account, but expected if negative bias is a conventionalized aspect of meaning. Based on Sadock's assertion diagnostics, I maintain that negative bias is an indirect assertion and, furthermore, that it is a *conventionalized* indirect assertion. §5.4 argues that the presence of an NPI is not as central to the presence of negative bias as often assumed in the semantic literature. I explore the contribution of intonation to bias below. §5.5 discusses how intonation contributes to a negative assertion. This implicature, I argue, has been “short-circuited” (Horn and Bayer 1984), or partly conventionalized.

5.4 Intonation and Negative Bias

5.4.1 The Role of Intonation in Bias

The analyses discussed in §5.2.1 are based largely on the lexical semantic properties of strong negative polarity items. On these accounts negative bias is a conversational implicature based on the literal meaning of the question and the pragmatic constraint in MIA. There is a direct link, then, between bias and the presence of a strong NPI. The previous section discussed a number of problematic examples for this kind of account. The current section presents an argument in favor of an alternative grammatical source for negative bias. Specifically, I argue that all of the questions in (1) share certain marked intonational features.

First, the approach to bias in §5.2.1 is, in certain respects, already international. Krifka (1995) is explicit about this, noting that NPIS resemble focused constituents in that they introduce a set of alternatives (Rooth 1992). In English, focus is normally marked with a nuclear pitch accent. Furthermore, many strong NPIS, notably the indefinite or quantificational ones, must be focused in order to be felicitous (Krifka 1995). (38b), for instance, is infelicitous when read with a neutral, or “broad” focus, intonation on *Mary*.

- [illegible]

Furthermore, the pitch accent used to mark the focus in (38a) is intuitively a low (L) tone, i.e. either L* or L*+H, rather than a less marked high (H) tone.

These observations suggest that intonation may play a more important role in negatively biased questions than normally thought. That intonation is an important cue to negative bias is not a new position. Borkin (1971) for one notices that biased

questions “have an intonation unlike that in comparatively neutral information-eliciting questions without strong stress” (p. 54). She does not discuss the intonation of biased questions in any detail, but her comments are provocative nonetheless, specifically her mention of “strong stress”. Asher and Reese (2005) attempt to provide an intonational account of negative bias. They argue that the presence of a strong NPI is a *sufficient*, but not a necessary, condition for negative bias. The examples discussed in §5.3, however, suggest that the presence of a strong NPI is not even a sufficient condition for negative bias; see (22) and (23). Predicate modifiers like *at all* and *all that* do not appear to be inherently focused like indefinite or quantificational NPIS, despite being associated with an alternative set. That is, they do not appear to require a pitch accent on the NPI itself. (21), for instance, is naturally read with the pitch accent on *clever*. When one reads the examples in (22) and (23) with an L*+H pitch accent on *at all*, however, the examples improve considerably, as shown in (39).

- (39) a. A: I can’t believe that John was awarded the fellowship.
 b. A: After all, is he at ALL clever ?
 L*+H H-L%

Similarly, questions with so-called domain wideners, i.e. *any* or *ever*, are neutral, unless the domain widener is pronounced with the same marked pitch accent as the strong NPIS in (2) and (39b). Consider the minimal pairs in (40) and (41).

- (40) a. Did Fred contribute anything to the campaign?
 b. Did Fred contribute ANYthing to the campaign?
 (41) a. Has John ever voted for a democrat?
 b. Has John EVER voted for a democrat?

The (a)-examples in (40) and (41) are neutral, whereas the (b)-examples, in which

the domain widener carries a L*+H accent, are negatively biased according to the assertion diagnostics in (42b) and (43b). These tests also show that the bias in these examples is the same as the bias in the examples in (2), i.e. it has the force of a negative assertion. The examples with unfocused domain wideners in (42c) and (43c), on the other hand, do not pass the assertion tests. Some care is required in confirming these intuitions. (42c) and (43c) should be read with a neutral question intonation and without any strong stress on *democrat*.

- (42) I don't understand why you think that John is a liberal.
- a. After all, he hasn't ever voted for a democrat.
 - b. After all, has he EVER voted for a democrat?
 - c. #After all, has he ever voted for a DEMOCRAT?
- (43) a. John hasn't ever voted for a democrat. Yet you continue to claim that he is a liberal.
- b. Has John EVER voted for a democrat? Yet you continue to claim that he is a liberal.
 - c. #Has John ever voted for a DEMOCRAT? Yet you continue to claim that he is a liberal.

(39), (42) and (43) suggest that NPis only produce a negative bias when they are in focus and marked with a particular pitch accent, viz. L* or L*+H. The presence of a strong NPI alone is not sufficient for negative bias, as with unfocused *at all*. However, these examples do not rule out a significant role for NPis in producing negative bias. For example, one might claim that the meaning of the L*+H pitch accent and the lexical semantic properties of NPis interact to yield a negative bias. This is, in effect, what Krifka (1995) proposes. Specifically, he assumes that emphatic focus (or strong stress) is associated with *emphatic assertion*, a pragmatic operator that mirrors the effect of the focus sensitive adverb *even*. Given the contribution of intonation, it

may be important that the alternatives introduced by strong NPIS are ordered by entailment. See Abels (2003) and Guerzoni (2004), for example.

A marked pitch accent *alone*, however, can produce negative bias, as shown by the examples in (44b) and (45). Again, these examples are most naturally intoned with an L* or L*+H pitch accent.⁹

- (44) a. Do you need that porkchop?
b. Do you NEED that porkchop?

- (45) Did I TELL you that writing a dissertation was going to be easy?

Sadock's assertion diagnostics place these examples in the same class as questions with strong NPIS, as demonstrated by (46a) and (46b).

- (46) [Nicholas is reaching for the last porkchop, after already having had three.]
a. You should have some fruit instead. After all, do you NEED another porkchop?
b. Do you NEED another porkchop? Yet, I know you'll eat it anyway.

The result of the preceding discussion is that it is possible to dissociate negative bias in polar questions from the presence of a strong negative polarity item and isolate it instead in the interpretive contribution of the intonational contour typically associated with biased questions, viz. L*+H H-L%. In §5.5, I argue that all of the examples discussed above can be captured under an intonational account.

⁹The placement of this pitch accent need not fall on the matrix verb, as it does in (44) and (45). Consider the examples in (i), for instance.

- (i) a. Did I tell YOU that writing a dissertation was going to be easy?
b. Did I tell you that WRITING a dissertation was going to be easy?
c. Did I tell you that writing a DISSERTATION was going to be easy?

The polar question in (ib) expects a negative answer and might be plausibly followed by the same speaker with *No. I told you that defending it would be easy.*

For instance, idiomatic minimizers like *a finger* or *a drop* require an L*+H pitch accent. Predicate modifiers like *at all* or *all that* and the domain wideners *any* and *ever* may or may not be focused. When they are marked with an L*+H pitch accent, the question is negatively biased. Interrogatives with some constituent marked with an L*+H, but without any special lexical item, are also negatively biased. So even if a question contains a strong NPI, intonation alone is the source of negative bias. Before presenting the details of the intonational analysis, I discuss exactly what information intonation contributes to interpretation.

5.4.2 The Meaning of Intonational Tunes

I loosely follow Steedman's (2000, 2003) compositional semantic account of intonational tunes, which is summarized in tables 5.1 and 5.2. Steedman provides relatively sparse meanings to intonational contours, as required by the range of implicatures that may be associated with any one tune (Cutler 1977).

According to Steedman (2000, 2003), pitch accents make two orthogonal contributions to interpretation: information structure and polarity.¹⁰ The information structural contribution provides information about the discourse status of a given bit of information. For instance, simple H* and L* pitch accents mark the rheme, i.e. the new information conveyed by an utterance. The bitonal L+H pitch accents, on the other hand, mark information that the speaker presents as presupposed. In (47b), for example, *Anna* is marked with an H* accent, since it provides the information that answers the question in (47a). *Manny* is marked with an L+H* accent, as it is background information that Manny will marry someone.

- (47) a. Q: I know EMMA will marry ARNIM. But who will marry MANNY?

¹⁰There is third dimension of meaning contributed by pitch accents which Steedman calls *kontrast* (following Vallduví and Vilkuuna 1998) and which corresponds roughly to the idea that focused constituents are associated with a set of alternative expressions.

	$[X]$	$\neg[X]$
∂	$L+H^*$	L^*+H
ρ	$H^*, (H^*+L)$	$L^*, (H+L^*)$

Table 5.1: The meanings of pitch accents (Steedman 2003).

- b. A: ANNA will marry MANNY .
 H^* $L-$ $L+H^*$ $L-H\%$

The information structural contribution of the pitch accents is shown in the rows of table 5.1. $\partial\phi$ indicates that ϕ is presupposed, while $\rho\phi$ indicates that ϕ is new information. ϕ may be a proposition or a λ -term, depending on intonational phrasing. In (47b), for instance, the $L-$ phrase accent after *Anna* marks its denotation as the rheme, i.e. $\rho\lambda P.P(\mathbf{anna})$, while the presupposed information is $\partial\lambda x.\mathbf{marry}(x, \mathbf{manny})$.

The second dimension of interpretation contributed by pitch accents is polarity. The L^* and L^*+H pitch accents indicate a negative polarity. Steedman characterizes this contribution in terms of whether or not a given information unit is, or is to be made, common ground. (48a), for instance, is understood as a simple assertion. The speaker indicates by the H^* pitch accents that it should be made common ground that the addressee put the speakers trousers in the microwave. A further implicature conveys that (48a) is possibly intended as a protest.

- (48) a. You put my TROUSERS in the MICROWAVE !
 H^* H^* $L-L\%$
- b. You put my TROUSERS in the MICROWAVE ?
 L^* L^* $L-H\%$

In (48b), on the other hand, the speaker indicates by the L^* accents that the propo-

$[S]$	L-, L-L%, H-L%
$[H]$	H-, H-H%, L-H%

Table 5.2: The meaning of boundary tones (Steedman 2003).

sition is *not* to be made common ground. Given this information, the contour may implicate skepticism or incredulity on the part of the speaker (though this may in part also follow from the final rising intonation).

Boundary tones, phrase accents and combinations of the two, contribute a modal operator $[X]$ on Steedman’s account. Non-rising intonation – L-, L-L% or H-L% – together with the polarity contributed by the pitch accent indicate the *speaker’s* suppositions about what is, or is not, common ground or to be made common ground. Similarly, rising intonation – H-, L-H% or H-H% – indicates the *hearer’s* suppositions about what is, or is not, common ground or to be made common ground. Non-rising intonation, then, introduces a speaker modality $[S]$, while rising intonation introduces a hearer modality $[H]$. Gunlogson (2003) provides a related analysis, as she also associates the non-rising/rising distinction with the speaker/hearer distinction. The contribution of the boundary tones is summarized in table 5.2.

In the following section, I adopt certain aspects of Steedman’s semantics of intonation, specifically the association of a negative polarity with the family of L pitch accents. However, I pursue the idea that intonation provides information about the speaker’s cognitive state rather than his model of the common ground. It is natural on this assumption to reinterpret Steedman’s modalities in terms of the belief operator from SDRT’s logic of cognitive modelling. Specifically, I assume that boundary tones provide information about the degree of strength associated with sincerity axioms (Vanderveken 1990, Krifka 2004, Faller 2006). This analysis was

introduced above in **Sincerity (Final Rise)** in the analysis of rising intonation tag questions. In the case of non-rising intonation, I adopt the axiom **Sincerity** from Asher and Lascarides (2003).

- **Sincerity**: $R(\alpha, \beta, \lambda) > \mathcal{B}_{S(\beta)}R(\alpha, \beta, \lambda)$
- **Sincerity (Final Rise)**: $(R(\alpha, \beta, \lambda) \wedge \text{RISE}(\beta)) > \mathcal{B}_{S(\beta)}\Diamond R(\alpha, \beta, \lambda)$

The idea pursued here is that non-rising intonation indicates that the speaker believes the information being presented, while rising intonation conveys only a weak belief. In other words, rising intonation introduces some measure of uncertainty on the part of the speaker with respect to the illocutionary contribution of his utterance. Since both belief and weak belief are closed under logical consequence, it follows on this analysis that if R is a right veridical relation, i.e. $R(\alpha, \beta, \lambda) \rightarrow K_\beta$, then $\mathcal{B}_{S(\beta)}p_\beta$ (or $\mathcal{B}_{S(\beta)}\Diamond p_\beta$ as the case may be). This analysis is thus very similar to Šafářová's (2005) treatment of final rises as introducing an epistemic possibility operator. The important difference is that I assume that this information contributes to the understanding of an utterance at the level of cognitive modelling rather than at the level of semantic content. This analysis improves on Šafářová's, I believe, while maintaining her core intuition that rising intonation expresses, in some sense, epistemic uncertainty. In §5.5, I show how this model of the interpretive contribution of intonation can be used to calculate a negative assertion from the use of a polar question with a particular intonation contour.

5.5 Linking Intonation to an Assertion

In the previous section, I argued for a new characterization of emphatic focus questions with respect to both their linguistic form and their discourse function. With respect to linguistic form, I argued that the characteristic grammatical feature of negatively-biased questions was the presence of a particular intonational tune,

viz. L*+H H-L%. At the level of discourse function, I presented evidence from the assertion tests in Sadock (1971, 1974) that negatively-biased questions are conventionalized indirect assertions. Following previous chapters, this entails assigning them a complex speech act type **ASSERTION • QUESTION**.

In the current section, I argue that this negative assertion follows from the literal meaning of the question and the information contributed to cognitive modelling by the L*+H H-L% intonation contour. Because I assume that the indirect assertion is conventionalized, this exercise is not strictly necessary on the treatment of indirect speech acts in Asher and Lascarides (2001). It is a useful exercise nonetheless, as it establishes that while the implicature may not be calculated online, it is in principle calculable (Morgan 1978, Horn and Bayer 1984).

Asher and Lascarides (2001) assume that indirect speech acts occur when a **SARG** ϕ is associated with an utterance β that is not normally associated with that sentence type, but which is associated with another, incompatible, sentence type γ . This assumption is formalized in **Inferring Dot Types** (repeated from chapter 2). Recall that \mathcal{R} consists of the axioms of cognitive modelling, while \mathcal{C} encodes conventionalized linguistic knowledge, including SDRT's glue logic axioms.

• **Inferring Dot Types:**

Suppose for some γ that:

- (a) $\mathcal{R}, \mathcal{C}, ?(\alpha, \beta, \lambda), Info(\lambda, \beta) \vdash_{\text{SARG}} (\beta, \phi)$;
- (b) $\beta : t_1, \neg(Info(\beta) > \text{SARG } (\beta, \phi))$;
- (c) $\gamma : t_2, (Info(\gamma) > \text{SARG } (\gamma, \phi))$.

Then:

- (d) $\beta : t_1 \bullet t_2$

In plain English, **Inferring Dot Types** states that if an agent can infer from the literal meaning of an utterance and from principles of rational and cooperative behavior that the speaker has a particular goal in uttering a sentence (clause (a)) which is not the goal one normally associates with that sentence type (clause (b)) but which is associated with a distinct sentence type (clause (c)), then that agent can infer that the speaker intends to convey an indirect illocutionary act (clause (d)).

The speech act related goals normally associated with declarative and interrogative sentences are those specified in **IRG** and **QRG** respectively. The default SARG of an indicative sentence, for example, is that the addressee believe some proposition, while the SARG of an interrogative sentence is that the speaker believe an answer to his question.

- **Indicative Related Goals:**

Suppose $Info(\tau) \wedge Done(Say(\beta)) \vdash R(\alpha, \beta, \lambda)$.

Then: $Info(\tau) \wedge Done(Say(\beta)) \wedge veridical(R, \lambda) \vdash_{SARG} (\beta, \mathcal{B}_{H(\beta)} p_\beta)$.

- **Question Related Goals (QRG):**

$Sanswer(\alpha, p) > SARG(\alpha, \mathcal{B}_{S(\alpha)} p)$

Suppose that from an utterance of an interrogative β and the information in the discourse context – which includes information about the intonation contour of β – that one infers that the SARG associated with β is ϕ . Furthermore, assume that ϕ is not the SARG that follows from **QRG**, but rather the one that follows from **IRG**. By **Inferring Dot Types**, then, β is assigned a complex speech act type **ASSERTION • QUESTION**.

Against this background, the next section argues that polar questions with an L*+H H-L% intonation contour can be associated with the default SARG of an assertion, viz. that the addressee believe some particular proposition. The contribu-

tion of intonation as described in §5.4 is crucial in the calculation of this implicature.

5.5.1 Calculating an Indirect Assertion

In order to derive the indirect assertion associated with emphatic focus questions, one must show that the speaker has a particular SARG, viz. the one specified in **IRG** that the addressee believe some proposition ϕ . In order to establish this SARG, it is necessary to add an additional axiom to the logic of cognitive modelling. The new axiom should be uncontroversial, as it is direct formulation of Searle's (1969) sincerity and preparatory conditions on assertive speech acts. The sincerity condition for asserting ϕ is that the speaker believe ϕ , i.e. $\mathcal{B}_S\phi$. The preparatory condition is that the speaker believes that the addressee does not already believe ϕ , i.e. $\mathcal{B}_S\neg\mathcal{B}_H\phi$. Searle presents these conditions as necessary and sufficient conditions for a successful act of assertion. I follow him in this and assume that if it follows from an utterance in a given context that the speaker has beliefs matching the sincerity and preparatory conditions, then the speaker has a certain intention, viz. that the hearer adopt the speaker's belief. This intention matches the SARG that is associated by default with an indicative sentence.

I formalize this idea in the axiom **Sufficient Conditions on Asserting**, which states if it can be inferred from an utterance α and the information in the discourse context τ that a speaker has beliefs that are consistent with Searle's sincerity and preparatory conditions, then the SARG of α is the same as that associated with a typical assertion.

- **Sufficient Conditions on Asserting:**

Suppose for some utterance α and discourse context τ that:

$$(a) \text{ Info}(\tau) \wedge \text{Done}(\text{Say}(\alpha)) \vdash \sim \mathcal{B}_{S(\alpha)}\phi \quad (\text{sincerity condition})$$

$$(b) \text{ Info}(\tau) \wedge \text{Done}(\text{Say}(\alpha)) \vdash \sim \mathcal{B}_{S(\alpha)}\neg\mathcal{B}_{H(\alpha)}\phi \quad (\text{preparatory condition})$$

Then:

$$(c) \text{ Info}(\tau) \wedge \text{Done}(\text{Say}(\alpha)) | \sim \text{SARG}(\alpha, \mathcal{B}_{H(\alpha)}\phi) \quad (\text{belief transfer})$$

I argue below that the sincerity and preparatory conditions follow from the L*+H H-L% intonation contour, other contextual information, and certain independent pragmatic assumptions. I start with the sincerity condition.

The Sincerity Condition

§5.4 introduced my assumptions about the contribution to interpretation of intonational tunes. Specifically, I assume intonation provides information about the speaker's beliefs about certain information and the status of that information in the discourse context. I also argued that emphatic focus questions are typically read with an L*+H H-L% intonation contour. This tune, for example when associated with (49b), adds to cognitive modelling the information that $\neg \mathcal{B}_{S(\pi_2)}\partial\phi$, where ϕ is the proposition that the addressee needs another porkchop.

- (49) [Nicholas reaches for the last porkchop, after already having had three.]
- a. (π_1) A: Have some fruit instead.
 - b. (π_2) A: After all, do you NEED another porkchop ?
L*+H H-L%

In other words, one learns from intonation that the speaker does not believe that it is *presupposed* that the addressee needs another porkchop. Furthermore, one can argue that it is possible to infer from this information that the speaker does not believe ϕ , i.e. $\neg \mathcal{B}_{S(\pi_2)}\phi$.¹¹

¹¹This step is not obvious. From the information that the speaker does not believe that ϕ is presupposed alone, it is *not* possible to infer that he does not believe ϕ , for his reason for not believing ϕ to be common ground may be that he believes that the *addressee* does not believe ϕ . It might even be the case that the speaker lacks some necessary higher-order belief, e.g. the speaker does not believe that the addressee believes the speaker believes ϕ . Within cognitive modelling, the information that ϕ is presupposed is cashed out in terms of mutual belief. Formally $MB_{A,B}\phi$

This information does not yet satisfy the sincerity condition for a negative assertion. It merely establishes that the speaker has at least one belief alternative at which ϕ does not hold. What needs to be established is the stronger statement that the speaker believes $\neg\phi$, that *all* of the speaker's belief alternatives are $\neg\phi$ worlds. The stronger statement can be inferred on the assumption that the speaker is competent with respect to ϕ , i.e the speaker has considered ϕ and taken a definite stance on its truth or falsity. (50c) follows from this competence assumption (50a) and the information contributed by intonation (50b) by disjunctive syllogism.

- $$\begin{array}{ll}
(50) \quad \text{a.} & \mathcal{B}_A\phi \vee \mathcal{B}_A\neg\phi \quad \text{(competence assumption)} \\
& \text{b.} & \neg\mathcal{B}_A\phi \quad \text{(from intonation)} \\
& \text{c.} & \mathcal{B}_A\neg\phi \quad \text{(from (50a) and (50b) by disjunctive syllogism)}
\end{array}$$

Is this competence assumption reasonable? The answer to this question will vary between contexts. In (49), for example, there is evidence that it holds. Given the fact of Nicholas reaching for the last porkchop, the interpreter can assume that he at least *wants* it. The speaker then suggests an alternative action in (49a), viz. that he have some fruit, and conveys by intonation that he does not believe that Nicholas

states that it is mutually believed between A and B that ϕ and is defined as follows (Asher and Lascarides 2003):

$$MB_{A,B}\phi \rightarrow (\mathcal{B}_A(\phi \wedge MB_{A,B}\phi) \wedge \mathcal{B}_B(\phi \wedge MB_{A,B}\phi))$$

Given this definition, *A* might not believe that ϕ is mutually believed because either he does not believe ϕ himself or does not believe that the addressee believes it, or does not believe that the addressee believes that he believes it, etc.

As discussed below, negatively biased questions require evidence in the discourse context that indicates that the addressee believes the underlying propositional content of the question, viz. ϕ . In the case of (49), for example, the fact of Nicholas reaching for the last porkchop defeasibly entails that he believes that he needs it. It is reasonable to conclude on the basis of this evidence that the speaker does not believe ϕ when he conveys the information that he does not believe that ϕ is mutually believed. This follows if one assumes that ϕ is not mutually believed because a particular first-order belief fails, i.e. either $\neg\mathcal{B}_A\phi$ or $\neg\mathcal{B}_B\phi$. Given evidence that $\mathcal{B}_B\phi$, it follows from this assumption that $\neg\mathcal{B}_A\phi$. Of course, this assumption does follow as a matter of logic, for it may be some higher-order belief that is problematic. I do believe, however, the the first-order beliefs are more salient than the higher-order ones, and, as a result, that the necessary inference follows as a best explanation for why the speaker does not believe that ϕ is mutually believed.

needs another porkchop. It seems obvious given this additional information that the speaker has considered the issue of whether Nicholas *needs* the porkchop and taken a stance on the issue. Otherwise why suggest that he have fruit instead? The competence assumption follows in this case as a kind of abductive inference.

The competence assumption is also reasonable with respect to polar questions with strong NPIS. Recall that Krifka (1995) and van Rooy (2003) assume that questions such as (51) (repeated from (2a)) are associated with a set of alternative questions. According to the principle MIA, the speaker must have some reason not to ask any of these alternatives. Krifka and van Rooy argue that they are not asked because the speaker already knows their answers. Furthermore, they must be answered negatively in order to assure that the actual questions is not settled.

- (51) Did Larry drink a DROP of whiskey ?
L*+H
H-L%

In other words, if ϕ is the proposition that Larry drank a minimal amount of whiskey, intonation provides the information that $\neg\mathcal{B}_S\phi$, while the semantics and pragmatics of strong NPIS yields the implicature that for all alternatives ψ that entail ϕ , $\mathcal{B}_S\neg\psi$. This implicature amounts to the claim that the speaker has considered every stronger alternative question and taken a definite stance on the issue it raises. Given that ϕ is an especially weak proposition, one might reasonably assume that the speaker has some definite opinion on the truth of ϕ , as well.

The contribution of strong NPIS to negative bias on this account is indirect. In particular, it provides evidence for the assumption that the speaker is competent on the issue raised by the question. An interesting example of the interaction of Krifka and van Rooy's implicature and the intonational account presented here is provided by the constructed discourse in (52). Recall that polar questions containing *all that* presented a challenge to Krifka and van Rooy's analyses, as these accounts predict a positive bias where a negative bias is observed. I analyzed *all that* as

a predicate modifier that strengthens the criteria of applicability for the predicate to which it applies. On this analysis, (52b) literally asks whether John is clever under the strictest standards of precision. The alternatives to (52b) ask about John's cleverness under less strict standards. The alternatives must be answered positively, in order to keep the issue raised by the actual question open, since if John is not clever under a certain standard of precision, then he is not clever under any stricter standard.

- (52) a. A: How did John manage to ace the calculus exam?
b. A: After all, is he all THAT clever?
L*+H H-L%
(53) a. A: How did John manage to ace the calculus exam?
b. A: After all, is he all THAT clever?
L*+H H-L%
(54) a. A: How did John manage to ace the calculus exam?
b. A: After all, is he all THAT clever?
L*+H H-L%

There is something to this result. Even though the speaker believes that John is not clever under the strictest criteria of cleverness – the negative bias predicted on the intonational account (with the competence assumption) – he still admits that John is clever under less strict criteria. Furthermore, the implicature that the speaker has considered the alternative questions and taken a stance on the issues they raise supports the competence assumption. But note that it does not determine the polarity of the assertion. It merely provides evidence that the speaker believes either ϕ or $\neg\phi$. The negative bias follows from this assumption and the information that the speaker does not believe ϕ as sketched in (50). That information is provided by the interpretation of the intonation contour.

The competence assumption is based on rather weak abductive reasoning. I see this as a strength of the argument, rather than a weakness. The idea is that by default the best explanation for the information that $\neg \mathcal{B}_A \phi$ is that $\mathcal{B}_A \neg \phi$. This default may be overridden by contradictory information. In fact, it is enlightening to consider contexts in which the default competence assumption is canceled. Consider, for example, (53) and (54).

- (53) [Nicholas reaches for the last porkchop, after already having had three.]
- a. A: It's really none of my business, I'm just curious.
 - b. A: Do you NEED another porkchop?
 - c. #A': You don't need another porkchop.
- (54)
- a. A: Oh my god! The alcohol has been poisoned!
 - b. A: Did anyone drink a DROP of whiskey?
 - c. #A': No one drank a drop of whiskey.

In both of these discourses, there is no assertion conveyed by the polar questions in (53b) and (54b). Evidence for the absence of an assertion is provided by the infelicity of a simple negative assertions in the same discourse contexts, as in (53c) and (54c).

Finally, the competence assumption is needed independently of the problem of negative bias. Russell (2004) and van Rooij and Schulz (2004), for instance, appeal to it in order to strengthen the weak epistemic implicatures that follow from Grice's Maxims of Quality and Quantity (Grice 1975). Given an assertion ϕ , these maxims predict that the speaker does not believe any proposition ψ that is strictly stronger than ϕ . They note that the stronger implicature that the speaker believes $\neg\psi$ is sometimes possible. This implicature follows from the competence assumption in the same manner as discussed above. Similarly, Bartsch (1973) relies on the competence assumption to derive the strong reading in cases of negative transportation. That is, belief statements like (55a) are often interpreted as equivalent to the statement in (55b).

- (55)
- a. Mary doesn't believe John left.
 - b. Mary believes that John didn't leave.

These independent uses of the competence assumption motivate, I believe, my appeal to it the derivation of a negative assertion, especially if there is no contextual evidence that it does not hold.

The Preparatory Condition

Inferring that the speaker believes that the addressee does not believe $\neg\phi$ is not directly tied to the meaning contribution of intonation. Rather, it follows from contextual constraints on the use of emphatic focus questions. Asher and Reese (2005) note that the use of a biased question requires contextual evidence supporting the bias of the question, in addition to evidence that the addressee considers ϕ a live epistemic possibility. For example, Asher and Reese argue that the progression of the dialogue in (56a) – (56e) supports the bias that John does nothing to help around the house.

- (56) a. (π_1) A: John is a decent husband.
- b. (π_2) B: Does he do the dishes?
- c. (π_3) A: Well...no.
- d. (π_4) B: Does he do the laundry?
- e. (π_5) A: No.
- f. (π_6) B: Does he lift a FINGER to help around the house?

More important for present purposes, *A*'s turn in (56a) defeasibly entails that she believes that John does at least the minimal amount of housework (assuming that decent husbands do their fair share of housework). The dialogue in (57) demonstrates that the negative bias cannot be jointly accepted by the discourse participants (Asher and Reese 2005).

- (57) a. (π_1) A: John never does the dishes, never cleans the house. All he does

is lie about, drink beer and watch TV.

- b. $(\pi_2) \#B$: Does he lift a FINGER to help?

The preparatory condition follows from these contextual constraints, in particular from the requirement that the addressee consider ϕ an epistemic possibility. The reasoning is sketched below in (58). With respect to (49), for example, I argue that the speaker assumes that the addressee has (at least) a weak belief in the proposition that he needs another porkchop (58a). (As already noted, this much follows from the fact of his reaching for it.) It follows from the fact that \Diamond is the dual of \mathcal{B}_A that the addressee does not believe $\neg\phi$ (58b). It then follows by negative introspection that the addressee believes that he does not believe $\neg\phi$ (58c). Finally from the **Competence** axiom from cognitive modelling, it follows that the speaker believes that the addressee does not believe $\neg\phi$ (58d).

- (58) a. $\Diamond\phi$ (assumption)
 b. $\neg\mathcal{B}_{H(\pi_2)}\neg\phi$ (def. of \Diamond)
 c. $\mathcal{B}_{H(\pi_2)}\neg\mathcal{B}_{H(\pi_2)}\neg\phi$ (from (58c) and 5 Axiom)
 d. $\mathcal{B}_{S(\pi_2)}\neg\mathcal{B}_{H(\pi_2)}\neg\phi$ (from (58c) and **Competence**)

The preparatory condition follows on this analysis from the rather weak assumption that the addressee has not ruled out ϕ . When this assumption is not tenable, as in (57), the question is infelicitous.

The discussion above and in the previous section show that it follows from *Done*(*Say*(π_2)), *Info*(τ) and what I hope were reasonable assumptions about the rationality of the discourse participants that $\mathcal{B}_{S(\pi_2)}\neg\phi$ (the sincerity condition) and $\mathcal{B}_{S(\pi_2)}\neg\mathcal{B}_{H(\pi_2)}\neg\phi$ (the preparatory condition). On the basis of these inferences, one can infer that the speaker has a particular intention in uttering a polar question with an L*+H H-L% contour. Specifically, the speaker has the SARG specified by

by **Sufficient Conditions on Asserting**) that the hearer adopt the belief that $\neg\phi$. In the context of (49b), this is the proposition that the addressee does not need another porkchop.

The interpreter will also note that this is not the SARG normally associated with questions by **QRG**, but rather is the SARG associated with assertions by **IRG**. By **Inferring Dot Types**, it follows that π_2 is assigned the complex speech act type **ASSERTION • QUESTION**. The implicature derived in the previous two sections, I maintain, is conventionalized. That is, I do not assume that interpreters go through this process each time a polar question is uttered with a L^*+H $H-L\%$ contour. Part of the reason for assuming this comes from Sadock's assertion diagnostics. I assume that it is part of the lexical semantic content of the discourse markers *after all* and *yet* that certain of their arguments are grammatically specified as assertions. The same reasoning is applied to conventionalized indirect requests such as (59a). Preverbal *please* occurs with requests issued with imperative sentences such as (59b) and conventionalized indirect requests such as (59a).

- (59) a. Could you *please* pass the salt?
 b. *Please* pass the salt.

It does not occur felicitously with the indirect request in (60), however. This is taken as evidence that indirect requests issued via assertions like (60) are not conventionalized indirect speech acts. Rather the implicature that (60) is intended as a request that the addressee close the window, for instance, is computed online in a particular discourse context.

- (60) #It's cold in here please.

5.5.2 Emphatic Focus Questions in Dialogue

Having established that emphatic focus questions are instances of a complex speech act type $\text{ASSERTION} \bullet \text{QUESTION}$, it is natural to ask what rhetorical function they play in discourse or dialogue. For the most part, this question has already been answered by the analyses in the previous chapters. Given that tag questions, outside-negation polar questions and emphatic focus questions are all assigned the type $\text{ASSERTION} \bullet \text{QUESTION}$, it is to be expected that they have similar range of discourse functions. One place where emphatic focus questions diverge from the other types of biased question discussed in this dissertation is in the rhetorical function that the assertion component plays. Specifically, tag questions and ONPQs intuitively take part in a wider range of assertion types than emphatic focus questions do. One reason for this difference is the contextual constraints on the use of emphatic focus question discussed above. Recall that Asher and Reese (2005) argue that there must be a positive bias in the discourse context that the indirect negative assertion attacks. Thus the assertoric component of emphatic focus questions often functions as correction or counterevidence.

Other, non-divergent, rhetorical functions are possible, however. Consider the dialogue in (49) again (repeated in (61)). In this discourse context, the negative assertion associated with (61b) is related to (61a) with the SDRT meta-talk relation *Explanation**. On this reading, $K_{\pi_{2a}}$ (the assertoric component of π_2) explains why A has π_1 's SARG. In other words, the negative assertion explains why A wants to see to it that Nicholas have fruit instead of another porkchop.

- (61) [Nicholas reaches for the last porkchop, after already having had three.]
- a. (π_1) A: Have some fruit instead.
 - b. (π_2) A: After all, do you NEED another porkchop ?

What still needs to be established is the rhetorical connection between the

component types of the complex type as required by the **Coherence Constraint on Complex Speech Act Types**. In other words, we need to establish the rhetorical role of the question. I assume that the question component of an emphatic focus question takes part in the same discourse functions as the question component of tag questions and ONPQs. Evidence for this assumption comes from the fact that the tag question in (62) intuitively plays a very similar discourse function to the emphatic focus question in (61b) (Sadock 1971).

(62) (π'_2) A: After all, you don't need another porkchop, do you.

Given this fact, one would expect the question component of (61b) to either function as an acknowledgement or confirmation question. This expectation is confirmed by the possible responses to (49b) in (63). For example, (63a) is a strong indicator that the question is linked to the assertion with the relation *Acknowledgement_q*. Recall from chapter 3 that answers to acknowledgement questions entail that the SARG of the discourse segment to which the question is attached has been achieved. This is precisely what the response in (63a) does. Note that (63a) is infelicitous as a response to an information seeking question such as *Do you want another porkchop?*. A simple negative answer can also serve as an answer to an acknowledgement question (63b).

- (63) a. (π_3) B: You're right. Thanks.
 b. (π_3) B: No, I don't.
 c. (π_3) B: Yes, I do. (I'm allergic to fruit and I start fasting tomorrow.)

On the other hand, the addressee may protest the bias as in (63c), suggesting that they have interpreted the question as a confirmation question. *B*'s response in (63c) attaches to π_{2q} with *QAP* (since it answers the question), but also attaches to π_{2a} with *Correction*, since the content of the answer is inconsistent with the content of the indirect negative assertion. (63c) might also attach to π_1 with the relation

Plan-Correction, since π_3 entails that B does not accept or is unable to achieve A 's SARG of π_1 , viz. that B have fruit instead of another porkchop (Asher and Lascarides 2003). As with tag questions and ONPQs, the felicity of a response that goes against the bias of the biased question is strengthened if additional material is included that explains why the speaker does not accept the bias, as in the bracketed material in (63c).

5.6 Conclusions and Open Issues

In this chapter I argued that the negatively-biased questions in (1) are conventionalized indirect assertions. This was modeled formally by assigning them a complex speech act type **ASSERTION • QUESTION**. This assertion was linked by pragmatic reasoning to an intonation contour that is typical of questions like those in (1). This analysis straddles the weak and strong characterizations of negative bias discussed in §5.3. For example, I share with Guerzoni (2004) the assumption that negative bias issues from an assertion. In this respect, I assume a strong characterization of negative bias. I diverge from Guerzoni, however, in my assumption that there is still an interrogative component to the interpretation of biased questions. Furthermore, I assume along with Krifka (1995) and van Rooy (2003) that bias is the result of an implicature (hence the calculable link between the question and negative bias). However, I assume that this implicature is short-circuited (Morgan 1978, Horn and Bayer 1984). That is, I do not assume that it is calculated “online” each time an emphatic focus question is used in a discourse or dialogue, but rather is a convention of language use. Thus, the information that emphatic focus questions are assigned the complex type **ASSERTION • QUESTION** is available to the grammar, for example in satisfying the selectional restrictions of discourse markers like *after all* and *yet*.

I believe that once one concedes that intonation makes a significant contribution to the computation of negative bias it is hard to avoid the kind of analysis

that I argued for in §5.5. The accounts in Krifka (1995), van Rooy (2003) and Guerzoni (2004) rely on the presuppositions of strong NPis in their derivation of negative bias. If one believes that the questions in (1) should be given a uniform analysis, then these accounts would appear to be non-starters, given the absence NPis in examples like (1c) and (49b). One might claim, however, that the intonation associated with emphatic focus questions introduces a presupposition similar to the one introduced by strong NPis. On this account, for example, one might assume that the L*+H H-L% contour shares certain presuppositions with *even*. Krifka (1995) suggests something along these lines.

There are several obstacles that such an attempt must overcome. First, the analyses discussed in §5.2 make incorrect predictions in certain cases (see §5.3). Simply assigning intonation the presuppositions of strong NPis will not solve these problems. More fundamentally, pinning down the meaning of intonation contours, or even specific elements of a contour, is a notoriously difficult task. (Cutler 1977, p. 106), for example, claims that the “effects exercised by intonation contours can be shown to be context-dependent to such a degree that the attempt to extract from them an element of commonality valid in all contexts must be reckoned a futile endeavour.” While I do not believe that the situation is as hopeless as Cutler does, there is something to her observation that intonational meaning is highly context dependent. In order to account for this, it is necessary to assign the elements of the intonational lexicon relatively impoverished, or underspecified, meanings. On such an account, it is problematic to assume that an L*+H pitch accent, for example, has the same presupposition as *even* simply as a matter of lexical semantics. Of course, it might be possible to derive this meaning in a specific context from the underspecified meaning one assumes and reasonable assumptions about rational and cooperative behavior, etc. But then the account begins to resemble in important respects the one presented above.

Finally, in §5.3 I mentioned that negative polar questions such as (64) present a problem for the pragmatic accounts of negative bias in §5.2.1. These examples are also potentially problematic for the intonation based account, as it predicts a *positive* bias. This follows by substituting $\neg\phi$ for ϕ in (50).

- (64) Didn't Larry drink a drop of whiskey ?
 L^*+H $H-L\%$

As discussed at length in Chapter 4, this is not the case. (64) does not assert that Larry drank a drop of whiskey. Other negative questions with the same intonation do convey a positive assertion, however. Consider (65b).

- (65) a. A: Go ahead, have the last porkchop.
 b. A: After all, don't you want it ?
 L^*+H $H-L\%$

It appears then that strong NPis block negative questions from conveying a positive assertion. The difference between these examples is the difference discussed in Chapter 4 between inside-negation and outside-negation polar questions. Recall that NPis forced the INPQ interpretation of polar questions. Since (65b) does not include an NPI, it is free to be interpreted as an ONPQ, which are indirect assertions.

Still, what blocks the reasoning from §5.5 from applying to (64)? It is hard to say. One might argue that the addressee in these cases has some reason to believe that the competence assumption does not hold. But it is not clear how this follows from the presuppositions of the NPI. What I believe may be at work in these cases are the blocking effects often noted with regard to conventionalized indirect speech acts (Asher and Lascarides 2001). For example, Morgan (1978) notes that the expression in (66a) has become a conventionalized way to wish someone luck. The semantically similar locutions in (66b) and (66c) cannot be used in the same way.

- (66) a. Break a leg.
 b. Fracture a tibia.
 c. I hope you break a leg.

Similarly, *Are you physically able to pass the salt?* is blocked from being interpreted as a request by the conventionalized expression in (59a).¹²

It is possible, then, that the use of the INPQ in (64) to convey a positive assertion is blocked by the potential to use the conventionalized indirect assertion provided by ONPQs. As it stands, this is merely speculative. But to the extent that a coherent blocking account could be developed, it counts as further evidence for the conventionalized status of the indirect assertions conveyed by emphatic focus questions and ONPQs.

¹²In lexical semantics, specialized expressions like *pork* to refer to foodstuffs blocks the use of *pig* for the same purpose.

Chapter 6

Conclusion

6.1 A Unified Analysis of Biased Questions

The questions discussed in the preceding chapters were argued to instantiate the complex speech act type **ASSERTION • QUESTION**. That is, each is a conventionalized indirect assertion. In addition, these sentences maintain their literal force, i.e. they are attempts by the speaker to have the addressee provide some information. What this information is depends, I argued, on the rhetorical connection between the assertion and the question. Since, in general, the asserted proposition is a semantic answer to the question, biased questions are not neutral requests for information. That is, they are not, generally, requests for information about what the world is like. Rather, they request specific kinds of feedback from the addressee, asking whether some goal or intention of the speaker has been achieved or requesting information that may help ground information that the speaker is reluctant to accept. I modeled these interpretations with discourse relations like *Acknowledgement_q*, *Confirmation_q* and *Evidence_q*.

For tag questions, this outline is mostly uncontroversial, though there are those who argue for certain alternative approaches (see Chapter 3). Nonetheless,

because tag questions possess both declarative and interrogative syntax, it is natural to assume that they convey both an assertion and a question. This follows from the default alignment of declarative and interrogative sentences with the illocutionary acts of asserting and questioning, respectively (Searle 1969, Sadock and Zwicky 1985). In other words, the “complex speech act” approach is, to some extent, obvious in the case of reversed-polarity tag questions.

The analysis predicts outside-negation polar questions and what I referred to as emphatic focus questions (what Sadock calls “queclaratives”) to be equivalent to tag questions. The form of the tag question depends, of course, on the polarity of the indirect assertion. ONPQs, recall, assert a positive proposition roughly equivalent to the negation of the underlying proposition of the question; emphatic focus questions, on the other hand, assert a negative proposition, again equivalent to the negation of the underlying proposition. Thus, the analysis predicts that ONPQs and reversed-polarity tag questions with a positive anchor have the same range of discourse functions. Similarly, emphatic focus questions and tag questions with a negative anchor share discourse functions. Moreover, given that inside-negation polar questions do not instantiate a complex speech act type, the analysis does not predict any overlap in the distribution of INPQs and tag questions.

These predictions are borne out by a quick examination of the distribution of these sentence types in particular discourse contexts. Consider the discourse in (1) (repeated from Chapter 4). As before, the priming expression in (1b) indicates that the utterance that follows objects to (1a) on some grounds, presumably associated with the use of the implicative verb *manage*. The alternative continuations in (1c) and (1d) reveal that the speaker objects to (1a) because of what he perceives to be a false presupposition, viz. that it was difficult for Nicholas to prove the theorem. Both the outside-negation question in (1c) and the reversed-polarity tag question in (1d) are felicitous in this context and both have equivalent discourse functions.¹

¹The tag question in (1d) is felicitous with either rising or falling final intonation. The falling

- (1) a. A: Nicholas managed to prove the theorem.
 b. B: I wouldn't say he [managed]_F to prove it.
 c. B: Wasn't it *rather* easy for him?
 d. B': It was *rather* easy for him, wasn't it?

Inside-negation polar questions, on the other hand, are not assigned a complex type and are, therefore, unbiased in so far as the speaker does not *commit* herself to a particular answer. The use of an INPQ *does* carry a contextual bias toward the negative answer. However, this bias is qualitatively different from the positive bias conveyed by ONPQs (as argued in Chapter 4). There is no reason to expect INPQs, then, to share any discourse functions with tag questions. This expectation is confirmed by the examples in (2). While the INPQ in (2b) and the tag questions in (2c) and (2d) are felicitous responses to (2a), they each have a distinct discourse function: (2b) requests evidence for the presupposition introduced by (2a), i.e. it is a grounding question; (2c) is, like (2c), a denial of (2a); (2d) expresses the speaker's *agreement* with the presupposition introduced by (2a).

- (2) a. A: Nicholas managed to prove the theorem.
 b. B: Wasn't it *at all* easy for him?
 c. B': Is was *easy* for him, wasn't it?
 d. B'': It wasn't *at all* easy for him, was it.

The analysis developed in the preceding chapters has no problems accounting for these observations. ONPQs and tag questions have complex discourse functions: they assert a proposition and request additional information related to the status of that proposition. INPQs, on the other hand, do not convey an assertion and, therefore, cannot be paraphrased with a tag question, since tag questions invariably

intonation variant is a more forceful denial of (1a), than either the rising intonation variant or the ONPQ in (1c).

ably assert the proposition expressed by their anchor. It is instructive to ask how alternative approaches fare in this respect. The gist of the discussion so far is that any analysis of negative questions should account for the observation that outside-negation questions are “like” tag questions, in some sense, while inside-negation questions are not. Does the analysis in Romero and Han (2004) meet this criterion? It is not clear that it does and to the extent that it doesn’t, this counts as a strike against it.

Consider the paraphrases in (3) and (4) showing the intentions that Romero and Han associate with ONPQs and INPQs in contradiction scenarios. The observations in (1) and (2) suggest that outside-negation questions and tag questions have the same “intent”, while inside-negation questions and INPQs do not.

(3) **Intent of an ONPQ in a “contradiction scenario”:**

- a. Given that I assume that p (implicature)
 - b. and that you implied $\neg p$, (contextual entailment)
 - c. are you not certain we should add to CG that p ? (intent)
- (Romero and Han 2004, p. 647)

(4) **Intent of an INPQ in a “contradiction scenario”:**

- a. Given that I assume that p (implicature)
 - b. and that you implied $\neg p$, (contextual entailment)
 - c. are you certain we should add to CG that $\neg p$? (intent)
- (Romero and Han 2004, p. 646)

But is there any difference between (3) and (4)? Specifically, is there any difference between them that would account for the data in (1) and (2)? As far as I can see, there is not. Take the conversational implicatures shown in (3a) and (4a). Both are triggered by the **Principle of Economy** described in Chapter 4. Similarly, the

contextual entailments in (3b) and (4b) have the same source, viz. the presupposition associated with (1a) and (2a)

That leaves (3c) and (4c) and it is difficult to view these as distinct conditions. Romero and Han interpret (4c) as a request for evidence for the proposition $\neg p$. But any evidence for this proposition is evidence *against* the proposition p ; and any evidence against p implies that the person supplying the evidence is *not certain* that p , which is just (3c). Furthermore, the description in (4) is perfectly consistent, as far as I can see, with the use of an ONPQ in a contradiction scenario. If so, (4) does not really distinguish INPQs from ONPQs and, as a result, does not explain why we cannot paraphrase an INPQ with an appropriate tag question.

The problem with (3) and (4) is that the speaker “assumption” in (3a) and the speaker “assumption” in (4a) need to be distinguished and the analysis in Romero and Han (2004) does not do so. According to (1), the anchor of a reversed-polarity tag question and the alleged implicature in (3a) have the same cognitive status. To the extent that one can show that anchors are asserted, one must also treat the implication in (3a) as an assertion. Thus whereas in Chapter 4 I argued independent of the interpretation of tag questions that ONPQs are associated with an assertion, here we arrive at the same result by noting the overlap in the distribution of ONPQs and tag questions. The same method can be applied to emphatic focus questions, as shown by (5b) and (5c) (repeated from Chapter 5).

- (5) [Nicholas is reaching for the last porkchop, after having had three already.]
 - a. A: You should have some fruit instead.
 - b. A: After all, do you NEED another porkchop?
 - c. A': After all, you don't NEED another porkchop, do you.

6.2 Other Kinds of Biases

Bias as indirect assertion is not the only bias one encounters in the linguistic wilderness. For example, looking more broadly at “rhetorical questions”, one finds a range of biases that have distinct cognitive statuses and distinct functional roles. (The difference between outside-negation and inside-negation polar questions already testifies to this fact.) Yet, I think the failure to note the existence of these different kinds of bias has caused much confusion, especially when evaluating competing analyses. The current thesis attempts to provide a formal account of just one kind of bias, viz. that characterized by an indirect assertion. However, it is instructive to look at a few other types of bias before closing.

Chapter 5 examined positive questions that assert a negative proposition. However, Rohde (2006) correctly notes that not all positive rhetorical questions assert a negative proposition, pointing to (6b) as a case in point. (6b) intuitively asserts that Clinton is a liberal.

- (6) a. A: Is Clinton a liberal?
 b. B: Is the Pope Catholic? (Han 1998, cited in Rohde 2006)

The analysis I presented in Chapter 5 does not account for examples like these. Nor should it, I would argue. Rhetorical questions like (6b) have a number of properties that distinguish them from “emphatic focus questions” like (5b). Most notably, the proposition conveyed by (6b) is in no way connected to the *form* of the question used to convey it. As a result, there is no way to identify the proposition expressed by (6b) independently of the utterance it is related to, normally another polar question. Intuitively, rhetorical questions like (6b) are examples of the use of a polar question whose answer is obvious to both the speaker and addressee to convey a positive answer to an antecedent question, indicating that its answer is similarly obvious. Rohde sees such obviousness as characteristic of rhetorical questions. But it is not

clear to me that the answer to questions like (1c) or (5b) is in any sense obvious to both the speaker and addressee. This is especially true for questions like (1c) where the addressee is committed to a proposition contradicting the bias.

Examples like (7) (from the Switchboard corpus) are closer to the kind of bias addressed in Chapter 5, as the content of the alleged bias is related to the underlying proposition of the question. As Rohde notes, there is a reading of (7) on which it conveys a positive bias: the speaker feels the educational system has been watered down. But is this bias the same as the negative bias addressed in Chapter 5?

- (7) Has the educational system been watered down so that anybody who's above average is now gifted? (Rohde 2006)

Again, the answer is “no”; the positively-biased interpretation of (7) is formally distinct from the negatively-biased interpretation. Positive polar questions conveying a positive bias do not pass the assertion diagnostics (Sadock 1971). Any felicitous use of (8) with the discourse marker *after all* is negatively biased.

- (8) After all, has the educational system been watered down so that anybody who's above average is now gifted?

There is no reason, then, to assume that the two readings of (8) should be given a unified analysis, as the biases associated with each appear to be different beasts.

There are rhetorical questions that *are* problematic for the current account, viz. biased *wh*-questions. While some biased *wh*-questions are associated with a negative assertion, the same question can also convey a *positive* bias that passes our assertion diagnostics. The latter type of biased *wh*-question can be accounted for as in Chapter 5. Take (9), for example, which intuitively conveys that the speaker believes that Onavi knows nothing about semantics.

- (9) I don't think we should have Onavi on our short list. After all, what does he know about semantics? (Caponigro and Sprouse 2007)

(10a) shows the logical form for the interrogative in (9) in which the question operator '?' applies to a lambda abstracted formula. If we take the contribution of intonation in this case to apply to the existential closure of this formula, we arrive at the formula in (10b), which is similar to the information that intonation contributes to the interpretation of emphatic focus polar questions. If, as before, one can justify pushing the negation inside of the belief operator one arrives at the correct bias, as shown in (10c).

- (10) a. $?(\lambda x. \text{knows-about-semantics}(\text{Onavi}, x))$ (logical form of (9))
 b. $\neg \mathcal{B}_S(\exists x. \text{knows-about-semantics}(\text{Onavi}, x))$ (intonation)
 c. $\mathcal{B}_S(\neg \exists x. \text{knows-about-semantics}(\text{Onavi}, x))$ (from the competence assumption)

However, as already noted, not all biased *wh*-questions convey a negative bias. Take the example in (11). According to the *after all* test in (12), this question is biased. However, the speaker asserts that *Mary* fed and educated the addressee, not that *no one* did. The analysis just sketched does not account for this positive assertion, at least on any straightforward application.

- (11) Who fed you and gave you a proper education? (Han 1998, cited in Rohde 2006)
 (12) You should be nicer to Mary. After all, who fed you and gave you a proper education?

That does not mean that an account along the lines in Chapter 5 is impossible. For instance, one might argue that the assertion conveyed by (12) is that nobody

but Mary fed the addressee and provided him a proper education. That is, for some $a \in D_e$ it is not the case that the speaker believes that there exists an x , $x \neq a$ and x fed and educated the addressee. On this analysis, (12) conveys a *negative* assertion similar to the one sometimes associated with exclusive sentences. This is pure speculation, of course, and further investigation must remain for future research.

In closing, the set of rhetorical questions, as conceived by Rohde (2006) and Caponigro and Sprouse (2007), among others, encompasses a wide variety of sentence types. However, there is no reason to assume that the set of rhetorical questions is uniform. That is, within the set of rhetorical questions there may exist well-defined subsets that exhibit their own formal and functional characteristics. This dissertation has looked at one such subset, viz. the set of biased questions. These questions, I argued, are defined by the existence of an indirect assertion as diagnosed by Sadock's diagnostics. It is useful, I believe, to isolate these subsets and identify the unique formal and functional characteristics that set them apart. Not only does this deepen our understanding of rhetorical questions, it allows us to isolate the interpretive effects of aspects of linguistic form that often go unrecognized, like intonation, and in so doing broaden our understanding of language and communication. I hope this dissertation has taken a step in this direction.

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