Intonational Commitments*

Deniz Rudin
drudin@usc.edu

1 Introduction

In this paper, I develop an account of the discourse effect of utterances of declarative sentences accompanied by rising intonation in American English (rising declaratives, or RDs) couched within the Table model (Farkas & Bruce 2010).

(1) You slapped him?

(2) There's a deer outside?

(3) You got a job?

RDs like (1)-(3) instantiate a kind of biased question: they solicit information from an addressee, but they also indicate that the speaker is not neutral about the expected answer. How to model the discourse behavior of such sentences has been the subject of much recent interest (e.g. Krifka 2015, Malamud & Stephenson 2015, Farkas & Roelofsen 2017, Westera 2017, Jeong 2018, Goodhue 2021), building on influential analyses by Bartels (1999), Gunlogson (2001, 2008), and Nilsenová (2006). I propose here that the discourse behavior of

---

RDs follows from an account in which rising intonation calls off speaker commitment (q.v. Truckenbrodt 2006).

The Table model analyzes discourse moves in terms of how they affect the Question Under Discussion, the individual discourse commitments of the interlocutors, and the Common Ground, including projection of possible future Common Grounds. Approaches to RDs within the Table model have taken their status as biased questions to motivate an extension of the model to include additional primitive components making reference to things like projected commitments and metalinguistic issues (Malamud & Stephenson 2015, Jeong 2018, Bhadra 2020), or explicit marking of commitment strength, evidence source, or epistemic bias (Northrup 2014, Farkas & Roelofsen 2017). One of the goals of this paper is to demonstrate that the discourse behavior of RDs can be derived entirely from components of the Table model independently necessary for modeling the basic speech acts of assertions and neutral questions: binarily-interpreted individual discourse commitments (distinguishing only between the presence and absence of full assertive commitment) and projected Common Grounds. I argue that RDs behave like biased questions because they have some attributes that questions have, but also some attributes that assertions have—they project only one future Common Ground, like assertions, but lack speaker commitment, like neutral questions. The discourse behavior of RDs falls out of this particular setting of the parameters of the most basic formulation of the Table model. This is not an argument that elaborations of the Table model making use of projected commitments, metalinguistic issues, variable commitment strength, or overt marking of evidence source and epistemic bias are unnecessary; it is an argument that such elaborations are not necessary to the analysis of the behavior of RDs.

Prior accounts of RDs within the Table model analyze them non-compositionally, by assigning a discourse effect to the sentence-tune pair, rather than deriving their behavior from the interaction between the meaning of rising intonation and the meaning of utterances of declarative sentences (Malamud & Stephenson 2015, Jeong 2018; Farkas & Roelofsen 2017 analyze RDs partially compositionally, but assign them additional construction-specific effects).[1] A second goal of this paper is to develop an account of RDs within the Table model that gives a fully compositional account of the interaction between intonational tune and clause type, deriving the behavior of RDs entirely from interaction between the meaning of rising intonation and the meaning of utterances of declarative sentences (following Gunlogson 2001 and Westera 2017, 2018).[2] This approach is suggested (as one of several theoretically plausible approaches to how to model the contribution of intonation compositionally) by Paul Portner like so: "...sentence mood and intonation specify two separate dimensions of discourse function, with the ultimate force of the utterance being a combination of the two." (Portner 2018, p.22). One prominent road block to an analysis of RDs that is compositional

---

[1]This is true as well of many analyses not couched within the Table model, e.g. Gunlogson (2008), Krifka (2015).

[2]Though the account proposed is compositional on the level of the sentence-tune pair, it is not compositional within the tune—that is to say that it assigns a meaning to the entire L* H-H% tune, rather than deriving the meaning of that tune from interactions between the meanings of L*, H-, and H%. For attempts to derive tune meanings entirely from the meanings of their constituent tones, see Pierrehumbert & Hirschberg (1990), Bartels (1999).

on the level of the sentence-tune pair has been bias effects associated with utterances of RDs, which are not shared by all utterances accompanied by the L* H-H% tune. This paper makes an empirical argument that bias effects associated with RDs should be regarded as pragmatic, not conventional, and therefore not part of what is delivered by the conventional, compositional update effect of RDs, eliminating the road block to a compositional account of sentence-tune pairs. The paper thus seeks to distinguish between what aspects of the discourse profile of RDs are conventionalized (q.v. Murray & Starr 2020), and which are pragmatic.

Correspondingly, a third goal of this paper is to develop a more explicit pragmatics for the Table model than has been previously presented, to the best of my knowledge. In order to fully work through the predictions made by the proposed discourse effect of RDs, I propose a series of maxims governing the cooperativity of making commitments and projecting Common Grounds, and develop a constraint-based implementation of these maxims that predicts both speaker-oriented and addressee-oriented inferences of epistemic bias for RDs. These maxims formalize the (sometime implicit) rationales behind the various components of the Table model. Formalizing the pragmatics of the Table is important, as intuitions about what the various components of the model represent are crucial to its appeal, and are often invoked as considerations guiding analyses in various ways. I hope that the pragmatic portion of this paper is of interest beyond the analysis of RDs, as the Table model is increasingly broadly used in the analysis of diverse phenomena—e.g. AnderBois (2018) and Kraus (2018) on mirativity, Beltrama (2018) on intensifiers, Faller (2019) and Bhadra (2020) on evidentials, Yuan & Hara (2019) on sentential adverbials, Wei (2020) on discourse particles, Rett (ms) on emotive markers, a.o.

In terms of empirical coverage, this paper addresses inferences to both the speaker's and the addressee's epistemic bias that typically accompany the use of an RD, offering an account of why RDs are always accompanied by an inference that the speaker takes the addressee to have positive epistemic bias, why RDs are compatible with inferences of both positive epistemic bias on the part of the speaker and negative epistemic bias on the part of the speaker (Farkas & Roelofsen 2017), and also an account of why negative speaker epistemic bias cases are in some sense non-canonical (Westera 2017, 2018). I present empirical arguments that the bias associated with RDs, and the effects of contextual manipulations on that bias, should be analyzed in terms of pragmatics, not hard-coded into the conventional discourse effect of RDs.

The paper is structured like so: in §2, I place limitations on the empirical scope of the investigation. In §3, I discuss the relevant empirical generalizations about the behavior of rising declaratives. In §4, I present the model in which the account is couched, giving background on Farkas & Bruce's (2010) Table model and Farkas & Roelofsen's (2017) general utterance function. In §5, I formalize the proposal that rising intonation calls off speaker commitment, and show how it applies to basic cases of rising and falling declaratives and interrogatives. In §6, I formalize a pragmatics for the Table model. In §7 I demonstrate the application of that pragmatics to the basic cases, and show how it derives the bias profile of rising declaratives. In §8 I sketch further ramifications of the account for the intonation of interrogatives. In §9, I conclude.

2 The Scope of the Investigation

2.1 Rising Declaratives: Preliminaries

Rising declaratives (RDs) are declarative sentences accompanied by rising intonation. To be more phonologically precise, these sentences are characterized by a low pitch accent followed by a rise in pitch through the end of the utterance. In an autosegmental-metrical system of intonational transcription (Pierrehumbert 1980, Beckman & Pierrehumbert 1986, Ladd 2008), which treats intonational tunes as discrete sequences of binary high or low tones, this can be represented as an L* H-H% tune, where * marks a pitch accent, - marks a phrase accent, and % marks a boundary tone. This tune is cashed out as a nuclear accent that is a local minimum in pitch, a return to a higher pitch after the nuclear accent, and an utterance-final rise from that higher pitch. It is commonly observed that the discourse function of such sentences is to request information, while expressing some kind of bias that is not present in the corresponding sentences with interrogative syntax:

(4)   L* H-   H%
      You slapped him?

When I refer to a 'tune' in this paper, I refer specifically to the terminal contour of an intonational phrase. I assume for the purposes of this paper that the meaning-bearing unit of an intonational tune is its terminal contour—that portion of the intonational phrase beginning with the nuclear pitch accent and continuing to the end of the sentence. In making this assumption, I follow Gunlogson (2001), (2008), Truckenbrodt (2006), Nilsenová (2006), Constant (2012), Farkas & Roelofsen (2017), Jeong (2018), a.o. For attempts to decompose tune meanings at least partially into the meanings of individual tones, see Pierrehumbert & Hirschberg (1990), Steedman (1991), (2014), Bartels (1999), Göbel (2019). Nothing crucial rests on the decision to treat the terminal contour as the irreducible bearer of tune meanings—if the effect ascribed here to the L* H-H% tune can be derived from the meanings of its tones, so much the better. For an argument in the other direction, namely an argument that constituents larger than the terminal contour bear irreducible meanings, see Liberman & Sag (1974), Sag & Liberman (1975). Note also that I treat the semantic effect of the position of the nuclear pitch accent (i.e. focus marking) as orthogonal to the meaning of the tune itself (cf. Schlöder & Lascarides 2020).

It is important to stress that the empirical focus here does not include all declarative sentences accompanied by a final rise. By focusing exclusively on steep monotonic rises (the L* H-H% tune), I mean to exclude from consideration 'list intonation' (H* H-L%), which is characterized by a high pitch accent which is maintained as a high plateau, rather than rising through the end of the utterance (Pierrehumbert & Hirschberg 1990), as well as the rise-fall-rise tune (L*+H L-H%), in which a rising pitch accent drops to a low phrase accent before rising again at the end of the utterance, expressing surprise or disbelief (see Constant 2012 for a more detailed characterization). I also mean to exclude assertive uses of RDs, which have been argued to be phonologically distinct from inquisitive uses of RDs (Jeong 2018), a point I discuss in the following subsection.

2.2 Assertive vs. Inquisitive RDs

Jeong (2018) argues that there are two different constructions in English that involve declarative sentences accompanied by monotonically rising intonation. One phenomenon is the one presented above, in which a steep rise accompanying a declarative sentence leads to it being interpreted, pretheoretically speaking, as a biased question. The other phenomenon is one in which a shallower rise accompanies a declarative sentence, leading it to be interpreted as a tentative assertion:

(5) **A**: Do you speak Chinese?

              H* H- H%
    B: I speak Mandarin?

In this case, **B**'s utterance doesn't solicit any information from **A**, and **B** is taken to have committed to the truth of the sentence she has uttered. The rising intonation here, rather, indicates that **B** is not completely sure whether her contribution is an adequate answer to **A**'s question. Malamud & Stephenson (2015) call these 'unsure-of-move' uses of RDs. Jeong (2018) argues on the basis of experiments involving acoustic manipulation of the height of the rise that cases like these are intonationally distinct from information-soliciting uses of RDs. The two varieties of rising declaratives are actually associated with phonologically distinct intonational tunes: the biased question with a steep, sharply scooped L* H-H% rise, and the tentative assertion with a shallower, less scooped H* H-H% rise, as indicated above. She refers to the former as 'inquisitive' RDs and the latter as 'assertive' RDs, terminology that I adopt here.

I follow Jeong (2018) in treating inquisitive and assertive rising declaratives as two separate constructions, associated with two separate intonational tunes, and I address only the discourse behavior of inquisitive RDs, and the meaning of the L* H-H% tune, in this paper.[3] An investigation of what, if anything, inquisitive and assertive RDs have in common is outside the scope of this paper (see Bartels 1999, Pierrehumbert & Hirschberg 1990, and Westera 2013, 2017 for accounts that assign a meaning to H% alone, providing a roof under which both constructions can rest). Throughout the rest of this paper, when I use the term 'rising declarative' without qualification, I intend it to refer to inquisitive rising declaratives, and when I use the term 'rising intonation' without qualification, I intend it to refer to a tune ending in the L* H-H% terminal contour (which I'll refer to as 'the L* H-H% tune' as a matter of convenience). When I place a question mark at the end of an example sentence, I intend it to signify that the sentence is accompanied by the L* H-H% tune. In the case that a context appears compatible with either an assertive or an inquisitive interpretation of the given RD, I ask for the reader's complicity in focusing on the inquisitive interpretation.

If, in the final calculus, the argument that inquisitive and assertive rising declaratives are phonologically distinct turns out not to hold water, this paper's analysis of the discourse effect of inquisitive RDs will be unaffected. However, its association of that discourse effect with the contribution of the L* H-H% tune will have to be sacrificed.

---

[3]In making this assumption I diverge from e.g. Malamud & Stephenson (2015), who attempt to provide a unified discourse effect for both constructions.

3 Empirical Generalizations

I take four empirical generalizations to be crucial desiderata for the empirical adequacy of any account of inquisitive RDs:

(6) FOUR CRUCIAL GENERALIZATIONS
   For any RD p? whose falling declarative counterpart denotes the proposition p
   a. NON-ASSERTIVENESS
      A speaker who utters p? does not commit to the truth of p
   b. ANSWER SOLICITATION
      An utterance of p? invites the addressee to weigh in on whether p is true
   c. VARIABLE SPEAKER EPISTEMIC BIAS
      An utterance of p? can license an inference that the speaker suspects that p is true or that it is false, depending on context
   d. INVARIABLE ADDRESSEE EPISTEMIC BIAS
      An utterance of p? is only felicitous when the speaker has reason to believe that the addressee believes p

The rest of this section presents empirical arguments for each of the above generalizations. Generalizations (6a) and (6b) are uncontroversial, and so the arguments presented for them will be brief. The status of generalizations (6c) and (6d) in the literature is less clear. (6c) is a synthesis of contradictory claims made in prior work: though it was uncontroversial until recently that RDs are associated with positive speaker epistemic bias (e.g. Gunlogson 2008, Krifka 2015, Malamud & Stephenson 2015, Westera 2017), Farkas & Roelofsen (2017) have recently made a forceful empirical argument that they are not always associated with such bias. Not all prior accounts of RDs have noted that (6d) is a valid generalization, but several have made it central to their empirical discussion (e.g. Gunlogson 2001, Krifka 2015 and Jeong 2018).

3.1 Non-assertiveness

An inquisitive RD p? whose falling declarative counterpart denotes the proposition p does not commit[4] the speaker to the truth of p—that is to say, the speaker does not assert p by uttering p? (Gunlogson 2001 and many others—empirical discussion here is heavily indebted to Gunlogson).

(7) *[Context: **A**lvin is looking at facebook on his phone, where he sees a cryptic post by his friend Carrie, which seems to suggest that she's been fired from her job. He turns to **B**ertha, who is close with Carrie, and says:]*
   A: Carrie got fired?

---

[4]Note that when I use the term 'commit' or 'commitment' throughout this paper, I refer to 'full' or 'assertive' commitment of the sort characteristic of garden-variety assertions. Whether or not RDs conventionally encode a gradient, partial, or tentative notion of commitment (q.v. Gunlogson 2008, Northrup 2014, Malamud & Stephenson 2015, Farkas & Roelofsen 2017, Jeong 2018, Bhadra 2020) is a separate question, which I turn to in §3.5

    a. **B:** #Thanks for the heads up.
    b. **B:** #Oh, I had no idea.

Bertha cannot felicitously reply by thanking Alvin for giving her information (7a) or by indicating receipt of previously unknown information with *oh* (7b).

In this respect RDs pattern with interrogatives (8); the opposite is seen with falling declaratives (9).

(8) *[Context: same as (7)]*
    A: Did Carrie get fired?
    a. **B:** #Thanks for the heads up.
    b. **B:** #Oh, I had no idea.

(9) *[Context: same as (7)]*
    A: Carrie got fired.
    a. **B:** Thanks for the heads up.
    b. **B:** Oh, I had no idea.

To summarize: unlike falling declaratives, RDs don't appear to communicate information—discourse moves acknowledging receipt of information or signaling that one's interlocutor has made a commitment are not felicitous responses to them.

3.2 Answer solicitation

Falling declaratives also behave differently from interrogatives in that the latter solicit an answer from the addressee, and the former do not:

(10) *[Context: **A**lvin is looking at facebook on his phone, where he sees a cryptic post by his friend Carrie, which seems to suggest that she has a new girlfriend. He turns to **B**ertha, who is close with Carrie, and says:]*
    A: Did Carrie get a new girlfriend?
    a. **B:** Yeah, she told me about it this morning.
    b. **B:** I don't think so, maybe she's just trying to stir up drama.
    c. **B:** #Did you know Delia is leaving her husband?

(11) *[Context: same as (10)]*
    A: Carrie got a new girlfriend.
    a. **B:** Yeah, she told me about it this morning.
    b. **B:** I don't think so, maybe she's just trying to stir up drama.
    c. **B:** Did you know Delia is leaving her husband?

An interrogative can be felicitously followed by an answer, whether positive (10a) or negative (10b), but it's infelicitous to reply by raising a related issue, rather than answering the question posed by the interrogative sentence (10c).[5] The same is not true for falling declaratives. Agreement (11a) and disagreement (11b) are felicitous, but it's also felicitous to reply by raising a related issue (11c)—in this case, we take Bertha to have tacitly accepted the truth of Alvin's statement. Again, RDs pattern like interrogatives (Gunlogson 2001 a.o.):

(12) *[Context: same as (10)]*
  A: Carrie got a new girlfriend?
 a. **B:** Yeah, she told me about it this morning.
 b. **B:** I don't think so, maybe she's just trying to stir up drama.
 c. **B:** #Did you know Delia is leaving her husband?

It's felicitous to respond to p? by giving information about whether or not p is true (12a, 12b), but just as with interrogatives, it comes off as a non-sequitur to respond by bringing up a related matter (12c). RDs pattern with interrogatives in soliciting an answer.

3.3   Variable speaker epistemic bias

Rising declaratives have been argued to indicate, by some means or another, that the speaker has epistemic bias in favor of the proposition denoted by the corresponding falling declarative (see especially Gunlogson 2008 and Westera 2017)—however, Farkas & Roelofsen (2017) make empirical arguments that rather than necessarily indicating bias in favor of p, an utterance of p? indicates an epistemic preference for p over $\neg p$ that is at best low, and at worst nonexistent. I'll call cases in which an utterance of p? allows us to infer that the speaker suspects p to be true cases in which the speaker has POSITIVE EPISTEMIC BIAS, and cases in which an utterance of p? allows us to infer that the speaker suspects p to be false cases in which the speaker has NEGATIVE EPISTEMIC BIAS.

In this section, I review data that has led analysts to these two contradictory positions. I argue that, though any satisfactory account of RDs must explain both sets of cases, neither should be taken to be a primitive or conventional feature of RDs. The fact that these inferences are flexible and context sensitive shows that reference to bias should not be hard-coded into the discourse effect of rising declaratives (cf. Gunlogson 2008, Krifka 2015, Malamud & Stephenson 2015, Farkas & Roelofsen 2017, Jeong 2018), but instead arise via pragmatic reasoning (q.v. Nilsenová 2006, Westera 2017).

3.3.1   Positive Bias

Many of the situations in which rising declaratives are felicitous are cases in which the speaker has strong epistemic bias in favor of the proposition denoted by the corresponding

---

[5]If the contrast is not apparent, try adding *huh* or *oh* at the beginning of the (c) examples. Explicit acknowledgement of receipt of information, followed up by a related contribution, is felicitous with declaratives, but not interrogatives.

rising declarative. Consider the following examples, based on examples from Gunlogson (2001).

(13) *[Context: The speaker has just seen her coworker enter the office wearing a wet raincoat. She says to him:]*
It's raining?

(14) *[Context: The speaker's typically overgrown coworker has just entered the office with a buzzcut. She says to him:]*
You got a haircut?

In (13), the speaker's visual evidence gives her strong reason to believe that it's raining—note the similarity to contexts used to facilitate the epistemic modal *must* (e.g. by Karttunen 1972), which is uncontroversially associated with strong epistemic bias in favor of its prejacent. In (14), again the speaker's visual evidence gives her strong reason to believe that her addressee has gotten a haircut—so strong, in fact, that one gets the sense that she is completely sure that he has gotten a haircut, and is merely being polite by avoiding using a falling declarative and thereby asserting to him facts about his own grooming.

To these cases, we can add double checking and expert consultation cases like the following:

(15) *[Context: The speaker and her addressee made plans two days ago to get drinks tonight. They haven't spoken about it since. She says to him:]*
We're still on for tonight?

(16) *[Context: The ship's captain is consulting with the android who maintains the ship about the logistics of their colonization voyage. The captain says:]*
We have, what, eight more recharge cycles to go before we get to Origae-6?

In (15), the speaker has no reason to suspect that the plans have been cancelled—the intuitive purpose of her utterance is to double check that they still hold, and indirectly, to remind her addressee of the plans, and perhaps initiate a logistical conversation.[6] In (16), taken from the film *Alien: Covenant*, the captain is pretty sure about how many recharge cycles are left before they reach their destination, but knows that the android is better informed than he is, and so he requests confirmation of the exact number from him. Cases like these suggest that p? is compatible with very strong speaker epistemic bias toward p, contra Farkas & Roelofsen (2017).

---

[6]Note that echoic uses of RDs are often assigned double-checking interpretations:

(1) **A:** Carrie is here.
B: Carrie is here?

Note that this is possible in noisy environments, as a way for **B** to double-check that they heard **A** correctly. In a context where mishearing is implausible, this is less likely to be interpreted as double-checking, and more likely to be interpreted as expressing disbelief—**B** is unwilling to commit to p, in spite of being fully aware that **A** has just asserted it.

3.3.2 Negative Bias

Given the data in the previous subsection, an account of RDs that treats them as conventionally indicating positive speaker epistemic bias might seem desirable. However, further investigation of the data problematize that view (q.v. Farkas & Roelofsen 2017). Consider the following case:

(17) *[Context: Alvin and Bertha are at a department store. Bertha has asked Alvin to go pick out a 100% cotton sweater; Alvin does not know much about clothes, and is not particularly detail-oriented. He returns with a sweater.]*
Bertha: That's 100% cotton? Maybe you should double check.

In this case, the RD does not indicate positive epistemic bias toward p. Rather, it expresses something more intermediate: skepticism, though skepticism that falls short of certainty that p is false.

For another example, see the following naturally occurring example, brought to my attention by Donka Farkas (p.c.):[7]

(18) *[Context: George Stephanopoulos is interviewing Donald Trump.]*
DT: I think I've made a lot of sacrifices. I work very, very hard. I've created thousands of jobs, tens of thousands of jobs, built great structures. I've had tremendous success. I think I've done a lot.
GS: Those are sacrifices?

In this case, again it is difficult to interpret the RD in any way other than expressing skepticism, verging on outright disagreement. Note that it might seem particularly natural for this utterance to be accompanied by overt markers, intonational or otherwise, of incredulity. However, the utterance is felicitous even if delivered with a pleasant, neutral tone, and the inference of skepticism still persists.

Note that it is not the content of the sentence itself that makes the difference between positive and negative bias, but rather properties of the context in which it is uttered. To see this, consider a contextual variant on (14):

(19) *[Context: The speaker's coworker walks into the room and announced that he just got a haircut. However, he does not look very different. She says to him:]*
You got a haircut?

Though the original presentation of this sentence in (14) generated an inference of positive bias, in its new context above it generates an inference of skepticism.

Cases where it is implausible that the speaker is not opinionated about p (i.e., either the speaker believes p to be true or they believe it to be false) generate a stronger inference: not just that the speaker is skeptical about p, but that the speaker believes p to be false.

---

[7]The source of the example is an ABC news interview from July 30th 2016.

Such cases include cases in which the speaker has epistemic authority over p, as in (20), or cases in which the speaker is an authority figure who has final say over whether the requirements for the truth of p have been met, as in (21), both examples from Farkas & Roelofsen (2017):

(20) *[Context: A student is solving a math problem in front of the class.]*[8]
      Student: The answer to this problem is 5 because the square root of 9 is 2 and 2 + 3 is 5.
      Teacher: The square root of 9 is 2?   (F&R's 55)

(21) *[Context: A mother asks her child to set the table, and he does a particularly bad job before announcing himself to be done. The mother says to the child:]*
      This table is set?   (based on F&R's 69)

Both of the examples above are somewhat echoic: the RD repeats a claim the addressee has just made.[9] But this is not crucial to the phenomenon. See the following for a non-echoic case where the speaker has epistemic authority over p, in which the strongly negative inference still results:

(22) *[Context: Bertha has set up a game for Alvin. She has placed various objects in a room, and asks him to follow her instructions. There are three vases in the room, of different sizes. Two vases are in front of Alvin; the third, which is by far the largest, is behind him. Bertha asks Alvin to bring her the largest vase in the room. He moves toward the largest of the two vases in front of him, unaware that the largest vase is behind him. Bertha says:]*
      That's the largest vase?

The data encountered in this section pose a great deal of difficulty for the idea that RDs intrinsically encode positive speaker epistemic bias—it is apparent that they can be used to express skepticism or contradiction in the right sorts of contexts. In other words, an account of the bias associated with utterances of RDs should not rule out the possibility of positive speaker epistemic bias, but should also not rule out the possibility of negative speaker epistemic bias.

Westera (2017) argues that strongly negatively biased cases like (20) and (21) could potentially be analyzed as involving pretense (e.g., the teacher could be pretending, for rhetorical purposes, to be biased in favor of the square root of 9 being 2). I share the intuition that these cases are pragmatically distinct from cases involving positive speaker bias, though not the intuition that their pragmatics piggybacks on positive epistemic bias. In §7, I give a pragmatics of rising declaratives that involves an explicit account of the role played by speaker pretense in strongly negatively biased cases.

---

[8]Farkas & Roelofsen (2017) credit this example to Jeroen Groenendijk (p.c.).

[9]Note that the easy availability of echoic negatively biased RDs follows from the generalization that RDs require the speaker to have reason to believe that the addressee believes p (q.v. §3.4): the speaker having just asserted p is one excellent great way to get evidence of their belief in p that is not necessarily also evidence for the truth of p itself (though only one way among many).

3.4 Invariable Addressee Bias

We've seen above that some rising declaratives facilitate an inference to the speaker being epistemically biased in favor of the proposition denoted by the corresponding falling declarative, and others facilitate an inference to the speaker being epistemically biased against the proposition denoted by the corresponding falling declarative. What unifies the cases above is not any generalization about what epistemic bias of the speaker's is communicated by rising declaratives, but rather is a generalization that is addressee-oriented: by uttering p?, the speaker indicates that they have reason to believe that the addressee believes p (Gunlogson 2001, Krifka 2015, Jeong 2018).[10]

It should be noted that it is actually fairly difficult to disentangle the speaker's epistemic bias toward p from the speaker's belief in the likelihood of the addressee's epistemic bias toward p in cases in which the speaker takes the addressee to be well-informed. In such cases, the relation between the speaker's epistemic bias toward p and the speaker's belief in the likelihood of the addressee's epistemic bias toward p is mediated by an inference pattern called Chancy Modus Ponens, argued to be valid by Yalcin (2010) and Moss (2015).[11]

(23)   CHANCY MODUS PONENS   (Yalcin 2010 V8)
      if ϕ then ψ
      probably ϕ
      ———————
      probably ψ

To see how this inference pattern relates speaker-oriented bias to addressee-oriented bias, consider again the rain case in (13). Assume that ϕ is the proposition that it is raining, and ψ is the proposition that the addressee believes that it's raining. In the context provided, it is specified that the addressee has just come in from outside. This makes it sensible for the speaker to assume that the addressee knows whether or not it's raining—that if it's raining, then the addressee believes it is raining. In other words, the speaker believes that *if ϕ then ψ* is true. The context also provides information to the speaker the most likely explanation of which is that it's raining—namely, the addressee's wet raincoat. In other words, the speaker believes that *probably ϕ* is true. Since the speaker believes both of these premises, then by Chancy Modus Ponens we can conclude that the speaker believes the conclusion: *probably ψ*, i.e. that it's likely that the addressee believes that it's raining. If the speaker takes that

---

[10]*Nota bene*: it is certainly not the case that the addressee must believe p in order for a rising declarative to be felicitous. Consider for example the case in (10): Alvin may well be mistaken in his understanding of the cryptic post, and if so, Bertha is not in any way implicated in his misunderstanding. So it would certainly be too strong to say that the addressee must believe p. Crucially, the generalization is that the speaker must have *reason to believe* that the addressee believes p; they need not *know for sure* that the addressee believes p, or *be right* that the addressee believes p. Because the generalization refers to the speaker needing a reason to believe that the addressee believes p, rather than requiring that the addressee actually believe p, it can handle the observations noted in this footnote: Alvin can have reason to believe that Bertha believes p even if he is ultimately mistaken about her belief, and of course she is not accountable for the evidence which he takes as justifying his suspicion that she believes p. Thanks to an anonymous reviewer for helpful discussion of these points.

[11]For discussion of potential counterexamples to Chancy Modus Ponens, see Neth (2019). The counterexamples involve confounding factors that are absent from the discussion here.

addressee to be informed about p, then their epistemic bias toward p translates into their expectation of the addressee's epistemic bias toward p.

Because of Chancy Modus Ponens, looking at cases in which the speaker believes the addressee to be well-informed about p doesn't necessarily tell us whether the bias of the RD is speaker-oriented or addressee-oriented. An account that takes speaker-oriented bias to be a basic feature of RDs will lead to an inference to addressee-oriented bias in such cases, via Chancy Modus Ponens. It's relevant to note that previous discussion in the literature focuses primarily on cases in which the addressee is taken to have more epistemic authority over p than the speaker (for the most explicit discussion of this, see Gunlogson 2008), i.e., on exactly those cases that license Chancy Modus Ponens, obscuring whether the source of epistemic bias is speaker-oriented or addressee-oriented.

Therefore, the most valuable cases for pulling apart speaker-oriented and addressee-oriented bias are cases in which the speaker doesn't take the addressee to have epistemic authority over p. It is exactly these cases in which we see an inference of negative speaker bias toward p. In these same cases, RDs are felicitous only if the context provides the speaker with a reason to believe that the addressee has positive epistemic bias toward p, suggesting that the addressee-oriented bias associated with RDs is constant, though the speaker-oriented bias is variable.

Consider (17), whose context is repeated here as (24a):

(24) a. *[Context: Alvin and Bertha are at a department store. Bertha has asked Alvin to go pick out a 100% cotton sweater; Alvin does not know much about clothes, and is not particularly detail-oriented. He returns with a sweater.]*
          Bertha: That's 100% cotton?
      b. *[Context: Alvin and Bertha are at a department store. Bertha has asked Alvin to go pick out a polyester blend sweater; Alvin does not know much about clothes, and is not particularly detail-oriented. He returns with a sweater.]*
          #That's 100% cotton?

In the felicitous context (24a), Bertha has good reason to suspect that Alvin believes the sweater to be 100%, namely because that's the kind of sweater she told him to pick out. In the infelicitous context (24b), Bertha has no such reason to suspect that Alvin believes the sweater to be 100% cotton, given that he was told to pick out a polyester blend sweater.

Consider also (18), repeated repeated here as (25a):

(25) a. **DT:** I think I've made a lot of sacrifices. I work very, very hard. I've created thousands of jobs, tens of thousands of jobs, built great structures. I've had tremendous success. I think I've done a lot.
          GS: Those are sacrifices?
      b. **DT:** I work very, very hard. I've created thousands of jobs, tens of thousands of jobs, built great structures. I've had tremendous success. I think I've done a lot.
          GS: #Those are sacrifices?

In these examples, the context for the RD is provided by the content of DT's utterance. In the felicitous context (25a), GS has good reason to suspect that DT believes that his achievements are sacrifices, because he prefaced his list of them by saying that he has made a lot of sacrifices. In the infelicitous context (25b), DT does not preface his list with that statement, giving GS no reason to suspect that DT believes those achievements to be sacrifices, and rendering his RD a non sequitur. Just as with the previous example, there is no reason for GS to believe that DT has epistemic authority over the question of whether those achievements count as sacrifices, and there is no change in GS's epistemic bias about whether those are sacrifices—what changes is whether DT gives GS reason to believe that he takes those achievements to be sacrifices.

The generalization, then, is that an utterance of p? is felicitous only if the speaker has reason to suspect that the addressee believes p—a precisification of the frequent observation that RDs are 'bad out of the blue'.

3.5   Partial Commitment?

Despite the fact that RDs clearly do not involve the same sort of commitment as garden-variety assertions, many prior proposals have analyzed them as conventionally encoding a weaker notion of commitment, whether that is cashed out as contingent commitment (Gunlogson 2008), gradient expression of evidence-based credence (Northrup 2014, Farkas & Roelofsen 2017), or projected or tentative commitment (Malamud & Stephenson 2015, Jeong 2018, Bhadra 2020). One reason to believe some expression of the bias of RDs to be conventionally encoded is the fact that the bias of an RD is difficult to overtly call off:[12]

(26)   *Context: Laura has just entered the room, where Max sees her for the first time that day.*   (adapted from Northrup 2014 ex.19)
　　　 Max: You got a haircut?
　　　 Laura: No, not yet.
　　a. **Max**: #(Yeah,) I didn't think so.
　　b. **Max**: Really? It looks like you did.

On the assumption that only what is conventionally encoded cannot be called off without infelicity, this observation motivates the conclusion that the bias associated with utterances of RDs is a conventional feature of the update they carry out, rather than a pragmatic inference generated by the observation of that utterance. However, that conclusion is too hasty, because that assumption is false. The relevant test distinguishing conventionally encoded content from pragmatic inferences is the test of cancellation-without-contradiction (Grice 1975), not cancellation without infelicity of any kind, at any distance. The implicatures that cancellation-without-contradiction is a relevant diagnostic for are enrichments of the at-issue truth-conditional content of an utterance: a sentence whose utterance generates such an implicature communicates stronger truth-conditional content than that which is conventionally encoded by the semantics of the sentence itself. Cancellation-without-contradiction is a

---

[12]Thanks to an anonymous reviewer for bringing up the relevance of Northrup's example.

relevant diagnostic for such inferences because it shows that it's possible to *prevent* the inference from being generated. As, on any account, the bias associated with RDs is not part of the truth-conditional content of the sentence, it's not obvious that cancellation-without-contradiction is a test that is in principle applicable: the inference goes through not-at-issue channels, and so can't be headed off at the level of the at-issue truth-conditional content of the sentence. To substantiate the claim that garden-variety implicatures cannot be cancelled without infelicity once they're been successfully generated, note that scenarios comparable to Northrup's involving classic cases of implicature display the same sort of infelicity:

(27)   a. Aditi has read some of the Bhagavad Gita—in fact, she's read the whole thing!
       b. **A**: Aditi has read some of the Bhagavad Gita.
           B: Okay, I'll go tell her to finish it.
           A: #What do you mean *finish* it? She read the whole thing!

(28)   a. **A**: Where can I buy cigarettes around here?
           B: There's a gas station around the corner, but they don't sell cigarettes.
       b. **A**: Where can I buy cigarettes around here?
           B: There's a gas station around the corner.
           A: Okay, I'll go buy a pack there.
           B: #What are you talking about, they don't sell cigarettes there!

In the (a) cases above, we see classic examples of cancellation-without-contradiction for Quantity-derived implicatures (27) and Relation-derived implicatures (28). In the (b) cases we see that, if the implicature is not cancelled immediately, attempts to cancel it later, after the implicature has been generated, feel self-contradictory, just as we see in (26). That is to say, cancellation-without-contradiction doesn't ensure cancellation-without-infelicity after the implicature has already been generated. Because the bias associated with RDs is not part of their at-issue content, tests akin to the (a) cases in the two examples above are not applicable to RDs. The suggestion that cancellation diagnostics are not applicable to RDs is not *sui generis* or *ad hoc*; for prior arguments that some pragmatic inferences are not subject to cancellability diagnostics, see Bade (2014), Lauer (2016), Bade & Renans (2021) on 'obligatory implicatures'.

Thankfully, we are not lost at sea without cancellability diagnostics. If the bias of RDs were truly a conventionalized aspect of their meaning, we would expect it to be contextually invariant; if there are contexts in which it disappears, than it cannot be a conventionalized aspect of their meaning. We have already seen that, in contexts in which the addressee is not taken by the speaker to be an epistemic authority, the positive bias toward p is not longer present, lending strong support to the proposal that bias inferences are pragmatic, not conventional. And indeed, in such contexts, the cancellability diagnostic in (26) yields the opposite result:

(29)   **DT:** I think I've made a lot of sacrifices. I work very, very hard. I've created thousands of jobs, tens of thousands of jobs, built great structures. I've had tremendous success. I think I've done a lot.
       GS: Those are sacrifices?

DT: Yep.
GS: No they're not!

In the right context, it is perfectly felicitous to follow up an RD with an expression of certainty that p is false, demonstrating that the observation in (26) cannot be explained in terms of a conventionalized partial commitment; in fact, the observation in (29) falsifies such proposals.

3.6 Takeaways

Given the empirical facts above, a successful account of RDs must capture the fact that they lack assertive force, and solicit an answer from the addressee. In addition, a successful account of the bias profile of RDs must capture the fact that the allow for a wide range of possible speaker epistemic biases, from positive bias falling short of full commitment at the top end, to skepticism or even outright certainty that p is false at the bottom end. It must also capture the fact that RDs invariably suggest that the speaker takes it to be probable that the addressee believes p, regardless of the speaker's own epistemic bias.

Though there is general consensus in the literature that RDs share at least two of the four properties discussed above (lack of speaker commitment[13] and answer solicitation), and there is general consensus that they involve some form of bias, accounts vary widely in which of these properties they take to be primitive features of RDs, and which they endeavor to derive from the other properties. The majority of previous accounts take bias to be a primitive feature of RDs (e.g. Gunlogson 2001, 2008, Krifka 2015, Malamud & Stephenson 2015, Farkas & Roelofsen 2017, Westera 2017, Jeong 2018), some additionally treating answer-solicitation as a primitive feature of RDs (e.g. Farkas & Roelofsen 2017, Jeong 2018, who treat RDs as denoting questions; for an argument that empirical support for treating TDs as question-denoting is inconclusive, see Rudin 2019) and others additionally treating lack of (full, assertive) speaker commitment as a primitive feature (e.g. Gunlogson 2001, 2008, Malamud & Stephenson 2015). In §5, I put forward an account that follows Truckenbrodt (2006) in taking the only primitive feature of RDs that distinguishes them from falling declaratives to be lack of speaker commitment. I take the L* H-H% tune to indicate that the speaker is making no commitments by virtue of their utterance, and I formalize this account within the discourse model of Farkas & Bruce (2010), assuming Farkas & Roelofsen's (2017) general utterance function, in 5. In §6, I formalize the pragmatics of the Table model, and in §7, I show how that pragmatics can derive the bias profile of RDs from the basic effect of withholding speaker commitment. In the following section, I give my theoretical assumptions.

4   Theoretical Assumptions: The Table Model

In this section, I describe the model in which this paper's proposal is couched. This part of the paper can be safely skipped by readers confident in their familiarity with Farkas &

---

[13]Recall again that I use 'commitment' here to refer only to full assertive commitment; see discussion above.

Bruce (2010) (§4.1) and Farkas & Roelofsen (2017) (§4.2).

4.1 Background: Farkas & Bruce (2010)

Farkas & Bruce (2010) break up the meaning of utterances into three interrelated but distinct parts: the denotation of the uttered sentence; how the utterance affects the speaker's discourse commitments, and what content the utterance makes at issue.[14]

These parts are interrelated because what a speaker commits to by virtue of their utterance, and what a speaker makes at issue by virtue of their utterance, are both defined in terms of the denotation of the uttered sentence, as is brought out particularly formally by Farkas & Roelofsen's utterance function (see §4.2 for details). In addition to a set A of discourse participants, the model has the following five components

(30) COMPONENTS OF THE Farkas & Bruce (2010) MODEL:
- a. COMMON GROUND (CG)
  The set of all propositions that all discourse participants are publicly committed to
- b. CONTEXT SET (CS)
  The set of all worlds that are compatible with all propositions in the Common Ground ($= \bigcap CG$)
- c. DISCOURSE COMMITMENTS
  For all discourse participants $a \in A$, there is a set DC_a of propositions a has publicly committed to
- d. THE TABLE
  A push-down stack of Issues (sets of propositions), the uppermost element of which MAX(T) represents the current local Question Under Discussion (QUD—Roberts 1996, Ginzburg 1996)
- e. PROJECTED SET (PS)
  The set of all Common Grounds that could result by adding an element of MAX(T) to CG (i.e. that could result from RESOLVING the current QUD—see below)

In this model, conversations are driven by the desire to shrink the Context Set, driving interlocutors to raise and resolve Issues.[15]

---

[14]This model builds on the work of Hamblin (1971), Stalnaker (1978), Lewis (1979), Roberts (1996), and Gunlogson (2001). For alternative approaches see e.g. Bach & Harnish (1979), Truckenbrodt (2006), and Ginzburg (2012).

[15]If an Issue proves unresolvable, it can be removed from the Table if the participants agree to disagree, which I give a formal definition of here:

(1) AGREEING TO DISAGREE
    An issue I can be removed from the Table if for any discourse participants X and Y, $\forall r \in I.(\bigcap DC_X \cap CS) \subseteq r \leftrightarrow \neg(\bigcap DC_Y \cap CS) \subseteq r)$

This is a dispreferred strategy for emptying the Table, as it does not lead to shrinking the Context Set.

(31) ISSUES
An Issue is a set of sets of worlds (= a set of propositions). To add an Issue to the Table is called RAISING an Issue.

(32) RESOLVING an Issue
If an Issue I is the topmost element of the Table, it is removed from the Table if $\exists p \in I.CS \subseteq p$

In other words, if the Context Set entails an answer to the current local QUD, it is removed from the Table.

Farkas & Bruce take agreement with assertions to be a default (following Walker 1996), leading a proposition p to become Common Ground if one participant asserts it and no other participants object. I will assume that default agreement is available whenever at least one discourse participant has made a commitment that could potentially provide an answer to the current QUD. This can be expressed formally like so:

(33) DEFAULT AGREEMENT
For some issue I and discourse participant a, if I is the top element of the Table and $\exists p \in DC_a, \exists q \in I.(CS \cap p) \subseteq q$ and no discourse participants have made discourse commitments that are incompatible with p, p will be added to CG unless somebody objects

Note, crucially, that some participant must make an Issue-resolving commitment in order for the Issue to be resolved via silent assent on the part of the other discourse participants.

Farkas & Bruce treat speech acts as functions from contexts to contexts, where a context is a six-tuple containing the five basic components above, plus a set of discourse participants.

(34) DISCOURSE CONTEXTS
A context c_n is a tuple $\langle A_n, DC_n, T_n, CG_n, CS_n, PS_n \rangle$
Where A_n is a set of individuals,
DC_n is a set of sets of discourse commitments, one for each $a \in A_n$
T_n is a Table,
and CG_n, CS_n, and PS_n are a Common Ground, a Context Set, and a Projected Set, such that $CS_n = \bigcap CG_n$ and $PS_n = \{CG_n + p : p \in \text{MAX}(T)\}$

Farkas & Bruce (2010) define the assertion of a sentence s denoting a proposition p as an act that raises the Issue $\{p\}$, and adds p to the speaker's discourse commitments. Formally speaking, for an speaker sp to assert a sentence s that denotes a proposition p in context c_n does the following:

(35) ASSERT$(s, sp, c_n) \rightarrow c_{n+1}$, such that   (cf. Farkas & Bruce's ex. 9)
i. $DC_{sp,n+1} = DC_{sp,n} + p$
ii. $T_{n+1} = T_n + \{p\}$

iii. $PS_{n+1} = \{CG_{n+1} + p\}$
iv. in all other respects, $c_{n+1} = c_n$

This is depicted visually in (36):

(36) a. **A**: I got a haircut.

  b. UPDATE WITH *I got a haircut.*

	c_0				c_1	
DC_A	Table	DC_B		DC_A	Table	DC_B
			$\rightarrow$	p	$\{p\}$	

$CG_0,\ PS_0 = \varnothing$ $CG_1 = CG_0,\ PS_1 = \{CG_1 + p\}$

Note that this assertion does two things: first, it adds p to DC_A, representing the fact that A has publicly committed to p. Second, it raises the Issue $\{p\}$, giving rise to a Projected Set that contains only one future Common Ground: one that includes p. It makes sense that we would want A's assertion of p to project only a future Common Ground which includes p, because given A's commitment to p, it is no longer possible for $\neg p$ (or any of its subsets) to become Common Ground. So an assertion's pairing of a commitment to p with a singleton PS is very natural. However, commitment to p and projection of a singleton PS are separable in principle within this model, and the account of RDs below will pull them apart.

Farkas & Bruce (2010) define the act of questioning as raising the Issue denoted by the question, and making no change to the speaker's discourse commitments. Formally speaking, for a speaker sp to question using a sentence s that denotes a set P in context c_n does the following:[16]

(37) QUESTION$(s, sp, c_n) \rightarrow c_{n+1}$, such that
  i. $T_{n+1} = T_n + P$
  ii. $PS_{n+1} = \{CG_{n+1} + p : p \in P\}$
  iii. in all other respects, $c_{n+1} = c_n$

This is depicted visually in in (38):

(38) a. **A**: Did you get a haircut?

  b. UPDATE WITH *Did you get a haircut?*

	c_0				c_1	
DC_A	Table	DC_B		DC_A	Table	DC_B
			$\rightarrow$		$\{p, \neg p\}$	

$CG_0,\ PS_0 = \{CG_0\}$ $CG_1 = CG_0,\ PS_1 = \{CG_1 + p, CG_1 + \neg p\}$

---

[16]In Farkas & Bruce's original formulation, they define a polar question operator that applies to a proposition-denoting sentence radical. The reason for their focus on polar interrogatives is because they are concerned with explaining why both declaratives and polar interrogatives license *yes* and *no* responses. I've generalized their questioning act to non-polar interrogatives here.

Note that the assertion in (36) allowed for the Issue raised to be resolved via default agreement, as A makes a potentially Issue-resolving commitment by virtue of her utterance. In this case, however, addressee response is necessitated: the speaker has made no commitments which could resolve the Issue on the Table, and so the addressee must make an Issue-resolving commitment if it is to be resolved. This explains why questions solicit addressee response: the speaker's discourse move has done nothing that will allow the Issue on the Table to be resolved, meaning the addressee is going to have to weigh in if the QUD is to serve its purpose of shrinking the CS.

In the following section I present Farkas & Roelofsen's (2017) proposal for deriving the association of declarative sentences with assertions, and of interrogative sentences with questions, from a general utterance function.

4.2   Farkas & Roelofsen's (2017) Utterance Function

I turn now to the assumptions that I make about what all utterances have in common. I adopt Farkas & Roelofsen's (2017) proposal for a general utterance function in its entirety. My proposal will pull apart from theirs below in taking the L* H-H% tune to alter the discourse move carried out by an utterance, rather than altering the semantic content of the uttered sentence.

Farkas & Roelofsen (2017) go a step further than Farkas & Bruce (2010), and provide a fully general utterance function that can derive Farkas & Bruce's asserting and questioning moves from the denotations of declarative and interrogative sentences, respectively. This is an important step forward, because it explains why asserting is the default function of declarative sentences, and why questioning is the default function of interrogative sentences: the interaction between the denotations of declarative and interrogative sentences and the general utterance function derives the conventional illocutionary force of each.

The utterance function defined by Farkas & Roelofsen has the effect of placing the denotation of a sentence on the Table, and adding its informative content to the speaker's discourse commitments; the role played by the form of the sentence is in determining whether that denotation is a singleton set of propositions (declarative) or a non-singleton set (interrogative).[17] Farkas & Roelofsen assume the framework of Inquisitive Semantics (Ciardelli et al. 2013, 2018), in which declarative sentences denote singleton sets of propositions, interrogative sentences denote non-singleton sets of propositions, and all sentential denotations are downward closed (= closed under the subset relation). That closure property will not be relevant to the phenomena we discuss here, and so I will make the simpler assumption of a Hamblin semantics (Hamblin 1973) in which declarative sentences denote singleton sets of propositions *simpliciter*, and interrogative sentences denote non-singleton sets of propositions *simpliciter*.[18]

---

[17]In their system, intonation also plays a role in determining whether a sentence denotes a singleton or non-singleton set of propositions. As this is not a feature of the system I develop here, I set is aside, as it is not crucial to understanding the utterance function.

[18]Nothing crucial about this account rests on the assumption of a Hamblin semantics or of Inquisitive Semantics—one could just as soon say that declarative sentences denote propositions *simpliciter*, and that

An utterance is a function from sentence-speaker-context triples to contexts, though, for convenience, I will often simply say "a function from contexts to contexts" in the text.

(39) UTTERANCES AS FUNCTIONS:
$\text{UTT}(\langle s, sp, c_n \rangle) = c_{n+1}$

All utterances share a discourse effect:

(40) THE DISCOURSE EFFECT OF AN UTTERANCE:
For any utterance $u : \langle s, sp, c_n \rangle \to c_{n+1}$,
   a. $T_{n+1} = T_n + [\![s]\!]^{c_n}$
   b. $DC_{sp,n+1} = DC_{sp,n} + \bigcup [\![s]\!]^{c_n}$
   c. in all other respects, $c_{n+1} = c_n$

Any utterance does two things. First, the denotation of the uttered sentence is pushed onto the Table. Second, the 'informative content' of the uttered sentence, or the grand union of its denotation, is added to the speaker's discourse commitments. In the case of a declarative sentence, which denotes a singleton set of propositions, its informative content will just be that proposition. In the case of an interrogative sentence, which denotes a non-singleton set of propositions, its informative content will be the union of those propositions—the set of all worlds compatible with some answer to that question (i.e., the presupposition of the question).

It should be clear that this general utterance function derives nearly identical results to Farkas & Bruce's assertion operator as applied to declarative sentences, and questioning operator as applied to interrogative sentences. In the case that the uttered sentence denotes a singleton set of propositions (as we will assume declarative sentences do), this utterance function will add that set's only member to the speaker's discourse commitments, and place that set onto the Table—exactly what Farkas & Bruce's assertions do. In the case that the uttered sentence denotes a non-singleton set (as we will assume interrogative sentences do), this utterance function will place that set on the Table, and will also add its grand union to the speaker's discourse commitments. This differs minimally from Farkas & Bruce's questioning acts. What is placed on the Table is the same, but Farkas & Bruce's questioning acts add nothing to the speaker's discourse commitments. However, this difference seems trivial. In the case of a polar interrogative, with a denotation of the form $\{p, \neg p\}$, the grand union of that denotation is W, and so given the utterance function in (40), the speaker is making a trivial commitment. In the case of a wh-interrogative, the grand union of the denotation represents the proposition that it has a true answer, and so given the utterance function in (40), the speaker is simply making a commitment to their question having a true answer, not a commitment that could potentially resolve the Issue they've raised (i.e. answer the question they've asked). So the addition of a very weak commitment to the discourse effect of an utterance of an interrogative sentence doesn't seem to pull the proposal apart from the proposal of Farkas & Bruce in a way that substantially impacts

---

they are type-lifted to singleton sets of propositions in the act of adding them to the Table. I've made the assumptions I've made entirely for the sake of presentational simplicity.

the predictions made about the discourse behavior of questions.[19] This is good—Farkas & Roelofsen's utterance function explains why asserting and questioning are associated with declarative and interrogative sentences while maintaining the basic mechanical operation of Farkas & Bruce's asserting and questioning operators.

5   L* H-H% as an Utterance Modifier

I adopt here Farkas & Bruce's (2010) Table model with no further modifications (cf. Northrup 2014, Malamud & Stephenson 2015, Farkas & Roelofsen 2017, a.o.), that is to say, with no components additional to those presented in (34). I adopt Farkas & Roelofsen's (2017) utterance function as given in (40). I differ from Farkas & Roelofsen (2017) in taking the L* H-H% tune to modify the utterance function, instead of the semantic content of the uttered sentence. I turn now to the implementation of my proposal.

I restate Farkas & Roelofsen's (2017) utterance function here, presented in λ-calculus.

(41)   Let k be the type of a context.

$$\llbracket \text{UTT} \rrbracket = \lambda P_{(st)t}.\lambda sp_e.\lambda c_k. \begin{bmatrix} DC_{sp} & = & DC_{sp,c} + \bigcup P \\ T & = & T_c + P \\ PS & = & \{CG + p : p \in P\} \\ c' = c \text{ in all other respects} \end{bmatrix}^{c'}$$

As the ordering of λ-expressions indicates, I assume that an utterance is a function that combines first with the compositional semantic value of a sentence.[20] It returns a function that will take a speaker and an input context as arguments, and return an output context. That output context is one in which the speaker has committed to the informative content of that sentential denotation (i.e. its grand union), that sentential denotation is raised as an Issue (i.e. it has been pushed onto the Table), and the projected set illustrates all hypothetical Common Grounds that could result from resolving that Issue.[21] The output context is not allowed to differ from the input context in any other way.

I assume, taking inspiration from Truckenbrodt (2006), that L* H-H% indicates that the speaker is making no discourse commitments by virtue of their utterance. I implement this by taking L* H-H% to denote a function from functions from contexts to contexts to functions from contexts to contexts.

(42)   Let K be an abbreviation for type ekk (a function from contexts to contexts).

---

[19]Note, however, that in §5.1 I argue that it may be useful to preserve a distinction between commitment and lack of commitment, even for interrogatives, noting in particular that this can shed light on differences in the intonational profile of polar and *wh*-questions, and on the source of the existential commitment of *wh*-questions.

[20]Recall that I am assuming a Hamblin semantics in which all sentences denote sets of propositions—declarative sentences singleton sets, and interrogative sentences non-singleton sets.

[21]Note here that I overload the interpretation of + by using it to represent both adding an element to a set, and pushing an element onto a stack. I trust that no confusion will result.

$$\llbracket\text{L* H-H\%}\rrbracket = \lambda K_K.\lambda sp_e.\lambda c_k.\left[\begin{array}{l} DC_{sp} \quad = \quad DC_{sp,c} \\ c' = K(sp,c) \text{ in all other respects} \end{array}\right]^{c'}$$

Utterances accompanied by L* H-H% do the same thing that standard utterances do given Farkas & Roelofsen's (2017) utterance function, except that the speaker's discourse commitments are held steady—L* H-H% overwrites any alterations that the utterance would ordinarily make to the speaker's discourse commitments.

I assume that the H* L-L% tune denotes an identity function over functions from contexts to contexts, not interfering with the default utterance function at all, i.e., retaining speaker commitment:[22]

(43) $\llbracket\text{H* L-L\%}\rrbracket = \lambda K_K.K$

I assume that the denotation of the sentence, the utterance function, and the tune interact compositionally like so:[23]

(44)

L* H-H

UTT   CP

⋮
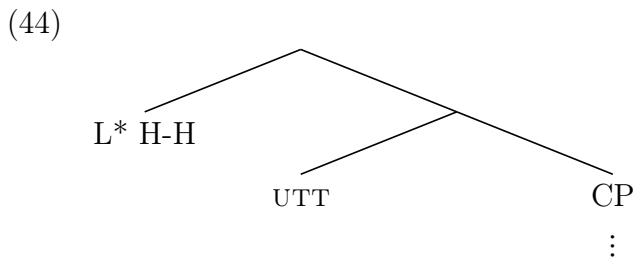
Composition of an utterance accompanied by L* H-H% proceeds like so: first, the familiar processes of compositional semantics deliver a compositional semantic value for the uttered sentence, providing a Hamblin set as the denotation of the CP node. The utterance function is applied to that Hamblin set, returning a function of type ekk, in search of a speaker and an input context. That function becomes the argument to L* H-H%, which returns a new function of type ekk. When supplied with a speaker and an input context, that function will deliver the same output context that would've been delivered by the unmodified utterance function, except that the speaker's commitments will remain as they were in the input context.

---

[22]Note that it would be possible to do things the other way around. That is to say, one could say that the default discourse effect of utterance involves no speaker commitment, that the H* L-L% tune adds in speaker commitment, and that the L* H-H% tune is an identity function. This would be a notational variant on the current account for the range of data examined in this paper, but might make some difference in terms of parsimony if a wider variety of intonational tunes were considered. The question of whether commitment or lack of commitment deserves status as the default is far outside the scope of this paper.

[23]*Nota bene:* this tree does not represent a commitment to the notion that UTT and L* H-H% are a part of the syntactic representation of a sentence; this tree is intended simply as a visual representation of the crucial compositional interactions I'm proposing. I remain agnostic about whether or not things like UTT are actually represented in the syntax. For my purposes, they could just as easily be analyzed as operators applied to the output of syntactic composition, without being syntactically represented in any substantive sense.
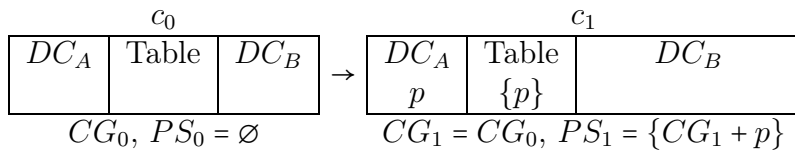
5.1 Basic applications

In this section, as a sanity check I apply the proposal for the meaning of L* H-H% to some basic cases before moving on to discuss rising declaratives in §5.2. In §5.1.1, I show that this proposal derives the effects of Farkas & Bruce's (2010) assertion and question operators as the discourse effects of falling declaratives and rising polar interrogatives, respectively. For discussions of the ramifications of this account for falling polar interrogatives, and for the intonation of *wh*-interrogatives, see §8.

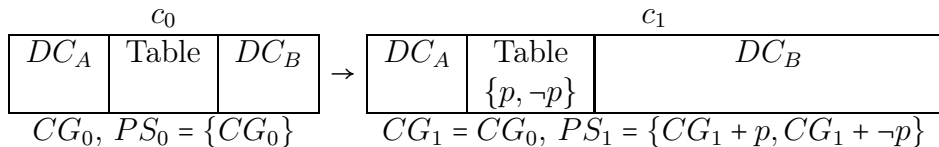### 5.1.1 Rising polar interrogatives and falling declaratives

The proposal at hand derives Farkas & Bruce's (2010) assertion operation as the discourse effect of declaratives that accompanied by H* L-L%: a singleton Issue will be raised by virtue of the singleton denotation of the declarative sentence; the speaker will commit to the proposition contained therein by virtue of the H* L-L% tune not altering the commitment incurred by the default utterance function.

(45)   UPDATE: $\{p\}$ denotation $+$ H* L-L% tune

	c_0				c_1	
DC_A	Table	DC_B	$\rightarrow$	DC_A	Table	DC_B
				p	$\{p\}$	

$CG_0,\ PS_0 = \varnothing$ $\qquad\qquad$ $CG_1 = CG_0,\ PS_1 = \{CG_1 + p\}$

This proposal also derives Farkas & Bruce's (2010) questioning operation as the discourse effect of interrogatives that are accompanied by L* H-H%: a non-singleton Issue will be raised by virtue of the non-singleton denotation of the declarative sentence; the speaker will incur no commitment by virtue of the modification to the utterance function made by L* H-H%.
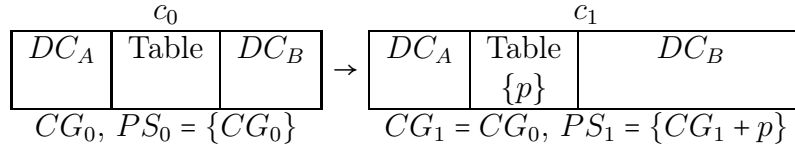
(46)   UPDATE: $\{p, \neg p\}$ denotation $+$ L* H-H% tune

	c_0				c_1	
DC_A	Table	DC_B	$\rightarrow$	DC_A	Table	DC_B
					$\{p, \neg p\}$	

$CG_0,\ PS_0 = \{CG_0\}$ $\qquad\qquad$ $CG_1 = CG_0,\ PS_1 = \{CG_1 + p, CG_1 + \neg p\}$

5.2 The Conventional Discourse Effect of Rising Declaratives

Farkas & Bruce's (2010) and Farkas & Roelofsen's (2017) assertions involve the speaker raising a singleton Issue while at the same time making a potentially Issue-resolving commitment; their (neutral) questioning acts involve the speaker raising a non-singleton Issue while making no potentially Issue-raising commitments. Given the proposal above, a declarative sentence uttered with the L* H-H% tune will behave in a unique way: the speaker raises a singleton Issue, projecting only one future Common Ground, as in a standard assertion; however, they make no potentially Issue-resolving commitment in the act of raising it, as in a standard question. This is illustrated in (47):

(47)   a. **A**: You got a haircut?

        b. UPDATE WITH *You got a haircut?*

$$c_0 \qquad\qquad\qquad\qquad c_1$$

DC_A	Table	DC_B

$\rightarrow$

DC_A	Table	DC_B
	$\{p\}$	

$$CG_0,\ PS_0 = \{CG_0\} \qquad\qquad CG_1 = CG_0,\ PS_1 = \{CG_1 + p\}$$

This update differs minimally from the updates with falling declaratives and with polar interrogatives described above. It differs from the utterance of a falling declarative only in not adding p to the speaker's discourse commitments (cf. 36), and it differs from the utterance of a polar interrogative only in not projecting a Common Ground including $\neg p$ (cf. 38). In other words, an utterance of an RD shares properties with both assertions and questions, explaining why RDs have so often been described as a type of 'biased question'.

We can now start to see how this proposal captures the four crucial generalizations discussed in §3.

On this view, that RDs don't involve speaker commitment is simply the conventional effect of the L* H-H% tune. In the following subsection, I explain how this account of RDs predicts that they solicit an answer from the addressee. I will argue that the final two generalizations follow from the pragmatics of the Table model. I propose a formalization of that pragmatics in §6, and apply it in §7.

5.3   Accounting for answer solicitation

The shared conversational goal that drives Issue-raising in the Table model is the desire to shrink the Context Set—therefore, in order for raising an Issue to prove conversationally useful, that Issue must be resolved. In order for an Issue to be resolved, it is necessary that some discourse participant make a commitment—recalling discussion in §4, an Issue is only resolved once an element of it is entailed by the Context Set; the Context Set only shrinks if propositions are added to the Common Ground; and propositions are added to the Common Ground only if they become shared commitments. If, by virtue of her utterance, the speaker makes a commitment that could potentially resolve the Issue she has raised (as the speaker does when uttering a falling declarative), the other participants can simply choose not to object, and the Issue gets resolved via default agreement. However, if the speaker makes no potentially Issue-resolving commitment by virtue of her utterance (as in the utterance of an interrogative), somebody else will have to weigh in in order for the Issue to be resolved—only once an interlocutor provides a potentially Issue-resolving commitment can the Common Ground be modified such that the context set entails a resolution to the Issue at hand. The rising declarative in (47) solicits addressee response for the same reason that interrogatives solicit addressee response: the speaker has raised an Issue without making a commitment that could resolve it, meaning that a further commitment is necessary if the Issue is to be resolved.

To put it very simply: in the Table model, all discourse moves that do not result in a situation that facilitates default agreement solicit addressee response—i.e. all discourse moves

that do not involve (a potentially Issue-resolving) speaker commitment solicit addressee response.

The final two generalizations, regarding the bias profile of RDs, will require more work to explain. I turn now to the development of the pragmatics of the Table model.

6 The Pragmatics of the Table Model

The majority of applications of pragmatic reasoning are concerned with propositional content: pragmatic principles are used to derive inferences about what proposition a speaker intended to communicate given their choice of sentence, and how it relates to alternative choices they could have made. Grice's (1975) familiar Cooperative Principle is the classic expression of this, and most subsequent approaches (from classic formalizations like Gazdar 1979 to contemporary frameworks like Goodman & Stuhlmüller 2012) share Grice's focus on propositional content. I'm going to be concerned here with the application of pragmatic reasoning not to propositional content, but to discourse moves—deriving inferences not about what can be concluded on the basis of a speaker's choice of a sentence denoting a particular proposition, but rather on the basis of a speaker's choice of whether to make a commitment or not, and whether to project a particular path forward for the conversation or not.

Grice's Cooperative Principle is a set of maxims that specify under what circumstances it is cooperative to utter a sentence denoting a particular proposition. I'll instead be interested in under what circumstances it is cooperative to make a commitment (or avoid making one), and under what circumstances it is cooperative to project a Common Ground (or avoid projecting one). I will focus on the formalization of a somewhat narrow notion of cooperativity here: I'll use the term 'cooperative' to describe is behavior which seeks to increase Common Ground via monotonic update to the discourse model. When it is important to distinguish between this narrow notion of cooperativity and a broader set of potential conversational goals, I'll do so by distinguishing between what is 'narrowly cooperative' and what is 'globally cooperative'. In the absence of explicit specification otherwise, I always intend the term 'cooperative' to be interpreted as 'narrowly cooperative'. I'll formulate a set of maxims here that apply to the making of discourse moves, specifying when it is cooperative to make a commitment, when it is cooperative to raise an Issue without committing to a resolution of it, when it is cooperative to project a Common Ground, and when it is cooperative to avoid projecting alternative Common Grounds. That is to say, the maxims that I formulate here describe the cooperative use of the various components of the Table model.

I assume that these maxims governing discourse moves are posterior to the more traditional pragmatic principles that serve to enrich propositional content: only after one has determined what proposition a speaker intends the sentence they've uttered to express can one reason about what to conclude on the basis of their (not) committing to that proposition, and on the basis of their projecting a Common Ground incorporating that proposition, and (not) projecting an alternative Common Ground incorporating its complement. As such, there is no conflict (and no interesting interactions) between these maxims and the more familiar Gricean maxims.

That said, the maxims that I present here are inspired by (though not identical to) Grice's QUALITY and QUANTITY: I'll define four maxims, two of which concern cooperative use of commitments, and two of which concern cooperative use of the projected set; each pair comprises a maxim in the spirit of QUALITY and a maxim in the spirit of QUANTITY, reimagined to apply in its proper domain.[24]

6.1   Maxims for commitment: SINCERITY and PUBLICITY

I propose that the cooperativity of making (and not making) discourse commitments is governed by two maxims, SINCERITY and PUBLICITY. I provide both informal statements of the maxims, modeled on Grice's maxims, and formal statements of the maxims defining the properties of discourse moves that violate them. The formal statements of the maxims are defined in terms of a speaker sp with doxastic state DOX_{sp} making a discourse move m : $k_i \to k_o$ that raises an Issue I.

(48)   a.   SINCERITY (informal version):
            1) Do not commit to a proposition if you know it to be false.
            2) Do not commit to a proposition if you don't know it to be true.
        b.   SINCERITY (formal version):
            Violated by any m that adds some p to $DC_{sp,o}$, where $DOX_{sp} \nsubseteq p$

It should be clear that SINCERITY is closely related to Grice's maxim of QUALITY: when a speaker makes a commitment, they are presenting themself as though they know the proposition they've committed to to be true. This is SINCERE only if they actually know it to be true. In a nutshell: public commitments should reflect private beliefs. It is a standard assumption in the literature on the Table model that commitment is subject to something similar to QUALITY, q.v. e.g. Farkas & Bruce (2010) p.86. I will propose that commitments are also subject to something fairly closely related to Grice's maxim of QUANTITY:

(49)   a.   PUBLICITY (informal version):
            1) Commit to the content of the Issue you raise, modulo SINCERITY.
            2) Don't make redundant commitments.
        b.   PUBLICITY (formal version):
            Violated by any m that doesn't add $\bigcup I$ to $DC_{sp,o}$, provided that $DOX_{sp} \subseteq \bigcup I$, and $\bigcap(DC_{sp,i} + \bigcup I) \subset \bigcap DC_{sp,i}$

This maxim is violated by discourse moves that do not commit the speaker to the content of the Issue they've raised, in the case that that commitment is sincere and nonredundant.

Among a speaker's options when making a discourse move are to utter a sentence accompanied by L* H-H% and to utter it accompanied by H* L-L%—i.e., they can commit to the

---

[24]Cf. Westera (2013, 2017), who also seeks to explain various uses of rising declaratives in terms of Gricean reasoning. Westera's account seeks to derive RD behavior from the standard Gricean maxims, addressing whether the content of the utterance is true, informative, relevant, and mannerly. I differ from Westera in seeking to derive RD behavior from the properties of the updates they carry out, rather than from properties of their propositional content.

content of the Issue they raise, or avoid committing to it. If they know the content of the Issue they've raised to be true, it is informative to publicize that knowledge via commitment, and uncooperative to withhold it. It's cooperative to avoid committing to the content of an Issue only if that commitment would be INSINCERE, or if it would provide no new information. Analogously to Grice's maxim of QUANTITY, providing more (non-redundant) information is better, and, analogously to the interaction between the maxim of QUALITY and QUANTITY, providing information is only cooperative if it is known to be true.

6.2 Maxims for projection: VIABILITY and COMPREHENSIVENESS

I assume that the act of adding content to the Projected Set, which is accomplished in the Table model via adding content to the Table, is subject to maxims analogous to QUALITY and QUANTITY as well. The Projected Set is defined in terms of the maximal element of the Table, and the Common Ground. Raising an Issue (= placing a set of propositions P on the Table) in a context with a Common Ground CG always has the effect of creating a Projected Set $PS = \{CG + p : p \in P\}$. In other words, for each proposition p that is a member of the raised Issue, the Projected Set contains a hypothetical Common Ground that is identical to the current one except that it also contains p. I assume that making a discourse move that adds a CG to the projected set is only cooperative if that CG is one that represents a state of the conversation that could actually come about given the current context.

(50)   a. VIABILITY (informal version):
           1) Do not project a Common Ground if it is incompatible with some interlocutor's commitment
           2) Do not project a Common Ground if you have reason to believe it is incompatible with some interlocutor's private beliefs
       b. VIABILITY (formal version):
           Violated by any m that adds $CG + p$ to PS, where $\bigcap DC_A \cap p = \varnothing$ for some interlocutor A;
           Violated by any m that adds $CG + p$ to PS, where DOX_{sp} entails that $DOX_A \cap p = \varnothing$ for some interlocutor A

The projected set represents possible future Common Grounds that could result from resolving the Issue most recently raised. A Common Ground is a representation of the interlocutors' mutual beliefs. So projecting a CG is cooperative only if it could indeed become a representation of the interlocutors' mutual beliefs, given the current state of the conversation. If some interlocutor has made a commitment incompatible with that CG, then it is not a viable candidate representation of the interlocutors' mutual beliefs; that interlocutor's commitment precludes the possibility of that CG coming about (barring a non-monotonic update). Likewise, even if no interlocutor has made a commitment precluding a projected CG, that projected CG is nonetheless unviable if it is incompatible with an interlocutor's private beliefs, as under those circumstances it could only come about by virtue of an insincere commitment—it would not be a sincere representation of the interlocutors' mutual beliefs. Though the analogy is more abstract than the analogy between SINCERITY and QUALITY, this maxim is also akin to QUALITY: when the speaker projects a Common Ground, they

indicate that it is a possible future state of the conversational context that could result simply from the resolution of the Issue at hand; this is only cooperative if they indeed believe this to be possible given the current state of the context.

I propose that the cooperativity of Common Ground projection is also subject to a maxim loosely analogous to QUANTITY, which prefers moves that project as broad a spectrum of CGs as possible. We can think of members of the projected set as the 'paths forward' suggested by the most recent discourse move, and we can think of each 'path' (i.e. projected CG) as highlighting a set of worlds ($\bigcap CG$) which would remain 'live options' if that path was taken (i.e., if CG resulted from resolving the current Issue). If there is no path in PS along which w is a live option, we say that PS EXCLUDES w. Asking a polar question suggests various paths forward which, taken *en masse*, exclude no worlds in the CS from the set of paths under consideration. Making an assertion, however, excludes all worlds not in the asserted proposition from the (singleton) set of paths under consideration. It's cooperative to exclude worlds from the projected set, highlighting no paths forward along which they are live options, only if the path to those worlds is not viable. This is quite clear in the case of an assertion: the resulting PS excludes all ¬p worlds, because the speaker's commitment to p renders them unviable.

Call a PS COMPREHENSIVE iff it excludes no worlds in CS, i.e. iff it is the result of raising an Issue that comprises a COVER of CS. The second maxim governing cooperative use of the projected set requires comprehensive projection except where that would run afoul of VIABILITY, as in the case of an assertion:

(51) a. COMPREHENSIVENESS (informal version):
Project a comprehensive PS, modulo VIABILITY.
b. COMPREHENSIVENESS (formal version)
Violated by any m whose resulting PS excludes at least one world w such that $w \in CS$ and $CG + \{w\}$ is viable

It is uncooperative to exclude viable paths forward from PS, because the PS is the set of all CGs that could result from resolving the Issue that has been raised; if there are viable worlds that are not live options relative to PS, then any resolution to the Issue will exclude those viable worlds from all future evolutions of the conversation, despite their being compatible with all interlocutors' public commitments (and, as far as the speaker knows, their private beliefs too!). Formally speaking, this is enforced via a prohibition on discourse moves that raise Issues that exclude viable worlds in CS from the resulting PS. In other words, this maxim prohibits raising an Issue that isn't a cover of CS except in cases where the excluded worlds are unviable.

7 Applying the pragmatics

This section shows how the maxims defined in the previous section can be used to derive inferences about a speaker's epistemic bias. An utterance will be cooperative if the speaker is in some belief states, but uncooperative in others; therefore, the assumption that the

speaker is being cooperative rules out some possible candidates for the speaker's epistemic state from consideration.

In §7.1, I walk through some basic applications of how the pragmatics above works, showing that it doesn't through any unexpected wrenches into the gears when applied to the basic cases of falling declaratives and rising polar interrogatives. In §7.2, I discuss a class of mildly uncooperative moves that I call 'adversarial', and show how they can be modeled in terms of the assumption that a speaker is being *minimally* uncooperative, even when a perfectly cooperative interpretation of their move i s not forthcoming. In §7.3, I show the predictions the account makes for epistemic inferences licensed by perfectly cooperative uses of rising declaratives, as well as the predictions made about adversarial uses of rising declaratives.

7.1 Basic applications

Throughout this section, we'll be interested in how different discourse moves give rise to different inferences about the speaker's epistemic bias toward some proposition p, and also the speaker's expectation of the addressee's epistemic bias toward p. I'll do this by defining a space of possible speaker belief states with respect to p and the addressee's bias toward p. In the table below, I make the following proprietary abbreviations: $\text{Dox}_{sp}(p)$ means that the speaker is sure that p is true; $\text{Dox}_{sp}(\neg p)$ means that the speaker is sure that p is false; $\neg\text{Dox}_{sp}(p)$ means that the speaker is not sure that p is true, but also is not sure that it is false (that is to say, the speaker is unsure about the truth value of p). $\text{Dox}_{ad}(p)$ means that the speaker takes it to be probable that the addressee believes p to be true; $\text{Dox}_{ad}(\neg p)$ means that the speaker takes it to be probable that the addressee believes p to be false; $\neg\text{Dox}_{ad}(p)$ means that the speaker takes neither to be probable (that is to say, either they are sure that the addressee is unsure about p, or they are unsure what the addressee believes about p).

The table below shows how we can partition the space of possible speaker belief states into cells defined by their bias toward p and their expectation of the addressee's bias toward p. This table assigns a name to each cell in this partition.

(52)

		Speaker bias		
		$\text{Dox}_{sp}(p)$	$\text{Dox}_{sp}(\neg p)$	$\neg\text{Dox}_{sp}(p)$
Ad. bias	$\text{Dox}_{ad}(p)$	$\langle sp(p), ad(p)\rangle$	$\langle sp(\neg p), ad(p)\rangle$	$\langle \neg sp(p), ad(p)\rangle$
	$\text{Dox}_{ad}(\neg p)$	$\langle sp(p), ad(\neg p)\rangle$	$\langle sp(\neg p), ad(\neg p)\rangle$	$\langle \neg sp(p), ad(\neg p)\rangle$
	$\neg\text{Dox}_{ad}(p)$	$\langle sp(p), \neg ad(p)\rangle$	$\langle sp(\neg p), \neg ad(p)\rangle$	$\langle \neg sp(p), \neg ad(p)\rangle$

A speaker's utterance will be cooperative if their doxastic state resides in some of these cells, and uncooperative if it resides in others. Therefore, an observer of such an utterance, given the presumption of cooperativity, will make an inference that excludes all uncooperative cells from consideration as candidates for the location of the speaker's doxastic state. I'll illustrate this inference using diagrams in the style of Optimality Theoretic tableaux (Prince & Smolensky 2004).[25] An utterance is an 'input'; a cell in the speaker's doxastic statespace

---

[25] *Nota bene:* I include these tableaux as convenient visual shorthand for the way that the assumption

is a 'candidate'; the maxims are 'constraints'. The 'output' is not necessarily a single cell, but rather the set of all cells in the doxastic statespace relative to which the utterance is fully cooperative—that is to say, the live candidates for the location of the speaker's doxastic state, assuming that their utterance was cooperative. In all tableaux, I'll indicate cells that remain live options for the speaker's doxastic state with the marker $\triangleright$.

I'll now move on to applications of the system to falling declaratives and polar interrogatives. I do not intend these applications to stand as novel claims about the pragmatics of falling declaratives and polar interrogatives; rather, I intend to demonstrate that the system delivers uncontroversial results, to head off the potential for suspicion that the results it delivers for RDs in §7.3 come at the cost of bad predictions elsewhere.

Let's start with the utterance of a declarative sentence denoting p, accompanied by the H* L-L% tune, represented in the tableau as $p \downarrow$. I'll abbreviate the four maxims as SIN, PUB, VIA, and COMP. A * indicates that the utterance would violate the indicated maxim (column) if the speaker had a doxastic state in the indicated cell (row).

(53)

$p \downarrow$		SIN	PUB	VIA	COMP
$\triangleright$	$\langle sp(p), ad(p) \rangle$				
$\triangleright$	$\langle sp(p), \neg ad(p) \rangle$				
	$\langle sp(p), ad(\neg p) \rangle$			*	
	$\langle \neg sp(p), ad(p) \rangle$	*			
	$\langle \neg sp(p), \neg ad(p) \rangle$	*			*
	$\langle \neg sp(p), ad(\neg p) \rangle$	*		*	*
	$\langle sp(\neg p), ad(p) \rangle$	*		*	
	$\langle sp(\neg p), \neg ad(p) \rangle$	*		*	*
	$\langle sp(\neg p), ad(\neg p) \rangle$	*		*	*

I'll walk through the individual violations here, for the sake of clarity. Rows three, six and nine violate VIABILITY by virtue of projecting a CG incorporating p, rendered unviable by the addressee's suspected belief that p is false. Rows seven and eight violate VIABILITY by virtue of that same projected CG being rendered unviable by the speaker's own belief that p is false. Rows four through nine violate SINCERITY by virtue of committing the speaker to p despite their lack of belief in p (rows four through six), or even belief in $\neg p$ (rows seven through nine). Finally, rows four, six, eight and nine violate COMPREHENSIVENESS by virtue of not projecting a CG incorporating $\neg p$, despite no interlocutors beliefs ruling $\neg p$ out.

We should read this tableau as saying that, if a speaker is taken to be fully cooperative, their utterance of a falling declarative licenses the inference that their doxastic state resides

---

of cooperativity, in conjunction with the maxims proposed in §6, can be used to derive inferences about the doxastic state of a speaker given the observation that they have made a particular move. I make no commitments here with respect to a genuinely Optimality Theoretic approach to pragmatics, in which relations between forms and meanings are legislated by interactions between markedness and faithfulness constraints. The scare quotes in the main text underscore this point. Crucially, I offer no account here of why speakers choose the forms they do in the contexts they do. For examples of more thoroughgoingly Optimality Theoretic approaches to pragmatics, see Blutner (2000), Krifka (2002), Aloni (2007), Franke (2009), Frank & Goodman (2012), Lauer (2013), Klecha (2018), a.o.

in one of the top two cells. One straightforward prediction of this is that an utterance of a falling declarative is cooperative only if the speaker believes the denotation of the sentence they've uttered to be a true proposition. All cases in which the speaker does not believe p to be true, whether or not they believe it to be false, are uncooperative by virtue of violation of SINCERITY. If the speaker believed that some interlocutor thinks p is false, the utterance would be uncooperative by virtue of violation of VIABILITY; if the speaker believed that no interlocutor thinks p is true, the utterance would be uncooperative by virtue of violation of COMPREHENSIVENESS.[26]

Note that speakers do in fact often make assertions that contradict another speaker's prior assertion, a move that this tableau predicts to be uncooperative by virtue of VIABILITY. I return to such moves in §7.2.

I turn now to utterances of rising polar interrogatives. Here an utterance of a polar interrogative denoting $\{p, \neg p\}$, accompanied by the L* H-H% tune, is represented in the tableau as $p? \uparrow$:

(54)

$p? \uparrow$		SIN	PUB	VIA	COMP
$\langle sp(p), ad(p) \rangle$				*	
$\langle sp(p), \neg ad(p) \rangle$				*	
$\langle sp(p), ad(\neg p) \rangle$				*	
$\langle \neg sp(p), ad(p) \rangle$				*	
▷ $\langle \neg sp(p), \neg ad(p) \rangle$					
$\langle \neg sp(p), ad(\neg p) \rangle$				*	
$\langle sp(\neg p), ad(p) \rangle$				*	
$\langle sp(\neg p), \neg ad(p) \rangle$				*	
$\langle sp(\neg p), ad(\neg p) \rangle$				*	

In the utterance of a rising polar interrogative, the speaker makes no commitments, and so cannot violate SINCERITY; the informative content of the question is just the set of all worlds W, so commitment to it would be redundant, and commitment-avoidance via L* H-H% doesn't violate PUBLICITY. And $\{p, \neg p\}$ comprises a cover of CS for any possible CS, so COMPREHENSIVENESS isn't violated. However, the utterance projects both a $CG + p$ and $CG + \neg p$, so VIABILITY is violated if either is unviable—that is to say, a rising polar interrogative violates VIABILITY in all contexts except that in which speaker is undecided about p, and isn't sure that the addressee believes p or believes $\neg p$. The pragmatic account at hand, therefore, predicts that asking polar questions is fully cooperative only in neutral contexts.[27] I discuss less-than-fully cooperative utterances of rising polar interrogatives in

---

[26]The maxim of PUBLICITY plays no role here, as it is violated primarily by avoidance of commitments, and here the speaker has made the relevant commitment to p.

[27]Note that this assumption of full neutrality for polar questions may be too strong—see Büring & Gunlogson (2000) for more detailed discussion. A fuller discussion of the nuances of polar question bias lie outside the scope of this paper. I'll note here as well that not all polar questions result in this inference to unbiasedness. For instance, questions with contracted negation are strongly biased. This bias is standardly analyzed as the result of negation scoping over some covert operator: a Verum focus marker (AnderBois 2011), a context-management operator (Romero & Han 2004, Repp 2013), an epistemic modal (Silk 2019),

7.2 Adversarial contexts and speaker pretense

In this section, I'll highlight an interesting class of mildly uncooperative utterances that will be relevant to strongly negatively biased uses of RDs, and I'll posit a crucial difference in the relative strength of maxims governing commitment and maxims governing projection in order to explain the mildly uncooperative character of these moves.

Recall the prediction made in the previous section, following from the maxim of Viability, that it would be uncooperative for a speaker to assert p if they know that their addressee believes $\neg p$ (or at least is committed to it). This might seem to be a problematic prediction, as the fact of the matter is that people make such assertions all the time, as in the case of assertions that directly contradict the previous assertion. Consider the following dialogue.

(55) **A**: Tupac is alive.
     B: No, he's dead.
     A: No, he's alive!
     B: No, he's dead!

A's initial utterance commits her to a proposition p; **B**'s reply commits him to $\neg p$. His reply also places $\neg p$ on the Table, projecting a Common Ground containing $\neg p$. This is despite the fact that **A**'s commitment to p renders that projected Common Ground unviable. This move is therefore, in our narrow, technical sense, uncooperative: it is not part of a strategy to increase the Common Ground via monotonic updates to the discourse model. We might suppose that **B** does indeed think that such a Common Ground could come about—that is to say, that **A** can be convinced to give up her commitment—and that he is therefore being globally cooperative, despite not being narrowly cooperative. However, the final two moves of the dialogue give up this facade entirely—though each move has the effect of projecting a Common Ground, it becomes clear that each party is only interested in reiterating their own commitment, and the use of assertions as a tool for building Common Ground falls by the wayside. In this case, the interlocutors are being genuinely uncooperative—they are not behaving in a way that seeks to increase Common Ground. I will call a move in which the speaker violates Viability an Adversarial move.[28]

(56) Adversarial Utterances
     An utterance u in a context c is Adversarial iff u violates Viability in c

---

or a speech act operator (Krifka 2017, Goodhue 2019). These accounts all have in common that they treat contracted negation questions as not simply denoting $\{p, \neg p\}$, where p is the sentence radical, situating the account of their exceptional bias profile directly in the semantics or conventional update potential of the utterance, and therefore outside of the scope of this investigation.

[28]Not that I intend the term 'adversarial' here to be used as a technical term, as defined below; there are certainly some cases that are not intuitively adversarial in the lay sense to which this technical term nonetheless applies.

A speaker who makes an adversarial move is being uncooperative. A speaker may make an adversarial move because their goal is to convince their interlocutor to rescind the commitment that renders the projected Common Ground unviable—cooperative *de facto*, if not *de jure*. However, a speaker may also make an adversarial move just for the pleasure of fighting, making them genuinely uncooperative.

We might wonder, however, why we interpret the speaker as being *merely* adversarial—once we've realized that they're being uncooperative, why isn't it the case that all bets are off with respect to their cooperative behavior? Why don't we conclude that they might not even believe what they're asserting? We can make sense of this in terms of the *relative strength* of the relevant maxims.

On the traditional Gricean view, some maxims are more important than others. This is expressed sometimes explicitly, as in the subservience of the maxim of QUANTITY to the maxim of QUALITY, and sometimes implicitly. But it's intuitively obvious that outright lying is more profoundly uncooperative than giving a little more detailed information than is strictly necessary, and that replying to a question with an unrelated non sequitur is less cooperative than using unnecessarily obtuse phrases. The four maxims presented in the previous section already have some information about relative importance baked in: SINCERITY is more important than PUBLICITY; VIABILITY is more important than COMPREHENSIVE-NESS. I propose as well that the maxims governing the making of commitments are more important than the maxims governing projection. This reflects the fact that being adversarial is less uncooperative than misrepresenting ones beliefs, or systematically withholding relevant information. The relative importance of the maxims is represented by their linear ordering in the tableaux, with the more important maxims occurring to the left of less important maxims.

I demonstrate now how the proposal that commitment-oriented maxims are more important than projection-oriented maxims accounts for the behavior of adversarial utterances. In the adversarial example in (55), when **A** reiterates her commitment to p, she knows full well that **B** is committed to $\neg p$. So we should rule out doxastic states in which the speaker doesn't know what the addressee thinks about p, or takes the addressee to believe p to be true, from our set of live options for the speaker's doxastic state. I've represented this in the tableau below by graying out the doxastic states already ruled out in such a context prior to the utterance:

(57)

$p\downarrow$	SIN	PUB	VIA	COMP
$\langle sp(p), ad(p)\rangle$				
$\langle sp(p), \neg ad(p)\rangle$				
▷ $\langle sp(p), ad(\neg p)\rangle$			*	
$\langle \neg sp(p), ad(p)\rangle$	*			
$\langle \neg sp(p), \neg ad(p)\rangle$	*			*
$\langle \neg sp(p), ad(\neg p)\rangle$	*		*	*
$\langle sp(\neg p), ad(p)\rangle$	*		*	
$\langle sp(\neg p), \neg ad(p)\rangle$	*		*	*
$\langle sp(\neg p), ad(\neg p)\rangle$	*		*	*

In this tableau, there is no way to interpret the speaker's utterance as fully cooperative; every doxastic state they could be in violates some maxim. In such a context, I propose that inferences are driven by the assumption that the speaker is being *minimally* uncooperative—they are in a doxastic state that violates the fewest, least important constraints.

(58)   SEVERITY OF VIOLATIONS
   a. Counting constraints from left to right in a tableau, a candidate c has minimally severe violations with respect to constraint 1 iff there is no candidate c' to which constraint 1 assigns fewer violation marks than c
   b. For any $n > 0$, candidate c has minimally severe violations with respect to constraint $n+1$ iff c has minimally severe violations with respect to constraint n and there is no candidate c' that has minimally severe violations with respect to constraint n to which constraint $n+1$ assigns fewer violation marks than c

(59)   MINIMAL UNCOOPERATIVITY
   A candidate c is minimally uncooperative with respect to a tableau with n constraints iff it has minimally severe violations with respect to constraint n

Informally speaking: moving from left to right, a constraint "knocks out" all candidates to which it assigns more violation marks than some other candidate still "in the running." A candidate can "survive" being assigned a violation mark only if all other live candidates are assigned it as well. This kind of reasoning should be familiar to readers accustomed to reading Optimality Theoretic tableaux.

In this case, the relative unseverity of a violation of VIABILITY ensures that we derive an inference that, in a context in which the speaker asserts p to an addressee they know believes $\neg p$, they are merely being adversarial, rather than being more pathologically uncooperative, as they would be if they did not believe their assertion to be true. In other words, even in a context where we conclude that a speaker is being uncooperative, the assumption of minimal uncooperativity rules out some speaker doxastic states from consideration.

Examining adversarial utterances as a special class of mildly uncooperative moves is useful in thinking about mildly uncooperative uses of polar interrogatives as well. It's obvious that many questions are asked by speakers who are not as unbiased as would be predicted by the perfectly cooperative use of polar interrogatives detailed in the previous section. Questions are often asked adversarially—i.e., by speakers who are not undecided about the answer. I'll consider two subtypes of adversarial questions: 'quiz' questions (60) and 'gotcha' questions (61).

(60)   *[Context: **A** is a teacher administering a pop quiz to his student **B**]*
   A: Was Freud born in the 20th century?
   B: . . . Yes.
   A: Wrong!

(61)   *[Context: **A** is **B**'s mother, and knows that **B** snuck out of her room to go to a party last night]*
   A: Did you go to bed early last night?

B: Yep, I finished my homework and turned in.
A: You liar!

In (60), **A**'s utterance projects both $CG + p$ and $CG + \neg p$. However, his private beliefs are compatible with only one of those Common Grounds, and he will correct his students if they give him the wrong answer—he has no intention of allowing one of those Common Grounds to come about. This is an adversarial context—by virtue of the speaker's own beliefs, one of the projected CGs is unviable. And indeed, this is intuitively uncooperative, in the narrow sense of the maximally efficient, rational exchange of information—the speaker is not trying to efficiently exchange information; he's trying to get his students to prove whether or not they've learned the material. I'll refer to adversarial contexts in which it's the speaker's own discourse commitments or private beliefs that render their projections unviable as contexts involving SPEAKER PRETENSE. In the context of a quiz question, where the addressee knows full well that the speaker is not unbiased, again we can remove some potential speaker doxastic states from consideration:

(62)

$p?\uparrow$		SIN	PUB	VIA	COMP
▷	$\langle sp(p), ad(p)\rangle$			*	
▷	$\langle sp(p), \neg ad(p)\rangle$			*	
▷	$\langle sp(p), ad(\neg p)\rangle$			*	
	$\langle \neg sp(p), ad(p)\rangle$			*	
	$\langle \neg sp(p), \neg ad(p)\rangle$				
	$\langle \neg sp(p), ad(\neg p)\rangle$			*	
▷	$\langle sp(\neg p), ad(p)\rangle$			*	
▷	$\langle sp(\neg p), \neg ad(p)\rangle$			*	
▷	$\langle sp(\neg p), ad(\neg p)\rangle$			*	

What it's crucial to note here is that all remaining speaker doxastic states are equally uncooperative—the utterance licenses no further inferences about the speaker's epistemic bias. This is a good prediction—if quiz questions licensed inferences about the direction of the speaker's epistemic bias, they would not serve their purpose.

In the context of a quiz question, that we are in a context involving speaker pretense is mutually understood (speaker pretense is overt). However, a gotcha question, like (61), is only effective if the addressee is not aware that they're in a context involving speaker pretense (speaker pretense is covert). In such a context, the addressee will not have ruled out the genuinely cooperative doxastic state from consideration, and the inference to speaker neutrality toward p that will be generated in such a case is exactly the effect the speaker intends to create, however dishonestly.

I move on now to the application of this system to rising declaratives.

7.3 The Pragmatics of Rising Declaratives

In this section, I walk through the predictions that the pragmatic system put forward in §6 makes for utterances of rising declaratives. First, I discuss the inferences the system derives

for completely cooperative uses of RDs ; then I discuss inferences the system derives for adversarial uses of RDs. Throughout, I make use of the representations and terminology introduced in §7.1 and §7.2.

7.3.1 Cooperative uses of rising declaratives

Utterances of declarative sentences accompanied by the L* H-H% tune make no commitments on behalf of the speaker, by virtue of the L* H-H% tune, and project only $CG+p$, by virtue of the declarative form of the sentence. In the tableau below, a rising declarative is represented as $p\uparrow$.

(63)

$p\uparrow$	SIN	PUB	VIA	COMP
$\langle sp(p), ad(p)\rangle$		*		
$\langle sp(p), \neg ad(p)\rangle$		*		
$\langle sp(p), ad(\neg p)\rangle$		*	*	
▷ $\langle \neg sp(p), ad(p)\rangle$				
$\langle \neg sp(p), \neg ad(p)\rangle$				*
$\langle \neg sp(p), ad(\neg p)\rangle$			*	*
$\langle sp(\neg p), ad(p)\rangle$			*	
$\langle sp(\neg p), \neg ad(p)\rangle$			*	*
$\langle sp(\neg p), ad(\neg p)\rangle$			*	*

As this tableau indicates, an utterance of an RD is only fully cooperative if the speaker is unsure about the truth of p, but takes it to be probable that the addressee believes p to be true. If the speaker was sure that p is true, her utterance would be uncooperative by virtue of PUBLICITY: she would be withholding her commitment to a proposition she believes to be true. If the speaker was sure that p is false, her utterance would be uncooperative by virtue of VIABILITY, as that belief would render the projected CG unviable. Finally, if the speaker had no suspicion that anybody believed p, their utterance would be uncooperative by virtue of COMPREHENSIVENESS: they would be excluding viable paths forward from PS.

That is to say, the assumption that the speaker is being cooperative in uttering an RD licenses the inference that they are undecided about p, but think it's probable that the addressee believes p. This is compatible with a wide range of potential speaker epistemic biases toward p. The empirical facts discussed in §3 suggest that this is a good result: RDs are sometimes accompanied by an inference of positive speaker epistemic bias toward p, and other times accompanied by an inference of speaker skepticism toward p. The basic pragmatics of RDs allows for the full range of possible speaker biases toward p, excluding only certainty that p is true and certainty that p is false. Additional contextual assumptions may derive precisifying inferences about where in that range the speaker's epistemic bias stands.

Consider for instance the positive bias cases presented in §3.3.1. In these cases, the addressee is taken by the speaker to have epistemic authority over p (i.e., if they believe p, then p is true). In such cases, the speaker taking it to be probable that the addressee believes p means that the speaker thinks that p is probably true, by virtue of the Chancy Modus Ponens reasoning put forward in §3.4. In other words, the contextual assumption that the speaker

takes the addressee to have epistemic authority over p means that the cell $\langle\neg sp(p), ad(p)\rangle$ contains only doxastic states characterized by positive epistemic bias toward p—doxastic states in that cell in which the speaker does not have positive epistemic bias toward p are ruled out by their belief in the addressee's epistemic authority. Given that the basic pragmatics identify that cell as the only cooperative location for the speaker's doxastic state, we derive the generalization that such cases license an inference to the speaker's positive epistemic bias.

However, if the speaker does not take the addressee to have epistemic authority over p, as in the cases presented in §3.3.2, no such inference is generated. Consider (17), repeated here as (64):

(64) *[Context: Alvin and Bertha are at a department store. Bertha has asked Alvin to go pick out a 100% cotton sweater; Alvin does not know much about clothes, and is not particularly detail-oriented. He returns with a sweater.]*
Bertha: That's 100% cotton? Maybe you should double check.

In this case, the speaker's epistemic bias toward p is not necessarily correlated with the addressee's probable belief in p: the context specifies that Bertha knows Alvin to be fashion-ignorant and unfastidious about details, meaning that his selection of a sweater does not guarantee that the sweater he has selected meets the requirements she indicated. This means that the cell $\langle\neg sp(p), ad(p)\rangle$ may contain doxastic states in which the speaker is negatively epistemically biased toward p, explaining why such contexts do not license the same inference to the speaker's positive epistemic bias as the cases presented in §3.3.1.

However, the data in §3.3.2 also includes cases in which there is a clear inference that the speaker believes p to be false: cases in which it is implausible that the speaker believes neither p nor $\neg p$, as in the math teacher case in (20). I turn now to discussion of these cases. I will argue that the strong negative bias associated with those cases follows directly from the fact that the context rules out the possibility of the speaker's doxastic state being in the maximally cooperative cell.

7.3.2 Adversarial rising declaratives

There is a class of utterances of RDs (presented in §3.3.2) which generate a clear inference that the speaker thinks p is false. This inference arises in contexts where it is not plausible to assume that the speaker believes neither p nor $\neg p$, such as the math teacher example in (20), repeated here as (65):

(65) *[Context: A student is solving a math problem in front of the class.]*
Student: The answer to this problem is 5 because the square root of 9 is 2 and 2 + 3 is 5.
Teacher: The square root of 9 is 2?

In such contexts, because the speaker is extremely well-informed about p, the addressee will not find it plausible that they are uncertain of its truth value—either the speaker believes

it's true, or they believe it's false. Again, we can show the predictions of the pragmatic account with respect to such a context by graying out those rows that are already ruled out independently at the time of the utterance: the rows in which the speaker is undecided about p. This represents the addressee's assumption that the speaker is not uncertain of the truth value of p.

(66)

$p\uparrow$	SIN	PUB	VIA	COMP
$\langle sp(p), ad(p)\rangle$		*		
$\langle sp(p), \neg ad(p)\rangle$		*		
$\langle sp(p), ad(\neg p)\rangle$		*	*	
$\langle \neg sp(p), ad(p)\rangle$				
$\langle \neg sp(p), \neg ad(p)\rangle$				*
$\langle \neg sp(p), ad(\neg p)\rangle$			*	*
▷ $\langle sp(\neg p), ad(p)\rangle$			*	
$\langle sp(\neg p), \neg ad(p)\rangle$			*	*
$\langle sp(\neg p), ad(\neg p)\rangle$			*	*

The only fully cooperative cell is here ruled out by the assumption of the speaker's well-informedness about p. However, if we assume that the speaker is being minimally uncooperative, we generate an inference that they believe p to be false, and take it to be probable that the addressee believes p. We generate the inference that the speaker believes p to be false, because if the speaker believed p, it would be strongly uncooperative to avoid committing to it via the choice of L* H-H%, violating PUBLICITY.

In the minimally uncooperative cell of the tableau above, the speaker has violated VIABILITY, rendering their move adversarial, and the move is unviable by virtue of the speaker's own beliefs, making this a context involving speaker pretense. However, the inference of positive addressee-oriented bias persists even in this mildly uncooperative case: if the speaker didn't take it to be probable that the addressee believed p, then $CG+\neg p$ would be a viable addition to PS, and the failure to project it would be an uncooperative exclusion of viable paths from PS.[29]

To summarize, the pragmatic account put forward in §6 treats strongly negatively biased uses of RDs as adversarial moves characterized by speaker pretense (q.v. Westera 2017), and predicts that even these adversarial uses of RDs involve positive addressee-oriented bias, capturing the empirical observation put forward in §3.4 that such addressee-oriented bias is intrinsic to utterances of RDs, irrespective of variation in speaker-oriented epistemic bias. An utterance of an RD by a speaker who does not take it to be probable that their addressee

---

[29]Attentive readers may worry about what goes on in cases where the addressee is taken to be an epistemic authority: would that also remove important cells from consideration? The answer is no. If the addressee is taken to be opinionated about p, that removes from consideration the second, fourth, and eighth rows; all those including $\neg ad(p)$. Those are all rows that are independently rendered less than maximally cooperative due to the maxim violations they incur; the optimal cell remains the same in such cases as it would've been if no cells were removed from consideration at all. In other words, it is only if the context rules out the possibility that the speaker's doxastic state is in the maximally cooperative cell $\langle \neg sp(p), ad(p)\rangle$ that there will be a change to what can be concluded on the basis of the basic pragmatics.

believes p is more strongly uncooperative than merely comprising an adversarial move.

The present account also captures the connection between the availability of negatively biased uses of RDs and the speaker's knowledgability about p: only if we have independent reason to believe that the speaker is not undecided about p should we rule out a perfectly cooperative interpretation of their utterance.

8 Further Ramifications

The primary empirical focus of this paper is RDs, but the account presented here makes predictions about a broader range of sentence-tune pairs. A fuller investigation of the ramifications of this account for this broader dataset is outside the scope of this paper; in this section I present a sketch of the potential ramifications of the account beyond RDs.

Biezma (2020) hypothesizes that L* H-H% marks a contrast between canonical and non-canonical updates in the realm of declarative sentences, *wh*-questions, and non-*wh*-questions, but expresses skepticism about whether it could be given a unified treatment across all the three categories, due to the difference between polar questions, where rising intonation is canonical and falling intonation is non-canonical, and *wh*-questions, where falling intonation is canonical and rising intonation is non-canonical. The account of L* H-H% proposed in this paper does not distinguish between how it affects polar questions and *wh*-questions. In this section, I show the predictions this account makes for falling polar interrogatives, and for rising vs. falling *wh*-questions; I'll suggest that the prospects for a unified account of the role of L* H-H% in delivering the discourse effects of rising and falling polar and *wh*-interrogatives is not as dim as Biezma suggests. A fuller investigation of these facts is outside of the scope of this paper, and for our purposes this section will remain a sketch.
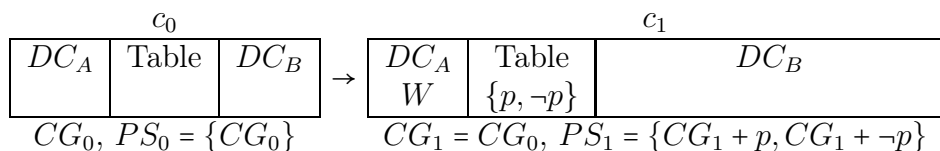
8.1 Falling polar interrogatives

When polar interrogatives are uttered accompanied by the H* L-L% tune, they preserve their basic information-requesting discourse function, as this account would predict. They're also accompanied by an inference of impatience or irritability:

(67) Are you coming.

An utterance of a polar interrogative accompanied by H* L-L% will incur a speaker commitment that is intrinsically trivial: for any p, the union of p and $\neg p$ is the set of all possible worlds W.

(68) UPDATE: $\{p, \neg p\}$ denotation + H* L-L% tune (cf. 46)

	c_0			c_1	
DC_A	Table	DC_B	DC_A	Table	DC_B
			W	$\{p, \neg p\}$	

CG_0, $PS_0 = \{CG_0\}$ $\quad\quad$ $CG_1 = CG_0$, $PS_1 = \{CG_1 + p, CG_1 + \neg p\}$

Because this commitment is intrinsically trivial, it can never be a potentially Issue-resolving commitment, and therefore doesn't interfere with the basic information-requesting discourse function of polar interrogatives (q.v. Farkas & Roelofsen 2017). Nonetheless, it is commonly assumed that redundant commitments are uncooperative (Hamblin 1971 a.o.). On the present proposal, we have an explanation for why rising intonation is the canonical intonation of polar interrogatives: it avoids making a necessarily redundant commitment.

That falling polar interrogatives convey impatience or irritability, rather than being infelicitous, is of a piece with other cases of informationally trivial commitments, which are also associated with an inference of impatience or irritability:

(69)   Either you're coming or you're not.

Whatever the source of this inference, the present proposal predicts that rising and falling polar interrogatives differ with respect to whether or not they make a trivial commitment, providing a formal distinction to which that inference might be traced, while still predicting that the basic discourse function of the utterance will be unaffected.[30]

8.2 *wh*-interrogatives

Interestingly, the canonical intonation of *wh*-interrogatives is H* L-L%, not L* H-H% (Bartels 1999):

(70)   a.   *Who invited Paul over.*
                     H*   L-L%
         b.   *??Who invited Paul over?*
                     L*   H-H%

Here orthographic practice and intonational facts pull sharply apart. Despite the fact that we conventionally write *wh*-questions with question marks at the end, they canonically are accompanied by the same terminal contour as assertions of declarative sentences; they are quite odd if accompanied by the L* H-H% tune that canonically accompanies polar interrogatives (hence the nonstandard punctuation above).

I would like to suggest that this fact is connected to what Dayal (2016) calls the existential commitment of *wh*-interrogatives (cf. Truckenbrodt 2012, who seeks to connect the individual tone H* to the existential commitment of *wh*-interrogatives).[31] In (70a), this is a commitment to the proposition *Somebody invited Paul over*. Note that that existential proposition is simply the grand union of the denotation of the *wh*-question—that is to say,

---

[30]Cf. Farkas & Roelofsen (2017), on which account rising and falling polar interrogatives carry out identical discourse moves, capturing the latter without providing the former.
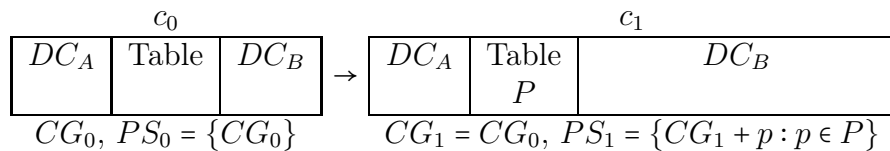
[31]This is sometimes described as a presupposition (since at least Bromberger 1966), though this categorization has been known to be problematic since at least Karttunen & Peters (1976). In brief, it appears that only the speaker is held accountable to this commitment, unlike presuppositions, which are taken to be shared if not actively resisted.

any proposal that attributes such a commitment to all utterances accompanied by H* L-L% automatically predicts the existential commitment for *wh*-interrogatives accompanied by their canonical intonation. Unlike with polar interrogatives, this commitment is not (intrinsically) redundant, and so there should be no pressure to avoid it. In fact, the oddness of *wh*-interrogatives accompanied by L* H-H% may be due to the fact that, in ordinary circumstances, it's odd to ask a question if you don't think it has an answer. However, in situations in which the speaker indeed wishes to suspend that commitment, rising *wh*-interrogatives become acceptable, as in this single-party dialogue:[32]
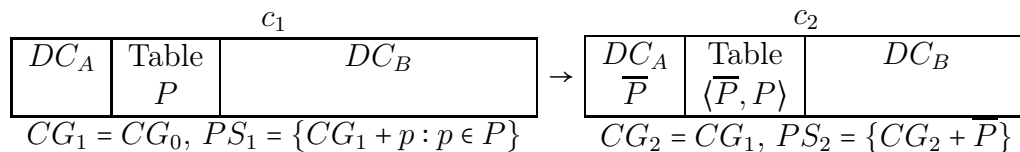
(71) Who invited Paul over?
    a. I don't know if he was invited at all!
    b. Nobody! He just showed up!

A speaker who utters a rising *wh*-interrogative can felicitously follow it up with an expression of uncertainty as to whether there is an answer (71a), or with an assertion that there is no answer (71b).

(72) a. Who invited Paul over? Nobody!
    b. UPDATE: P denotation + L* H-H% tune

	c_0				c_1	
DC_A	Table	DC_B	$\rightarrow$	DC_A	Table P	DC_B

$$CG_0,\ PS_0 = \{CG_0\} \qquad CG_1 = CG_0,\ PS_1 = \{CG_1 + p : p \in P\}$$

    c. UPDATE: $\overline{P}$ denotation + H* L-L% tune

	c_1				c_2	
DC_A	Table P	DC_B	$\rightarrow$	DC_A $\overline{P}$	Table $\langle \overline{P}, P \rangle$	DC_B

$$CG_1 = CG_0,\ PS_1 = \{CG_1 + p : p \in P\} \qquad CG_2 = CG_1,\ PS_2 = \{CG_2 + \overline{P}\}$$

The speaker's first move (72b) doesn't commit them to $\bigcup P$, and so their followup commitment to its complement $\overline{P}$ in (72c) is not self-contradictory. Likewise, denial of belief in $\bigcup P$ will not be contradictory. Note that the examples in (71) stand as a counterexample to Dayal's (2016) generalization that "existence can only ever be denied in cross-speaker exchanges" (p.51). It appears that existence can be denied in single-party dialogues, as long as the question is asked with a commitment-withholding tune.
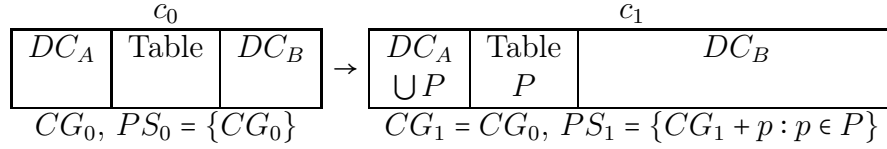
As an account in which the existential commitment follows from the discourse effect of all utterances associated with the H* L-L% tune would predict, these follow-ups are unacceptable after *wh*-interrogatives with canonical falling intonation (q.v. Karttunen & Peters 1976):
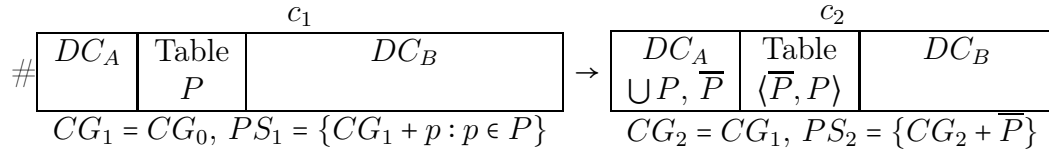
(73) Who invited Paul over.

---

[32] *Nota bene:* as is my notational convention throughout this paper, a ? should be read as indicating a L* H-H% terminal contour, regardless of the ordinary orthographic practice of marking all *wh*-interrogatives with question marks.

a. #I don't know if he was invited at all!

b. #Nobody! He just showed up!

(74) a. Who invited Paul over. #Nobody!

b. UPDATE: P denotation + H* L-L% tune

c_0				c_1	
DC_A	Table	DC_B	$\rightarrow$	DC_A $\cup P$	Table P	DC_B

$$CG_0,\ PS_0 = \{CG_0\} \qquad\qquad CG_1 = CG_0,\ PS_1 = \{CG_1 + p : p \in P\}$$

c. UPDATE: $\overline{P}$ denotation + H* L-L% tune

	c_1				c_2	
#	DC_A	Table P	DC_B	$\rightarrow$	DC_A $\cup P, \overline{P}$	Table $\langle \overline{P}, P \rangle$	DC_B

$$CG_1 = CG_0,\ PS_1 = \{CG_1 + p : p \in P\} \qquad CG_2 = CG_1,\ PS_2 = \{CG_2 + \overline{P}\}$$

Here, because the speaker's first move (74b) incurs a commitment to $\cup P$, their commitment to its complement $\overline{P}$ in (74c) is self-contradictory, resulting in a commitment set with an empty intersection. Likewise, denial of belief in $\cup P$ would directly contradict the commitment made in (74b).

It seems, then, that taking L* H-H% to be a commitment-targeting utterance modifier[33] can account for the difference between the canonical intonational profiles of *wh* and polar interrogatives, and perhaps even lend some insight into the problem of the existential commitment of *wh*-interrogatives. Because of this paper's primary focus on RDs, this will remain a sketch—for recent arguments in favor of a presuppositional explanation of the existential commitment of *wh*-interrogatives, see Abusch (2010) and Uegaki (2021). For more detailed empirical discussion of rising and falling intonation of polar and *wh*-interrogatives, see Bartels (1999) ch. 5 & 6.

9 Conclusion

In this paper, I've proposed an account of the discourse effect of the L* H-H% tune, namely that it calls off speaker commitments, and argued that, given some assumptions about the pragmatics of the Table model, the proposal derives the observed discourse behavior of rising declaratives. I've proposed that the inferences about speaker- and addressee-oriented bias that are associated with such utterances are not a part of their conventional effect, but rather stem from pragmatic reasoning.

The proposal that I've made is English-specific. There is no reason to suspect that rising intonation has the same discourse effect cross-linguistically, any moreso than there is to assume that the string of phonemes /kæt/ has the same meaning cross-linguistically. That said, some languages may well use intonation in a comparable way. And there is no reason to suppose that a language that provides a way for speakers to call off commitment must

---

[33]Cf. Davis (2009), Bhadra (2020).

do so via intonation. The meaning that I've associated with L* H-H% in English is comparable to meanings proposed for discourse particles in other languages (see e.g. Northrup 2014, Rojas-Esponda 2014, Law et al. 2018, Kraus 2018, Wei 2020 a.o.). It's an interesting question for future research to what extent there is cross-linguistic uniformity in the effect of rising intonation, and to what extent meanings associated with intonational tunes in some languages are associated with particles in others.

I've taken a compositional approach to the account of rising declaratives, in which the discourse effect of a sentence accompanied by rising intonation is determined by the standard discourse effect of an utterance of a sentence of that type, modified by the discourse effect of rising intonation. One strength of this approach is that it makes predictions regarding a range of constructions broader than just rising declaratives. In this paper I've shown that the proposal derives Farkas & Bruce's (2010) polar question act as the discourse effect of utterances of polar interrogative sentences accompanied by L* H-H%, and shown that this account predicts the existential commitment for *wh*-interrogatives accompanied by H* L-L%, and derives the observed asymmetry between disjunctive questions uttered with rising intonation and with falling intonation. But the predictions this account makes are broader than the discourse behavior of rising and falling declaratives and interrogatives. As observed by Portner (2018) and Rudin (2018b), English imperatives can also be accompanied by rising intonation:

(75)   Have a seat?

Extending this paper's proposal to utterances of imperatives requires a model of utterances of imperative sentences that decomposes them into commitment, Issue-raising, and projection along the same lines of Farkas & Bruce's decomposition of assertions and questions. Developing such an extension is outside of the scope of this paper, but see Portner (2018) and Rudin (2018a, 2018b) for recent proposals.

References

Abusch, Dorit. 2010. Presupposition triggering from alternatives. *Journal of Semantics* 27. 37–80.

Aloni, Maria. 2007. Expressing ignorance or indifference: Modal implicatures in bi-directional Optimality Theory. In Baldur ten Cate & Henk Zeevat (eds.), *Logic, language, and computation: Papers from the 6th International Tbilisi Symposium*, .

AnderBois, Scott. 2011. *Issues and alternatives*: University of California, Santa Cruz dissertation.

AnderBois, Scott. 2018. Illocutionary revelations: Yucatec Maya Bakáan and the typology of miratives. *Journal of Semantics* 35(1). 171–206.

Bach, Kent & Robert Harnish. 1979. *Linguistic communication and speech acts*. Cambridge, MA: MIT Press.

Bade, Nadine. 2014. Obligatory implicatures and the presupposition of "too". In *Proceedings of Sinn und Bedeutung 18*, 42–59.

Bade, Nadine & Agata Renans. 2021. A cross-linguistic view on the obligatory insertion of additive particles: Maximize Presupposition vs. Obligatory Implicatures. *Glossa* 6(1).

Bartels, Christine. 1999. *The intonation of English statements and questions: A compositional interpretation*. Routledge.

Beckman, Mary E. & Janet B. Pierrehumbert. 1986. Intonational structure in English and Japanese. *Phonology Yearbook* 3. 255–309.

Beltrama, Andrea. 2018. *Totally* between subjectivity and discourse: Exploring the pragmatic side of intensification. *Journal of Semantics* .

Bhadra, Diti. 2020. The semantics of evidentials in questions. *Journal of Semantics* 37. 367–423.

Biezma, María. 2020. Non-informative assertions: The case of non-optional *wh*-in-situ. *Semantics and Pragmatics* 13(18).

Blutner, Reinhard. 2000. Some aspects of optimality in natural language interpretation. *Journal of Semantics* 17. 189–216.

Bromberger, Sylvain. 1966. Why-questions. In *Mind and cosmos: Essays in contemporary science and philosophy*, 68–111. University of Pittsburgh Press.

Büring, Daniel & Christine Gunlogson. 2000. Aren't positive and negative polar questions the same? Manuscript, UCSC.

Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen. 2013. Inquisitive Semantics: A new notion of meaning. *Language and Linguistics Compass* 7(9). 459–476.

Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen. 2018. *Inquisitive semantics*. Oxford University Press.

Constant, Noah. 2012. English rise-fall-rise: a study in the semantics and pragmatics of intonation. *Linguistics and Philosophy* 35(5). 407–442.

Davis, Christopher. 2009. Decisions, dynamics and the Japanese particle *yo*. *Journal of Semantics* 26. 329–366.

Dayal, Veneeta. 2016. *Questions*. Oxford University Press.

Faller, Martina. 2019. The discourse commitments of illocutionary reportatives. *Semantics and Pragmatics* 12(8). 1–46.

Farkas, Donka & Kim Bruce. 2010. On reacting to assertions and polar questions. *Journal of Semantics* 27. 81–118.

Farkas, Donka & Floris Roelofsen. 2017. Division of labor in the interpretation of declaratives and interrogatives. *Journal of Semantics* .

Frank, Michael C. & Noah D. Goodman. 2012. Predicting pragmatic reasoning in language games. *Science* 336(6084). 998.

Franke, Michael. 2009. *Signal to act: Game theory in pragmatics*: Universiteit van Amsterdam dissertation.

Gazdar, Gerald. 1979. *Pragmatics: Implicature, presupposition, and logical form.* Academic Press.

Ginzburg, Jonathan. 1996. Dynamics and the semantics of dialogue. In J. Seligman & Dag Westerståhl (eds.), *Language, logic, and computation*, vol. 1, 1–16. CSLI.

Ginzburg, Jonathan. 2012. *The interactive stance.* Oxford University Press.

Göbel, Alexander. 2019. Additives piching in: L*+H signals ordered Focus alternatives. In Katherine Blake & Forrest Davis (eds.), *Proceedings of SALT 29*, Linguistic Society of America.

Goodhue, Daniel. 2019. High negation questions and epistemic bias. In *Proceedings of Sinn und Bedeutung 23*, .

Goodhue, Daniel. 2021. A unified account of inquisitive and assertive rising declaratives. In *The proceedings of the Linguistic Society of America 6*, 951–965.

Goodman, Noah D. & Andreas Stuhlmüller. 2012. Knowledge and implicature: Modeling language understanding as social cognition. In *Proceedings of the thirty-fourth annual conference of the Cognitive Science Society*, .

Grice, Paul. 1975. Logic and conversation. In P. Cole & J. Morgan (eds.), *Syntax and semantics 3: Speech acts*, 41–58. Cambridge, MA: Academic Press.

Gunlogson, Christine. 2001. *True to form: Rising and falling declaratives as questions in English*: University of California, Santa Cruz dissertation.

Gunlogson, Christine. 2008. A question of commitment. *Belgian Journal of Linguistics* 22. 101–136.

Hamblin, C.L. 1971. Mathematical models of dialogue. *Theoria* 37. 130–155.

Hamblin, C.L. 1973. Questions in Montague English. *Foundations of Language* 10(1). 41–53.

Jeong, Sunwoo. 2018. Intonation and sentence type conventions: Two types of rising declaratives. *Journal of Semantics* 35(2). 305–356.

Karttunen, Lauri. 1972. Possible and must. In John Kimball (ed.), *Syntax and semantics*, vol. 1, 1–20. Academic Press.

Karttunen, Lauri & Stanley Peters. 1976. What indirect questions conventionally implicate. In *Proceedings of Chicago Linguistic Society 12*, 352–368.

Klecha, Peter. 2018. On unidirectionality in precisification. *Linguistics and Philosophy* 41. 83–124.

Kraus, Kelsey. 2018. *Great intonations*: University of California, Santa Cruz dissertation.

Krifka, Mandred. 2002. Be brief and vague! And how bidirectional Optimality Theory allows for verbosity and precision. In D. Restle & D. Zaeferer (eds.), *Studies in structure and change: A festschrift for Theo Venneman*, 439–458. Mouton de Gruyter.

Krifka, Manfred. 2015. Bias in commitment space semantics: Declarative questions, negated questions, and question tags. In *Proceedings of SALT 25*, 328–345.

Krifka, Manfred. 2017. Negated polarity questions as denegations of assertions. In Chung-min Lee, Ferenc Kiefer & Manfred Krifka (eds.), *Constrastiveness in information structure, alternatives and scalar implicatures*, 359–398. Springer.

Ladd, D. Robert. 2008. *Intonational phonology*. Cambridge University Press second edition edn.

Lauer, Sven. 2013. *Towards a dynamic pragmatics*: Stanford dissertation.

Lauer, Sven. 2016. On the status of 'Maximize Presupposition'. In *Proceedings of SALT 26*, .

Law, Jess, Haoze Li & Diti Bhadra. 2018. Questions speech acts. In *Proceedings of Sinn und Bedeutung 22*, .

Lewis, David. 1979. Scorekeeping in a language game. *Journal of Philosophical Logic* 8. 339–359.

Liberman, Mark & Ivan Sag. 1974. Prosodic form and discourse function. In *Proceedings of Chicago Linguistic Society 10*, .

Malamud, Sophia & Tamina Stephenson. 2015. Three ways to avoid commitments: Declarative force modifiers in the conversational scoreboard. *Journal of Semantics* 32. 275–311.

Moss, Sarah. 2015. On the semantics and pragmatics of epistemic vocabulary. *Semantics and Pragmatics* 8. 1–81.

Murray, Sarah E. & William B. Starr. 2020. The structure of communicative acts. *Linguistics and Philosophy* .

Neth, Sven. 2019. Chancy modus ponens. *Analysis* 79(4). 632–638.

Nilsenová, Marie. 2006. *Rises and falls: Studies in the semantics and pragmatics of intonation*: Institute for Logic, Language and Computation dissertation.

Northrup, Oliver. 2014. *Grounds for commitment*: University of California, Santa Cruz dissertation.

Pierrehumbert, Janet & Julia Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. In P. Cohen, J. Morgan & M. Pollack (eds.), *Intentions in communication*, 271–311. MIT Press.

Pierrehumbert, Janet B. 1980. *The phonology and phonetics of English intonation*: MIT dissertation.

Portner, Paul. 2018. Commitment to priorities. In Daniel Fogal, Daniel Harris & Matt Moss (eds.), *New work on speech acts*, Oxford University Press.

Prince, Alan & Paul Smolensky. 2004. *Optimality Theory: Constraint interaction in generative grammar*. Blackwell.

Repp, Sophie. 2013. Common ground management: Modal particles, illocutionary negation and VERUM. In Daniel Gutzmann & Hans-Martin Gärtner (eds.), *Beyond expressives: Explorations in use-conditional meaning*, 231–274. Brill.

Rett, Jessica. ms. The semantics of emotive markers and other illocutionary content. UCLA.

Roberts, Craige. 1996. Information structure in discourse. In J.H. Yoon & A. Kathol (eds.), *OSU working papers in linguistics 49: Papers in semantics*, 1–53. Ohio State University.

Rojas-Esponda, Tania. 2014. A discourse model for *überhaupt. Semantics and Pragmatics* .

Romero, Maribel & Chung-Hye Han. 2004. On negative yes/no questions. *Linguistics and Philosophy* 27(5). 609–658.

Rudin, Deniz. 2018a. *Rising above commitment*: University of California, Santa Cruz dissertation.

Rudin, Deniz. 2018b. Rising imperatives. In *Proceedings of SALT 28*, 100–119.

Rudin, Deniz. 2019. Embedded rising declaratives and embedded quotation. In *Proceedings of SALT 29*, 1–21.

Sag, Ivan & Mark Liberman. 1975. The intonational disambiguation of indirect speech acts. In Robert E. Grossman, L. James San & Timothy J. Vance (eds.), *Proceedings of Chicago Linguistic Society 11*, 487–497.

Schlöder, Julian J. & Alex Lascarides. 2020. Understanding focus: Pitch, placement and coherence. *Semantics and Pragmatics* 13(1).

Silk, Alex. 2019. Expectation biases and context management with negative polar questions. *Journal of Philosophical Logic* .

Stalnaker, Robert. 1978. Assertion. In Peter Cole (ed.), *Syntax and semantics 9*, 315–32. Academic Press.

Steedman, Mark. 1991. Structure and intonation. *Language* 67(2). 260–296.

Steedman, Mark. 2014. The surface-compositional semantics of English intonation. *Language* 90(1). 2–57.

Truckenbrodt, Hubert. 2006. On the semantic motivation of syntactic verb movement to C in German. *Theoretical Linguistics* 32(3). 257–306.

Truckenbrodt, Hubert. 2012. Semantics of intonation. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning*, vol. 3, 2039–2969. de Gruyter.

Uegaki, Wataru. 2021. The existential/uniqueness presupposition of *wh*-complements projects from the answers. *Linguistics and Philosophy* 44. 911–951.

Walker, Marilyn. 1996. Inferring acceptance and rejection in dialog by default rules of inference. *Language and Speech* 39(2-3). 265–304.

Wei, Wei. 2020. *Discourse particles in Mandarin Chinese*: University of Southern California dissertation.

Westera, Matthijs. 2013. 'Attention, I'm violating a maxim!' a unifying account of the final rise. In *Proceedings of the 17th Workshop on the Semantics and Pragmatics of Dialogue (SemDial)*, ILLC, Amsterdam.

Westera, Matthijs. 2017. *Exhaustivity and intonation: A unified theory*: Institute for Logic, Language and Computation, Universiteit van Amsterdam dissertation.

Westera, Matthijs. 2018. Rising declaratives of the Quality-suspending kind. *Glossa* 3(1).

Yalcin, Seth. 2010. Probability operators. *Philosophy Compass* 5(11). 916–937.

Yuan, Mengxi & Yurie Hara. 2019. Guiding assertions and questions in discourse: Mandarin *dique* and *zhende*. *Natural Language and Linguistic Theory* 37. 1545–1583.