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Intonation and Sentence Type Conventions: Two Types of Rising Declaratives

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Abstract

This paper presents an experimental study that provides evidence for the existence of two types of rising declaratives in English which differ systematically in their forms and their functions. The two are labelled assertive rising declaratives and inquisitive rising declaratives, respectively. Guided by the experimental results, the paper develops a semantic analysis of them. Having as backdrop an extended Lewisian model of discourse involving a conversational scoreboard, the analysis associates assertive and inquisitive rising declaratives with distinct sets of context-changing conventions that bring about fundamentally different updates to core elements of the context. In the process, it highlights their respective partial overlaps with the conventions for two other sentence types, falling declaratives and polar interrogatives. The analysis fully captures the experimental results presented in the paper and reconciles disparate, seemingly contradictory observations about English rising declaratives noted in previous work.

1 INTRODUCTION

Recent work on sentence-types emphasizes the dynamic nature of their semantic and pragmatic contributions, associating distinct context-changing conventions with each of them (Farkas & Bruce 2010; Condoravdi & Lauer 2012; Krifka 2015; Farkas & Roelofsen 2017; cf. Stalnaker 1978; Lewis 1979). Within this tradition, there has been a growing interest in the question of how intonation interacts with these conventions. Terminal contours such as falling and rising tunes have been noted to give rise to potentially different sentence types such as falling and rising declaratives; inquiry into their diverging discourse effects has engendered a fruitful line of research, resulting in significant enrichments in models of discourse context (Gunlogson 2003; Malamud & Stephenson 2015; Farkas & Roelofsen 2017). At the same time, the data involved have also revealed some complex distributional patterns that have not yet been fully accounted for.

English rising declaratives highlight this complexity. They are associated with a wide range of seemingly disparate discourse effects, and characterizing the core effect that crosscuts their varied uses remains a challenge. A central problem that underlies this issue is whether English rising declaratives comprise two or more distinct phenomena. In answer to this, a few approaches have sought a unified account, essentially treating rising declaratives as a single phenomenon (Westera 2013 2017; Malamud & Stephenson 2015). In contrast, other approaches have either implicitly or explicitly acknowledged the existence of potentially distinct types of rising declaratives, but have focused on addressing a particular subpart of the rising declarative data (Gunlogson, 2003 2008; Farkas & Roelofsen 2017). While both types of approaches have been revealing in their own respects, the problem still remains unresolved.

This paper addresses this issue and argues for the existence of two fundamentally different types of rising declaratives. The two are labeled as *assertive* rising declaratives and *inquisitive* rising declaratives (abbreviated as ARDs and IRDs), respectively, and are shown to differ in form and function. The evidence for this argument is drawn from a series of perception experiments that used stimuli representing diverse sentence types (rising declaratives, falling declaratives and polar interrogatives), prosodically manipulated in their terminal contours, and systematically controlled for their content and speakers. The experiments probed into participants' judgements on a variety of contextual meanings associated with a given utterance. The results demonstrate the existence of highly codependent functional effects, in which a range of contextual inferences with inquisitive shades all pattern together on the one hand, and those with assertive shades pattern together on the other. Moreover, the former range of effects is shown to be strongly correlated with low rising (L* H-H%) declaratives and polar interrogatives, whereas the latter range of effects is shown to be strongly correlated with high rising (H* H-H%) declaratives and falling declaratives. In addition to establishing a key distinction between inquisitive and assertive interpretations, the experimental results also demonstrate a graded, more nuanced four-way functional distinction between the four sentence types.

Guided by these experimental results, the paper develops a semantic and pragmatic analysis of assertive vs. inquisitive rising declaratives, in which each type of rising declarative is associated with a distinct set of context-changing conventions. The analysis follows the steps of Farkas & Bruce (2010) and Malamud & Stephenson (2015) in having as backdrop an extended Lewisian model of discourse (Lewis 1979). Building from this framework, assertive and inquisitive rising declaratives are analyzed as updating different elements of the conversational scoreboard, thereby giving rise to distinct commitment statuses of the interlocutors (cf. Gunlogson 2003) as well as distinct expectations about future discourse trajectories. Their respective conventional effects are also shown to partially overlap in systematic ways with two other sentence types, falling declaratives and polar interrogatives.

The analysis provides an account of the full range of experimental data presented in the first half of the paper, as well as data from the previous literature. In particular, the analysis is able to capture why ARDs are often construed as *tentative assertions*, while IRDs are often construed as *biased questions*. The analysis also synthesizes different proposals from previous work that on the surface seem incompatible with each other, and demonstrates that with only minor adjustments, their respective strengths can be maintained as long as we establish a clear boundary between assertive and inquisitive rising declaratives. On the empirical side, the resulting account reconciles disparate, potentially conflicting observations that have been made on English rising declaratives data. It also sheds light

on different ways in which terminal contours interact with sentence types, content and context to modify the force of the utterance and the subsequent discourse context.

2 OBSERVATIONS

Rising declaratives have been associated with various types of semantic, pragmatic and social meanings. (1) summarizes the salient uses noted in previous work.

(1) a. CONTRADICTORY QUESTIONS (cf. Pierrehumbert & Hirschberg 1990)
   A: Please apologize to him.
   B: *I was wrong and I should apologize*? No way.
 b. INCREDULOUS QUESTIONS (cf. Gunlogson 2003)
   A: John went to the airport to pick up his sister.
   B: *John has a sister?*
 c. CONFIRMATIVE QUESTIONS (Poschmann 2008)
   A: (airline agent): There's one flight to Helsinki.
   B: (customer): *The flight leaves at 4pm?*
 d. UNSURE ABOUT A METALINGUISTIC ISSUE (Hirschberg & Ward 1995)
   A: Do you speak Spanish?
   B: *I speak Ladino?*
 e. UPTALK (building rapport; eliciting uptake; cf. Podesva 2011)
   (A waitress in a restaurant talking to a customer)
   B: Hello! *My name is Anna? I'll be your waitress?*

 (1a) and (1b) exemplify their uses as surprised or incredulous questions. (1a) is additionally marked with a flavor of speaker disagreement (for the sake of convenience, these cases will henceforth be called contradictory questions).[1] (1c) demonstrates that they can also be used as confirmatory questions, which are very different in flavor from incredulous uses. (1d) suggests that they can be used to mark speaker uncertainty about the relevance or the adequacy of her utterance to the discourse at hand (sometimes referred to as the 'metalinguistic uncertainty' uses; Hirschberg & Ward 1995; Malamud & Stephenson 2015). And (1e) showcases uses in which they function primarily as a rapport-building device, generating particular perlocutionary and (sometimes stigmatized) social effects (Podesva 2011; Levon 2016); these uses are commonly referred to as 'uptalks' (cf. Warren 2005).

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1   A few previous works associate more complex tunes such as L*+H L-H% with incredulity readings (Hirschberg & Ward 1992). However, there is growing evidence in production studies that indicates that just the rising terminal contour, in particular, L* H-H% (standardly used in yes/no questions, as well as in non-incredulous questioning uses of rising declaratives), often suffices in signaling the incredulity readings (Goodhue *et al.* (2015)). Based on this evidence, the paper will assume that incredulous interpretations also fully partake in the phenomena of rising declaratives (declaratives with rising terminal contours), while leaving open the possibility that particular configurations of preceding pitch accents may further push the listener toward incredulous or contradictory interpretations. Note also that the contradictory question uses (1a) picked out by the paper differ from the uses that are associated with the so-called 'contradiction contour' (Liberman & Sag 1974); the former is characterized by a simple yes/no question rise, whereas the latter has a more complex and distinctive intonational profile.

This functional heterogeneity raises the question of whether there are two or more distinct types of rising declaratives. As a way of motivating the paper's main hypothesis as well as the subsequent experimental study, let us examine a few core inferences associated with rising declaratives in (1) with the aim of establishing a fundamental distinction between them. A detailed comparison of previous approaches is postponed until section 6.2, after the discussion of the experiment.

2.1 *Speaker commitment and presumptions about the addressee: a first pass*

Recent work on declaratives (be they rising or falling) standardly posits updates to the commitment set of an interlocutor (with the content of the declarative) as their core conventional effects (Gunlogson 2003; Condoravdi & Lauer 2011; Lauer 2013; cf. Farkas & Roelofsen 2017). Within this general approach, rising declaratives are further distinguished from falling ones by attributing the commitment to a different interlocutor (to the addressee instead of the speaker; Gunlogson 2003; cf. Portner forthcoming) or by associating a different type of commitment with it (projected or contingent commitments instead of categorical ones; Gunlogson 2008; Malamud & Stephenson 2015). In addition to this, rising declaratives have been argued to be associated with particular kinds of speaker presumptions about the addressee (Gunlogson 2008). These arguments often draw their evidence from a subset of rising declarative uses summarized in (1), but it remains an open question whether the generalizations hold across all uses of rising declaratives.

Let us therefore take a closer look at these core notions. Can we observe any significant difference between the rising declaratives in (1) with respect to the commitment status of interlocutors and speaker presumption about the addressee? In answering this question, introducing a more controlled paradigm is helpful. While the contents of rising declaratives often introduce biases toward different uses ((1) demonstrates this to a certain extent), it is possible to map the same string of words onto heterogeneous uses by embedding them in the right kinds of contexts. (2) presents such a paradigm (each type of use is ordered in the same way as in (1)).

(2) a. CONTRADICTORY QUESTIONS
         A: John has a sister. We should invite her too.
         B: *John has a sister*? No way. You must be thinking of his young brother.
     b. INCREDULOUS QUESTIONS
         A: John went to the airport to pick up his sister.
         B: (What?) *John has a sister*?
     c. CONFIRMATIVE QUESTIONS
         (A is giving tips to B, who needs to interview a female relative of a friend)
         A: You should talk to John. He has a few female members in the family.
         B: (Aha!) *John has a sister*?
     d. UNSURE ABOUT A METALINGUISTIC ISSUE
         A: Do you know if John has any female relatives?
         B: (Um...) *John has a sister*?
     e. UPTALK (politeness; building rapport; eliciting uptake)
         A: Tell me about John's family.
         B: *John has a sister*? But no other siblings? He's quite close to her?

The adapted examples in (2) suggest that a major divide exists between contradictory, incredulous, and confirmative questions (2a–c) on the one hand, and metalinguistic assertions and uptalks (2d–e) on the other (the same can be said for (1) as well, upon extrapolation). The two groups seem to signal fundamentally distinct statuses relating to speaker commitment and speaker presumption about addressee knowledge, with respect to the proposition that John has a sister.

With respect to speaker commitment, the intuition is that (2a–c) do *not* signal a speaker commitment toward the proposition that John has a sister. For (2a–b), their incredulous or contradictory flavor strongly suggest that the speaker does not yet intend to publicly commit to the belief that John has a sister until further clarification or justification from the addressee. For (2c) as well, the speaker again seems to want to elicit explicit confirmation from the addressee that John has a sister, and thus does not yet seem to be publicly committed toward this information. In contrast, (2d–e) do seem to signal some kind of speaker commitment toward the proposition that John has a sister. B's utterance of the rising declaratives in (2d–e) is likely to have particular repercussions: by virtue of this utterance, B will subsequently be expected to act as though she thinks that John has a sister. Similar kind of expectations don't arise for the first three cases.

With respect to speaker presumption about the addressee, the intuition is that (2a–c) all signal that the speaker expects the addressee to have some privileged knowledge or evidence necessary to back up the proposition that John has a sister. For (2a–b), this holds because the context is such that the addressee has already explicitly said or presupposed that John has a sister. This corresponds to Gunlogson's (2003) 'contextual evidence condition' (see section 6.2 for more details). For (2c), such an explicit, pre-existing commitment from the addressee is absent, but the context is still such that the speaker expects the addressee to have more epistemic authority than the speaker to confirm that John has a sister (cf. Gunlogson 2008; see section 6.2). In contrast, (2d–e) do not seem to signal such speaker presumption about the addressee. Rather, for (2d–e), it is instead the speaker that seems to have more evidence or knowledge that John has a sister (than the addressee).

2.2 *Further probe: tracking the discourse effects*

These intuitions can be probed deeper and at least partially corroborated. To this end, Gunlogson's (2008) *Oh vs. Yes* diagnostic is useful, as it provides us with insights about the nature of the subsequent discourse states generated by different types of linguistic expressions. According to Gunlogson (2008), *Oh* (with falling intonation) signals that the speaker is implicitly and dependently committing to the previous speaker's (i.e. the addressee's) commitment, whereas *Yes* signals that the speaker is explicitly and independently committing to the upcoming (or preceding) proposition as a separate 'source' (cf. Farkas & Bruce 2010). Although Gunlogson (2008) uses this diagnostic mainly to explain the discourse effects of falling declaratives, it can also be productively applied to a range of rising declarative uses, as can be seen in (3–4) which further extends a few examples in (1–2). These reveal a clear difference in the possible follow-up responses between rising declaratives in (3) vs. those in (4), although the declaratives in question again consist of identical strings of words for each pair.

(3) a. Incredulous question (1b), (2b)
      A: John went to the airport to pick up his sister.
      B: (What?) *John has a sister?*

    A: *Yes*, he does. Didn't you know? / cf. A: #*Oh*, I see.

  b. CONFIRMATIVE QUESTION (1c), (2c)

    B: (an actor talking to a stage director) So, *my name is Wendy?*

    A: (stage director) *Yes*, we changed it from Molly, because we thought Wendy sounds friendlier. / cf. A (stage director): #*Oh*, I see.

(4) a. METALINGUISTIC UNCERTAINTY (1d), (2d)

    A: Do you know if John has a close female relative?

    B: (Um...) *John has a sister?*

    A: *Oh*, I didn't know that. / cf. A: #*Yes*, he does.

  b. UPTALK; PERLOCUTIONARY POLITENESS (1e), (2e)

    B: Hello, *my name is Wendy?* I'll be your tour guide today?

    A: *Oh*, hi Wendy. Nice to meet you. / cf. A: #*Yes*, it is.

First, the rising declarative in (3a) which has the function of an incredulous question (akin to 1a–b) does not allow for the *Oh* response. Instead, the most felicitous response in this case is *Yes*, as indicated by the addressee's follow-up response *Yes, he does*. The situation is similar for the rising declarative in (3b), which has the function of a confirmatory question (akin to 1c). Again, the *Oh* response sounds infelicitous and the *Yes* response is preferred, as indicated by the addressee's follow-up response *Yes, we changed it*.

Given these behaviors, Gunlogson's (2008) *Oh* diagnostic leads us to the conclusion that B is either not committed at all to the propositions 'John has a sister' and 'my name is Wendy' in (3), or is only defectively committed to them. If B had made definitive commitments to the respective propositions, then one would expect A to be able to dependently ride on B's commitment; however, such dependent commitments via *Oh* seems to be unlicensed in (3).[2] In sum, given the infelicity of *Oh* responses demonstrated in (3), the rising declaratives in (3) seem to be construed by the addressee as *not* incurring any definitive speaker commitment to the proposition at hand, further corroborating the initial intuition about the absence of speaker commitment for contradictory, incredulous and confirmative questions (1a–c). In addition, the expectation of *Yes* as the most likely addressee response further supports the intuition that the addressee is construed by the speaker as having some evidence or knowledge toward the positive answer to the issue at hand, in (1a–c).

Compare this state of affairs to rising declaratives in (4). First, the one in (4a) which has the function of signaling metalinguistic uncertainty (akin to 1d) allows for the *Oh* response, as can be seen by the addressee's follow-up response, *Oh, I didn't know that*. Likewise for the rising declarative in (4b), which functions primarily as a rapport-building device (akin to 1e); it also seems to allow for the *Oh* response, as can be seen by the addressee's follow-up response, *Oh, Hi Wendy*.

Adopting the line of reasoning mentioned above, we arrive at the conclusion that B's commitments to the propositions 'John has a sister' and 'my name is Wendy' in (4) are definitive and categorical. If B's commitments had not been in some sense definitive, then

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2 In the case of (3a), there is likely yet another independent reason as to why *Oh* is infelicitous (in addition to the lack of B's commitment): A is already source-committed to the proposition, and thus would not be motivated to mark any dependent commitment. I thank an anonymous reviewer for pointing this out.

one wouldn't expect A to be able to *dependently* latch onto B's commitment via her response *Oh*, without resorting to any additional steps. In sum, given the nature of the responses (*Oh*) demonstrated in (4), the rising declaratives in (4) seem to be construed by the addressee as incurring speaker's full, non-defective commitment to the proposition at hand, further corroborating the initial intuition about the presence of speaker commitment for metalinguistic assertions and uptalks (1d–e). In addition, the lack of preference toward *Yes* as the addressee response (for these cases, it even sounds infelicitous) further supports the intuition that the speaker does *not* attribute any privileged knowledge to the addressee in confirming the verity of the relevant propositions, in (1d–e).

To recapitulate, the systematic differences in the inferences about speaker commitment, speaker presumption about the addressee and allowed follow-up responses provide an indication that there may exist two fundamentally different types of rising declaratives. The patterns observed so far suggest that the core boundary lies between (1a–c) on the one hand, and (1d–e) on the other (likewise for 2).

2.3 *Emerging parallels with other sentence types*

This core division between two types of rising declaratives is thrown into further relief by examining the systematic difference in their overlaps with two other sentence types. While rising declaratives of the former type can all be felicitously substituted with polar interrogatives but not with falling declaratives, those of the latter type can all be felicitously substituted with falling declaratives but not with polar interrogatives. This state of affairs is summarized in (5–8), which include examples adapted from (3–4).

(5) Rising declarative (type: 2a–c)
    A: John is picking up is sister.
    B: *John has a sister?* (3a)
    A: *Yes*, didn't you know? / #*Oh*.

(6) Polar interrogative
    A: John is picking up his sister.
    B: (Huh.) *Does John have a sister?*
    A: *Yes*, didn't you know? / #*Oh*.

(7) Rising declarative (type: 2d–e)
    A: Tell me about John's family.
    B: (Um...) *John has a sister?* (4b)
    A: *Oh*, I didn't know that. / ?*Yes*.

(8) Falling declarative
    A: Tell me about John's family.
    B: *John has a sister.*
    A: *Oh*, I didn't know that. / ?*Yes*.

The expanded axes of comparison (which now include falling declaratives and polar interrogatives) not only further highlight the difference between the two types of rising declaratives but also provide a window into the conventional effects that are associated with them. The observed parallels between the former type of rising declaratives (i.e. contradictory, incredulous and confirmative question uses in 1a–c) and polar interrogatives on the one hand (5–6), and the latter (i.e. metalinguistic and uptalk uses in 1d–e) and falling declaratives on the other (7–8), suggest that the conventional effects associated with the former have significant overlaps with polar interrogatives but not with falling declaratives, whereas those associated with the latter have significant overlaps with falling declaratives but not with polar interrogatives. The overlap in the felicity patterns of *Oh* for each pair (*Oh* vs. #*Oh*) also suggests that the respective (shared) conventional effects will likely tap into the presence vs. absence of speaker commitment.

At the same time, the new comparison points also indicate that the two types of rising declaratives generate additional inferences that are absent in polar interrogatives and falling declaratives. The intuition is that the rising declaratives in (1a–c) often function as *biased*

questions (the exact flavor and the orientation of the bias differs from case to case; e.g. contradictory (1a) vs. confirmative (1c)) whereas polar interrogatives lack the indication of a bias toward a particular answer (negative or positive) and often signal more neutral questions (cf. Büring & Gunlogson 2000). In comparison, rising declaratives in (1d–e) often seem to function as *tentative* assertions whereas falling declaratives lack such a flavor of tentativeness and often signal more authoritative assertions.

In sum, not only do the two types of rising declaratives seem to contrast with each other by aligning with two different sentence types (falling declaratives vs. polar interrogatives); they also seem to contrast subtly with the latter two sentence types as well, eliciting a more nuanced four-way comparison. This state of affairs can be captured if the two sets of conventions associated with the two types of rising declaratives partially overlap with polar interrogatives on the one hand and falling declaratives on the other but also include extra conventions that are specific to each. The paper's ultimate goal is to establish such two distinct sets of conventions for each type of rising declaratives.

2.4 *Distinction in form*

We have so far argued for the existence of a core division between English rising declaratives by focusing on their distinctive *functions* in the discourse. But the argument can be made from the *form* side as well. The intuition is that (1a), (1b) and (1c) call for steeper rising slopes, whereas (1d) and (1e) call for weaker rising slopes. The possibility that different types of rising declaratives are associated with distinct intonational forms has been argued for in previous work as well (Westera 2013; cf. Poschmann 2008), although the evidence for such an intonational distinction has so far not been entirely conclusive. Nevertheless, this additional observation is suggestive, as the intuitive intonational distinction seems to align with the hypothesized functional distinction outlined so far (the boundary is again between contradictory, incredulous and confirmative question uses (1a–c) on the one hand, and metalinguistic and uptalk uses (1d–e) on the other).

The subsequent sections further corroborate the observations and intuitions outlined in this section by presenting an experimental study that enabled a more controlled comparison between the two hypothesized types of rising declaratives. Before moving directly to the experimental study however, let us first carve out the paper's main hypotheses more fully and interpret them into specific, experimentally testable predictions.

3 HYPOTHESES

Based on the observations outlined in section 2, we propose that there exist two different types of rising declaratives. The paper will henceforth call them 'inquisitive' (e.g. 1a–c) and 'assertive' (e.g. 1d–e) rising declaratives, respectively, making intuitive reference to the most stereotypical interpretation associated with each of them (as mentioned earlier, they are abbreviated as IRD and ARD, respectively). Each type of rising declarative is argued to be associated with distinct intonational forms as well as with distinct conventional effects.

First, in terms of *form*, the paper hypothesizes that the slope of the rise (which is often determined by the relative position of the nuclear pitch accent (henceforth NPA)) is the most relevant indicator of the assertive vs. inquisitive rising declarative distinction (cf. Westera 2013). Adopting the ToBI representation of intonation, this would amount to the prediction that high rising terminals (H* H-H%; higher position of the NPAs, along with weaker

rising slopes) are associated with ARDs, whereas low rising terminals (L* H-H%; lower position of the NPAs, along with steeper rising slopes) are associated with IRDs.[3] While the former association has been explicitly argued for by previous work (Hirschberg & Ward 1995), the latter association has only been indirectly alluded to, often by extrapolating from the observation that low rising terminals standardly occur with polar interrogatives (cf. Poschmann 2008). The experimental study thus aims to explicitly test the above hypothesis by including stimuli that are prosodically manipulated along the range of H* H-H% and L* H-H%. Based on these considerations, the first prediction to be tested is as follows: other things being equal (content, speaker, etc.), steeper rises (L* H-H%) are more likely to elicit IRD interpretations, whereas weaker rises (H* H-H%) are more likely to elicit ARD interpretations.

Intonational distinctions are known to be highly variable and speaker-dependent in their manifestation. In light of this, it is likely that other factors such as content and contextual inferences conspire with intonational cues to fully disambiguate the two hypothesized types of rising declaratives. That is, the burden of signaling the relevant interpretational distinction is not taken up solely by intonation. For instance, the difference in the content of the rising declaratives in (1) and the difference in their surrounding context in (2) gave us sufficient cues to infer whether the speaker intended inquisitive vs. assertive interpretations. A key factor here seems to be speaker knowledgeability. Where the speaker is more knowledgeable than the addressee, we tend to perceive an assertive interpretation. Where the addressee is more knowledgeable, inquisitive interpretations are preferred. Based on this intuition, the second prediction to be experimentally tested is formulated as follows: other things being equal (intonation, speaker, etc.), content and context marked with higher addressee knowledgeability are more likely to elicit IRD interpretations, whereas those marked with higher speaker knowledgeability are more likely to elicit ARD ones.

Turning to systematic *functional* differences, the paper hypothesizes that assertive vs. inquisitive rising declaratives are associated with distinct, conventional, context-changing effects. What exactly those conventional effects are still remains to be seen, but we do have some promising pointers in formulating more concrete hypotheses about them. For instance, the observations in section 2 suggest that ARDs incur the speaker's full commitment to the proposition, whereas IRDs do not incur speaker commitment. However, such hypothesized conventional effects may not be ideally suited for being directly probed in an experimental setting. Asking about the commitment status of the interlocutors or the status of other more fundamental, abstract constructs may end up being too formal and unintuitive as an experimental task. Therefore, testing for more intuitive, second-order inferences that

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3   The paper thus predicts the core intonational distinction to arise at the level of terminal contours, consisting of NPA, phrase accent and boundary tone. Terminal contour is a larger unit of intonation than the one adopted by more decompositional approaches (cf. Truckenbrodt 2012; Bartels 2014), which assume isolated tones such as H and L as the basic meaningful unit of intonation. It is also a smaller one than the one adopted by works such as the study by Constant (2012), which posit more complex strings of tones as relevant units. The paper does not intend to make strong claims about what the basic meaningful unit of intonation is. The hypothesized intonational unit is thus delimited to the case of rising declaratives, based on the evidence from previous work. While terminal contour is predicted to be the most relevant intonational cue in distinguishing the two types of rising declaratives hypothesized in this paper, more elementary or more complex units of tunes may indeed be the relevant units of intonation in explaining other semantic phenomena.

standardly arise as a result of the hypothesized underlying conventions would be more viable, methodologically.

What could be such second-order inferences? One intuitive inference that we have already seen is the type of follow-up responses (*Oh* vs. *Yes*) expected by the listeners. Another strong inference that may pattern differently between the two types of rising declaratives is listeners' illocutionary inferences, that is, the type of speech act that listeners associate with each. Although speech acts are ultimately assumed to be context-dependent, second-order inferences arising from more fundamental conventions (which remain to be established in later sections), the paper also expects ARDs to be standardly associated with acts of assertion, and IRDs to be standardly associated with acts of questioning, given experimentally controlled content and contexts.

Rather than translating these expectations onto additional experimental predictions, we may instead use them as basic methodological assumptions that enable us to bootstrap our way into systematically testing the experimental predictions. More specifically, we may use participants' intuitive and categorical judgments about the likely illocutions and follow-up responses as a fairly reliable probe for getting at whether they construed a given rising declarative token as an assertive one or an inquisitive one at a given moment. We thus posit that given controlled content and contexts, ARD interpretations can be tracked via participants' *information giving* (assertion) illocutionary judgments and *Oh* follow-up responses, and IRD interpretations can be tracked via participants' *information seeking* (question) responses and *Yes* responses.

These assumptions not only give us a way of testing for predictions relating to intonational/contextual effects on the ARDs vs. IRDs distinction (outlined above) but also those relating to other corollary functional differences hypothesized for ARDs vs. IRDs. For instance, the discussion in section 2.1 suggests that assertive vs. inquisitive rising declaratives are associated with systematically different inferences about the degree of speaker vs. addressee epistemic certainty with respect to the relevant proposition. On the one hand, ARDs seem to be associated with an inference that the speaker has higher epistemic certainty about the proposition (e.g. 'John has a sister' for 2d–e) than the addressee. On the other hand, IRDs seem to be associated with an inference that the addressee has higher epistemic certainty than the speaker about the positive answer (e.g. 'John has a sister' for 2a–c) to the issue raised (e.g. whether John has a sister, for 2a–c).[4] These seem to be prominent secondary inferences worth testing more systematically. Therefore, the third prediction to be experimentally tested is formulated as follows: other things being equal (sentence radical, speaker, etc.), ARD interpretations will be associated with higher speaker epistemic certainty than the addressee about the proposition, whereas IRD interpretations will be associated with higher addressee epistemic certainty than the speaker about the positive answer to the issue raised by the rising declarative.

Finally, the existence of potentially different axes of comparison (falling declarative vs. rising polar interrogative) noted in section 2.3 suggests that graded four-way differences in perceived speaker/addressee epistemic certainty will emerge between the four sentence types. Based on the intuition that ARDs often give rise to *tentative* assertions and IRDs often give

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4   The relevant proposition and the issue raised correspond respectively to the content assumed for
    each type of rising declarative. More details about the rationale behind the difference in content
    assumed for assertive vs. inquisitive rising declaratives are postponed until section 7.

rise to *biased* questions, the fourth prediction to be experimentally tested is formulated as follows: other things being equal (sentence radical, speaker, etc.), falling declaratives will be associated with the highest degree of speaker epistemic certainty, ARDs with the second highest, IRDs with the second lowest and polar interrogatives with the lowest degree.

4 EXPERIMENT

In order to test these hypotheses, three perception experiments were conducted. They had the following design: participants were presented with five to eight declarative and polar interrogative sentences (spoken by six speakers) systematically manipulated in their terminal contour intonations (representing a variety of rises and falls). Upon hearing sentences with diverse content, they were asked to answer two types of questions. One was a forced choice task that inquired either about the most likely illocutionary interpretation of the utterance (info-giving vs. info-seeking) or about the most likely follow-up response (*Oh* vs. *Yes*). The other was a range of gradient rating tasks inquiring about the perceived epistemic certainty of the interlocutors, as well as other contextual inferences. Details regarding the experimental designs are presented below.

4.1 Methods

4.1.1 *Participants*   1200 native speakers of American English were recruited as participants (400 for each experiment) from Amazon Mechanical Turk.

4.1.2 *Materials*   Each of the three experiments used partly overlapping sets of sentences that focused on different aspects of the hypothesis. The four sets of sentences used in the experiments are presented in the Appendix. Preference for sonorants and avoidance of obstruents was one consideration in coming up with the sentences. This was in order to facilitate the subsequent prosodic manipulations. Other criteria used for selecting the sentences were as follows:

Set I contained declarative sentences that varied in the likelihood of the content being true in the world, from moderately likely (e.g. *Ellen is married!/?*) to not very likely (e.g. *Maria was in a spaceship to the moon!/?*). These sentences were expected to be compatible with a variety of rising declarative interpretations (both assertive and inquisitive), and differences in the degree of the likelihood of the proposition were expected to introduce diverse interpretative biases. In order to systematically control for the range of content in other dimensions, all sentences concerned information about a third party (*Ellen, Maria,* etc.).

Set II contained sentences that had identical radicals as set I, but were polar interrogatives. They were introduced to enable the stratified, four-way comparison between falling declaratives, ARDs, IRDs and polar interrogatives mentioned in section 3. During the subsequent manipulation procedure, falling declarative and rising declarative stimuli were created from recordings of the set I sentences, and matching polar interrogative stimuli (produced by same speakers) were created from recordings of the set II sentences.

Set III contained declarative and polar interrogative sentences that varied minimally with respect to each other. All had near identical content except for the choice in the subject pronoun/proper noun (e.g. *I'm from Yemen!/?* vs. *You're from Yemen!/?* vs. *Lenny's from Yemen!/?*). These sentences were included to test if content and inferred contexts (in particular, variation in the perceived knowledgeability of the speaker vs. the addressee with respect to the proposition at hand, as hypothesized in section 3) are significant factors in predicting assertive vs. inquisitive interpretations of a given rising declarative.

Finally, Set IV contained four declarative sentences that had non-person subjects (e.g. *It's raining!/?, Armadillos are mammals?*) or were biased toward illocutionary interpretations other than assertions or questions (e.g. sentences with request bias such as *You need to mow the lawn!/?*). They were included in order to ensure that the stimuli represented a variety of content and illocutionary biases. For the purpose of this paper however, we will not dwell much on the results for them and focus more on results for other sets of sentences.

The auditory stimuli for the sentences above were then recorded in a sound-attenuated room. The sentences were produced by six native speakers of American English (three male and three female speakers). Each speaker participated in two recording sessions. During the first recording session, the speaker read through the target sentences as naturally as possible without any prior instructions. During the second, the speaker was asked to produce the sentences in level (flat) terminal contours, aided by a sample recording. The utterances with level terminal contours from the second session were used as the base materials for subsequent acoustic manipulations, after checking that they were comparable to the recordings produced in the first session in terms of their naturalness. Recordings with level intonation serve as ideal bases for creating prosodically manipulated stimuli, as they can control for intonational biases coming from original recording bases, while at the same time preventing manipulation-complicating prosodic features from occurring (cf. Jeong 2016; Jeong & Potts 2016).

The level contours produced by the speakers were then manipulated to create one falling and three rising variants for declaratives and one rising variant for polar interrogatives. The procedure for this was as follows. First, the NPAs (the last pitch accent in an intonational phrase) and the endpoints of the utterances were located. Second, new pitch values were assigned to the endpoints of the utterances. Finally, the pitch values of the NPAs and the new endpoints were interpolated in a linear fashion to produce four types of stimuli for each recording: falling, rise 1, rise 2 and rise 3 (In contrast, only one canonical type of stimuli, rise 3, was created for polar interrogatives.). The new pitch values at the endpoints were 10 st. lower than the NPA for the falling contour, and 6 st., 8 st. and 10 st. higher than the NPA for the rise 1, rise 2 and rise 3 contours, respectively (the slope of the rise incremented by 2 st. at each interval from rise 1 to rise 3).

Following ToBI transcription conventions (Beckman & Ayers 1997), the falling contour corresponded to (!)H* L-L%. The three types of rises corresponded to terminal contours ranging from L* H-H% (steep rise; low rising) to (!)H* H-H% (weaker rise; high rising), with ambiguous rises in between.[5] It was noted that the manipulations in just the final contour could still shift the pitch range of the entire sentence, thereby potentially changing the identity of the NPAs and affecting the pitch configurations of the sentence as a whole. Polar interrogatives and declaratives with the same radical, produced by the same speakers, were also checked to see that they had roughly the same duration and voice quality

5 Previous work note that declaratives may host yet other varieties of rising terminals such as *L L-H% (Ritchart & Arvaniti 2014; Californian uptalks). Since the intonational manipulation used in this study targeted both the phrase accent and the boundary tone for the rising slope, the resulting stimuli did not contain contours that rise only at the very end. Nevertheless, the current manipulation strategy yielded a range of rising intonation that can generate all of the readings considered in (1), while varying along a single dimension, that is, the slope of the rise (and indirectly, the perceived starting position of the NPA).

throughout. This ensured polar interrogative stimuli with rise 3 intonation (+10 st.) and their matching rising declarative stimuli with rise 3 intonation (+10 st.) to be maximally comparable.

All manipulations were done in Praat (Boersma & Weenink 2015), using the built-in PSOLA pitch manipulation program. As an added precautionary measure, all manipulated stimuli were checked for naturalness by two–three native speakers of American English.

4.1.3 *Procedure*

Experiment 1 sought to introduce a wide range of declarative content, and thus included sets I, III and IV sentences. Experiments 2 and 3 focused on establishing a direct four-way comparison between falling declaratives, ARDs, IRDs and polar interrogatives, while controlling for content. They thus included sets I and II sentences. In experiment 1, each participant listened to eight sentences (all the sentences from set I, two randomly chosen sentences from sets III and IV, respectively). In experiments 2 and 3, each participant listened to five sentences (all five sentence radicals from sets I and II). In all three experiments, each sentence radical was presented in a randomly chosen intonation + sentence type combination, among the four to five patterns available (falling declarative, rise 1 declarative, rise 2 declarative, rise 3 declarative and polar interrogative; the last option was available only for experiments 2 and 3). Each stimulus was also presented in a randomly chosen voice among two speaker voices differing in gender. Speaker gender and intonation + sentence type combination were counterbalanced for each participant across five to eight sentences. After listening to each sentence, six questions (summarized in (9)) were posed.

Q1 was a forced choice task that differed between experiments 1 and 2 on the one hand, and experiment 3 on the other. In experiments 1 and 2, Q1 probed participants' illocutionary inferences (Q1-1). In experiment 3, Q1 instead probed participants' inferences about the more likely follow-up response (Q1-2). The rest of the questions were of the same format for all three experiments. Q2 and Q3 inquired about listeners' ratings (from 0 to 100) for the inferred speaker and addressee epistemic certainty with respect to the proposition p. The relevant p was adjusted for each trial; for instance, if the participant heard *Lenny is from Yemen?* (rising 3) in a given trial, the associated Q2 was: 'How certain is the speaker that Lenny is from Yemen?', and Q3 was: 'How certain is the speaker that the addressee knows or thinks that Lenny is from Yemen?'[6] Q4 and Q5 inquired about listeners' ratings (again from 0 to 100) for the inferred speaker politeness and authority (i.e. these questions probed potential perlocutionary and social effects). For space reasons, we will not discuss the results for them in subsequent sections and focus on the results for Q1–Q3.[7] Finally, participants were encouraged to submit additional free format responses at the end of each trial. At the end of the experiment, participants also provided basic demographic information (gender, age, ethnicity, and region). Links to all three experiments can be found in the Appendix. The experiment lasted around 10–15 minutes.

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6 Note that the questions weren't formulated with *whether p* but rather with *that p*; that is, they did not inquire about the general epistemic authority of the interlocutors about a given issue (Gunlogson 2008) but rather about more targeted epistemic certainty about a particular proposition, that is, the positive answer to the issue.

7 The results and visualizations for politeness and authority ratings, which are interesting in their own respects, can be found in the link in the Appendix.

(9) Q0.   Please type in what you just heard. (verification)
     Q1-1.   What is the most likely interpretation of the utterance you heard?
            a.   The speaker is **giving out information** (Assertion)
            b.   The speaker is **seeking information** (Question)
            c.   The speaker is **inviting** (only included in experiment 1)
            d.   The speaker is **requesting** (only included in experiment 1)
     Q1-2.   What is the more likely follow-up response to the utterance you heard?
            a.   **Oh,** I didn't know that.
            b.   **Yes,** didn't you know?
     Q2.   How certain is the speaker that p?
     Q3.   How certain is the speaker that the addressee knows or thinks that p?
     Q4.   How polite did the speaker just sound?
     Q5.   How authoritative did the speaker just sound?
     Q6.   Any other comments?

5 RESULTS

Let us first examine the experimental results for the difference in intonational form between the two types of rising declaratives, as well as the results for other factors that systematically contribute to the disambiguation of the two types of rising declaratives (section 5.1). We will then establish systematic differences in epistemic certainty ratings elicited by the two types of rising declaratives (section 5.2), highlighting the existence of certain codependent functional effects associated with each. All the statistical analyses have been conducted using the *lmerTest* package (Kuznetsova *et al.* 2016) in R (R Core Team 2015).

5.1 *Factors that influence interpretation*

As mentioned in section 3, answers to most likely speech acts (info-seeking; question vs. info-giving; assertion) and answers to more likely follow-up responses (*Oh* vs. *Yes*) can be considered as a good approximation of, or at least a workable stand-in for participants' assertive vs. inquisitive rising declarative interpretations. Therefore, investigating into factors that significantly influence participants' choice for Q1 will help us answer whether there is a systematic difference in form (and other factors) between the two hypothesized types of rising declaratives. A positive answer to this question will go some way toward establishing the core distinction argued for in the paper.

To this end, section 5.1.1 examines the effect of intonation on Q1 responses by fitting mixed effects logistic regression models to the data. The models posit by-speaker random intercepts,[8] and predict participants' responses to Q1 (the main dependent variable) from intonation/sentence-type manipulations and content radicals (two independent variables). Likewise, section 5.1.2 examines the effect of contextual assumptions on Q1 responses by fitting a mixed effects logistic regression model with the same structure to a relevant

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8 By-participant intercepts were initially posited as well, but had to be dropped due to convergence considerations.

subset of the data from experiment 1. The discussion in section 5.1.1 focuses on the 'intonation/sentence-type' predictor and the discussion in section 5.1.2 focuses on the 'content radical' predictor.

5.1.1 *Effects of intonation*   Corroborating the paper's first prediction, intonation turned out to be a significant predictor of ARD vs. IRD interpretations. Steeper rising slopes (i.e. low rising slopes) were significantly more likely to signal IRDs, whereas weaker rising slopes (i.e. high rising slopes) were significantly more likely to signal ARDs. This generalization stemmed from the mixed effects model which reports a four-way intonational distinction among declaratives in predicting participants' illocutionary inferences. According to the model, significantly more assertion interpretations (and fewer question interpretations) for Q1 were elicited in the following order: falling declaratives > ($\beta = 2.98$, $SE = 0.13$, $z = 21.81$, $p < 0.001$) rise 1 declaratives > ($\beta = 0.30$, $SE = 0.08$, $z = 3.46$, $p < 0.001$) rise 2 declaratives > ($\beta = 0.29$, $SE = 0.08$, $z = 3.31$, $p < 0.001$) rise 3 declaratives. Similar results emerged for the model fitted to the data for experiment 3, in which the task for Q1 was switched to predicting the more likely follow-up response. Again, significant (albeit less graded) intonational distinction was reported: rise 2 and 3 elicited the fewest *Oh* responses (i.e. fewer assertive interpretations), rise 1 elicited significantly more *Oh* responses and falling elicited the most *Oh* responses. Full models can be found in the Appendix.

Figure 1 visually demonstrates this state of affairs. Figure 1a plots data from experiments 1 and 2. Sentence type + intonation variation has been plotted on the x-axis, and participants' choices for speech acts have been plotted on the y-axis (in %), with dark bars representing assertion (info-giving) interpretations, and white bars representing question (info-seeking) interpretations (to facilitate the comparison, invitation and request responses (which were small in number) have been omitted from the graph). Figure 1b plots data from experiment 3. This time, participants' choices of the likely follow-up response have been plotted on the y-axis (in %; *Oh*: dark bars, *Yes*: white bars). As can be seen from the two graphs, steeper rises (e.g. rise 3 over rise 1 and rise 2) are associated with more question illocutions and more *Yes* follow-up responses (higher white bars), suggesting more IRD (inquisitive) interpretations. In contrast, weaker rises are associated with more assertion illocutions and more *Oh* follow-up responses (higher dark bars), suggesting more ARD (assertive) interpretations. These patterns seem to corroborate the observation made in the previous literature (Hirschberg & Ward 1992 cf. Poschmann 2008) that assertive uses of rising declaratives are generally characterized by high rising terminals (H* H-H%).

Small differences in results between the two types of tasks (choosing the most likely illocution vs. choosing the more likely follow-up response) are worth mentioning: people were generally more conservative in attributing *Oh* responses than 'assertion' illocution. This is expected, as *Oh*'s competitor *Yes* is a response that is also compatible with a preceding assertion. As noted in section 2.2, *Oh* is compatible solely with previous assertions but *not* with previous questions; in contrast, *Yes* is compatible with both previous questions and assertions (Farkas & Bruce 2010). The experimental design aimed to discourage the potential pairing of *Yes* with ARDs (in order to get a clearer split between assertive vs. inquisitive rising declarative interpretations) by providing a follow-up phrase *didn't you know?* However, this additional phrase might not have been sufficient in fully preventing people from associating *Yes* with an ARD. This can provide at least a partial explanation of the smaller percentage of *Oh* responses compared to 'assertion' responses, although other factors might also have contributed. Nevertheless, the general pattern of

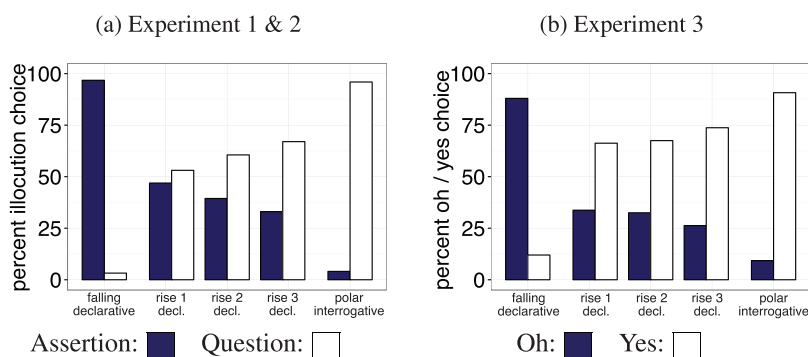(a) Experiment 1 & 2   (b) Experiment 3

Figure 1 The effect of intonation on the interpretation of rising declaratives.

results between the two types of tasks bears a striking resemblance, suggesting that assertive interpretations and *Oh* responses pattern together, and are similarly affected by intonational changes.

While the difference in the intonational contour of a given declarative was a significant predictor of assertive vs. inquisitive interpretations, it also turned out to be a non-categorical predictor. This state of affairs created a contrast with the sentence type + intonational effect of their canonical alternatives: falling declaratives and (rising) polar interrogatives. As can be seen from the left graph in Figure 1, polar interrogatives elicited near-categorical question interpretations (less than 5% assertion responses) and falling declaratives elicited near-categorical assertion interpretations (less than 5% question responses). In contrast, all three types of rises included in the experiment allowed for both assertive and inquisitive interpretations and did not categorically preclude either interpretations.

To recapitulate, the experimental results for intonational effects provide significant evidence toward the existence of difference in forms between the two types of rising declaratives. At the same time, they also demonstrate that the effect of intonation is not categorical, suggesting that other factors may conspire to fully disambiguate between the two possible interpretations of rising declaratives.

5.1.2 *Effects of contextual inferences*   One other salient factor that came into play in the interpretation of rising declaratives was participants' contextual inferences. As mentioned earlier, the effects of contextual inferences were tested by including minimal triplet sentences that varied solely in their subjects (*I* vs. *You* vs. *Lenny*); this variation was expected to elicit varying inferences about speaker vs. addressee knowledgeablity with respect to the proposition. The results indicate that this is indeed a strong predictor of participants' assertive vs. inquisitive interpretations. Sentences starting with *I* (*I'm from Yemen*) were much more likely to be interpreted as an ARD, whereas the sentence starting with *You* (*You're from Yemen*) was much more likely to be interpreted as an IRD, other things being equal (i.e. for the same intonation and speaker). This generalization stemmed from the mixed effects model fitted to a relevant subset of the experimental data from experiment 1 (those concerning the minimal triplet sentences). The model captures the significant effect of the content radical and reports, for instance, that *Lenny's from Yemen* elicits significantly more
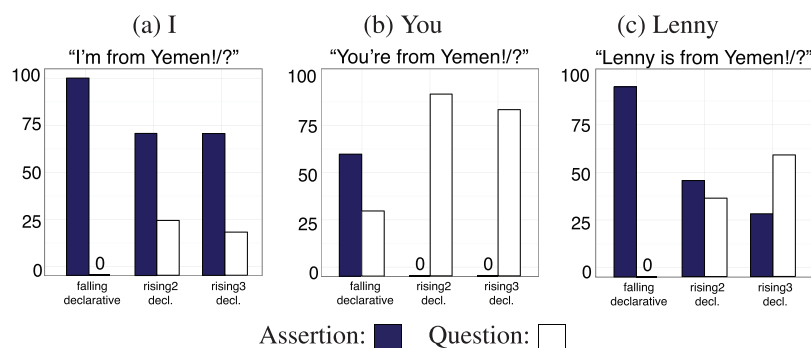
Figure 2 Content effects on the interpretation of rising declaratives.

assertion illocution than *You're from Yemen* ($\beta = 4.74$, $SE = 0.73$, $z = 6.48$, $p < 0.001$) and significantly less assertion illocution than *I'm from Yemen* ($\beta = -1.14$, $SE = 0.30$, $z = -3.80$, $p < 0.001$). Full models can again be found in the Appendix.

This state of affairs is summarized in Figure 2. The x-axes and the y-axes of the three graphs plot the same types of values as in Figure 1.[9] Figure 2a shows that dark bars (assertion interpretations) are the highest throughout all three types of falling and rising declaratives for the sentence *I'm from Yemen*. In contrast, Figure 2b shows that white bars (question interpretations) are the highest throughout the same types of rising declaratives (rising 2 and rising 3) for the sentence *You're from Yemen*. In sum, even when a given pair of sentences was spoken by the same speaker with the same degree of rising intonation (e.g. rising 3 declaratives with +10 st. slope), the one with *I* in the subject position elicited significantly more assertion interpretations, and the one with *You* in the subject position elicited significantly more question interpretations.

As expected, the sentence with the third person proper noun *Lenny* as the subject, that is *Lenny is from Yemen?*, was the one that maximized the effects of non-context related factors such as intonation. Figure 2c demonstrates that for the sentence *Lenny is from Yemen?*, the steeper rise (rising 3) elicited more question interpretations than assertion interpretations (white bar higher than dark bar), whereas the lower rise (rising 2) elicited more assertion interpretations than question interpretations (dark bar higher than white bar). In sum, intonation plays a more significant role in influencing assertive vs. inquisitive interpretation of the sentence *Lenny is from Yemen*, compared to the sentences *I'm from Yemen* and *You're from Yemen*. Such results can be captured if one assumes that inferences about more addressee knowledgeability push listeners toward inquisitive interpretations, whereas inferences about more speaker knowledgeability pushes them toward assertive interpretations (cf. Gunlogson 2008). Since the degree of knowledgeability about the proposition is more likely to be comparable between the speaker and the addressee when the information concerns a third party, this is expected to be the

9　Rising 1 declaratives and polar interrogatives have not been included the graphs because they lacked data points for one or more of the three sentences. Instances of 'invitation' or 'request' interpretations for Q1 have been left out as well, again to facilitate the comparison; they occupied less than 10% of participants' responses.

case that elicits the most amount of ambiguity in its interpretation and is thus most amenable to the disambiguating effects of intonation. In comparison, when there is strong contextual bias (via content such as *I* vs. *You*), it can overcome the effects of intonation.

5.2 *Different discourse effects of the two rising declaratives*

We have so far examined the systematic distinction in form between the two hypothesized types of rising declaratives. While significant, the intonational distinction was not the sole or a categorical determinant of assertive vs. inquisitive rising declarative interpretations, highlighting the confluence of other factors that comes into play in their ultimate disambiguation. In light of this, it would be useful to continue with the assumption that inferences about illocutions and follow-up responses (i.e. participants' answers to Q1) are more directly accessible stand-ins (than particular physical correlates) for participants' assertive vs. inquisitive interpretations of rising declaratives at a given moment. Starting from this assumption, let us now examine whether systematically different inferences about epistemic certainty arise *depending on* whether the participant categorized a given rising declarative as an assertive one vs. an inquisitive one in Q1. This would help reveal whether there exists systematically different sets of codependent functional effects that are associated with respective type of rising declaratives.

To this end, section 5.2.1 examines the speaker epistemic certainty ratings (Q2) and section 5.2.2 examines the relative addressee epistemic certainty ratings (Q3–Q2) by fitting mixed effects logistic regression models to the data. The models posit by-participant and by-speaker random intercepts and predict participants' responses to Q2 (models in section 5.2.1) or their responses to Q3–Q2 (models in section 5.2.2) from experimentally defined sentence types. The 'sentence–types' independent variable is henceforth referred to as 'type+tune' and consists of four factors: falling declaratives (all falling declarative stimuli, which elicited near-categorical Assertion or *Oh* responses in Q1), ARDs (rise 1, 2 and 3 declaratives that elicited Assertion or *Oh* responses in Q1), IRDs (rise 1, 2 and 3 declaratives that elicited Question or *Yes* responses in Q1), and polar interrogatives (all polar interrogative stimuli, which elicited near-categorical Question or *Yes* responses in Q1).[10]

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10 This predictor introduces an abstract distinction (rather than a physical one) between the two types of rising declaratives; the distinction crucially hinges on participants' forced-choice response to Q1 rather than a definitive acoustic distinction. Such a way of classifying sentence-types has been chosen for two reasons: first, we want primarily to see whether certain inferences (e.g. inferences about speaker epistemic certainty) are systematically *contingent* on other inferences (e.g. *Oh* vs. *Yes*) that participants make. Second, given the non-categorical effect of intonation demonstrated in section 5.1.1, we predict that answers to Q1 would get more directly at whether a participant categorized a given rising declarative token as an assertive one vs. an inquisitive one at a given moment; the systematic patterns demonstrated in Figure 3 suggest that this is indeed the case. Alternative models that use intonational distinction (rise 1, rise 2, rise 3) and participants' answers to Q1 as separate predictors can be envisaged. In such models, the effects captured below would manifest as significant interactions between the two types of predictors. For space reasons, discussions about these alternative models are not included; they can be found in the repository accessed via the link in the Appendix.

5.2.1 *Speaker epistemic certainty about the proposition* Do the overlapping ranges of rising declarative tokens elicit different inferences about speaker epistemic certainty, depending on whether they are construed as an inquisitive vs. an assertive rising declarative? Analysis of participants' responses to Q2 (How certain is the speaker that *p*?) in conjunction with their responses to Q1 indicates that the answer is yes. Confirming the hypothesis delineated in section 3, there was a four-way distinction in how *speaker epistemic certainty* is marked, ordered as follows:

(10)   Ratings for speaker epistemic certainty about *p*

<div align="center">Falling Dec > Assertive RD ≫ Inquisitive RD > Polar Int</div>

This generalization stemmed from the mixed effects model fitted to the data from experiment 2 (where the 'type+tune' categorization depended on participants' Assertion vs. Question responses in Q1). The model reports a four-way distinction in speaker epistemic certainty ratings depending on the type+tune (i.e. experimentally defined sentence types). It predicts not only a significant difference between ARDs and IRDs ($\beta = -43.32$, $SE = 1.26$, $t = -34.35$, $p < 0.001$) but also a significant difference between ARDs and their canonical alternatives, falling declaratives ($\beta = 14.86$, $SE = 1.34$, $t = 11.04$, $p < 0.001$), as well as between IRDs and their canonical alternatives, polar interrogatives ($\beta = -8.23$, $SE = 1.22$, $t = -6.72$, $p < 0.001$), in their Q2 ratings.

The same four-way type+tune distinction shown in (10) was also predicted by the model fitted to the data from experiment 3 (where the 'type+tune' categorization depended on participants' *Oh* vs. *Yes* responses in Q1). Both models thus seem to corroborate the generalization that the four type+tunes (i.e. falling declaratives, ARDs, IRDs and polar interrogatives) are associated with systematically different inferences about speaker epistemic certainty. Since each type+tune that were tested in the experiments shared an identical range of radicals (e.g. *Ellen is married!, Ellen is married?, Is Ellen married?*) as well as an identical range of speakers (included as random effects), we are able to conclude that different type+tunes are associated with intrinsically different baselines in speaker epistemic certainty, when the associated content and speaker is held constant. Full models can again be found in the Appendix.

Figure 3 visually captures this generalization. The y-axes of the graphs in Figure 3 represent mean ratings (from 0–100) and standard errors (indicated by error bars) on speaker epistemic certainty about *p*, that is participants' responses to Q2. Figure 3a plots data from experiment 2: the x-axis represents participants' choices on the most likely illocution (i.e. responses to Q1) between assertion (info-giving) and question (info-seeking). Figure 3b plots data from experiment 3: the x-axis here represents participants choices on the most likely follow-up response (i.e. responses to Q1), between *Oh* and *Yes*.[11] The polar interrogative bars (lightest grey) are only on the right sides of the x-axes representing question interpretations, and the falling declarative bars (darkest grey) are only on the left sides of the x-axes representing assertion interpretations, as they almost always elicited

11 While similar data patterns emerge for experiment 1 as well, its data will not be considered for the next few sections. This is because experiment 1 did not test for the full range of matching polar interrogative sentences, such that a controlled four-way comparison between the four type+tune categories cannot be established.
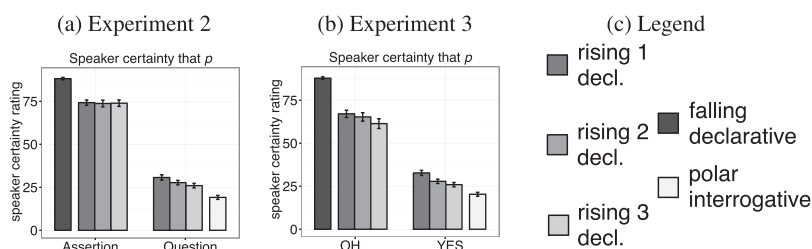
Figure 3 Speaker epistemic certainty about *p*: mean and standard errors.

question vs. assertion interpretations, respectively.[12] In contrast, the three types of rising declaratives (rise 1, rise 2, rise 3) figure both in the assertion side and in the question side of the x-axis, as all three types of rising declaratives elicit some amount of both assertive and inquisitive interpretations.

Both graphs in Figure 3 demonstrate that ratings for speaker epistemic certainty were the highest for falling declaratives (leftmost darkest grey bars) and the second highest for rise 1, rise 2 and rise 3 declaratives when they were construed as ARDs (the cluster of intermediate grey bars on the left side of x-axes, labeled as 'Assertion' or 'OH') by the participants. On the other hand, speaker epistemic certainty ratings were significantly lower for the same rise 1, rise 2 and rise 3 declaratives when they were construed as IRDs (the cluster of intermediate grey bars on the right side of x-axes, labeled as 'Question' or 'YES') by the participants, and they were the lowest for polar interrogatives (rightmost lightest grey bars). In sum, Figure 3 visually reflect the generalization drawn in (10) and the accompanying statistical results.

The data patterns illustrated in (10) and Figure 3 highlight the two dimensions of comparison that come into play in the semantic configurations of rising declaratives. First, a fundamental divide can be observed between the two types of rising declaratives argued for in this paper. Whereas ARDs are associated with fairly *high* degrees of speaker epistemic certainty (well above the 50/100 threshold and closely tracking the mean ratings for falling declaratives), IRDs are associated with much *lower* degrees of speaker epistemic certainty (well below the 50/100 threshold and closely tracking the mean ratings for polar interrogatives). Considering that assertive and inquisitive rising declaratives consist of overlapping range of stimuli (although as noted in section 5.1.1, weaker rises are significantly more often associated with the former, and steeper rises with the latter), participants' categorization of a given rising declarative between an assertive one and an inquisitive one in Q1 (based on a variety of factors such as inferred contexts and intonation) seems to have played a crucial role in eliciting fundamentally different inferences about perceived speaker epistemic certainty on the proposition.

There also exists another axis of comparison that can be drawn for the two types of rising declaratives. Both the assertive and the inquisitive rising declaratives seem to elicit different speaker epistemic certainty ratings from their respective alternatives.

12 In rare occasions, falling declaratives were interpreted as questions and polar interrogatives as assertions. These data points are omitted from graphs as they are sparse in number and characterized by wide error bars.

Whereas ARDs are associated with significantly *lower* speaker epistemic certainty than their potential alternative, falling declaratives, IRDs are associated with significantly *higher* speaker epistemic certainty than their potential alternative, polar interrogatives. In sum, differences in respective baselines seem to bring about opposite effects on speaker epistemic certainty for the two types of rising declaratives: assuming that falling declaratives and polar interrogatives standardly signal basic assertions and questions, ARDs come to signal lower speaker epistemic certainty than the one signaled by baseline assertions, whereas IRDs come to signal higher speaker epistemic certainty than the one signaled by baseline questions. Thus, corroborating the initial hypothesis, the two types of rising declaratives seem to have the function of equipping speakers with more granulated ways of marking epistemic certainties in questions and assertions, enabling them to signal more nuanced speech acts such as tentative assertions and biased questions.

5.2.2 *Relative addressee epistemic certainty about the proposition*   We have seen that participants' categorizations of rising declaratives, oscillating between 'assertive' and 'inquisitive' interpretations in Q1, give rise to significantly different inferences about speaker epistemic certainty about the proposition. Do assertive vs. inquisitive rising declaratives bring about systematically different inferences about perceived addressee epistemic certainty as well? Analysis of participants' responses to Q3 (How certain is the speaker that the addressee knows or thinks that *p*?), in conjunction with their responses to Q1 and Q2, indicates that the answer is yes.

With respect to inferences about addressee epistemic certainty, the more relevant information seems to be the *relative* epistemic certainty of the addressee *compared* to the speaker (i.e. whether the addressee is construed as having more epistemic authority on a certain piece of information than the speaker), rather than the raw epistemic certainty of the addressee (cf. Gunlogson 2008). A given participant's rating for Q3 (addressee epistemic certainty on *p*) *minus* his/her rating for Q2 (speaker epistemic certainty about *p*) for a given token, that is Q3–Q2, henceforth called *relative addressee epistemic certainty* values, can tap more directly into such inferences. There was a three-way distinction in how this value (as construed by the speaker) was marked, ordered as follows:

(11)   Ratings for relative addressee epistemic certainty about *p*

PolAR INT (>) INQUISITIVE RD ≫ ASSERTIVE RD > FALLING DEC

This generalization stemmed from two mixed effects models fitted to the data from experiments 2 and 3, respectively. Both models support a three-way distinction in relative addressee epistemic certainty ratings depending on the type+tune. For instance, the model fitted to the data from experiment 2 predicts a significant difference in Q3–Q2 values not only between ARDs and IRDs ($\beta = 33.33$, $SE = 1.90$, $t = 17.47$, $P < 0.001$), but also between ARDs and their canonical alternatives, falling declaratives ($\beta = -13.02$, $SE = 2.13$, $t = -6.11$, $P < 0.001$). However, it does not predict a significant difference between IRDs and their canonical alternatives, polar interrogatives ($\beta = 3.23$, $SE = 1.95$, $t = 1.65$, $P = 0.09$), although Figure 4 suggests that there may be a subtle difference between the two. Following the same type of reasoning we adopted for (10), we are again able to conclude that different type+tunes are associated with intrinsically different baselines in relative addressee epistemic certainty. Full models can again be found in the Appendix.
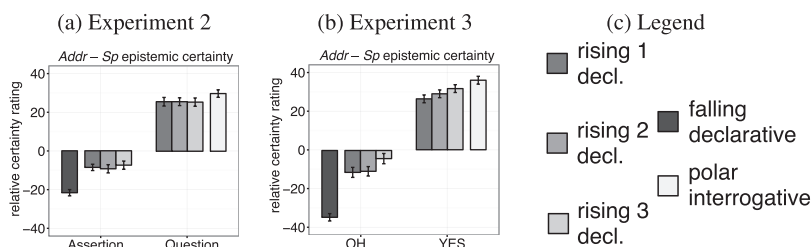
Figure 4 Relative addressee epistemic certainty on *p*: mean & standard errors.

Figure 4 further visually captures this state of affairs. Color-coded bars as well as the x-axes of the two graphs represent the same types of values as in Figure 3. The y-axes here represent relative addressee epistemic certainty ratings (means and standard errors) for experiments 2 (Figure 4a) and 3 (Figure 4b), respectively. Given the type of values plotted (Q3–Q2), we can easily observe that minus values carve out cases where the speaker was construed to have more epistemic authority about the relevant proposition than the addressee, and plus values carve out cases where the addressee was construed to have more epistemic authority about the proposition than the speaker. Corroborating our intuition, all inquisitive interpretations (polar interrogatives and IRDs) are associated with more addressee epistemic certainty than the speaker (i.e. plus values), and all assertive interpretations (falling declaratives and *ARDs* are associated with more speaker epistemic certainty than the addressee (i.e. minus values). These data patterns thus provide significant empirical support to previous theoretical studies that introduced the notion of '(addressee) epistemic authority' in accounting for the questioning uses of rising declaratives (Gunlogson 2008).[13]

Overlaid on top of this fundamental distinction (plus values for inquisitive interpretations, minus values for assertive interpretations), we also observe a more fine-grained four-way distinction summarized in (11). Falling declaratives (darkest grey bars) are associated with the lowest relative addressee epistemic certainty, and ARDs (cluster of intermediate grey bars labeled as 'Assertion' or 'OH') are associated with significantly higher relative addressee epistemic certainty than falling declaratives. In comparison, IRDs (cluster of intermediate grey bars labeled as 'Question' or 'YES') are associated with fairly high relative addressee epistemic certainty, and polar interrogatives (lightest grey bars) are associated with slightly higher relative addressee epistemic certainty than IRDs (although the difference between them is not significant). Importantly, this was not because the raw values of addressee epistemic certainty was lower for IRDs; if anything, they were slightly higher than those for polar interrogatives.[14] However, as we saw in (10), IRDs were associated with significantly higher *speaker* epistemic certainty, and this rendered their *relative* addressee epistemic certainty values slightly lower than polar interrogatives. In sum, *assertive* and *inquisitive* rising declaratives seem to signal a reduction in epistemic disparity between the speaker and the addressee compared to their canonical alternatives.

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13 Although as mentioned earlier, the relevant factor seems to concern not the global epistemic authority of the addressee about a given issue (i.e. whether *p*) but addressee epistemic certainty about a particular proposition (i.e. that *p*).

14 The corresponding plots can be found in the link in the Appendix.

5.3 *General discussion*

Let us take stock of the experimental results presented so far. As hypothesized, the results provide a range of evidence that support the existence of two distinct types of rising declaratives: assertive and inquisitive. First, they indicate that the two types of rising declaratives are associated with different intonational forms (section 5.1.1): whereas ARDs favor weaker rising slopes (alternatively, high rises; i.e. H* H-H%), IRDs favor steeper rising slopes (alternatively, low rises, which also characterize English polar interrogatives; i.e. L* H-H%).

At the same time, they also suggest that listeners make the ultimate distinction between assertive vs. rising declaratives not just via intonation, but also via a host of other factors, the most prominent one being the construed contextual information about speaker vs. addressee knowledgeability about a given proposition (section 5.1.2; probed via differences in the content in the experiment). The results thus corroborate the intuition that emerged from examining (1)–(3) in section 2, namely that certain types of content and/or prior contexts strongly push the listeners toward one type of rising declarative interpretation over the other.

One way of capturing this confluence of intonation and other factors is to posit an abstract intonational distinction. It is widely known that speakers have different baselines in their pitch range and variability, such that a given pitch excursion can be considered as a weak rise for someone with a generally wide pitch range, vs. a steep rise for someone with a generally narrow pitch range. Given this state of affairs, it is likely that the boundary between the two types of intonational configurations that signal assertive vs. inquisitive rising declarative is malleable and heavily dependent on the speaker. In the absence of more information about respective speakers in the experiment, rises with the same acoustic profile paired with different contents/contexts (that either favor assertive or inquisitive interpretations) could have been interpreted as two different types of rises: the one associated with assertive rising declaratives vs. the one associated with inquisitive ones.

In sum, the experimental results support a nuanced distinction in form (between the two types of rising declaratives) that is sensitive to a variety of factors that listeners make use of.

The experimental results also point toward the existence of a core functional distinction between the two types of rising declaratives. In particular, the results revealed two distinct sets of codependent discourse effects: assertion illocutions, follow-ups via *Oh*, higher speaker epistemic certainty ratings about p (the relevant proposition) than the addressee, etc. all patterned together on the one hand, and question illocutions, follow-ups via *Yes*, higher addressee epistemic certainty about p than the speaker, etc. all patterned together on the other (section 5.2). Combined with the observation that the former range of effects is strongly correlated with weak/high rises, whereas the latter range of effects is strongly correlated with steep/low rises (i.e. distinction intonations; section 5.1.1), this systematic functional distinction lends further support to the core division argued in the paper.

Among these two sets of effects, inferences relating to epistemic certainty were also shown to form a graded, highly systematic four-way distinction when compared with the effects of two other sentence types, falling declaratives and polar interrogatives.[15] These patterns are summarized in one place in Table 1.

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15 It is possible that Q2 and Q3 made inferences about the interlocutors' epistemic certainty highly salient to participants, further amplifying the latent systematic distinction between the four sentence types.

Table 1   Summary of the experimental findings

Intonation and sentence type	Speech acts	*Speaker* epistemic certainty	*Relative Addr* epistemic certainty
Falling declaratives		Very high	Very low
	Assertion		
Assertive rising declaratives		High	Low
Inquisitive rising declaratives		Low	High
	Question		
Polar interrogatives		Very low	(Very) high

The four-way distinction captured in Table 1 brings to the fore the core contrast between the two types of rising declaratives. Often evoking two fundamentally different speech acts, they seem to endow the respective speech acts with opposite kinds of flavors. Whereas ARDs often end up having the function of signaling *less* certain (i.e. tentative) assertions, IRDs often end up having the function of signaling *more* certain (i.e. biased) questions (compared to baseline assertions and questions, signaled by falling declaratives and polar interrogatives, respectively).

To recapitulate, the experimental results presented in section 5 enabled us to conduct a direct and more controlled comparison between the two types of rising declaratives. As hypothesized, the results corroborate the existence of a systematic intonational and functional distinction between assertive and inquisitive rising declaratives, highlighting the contrasts in possible discourse effects that can be associated with them. The remaining issue at this point is figuring out the exact nature of the core conventions associated with assertive vs. inquisitive rising declaratives, such that they can systematically derive the two contrasting ranges of discourse effects that have been experimentally elucidated. The subsequent section addresses this issue by providing a formal analysis of the conventional effects of assertive vs. inquisitive rising declaratives.

6 SEMANTIC AND PRAGMATIC ANALYSIS: PREVIOUS WORK

The paper's analysis of the two types of rising declaratives is based on a critical synthesis of existing approaches. In particular, the experimental results presented in section 5 generate additional data against which existing theories of rising declaratives can be evaluated. Examining how these approaches fare in accounting for the new experimental data as well as the core examples in (1) will give insights into how their strengths can be maintained in the new analysis, as well as how their weaknesses can be addressed. Since an exhaustive literature review on the topic of rising declaratives is beyond the scope of this paper, this section focuses on examining approaches that have strong connections with the paper's ultimate analysis. Before embarking on this review however, let us first go over the basic components of the discourse context that many of the relevant analyses posit and will figure in the paper's ultimate analysis as well.

6.1 Basic components of the context

The Lewisian conception of the discourse (Lewis 1979), in which updates to various contextual information are kept track of in the conversational scoreboard, has often been adopted to capture the conventional effects of sentence types and the associated discourse moves. The set of contextual elements that make up this conversational scoreboard has undergone significant enrichments since its original conception, in particular via the works by Farkas & Bruce (2010) and Malamud & Stephenson (2015). (12) summarizes the context components posited by Malamud & Stephenson (2015), which in turn have been adapted from Farkas & Bruce (2010), as well as a range of other previous work cited in (12). The paper will henceforth adopt the notational conventions used in the study by Malamud & Stephenson (2015) when referring to respective elements, bearing in mind that each of the notions themselves have longer history and have occasionally been referred to with different labels.

(12) a. **Common ground (CG)**: set of propositions mutually and publicly agreed upon by participants; its intersection is the context set *cs* (Stalnaker 1978)
   b. **Table**: stack of issues raised (Farkas & Bruce 2010); cf. stack of Questions Under Discussion (Ginzburg 1996; Roberts 1996; Büring 2003)
   c. **DC_X** (commitment set of the participants): set of propositions that the participant X has publicly committed to during the conversation up to the relevant time (Hamblin 1971; Gunlogson 2003)
   d. **CG*** (projected set): set of possible future CGs (Farkas & Bruce 2010)
   e. **DC_X*** (projected commitment set): set of propositions that the interlocutor X is expected to become committed to in the normal course of conversation (Malamud & Stephenson 2015)

The most fundamental building blocks of the context, which many dynamic accounts of speech acts draw on, are the now familiar notions of CG (Stalnaker 1978) and Table (Farkas & Bruce 2010; cf. Ginzburg 1996). Farkas & Bruce (2010) have claimed that two main forces, adding new issues on the Table and resolving them (i.e. emptying the Table) in a way that increases the CG, govern many conversational exchanges.

In addition to these basic units of context, a few more components have been proposed: Gunlogson (2003) has argued that in order to better capture certain conversational moves, we need a way of keeping track of not just the joint commitments of the participants (i.e. CG), but also the individual commitments of each participant (cf. Hamblin 1971). Consequently, the notion of the commitment set of the participant X, DC_X, has been introduced.

Relatedly, Farkas & Bruce (2010) have argued that in order to more directly connect the individual commitments, the Table and the CG, as well as explain certain anticipatory discourse moves, we need the notion of a projected set (potential future CGs; CG*). The projected set is a device that anticipates possible future developments of the conversation. It can be predictably calculated from the Table and the current CG in the following way: the proposition(s) that have been added as an issue to the Table are (each) added to the current CG to yield a set of possible future CGs. For instance, an issue on the Table with content p would update the projected set to $\{s_1 \cup \{p\}\}$, where s_1 is the CG before the utterance p. In comparison, an issue on the Table with content $\{p, \neg p\}$ would update the projected set to $\{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$. The introduction of individual commitment sets as well as the projected set enabled Farkas & Bruce (2010) to capture the ways in which the same type

of reactions (e.g. confirmation via *yes*) to assertions and polar questions generate different discourse effects.

In addition to the projected set, yet another projected component has been posited: the projected commitment set (Malamud & Stephenson 2015). The projected commitment set (DC_X*) is analogous to the projected set ($CG*$), in that it is anticipatory in nature. However, unlike the $CG*$, which can be automatically derived from the Table and the current CG, the DC_X* *cannot* be predictably derived from other components of the context and thus figures as a truly independent component. One crucial characteristic of this set is that, upon ratification from the addressee, the projected commitment (of the speaker or of the addressee, depending on X) is automatically added to that interlocutor's actual commitment set. Positing the notion of DC_X* enabled Malamud & Stephenson (2015) to capture subtle differences in the discourse effects of a variety of marked sentence types such as positive/negative tag interrogatives.

6.2 *Related approaches*

Having looked at the core elements of the extended Lewisian model of the discourse context, let us examine existing works on rising declaratives that partly or substantially adopt these contextual elements. As noted in the introduction, these can be divided into two main types: ones that adopt a unifying approach, and ones that don't.

6.2.1 *Malamud & Stephenson's (2015) approach*

Malamud & Stephenson's (2015) analysis can be considered as a unifying approach to rising declaratives. Although they do not explicitly frame their analysis in this way, the range of data covered suggests that they aim to account for both the questioning uses of rising declaratives such as (1c) *The flight leaves at 4pm?*, as well as the more assertive uses of rising declaratives such as (1d) *I speak Ladino?* (repeated in (13)) using a single mechanism. Assuming the elements of context outlined in (12) and building on the framework by Farkas & Bruce (2010), they analyze the core effect of rising declaratives as adding the proposition p to the projected commitment set of the speaker ($DC_{Sp}*$), as well as adding a contextually determined metalinguistic issue, MLI^p, to the Table (Malamud & Stephenson 2015; cf. Ginzburg 1996). The metalinguistic issue associated with p can target any aspects of the utterance as well as the resulting speech act, as long as it is contextually inferrable by the listener. For example, the MLI^p most likely associated with (1d) would be: *Is p (the proposition that I speak Ladino) a relevant enough answer to your question?*

(13)   A: Do you speak Spanish?
       B: *I speak Ladino?* (repeated from (1d))

The latter aspect of Malamud & Stephenson's (2015) analysis (adding MLI^p to the Table) has the advantage of being able to explain the core mechanism underlying many uses of ARDs. It also seems to be well suited to explaining the experimental results for ARDs, especially the part in which ARDs are shown to be associated with significantly lower speaker epistemic certainty about the proposition than falling declaratives. Assuming that falling declaratives do not add any metalinguistic issue to the Table (it just adds the proposition p to the Table), such results are expected, as adding a metalinguistic issue on p to the Table will often end up signaling the speaker's uncertainty about some issue relating to p.

However, the former aspect of the analysis (adding *p* to the *projected* speaker commitment set) is both too strong in accounting for cases that the paper has labeled as IRDs and too weak in accounting for cases labeled as ARDs. On the one hand, positing such a move cannot predict the contradictory uses of rising declaratives such as (1a) *I was wrong and I should apologize?* (repeated in (14)). As mentioned earlier, one consequence of adding *p* to the speaker's projected commitment set is that, upon ratification from the addressee, *p* automatically gets added to the speaker's actual commitment set. Thus, in example (1a), if the addressee *A* ratifies *p* (*B* should apologize) by reiterating her previous statement, Malamud & Stephenson's (2015) approach would predict *p* to necessarily enter *B*'s actual commitment set. However, *B*'s response in (1a), *No way*, suggests that even after the addressee explicitly commits to *p*, the speaker of the rising declarative can follow it up with ¬*p*, preventing *p* from entering into the CG. In sum, certain questioning uses of rising declaratives do not seem to commit the speaker at all (projected or otherwise) to the proposition *p*. (Farkas & Roelofsen 2017 make a similar point about Gunlogson's 2008 account; see section 6.2.4 for more details.)

(14) A: Please apologize to him.
     B: *I was wrong and I should apologize*? No way. (repeated from (1a))

(15) A: Do you know if John has a close female relative?
     B: (Um...) *John has a sister?*
     A: *Oh*, I didn't know that. (repeated from (4))

On the other hand, positing projected speaker commitment cannot predict the felicity of *Oh* responses to ARDs noted in (4) *John has a sister?* (repeated in (15)). As mentioned earlier, *Oh* signals a dependent commitment of the speaker, which strongly suggests that the commitment of the previous speaker (i.e. in the case of (15), the speaker of the rising declarative, *B*) is categorical. If *B*'s commitment had been a projected one in (4), we would expect it to be dependent on *A*'s confirmation (via *Yes* or other means). However, *A*'s actual reply *Oh* suggests that the direction of dependency is the other way around: it seems to be *A* who is dependent on *B*'s commitment, leading us to conclude that *B*'s initial commitment to the proposition that John has a sister via the rising declarative must have been categorical.

In sum, by trying to unify two fundamentally different speaker commitment statuses associated with assertive vs. inquisitive rising declaratives, Malamud & Stephenson's (2015) analysis seems to have run into issues in capturing the significant difference in subsequent discourse states generated by the two. In a similar vein, being a unified approach, the analysis cannot account for the systematic formal/functional distinction between the two types of rising declaratives that was experimentally observed in section 5.

6.2.2 *Westera's (2013; 2017) approach* Westera's (2013; 2017) analysis is another instance of a unifying approach to rising declaratives. Westera (2017) provides a compositional account of the contribution of the rising intonation and the declarative syntax, further developing the core ideas in the study by Westera (2013). Under this analysis, the declarative syntax signals the speaker's intention to add the proposition to the CG, and the rising intonation (the entire terminal contour in the study by Westera 2013, the boundary tone H% in Westera 2017) signals the speaker's belief that she has potentially violated one (or more) of the Gricean conversational maxims. In addition, the steepness

of the rising tune is analyzed as indicating the speaker's emotional activation, such that violations of more serious maxims (e.g. maxim of quality) are expected to be signaled by steeper rises.

(16)   Was John at the party?   (17)   (English tourist in a French café)
        Well he was planning to go?   *I'd like... err... je veux... coffee?*

Westera's (2017) analysis has the advantage of being able to unify diverse uses of rising declaratives noted in (16), (17), and (13). The rising declarative in (16) can be analyzed as signaling a violation of the maxim of relevance. Likewise, (17) can be analyzed as signaling a violation of the maxim of manner and, (13), the maxim of quantity (i.e. uncertainty about whether the answer is sufficient enough).

More generally, the analysis seems to excel at capturing diverse examples of ARDs, similar to Malamud & Stephenson's (2015) approach. Positing speaker uncertainty about the observance of conversational maxims can capture the speaker tentativeness associated with ARDs, again capturing the experimental results on speaker epistemic certainty (relatively lower ratings than those of falling declaratives but crucially not to the point of being inquisitive). One may even envisage an account in which the two analyses complement each other: Westera (2017) can provide the most likely candidates for MLI^ps, formulated around conversational maxims (see section 7.1.4 for an application).

In addition to examples like (16)–(17), which are all instances of ARDs, Westera (2013, 2017) extends the same analysis to account for the cases of IRDs as well: these are analyzed as a particular subset of the general phenomenon in which the rising intonation specifically signals a violation of the maxim of *quality*; that is, it signals that the speaker's epistemic base does not guarantee the truth of the proposition. Combined with other assumptions in the analysis, this results in a correct prediction that inquisitive uses of rising declaratives are associated with steeper rises (a prediction that has been experimentally corroborated in this paper, in section 5.1.1): since the maxim of quality is assumed to be the most important maxim, its violation is expected to elicit higher emotional activation of the speaker, and consequently, steeper rises.

At the same time, the unifying aspect of this move runs into roughly the same kinds of problems as Malamud & Stephenson (2015) mentioned in section 6.2.1. For instance, the assumption that the declarative component of the rising declaratives always signals the speaker's intention to add the proposition to the CG (even in inquisitive uses) does not generate correct predictions for incredulous or contradictory cases of IRDs in (14).

In sum, Westera's (2013; 2017) account seems to provide further insights to cases of ARDs, but again doesn't seem to be able to fully capture the fundamental distinction between assertive and inquisitive rising declaratives.

6.2.3 *Gunlogson's (2003; 2008) approach*   Gunlogson's (2003) analysis can be considered as a non-unifying approach. Gunlogson (2003) focuses on questioning uses of rising declaratives and leaves the assertive uses outside the domain of her analysis. According to her analysis, rising declaratives have the effect of attributing the commitment to the proposition p to the *addressee*. In this sense, both rising and falling declaratives incur commitments to p, but the former attributes it to the hearer whereas the latter attributes it to the speaker.

In casting a backdrop for this core analysis, Gunlogson (2003) also moves beyond characterizing rising declaratives with their bias toward a particular answer and observes

that they are licensed only when certain contextual preconditions hold (the 'contextual evidence condition', briefly mentioned in section 2). Gunlogson (2003) argues that in order for rising declaratives to be licensed as felicitous questioning uses, there has to be some kind of public evidence that the addressee has committed to, or is likely to commit to, the positive answer p to the question raised by the rising declarative.

Gunlogson's (2003) attributive account has the advantage of being able to capture the contradictory uses of rising declaratives (such as (1a)). This is because associating the commitment to p with the hearer (rather than the speaker) opens up the possibility for the speaker to commit to $¬p$ in the subsequent discourse. More generally, the account is ideally suited for 'echo' uses of rising declaratives (cf. Poschmann 2008), whereby the context is such that the addressee has already committed to p or is strongly indicative of being willing to commit to p. In sum, Gunlogson's (2003) analysis is well suited for capturing examples such as (1a) *I was wrong and I should apologize?* or (1b) *John has a sister?*. However, the account has been known to encounter difficulty in explaining other questioning uses of rising declaratives such as (1c) *The flight leaves at 4pm?*, in which there isn't yet any public contextual evidence that the addressee is biased toward the positive answer p.

Gunlogson (2008) addresses this problem. Again focusing on questioning uses, Gunlogson (2008) now turns to what she calls 'Initiating Declarative Questions' (IDQs), that is rising declaratives that seem to function as more out of the blue questions, as in (1c). As mentioned earlier, she posits a more nuanced contextual condition in order to accommodate these IDQs: IDQs are analyzed as *obtaining* question interpretations when the epistemic authority of the speaker is construed as being lower than the addressee, such that the speaker's commitment to the proposition p is construed as being *contingent* on the addressee. Such an analysis seems ideally suited for explaining the experimental results for IRDs; in particular, it can capture (perhaps with minor modifications)[16] the part in which IRDs were consistently associated with higher relative addressee epistemic certainty about p than the speaker (i.e. plus values for Q3–Q2; section 5).

However, the associated theoretical move that Gunlogson (2008) makes to capture this observation raises some issues. Gunlogson (2008) characterizes questioning uses of rising declaratives as incurring speaker's *contingent* commitment (similar to Malamud & Stephenson's 2015 projected commitment). By shifting the orientation of the commitment to the speaker, Gunlogson (2008) is able to capture confirmative questions like (1c) which were difficult to explain using her earlier account that categorically attributes the commitment to the addressee. However, this resolution seems to have come at a cost, as the new account encounters difficulty in addressing the data that her earlier account (Gunlogson 2003) captured more easily: namely, the contradictory questioning uses of rising declaratives, such as (1a). Similar to the problem encountered by Malamud & Stephenson's (2015) account, attributing the commitment to p to the speaker (albeit *contingent* on the addressee) cannot predict cases where the speaker is not committed at all to p (contingent or otherwise) and can thus give a follow-up assertion of $¬p$ even after the addressee commits to p.

16 As mentioned earlier, what is relevant seems to be the addressee's epistemic certainty about a particular proposition, rather than more general epistemic authority about a relevant issue.

6.2.4 *Farkas & Roelofsen's (2017) approach*   Farkas & Roelofsen's (2017) analysis is another example of the non-unifying approach to rising declaratives. Farkas & Roelofsen (2017) explicitly mention that they will only focus on questioning uses of rising declaratives, and exclude uses such as (1d) and (1e) from their analysis. Couched within the inquisitive semantics framework, they analyze rising declaratives as having the same content as polar interrogatives with the same radicals (both have non-trivial inquisitive content but trivial informative content; the former comes to have such content via the rising intonation which is analyzed as playing a role in the semantic composition) and having the general conventional effect of adding such content to the Table.

However, the former (rising declaratives) differ from the latter in that they are associated with marked conventions of use that signals zero to low credence level of the speaker toward p. More generally, Farkas & Roelofsen (2017) analyze different kinds of 'biased questions' as adding the content of the sentence radical to a list of possibilities that the speaker signals having evidence for. To distinguish between different kinds of bias, credence levels toward p vs. $\neg p$ are posited.

Farkas & Roelofsen's (2017) account has the advantage of generating correct predictions about the discourse effects of a wide range of IRDs. This is achieved by treating the content of the rising declaratives as being equivalent to polar interrogatives rather than falling declaratives, contra other approaches that choose the latter option (Gunlogson 2008; Westera, 2013; Malamud & Stephenson 2015): since no speaker commitment to p is signaled, and since the content of the type $\{p, \neg p\}$ is added to the Table[17], the discourse effects of both the contradictory cases (e.g. (1a)) as well as the confirmative (e.g. (1c)) cases (e.g. their incompatibility with *Oh* responses; their lack of speaker commitment; the availability of the speaker to commit to $\neg p$ for contradictory uses) can be captured without difficulty. Accounts that posit the content of type p for IRDs would have difficulty capturing some of these effects (see section 7.2 for more details).

Farkas & Roelofsen's (2017) account also fares well in explaining the experimental results for IRDs, especially the part in which IRDs are consistently associated with low speaker epistemic certainty about p (close to that of polar interrogatives). Since an inquisitive content of type $\{p, \neg p\}$ instead of an informative content of type p is added to the Table, the speaker is naturally assumed to have much lower epistemic certainty about p, and the ratings for IRDs are expected to resemble that of polar interrogatives.

Finally, Farkas & Roelofsen (2017) are able to streamline the basic vs. special effects of rising declaratives in a non-stipulative way: within the framework of inquisitive semantics, they are able to unify the core discourse effects shared by all sentence types (adding their respective content to the Table and their informative content to the commitment set of the speaker) and attribute additional special discourse effects only to marked sentence types such as rising declaratives and tag questions.

The analysis by Farkas & Roelofsen (2017) brings to the fore an issue that has so far not received much attention. At least a subset of IRDs (especially contradictory and incredulous uses) seem to signal a dual dimension of bias; not just the addressee-attributed or the evidential bias toward the positive answer p, but also the epistemic bias (relating to speaker's pre-existing private belief) toward the negative answer $\neg p$ (cf. Romero & Han 2004;

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17 More precisely, $\{p, \neg p\}^{\downarrow}$ (downward closed set of information states) is added to the Table (cf. for falling declaratives, $\{p\}^{\downarrow}$ is added to the Table).

Sudo 2013). However, other types (e.g. confirmatory uses) only seem to signal positive bias (often that of the speaker). Farkas & Roelofsen (2017) provide one way of deriving this divergence in biases from a single set of conventions. Their core assumption is that the context disambiguates which interval of speaker credence, between zero (contradictory questions) to low (confirmatory questions), has been signaled. The analysis to come entertains an alternative way of reconciling the two uses by making use of the addressee's projected commitments, instead of the speaker's evidenced possibilities.

6.2.5 *A brief summary and some desiderata*   The four approaches examined in this section seem to fare well in addressing certain aspects of the intuitive and experimental data but not others. The unifying approaches by Malamud & Stephenson (2015) and Westera (2013, 2017) capture the data on ARDs in intuitive ways but run into a few problems by glossing over meaningful distinctions between the two types of rising declaratives.

In comparison, non-unified approaches to rising declaratives such as the studies by Gunlogson (2003, 2008) and Farkas & Roelofsen (2017) succeed in providing targeted insights on IRDs but leave open the question of what the full landscape of rising declaratives should look like.

Finally, neither types of approaches have established direct connections between differences in intonational properties (i.e. different types of rises) and semantic distinctions that may arise from them (cf. Westera 2013). The analysis presented below addresses these gaps, while also synthesizing many existing insights from these previous work.

7 SEMANTIC AND PRAGMATIC ANALYSIS: A NEW APPROACH

This section presents a new analysis of rising declaratives that aims to combine the strengths of previous approaches and capture the experimental patterns presented in the first half of the paper. It must be noted that the goal of the analysis is to provide a general direction which a successful account of rising declaratives should move toward, rather than to fully resolve all issues associated with the phenomenon (see sections 7.1.4 and 7.2.5 for a discussion of a few remaining issues).

Based on the experimental results from section 5, this paper argues that there exist two distinct phenomena that need to be accounted for: ARDs and IRDs. The paper posits two different types of rising intonation, RISE-A (short for assertive rises) and RISE-I (short for inquisitive rises). The labels RISE-A and RISE-I (which correspond roughly to H* H-H% and L* H-H%, respectively) highlight the abstract nature of the intonational distinction, as argued in section 5.3. Although the intonational distinction does not have categorical acoustic correlates that remain constant across speakers and contexts, it is nonetheless cognitively real, such that systematically different inferences will be drawn depending on whether a given language user categorizes a given tune as RISE-A vs. RISE-I at a given moment.

The paper also posits that the two types of rises, RISE-A and RISE-I, give rise to two different *marked* sentence types by combining with morphosyntactically declarative utterances. These two marked sentence types will continue to be called ARDs and IRDs. Following the insights of Farkas & Roelofsen (2017), marked sentence types are analyzed as being characterized by additional marked conventions that unmarked sentence types (falling declaratives, polar interrogatives) lack. At the same time, ARDs are shown to have the same basic convention as its unmarked alternative, falling declaratives and IRDs are shown to have the same basic convention as its unmarked alternative, polar interrogatives

(see below).[18] Relatedly, one can analyze assertive vs. inquisitive rising declaratives as highlighting different dimensions of markedness: ARDs are marked because they are essentially assertive in their effects but are paired with rising intonation; IRDs are marked because they are essentially inquisitive but are paired with declarative syntax (the latter point is made by Farkas & Roelofsen 2017 as well).

Finally, the set of elements presented in (12), that is CG, CG*, DC_X, DC_X* and Table, is posited as relevant components of the context. The original definitions and assumptions associated with each element (Farkas & Bruce 2010; Malamud & Stephenson 2015) have been by and large inherited by the current analysis, but one additional assumption about the DC_X* (which seems to be implicitly present in earlier works as well) is worth mentioning more explicitly: the proposition that is added to the DC_X does *not* get automatically added to the DC_X*. In this sense, although a projected commitment anticipates an actual commitment (addressee's confirmation can upgrade a projected commitment to an actual one), an actual commitment does not encompass a projected commitment. This dissociation between the current and projected commitment plays a crucial role in deriving certain inferences associated with contradictory questions (see section 7.2 for details). Other potential refinements and small deviations from Farkas & Bruce's (2010) and Malamud & Stephenson's (2015) frameworks are mentioned later, in the context of specific examples.

7.1 *ARDs*

With the above components of context in mind, ARDs are analyzed as being associated with the following context updating conventions. First, ARDs add their content p to the speaker's actual commitment set, as well as to the Table. In this respect, they are associated with the same basic conventions as falling declaratives. Second, ARDs are also associated with the marked convention of adding a metalinguistic issue MLI^p to the Table. In this respect, they differ from falling declaratives, which do not add any metalinguistic issue on the Table. These conventions are summarized in (18). For the sake of comparison, the conventions posited for falling declaratives (from Farkas & Bruce 2010; cf. Lauer 2013) are summarized in (19).

(18)   ARD (content: p)
    a.   Add p to speaker's current commitment set, DC_{Sp}.
    b.   Add $\{p\}$ to the **Table**.
    c.   Add MLI^p to the **Table**.

(19)   cf. Falling declarative (content: p)
    a.   Add p to speaker's current commitment set, DC_{Sp}.
    b.   Add $\{p\}$ to the **Table**.

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18 Farkas & Roelofsen (2017) unify this even further. Unmarked sentence types such as polar interrogatives and falling declaratives, are associated with the same conventions (as *all* sentence types share the same *basic* conventions, as noted in section 6.2.4) but with different types of content ('propositions'). While this unification is advantageous, we will not incorporate it into the present analysis as space constraints prevent us from elaborating on a particular conceptualization of the 'proposition' that enables this move (i.e. inquisitive semantics).

Part (18c) of the analysis that posits MLI^p is a straightforward implementation of a subpart of Malamud & Stephenson's (2015) approach noted in section 6.2.1. The current analysis also shares the following assumptions with the original account: MLI^p comes to be placed on top of the stack (Table), and thus needs to be resolved before interlocutors get to p on the Table. The resolution of MLI^p as well as the acceptance of p by the addressee will often happen simultaneously via a single uptake (see example (21)). It is also worth noting that the analysis follows the study by Malamud & Stephenson (2015) and diverges from the study by Farkas & Bruce (2010) in assuming that only the issue at the top of the Table (at the end of a conversational move) is added to the projected set (cf. Farkas & Bruce 2010 assume that all items on the Table are projected). This assumption results in a few desirable empirical predictions (see section 7.1.3).

ARDs carve out the uses of rising declaratives noted in (1d), (1e) and (4), as well as the experimental data that elicited 'Assertion' or 'Oh' responses for Q1. The analysis in (18) succeeds in accounting for all of them.

7.1.1 *An account of the core examples*   First, the analysis reconciles the uses of ARDs noted in (1d) and (1e). It assumes that a variety of MLI^ps can be associated with ARDs, and that the speaker may have a range of different motivations for adding a MLI^p to the Table. In the case of (1d) *I speak Ladino?* and (4) *John has a sister?*, the motivation likely stems from the speaker being unsure about whether his response is a relevant or sufficient enough answer to the addressee's question. In the case of (1e) and (3) *My name is Wendy?* (a waitress), the motivation likely stems from the speaker's desire to build rapport with the addressee, signal politeness, and elicit uptakes. In both cases, adding relevant MLI^ps to the Table: 'Is p (i.e. my answer) relevant/sufficient enough to your question?' and 'Am I in the right social context to utter p (i.e. introduce myself)?', respectively, achieves these desired effects.

The analysis also predicts the felicity of *Oh* responses noted in (4). As ARDs incur definitive and categorical speaker commitment instead of projected speaker commitment, the addressee can latch on to the speaker's commitment by responding with *Oh*. This state of affairs would not be easily captured by accounts that analyze rising declaratives as incurring non-categorical, projected speaker commitment (e.g. Malamud & Stephenson 2015). The tentativeness associated with ARDs thus seems to crucially concern the relevance or the appropriateness of the proposition p, rather than the speaker's commitment (toward the verity of p) per se.

7.1.2 *An account of the experimental results*   The analysis in (18) also captures the full range of experimental results presented in section 5. First, the account explains why ARDs are associated with a high degree of speaker epistemic certainty (in particular, higher than that of the addressee; section 5.2.2), as well as with *Oh* and 'assertion' responses. Since ARDs incur full speaker commitment to the proposition p, they are inevitably associated with a fairly high degree of speaker epistemic certainty about p, as well as a follow-up response that presupposes previous speaker's commitment such as *Oh*. Relatedly, since committing to p is a move that is most stereotypically associated with assertions, ARDs are naturally expected to elicit illocutionary inferences of assertion. In addition, since a non-truncated assertion with the content p often appears in contexts in which the addressee

does not yet believe or know p,[19] ARDs are expected to presume a low degree of relative addressee epistemic certainty on p (lower than that of the speaker).

At the same time, the account can also explain why the speaker epistemic certainty associated with ARDs is significantly lower than that of falling declaratives and why ARDs often trigger inferences such as speaker politeness and tentativeness (section 5.2.1). Since ARDs also put a MLI^p on the Table (in addition to p), they standardly elicit inferences about speaker tentativeness about the adequacy of the speech act incurred. Such inferences are in turn likely to have manifested as significantly lower speaker epistemic certainty ratings about the proposition than falling declaratives,[20] as the latter does not add any MLI^p on the Table and therefore does not signal any tentativeness with respect to metalinguistic issues about p.

As all of the discourse effects observed in the experiment are assumed to be derived from the more fundamental conventions posited in (18), some of the more indirect effects are expected to be cancelable. For instance, in certain marked contexts such as the one in (20), a given MLI^p: 'Is p a good enough answer for you?' may not necessarily signal tentativeness or uncertainty but instead signal speaker attitude in the vein of: 'Duh, why would you even ask me that?' In most contexts however (including the highly underspecified ones evoked in the experiment), the second-order effects captured by the experiment are standardly expected to arise and co-occur.

(20)   A: *Why do you hate him so much?*
         B: *(Um...) He's a racist idiot?*

7.1.3 *A demonstration*   Let us now examine some concrete examples of the dynamic effects created by the ARD conventions in (18). Consider the ARD we saw in (4), repeated below in (21). This utterance can be followed by at least two different types of responses. First, it can be followed by a confirmation response from the addressee, such as *Oh*. Second, it can be followed by a response that clarifies the relevant issue, such as *I meant cousins or nieces. Does he have any?* The changes to the context created by the rising declarative and by confirmatory vs. clarifying responses are summarized in tables (21) and (22), respectively. For the sake of convenience, the content of *Does John have any female relatives?* is marked with $\{f, \neg f\}$, and the contents of possible resolutions to MLI^p are marked with r (p is a relevant answer) and $\neg r$ (p is not a relevant answer).

As argued in (18), uttering an ARD adds the proposition p, in this case: 'John has a sister' to the Table, as well as to the actual commitment set of the speaker. It also puts the MLI^p, in this case, 'Is p a relevant answer?' onto the Table. Since the issue on top of the Table is MLI^p, the projected set at t_2 is updated with possible resolutions to MLI^p, namely, r and $\neg r$ (recall that following Malamud & Stephenson 2015, only the issue on top of the stack is projected; hence, p itself is not projected). This state of affairs is summarized in the third columns of tables (21) and (22).

19 Confirmatory assertions that take place when the addressee has also already committed to p, often take on truncated forms such as *Yes, he does.*

20 Although Q3 in the experiment did not directly target inferences about the speaker's metalinguistic uncertainty surrounding p, but rather her/his uncertainty about the proposition p itself, it is likely that the perceived speaker uncertainty about the former seeped into, and got indirectly reflected in participants' ratings of the latter, resulting in marginally but significantly lower ratings of the latter compared to falling declaratives.

In the case of the confirmatory *Oh* response, the response triggers two updates. First, as it signals addressee confirmation, it automatically selects r (p is a relevant answer) as the resolution of MLI^p, thereby having the effect of A acknowledging that the proposition that John has a sister is a relevant issue to the discourse at hand. This in turn updates the projected set (CG*) to the one that includes p, namely, $\{s_2 \cup \{p\}\}$, as the issue p (which was previously right below $\{r, \neg r\}$ in the stack) comes to be on top of the Table upon the resolution of MLI^p via r. This process is summarized in step 1 in (21). The *Oh* response also has the effect of updating A's commitment set with p, as *Oh* also signals that A is dependently committing to B's proposition. This in turn has the effect of updating the actual CG with p (cf. Gunlogson, 2003). This process is summarized in step 2 in (21).[21]

(21)   A: Does John have any female relatives? t_1
         B: *John has a sister?t_2*
         A: *Oh*, I didn't know that. t_3

	A utters f? in t_1	B utters p in t_2	A utters *Oh* in t_3	
			step 1	step 2
Table	$\langle\{f, \neg f\}\rangle$	$\langle MLI^p \rangle, \langle\{p\}\rangle$	$\langle\{p\}\rangle$	
DC$_B$		$\{p\}$	$\{p\}$	$\{p\}$
DC$_B$*				
DC$_A$				$\{p\}$
DC$_A$*				
CG	s_1	s_1	$s_1 \cup \{r\} = s_2$	$s_2 \cup \{p\} = s_3$
CG*	$\{s_1 \cup \{f\},$ $s_1 \cup \{\neg f\}\}$	$\{s_1 \cup \{r\},$ $s_1 \cup \{\neg r\}\}$	$\{s_2 \cup \{p\}\}$	$\{s_3\}$

In the case of the clarifying response *I meant cousins or nieces. Does he have any?*, the response again triggers two updates. First, as it signals A's belief that p is not a relevant issue to be discussed, the metalinguistic issue is resolved via $\neg r$ (p is not relevant). The proposition p thus does not get a chance to become a part of the CG, as A immediately adds a new relevant issue $\{q, \neg q\}$ on top of the stack before p gets a chance to surface to the top of the Table. However, it remains the case that the speaker B is publicly committed to p. All of these are desirable outcomes. First, the trajectory of the conversation does not reveal whether A endorses in p or not: A seems to think p is irrelevant, but A may or may not agree with p. We thus expect p to *not* become a part of the CG (joint commitments of A and B). At the same time, we still expect B to continue to act as though she believes p.

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21   As can be seen in (21), the analysis assumes that the issue initially brought up by A, namely, $\{f, \neg f\}$ (added to the Table and the CG* at t_1) is removed from the Table and retracted from the CG*, once a (likely) partial answer (p, with an MLI^p) is added via B's ARD. This assumption is rather orthogonal (one may just as well assume that instead of being entirely removed, $\{f, \neg f\}$ is merely pushed back to the bottom of the Table stack upon the addition of p and MLI^p and does not re-emerge for the relevant duration of the conversation; this would still yield roughly the same predictions outlined above). It is nevertheless an additional detail that does not directly follow from Farkas & Bruce (2010) and Malamud & Stephenson's (2015) initial conceptualizations of the Table and the CG*.

For instance, at no point in the future discourse can *B* felicitously say something like *By the way, I don't think John has a sister*, without resorting to explicit additional steps of recanting her previous commitment (cf. Lauer 2013). We thus expect p to remain in DC_B.

The second update triggered by the clarifying response at t_3' is adding a new inquisitive issue: 'Does John have a female cousin or a niece?' to the current Table. The projected set (CG*) is updated accordingly (with q and $\neg q$), and the trajectory of the future discourse thus comes to take on a different turn via *A*'s clarifying response. The two updates at t_3' are summarized in (22).

The alternative utterance in t_3'' in (22) suggests that the current analysis has the advantage of predicting the subtle differences in allowed future responses between falling declaratives and ARDs. To a large extent, both sentence types allow for overlapping ranges of uptakes, such as explicit, confirmatory responses like *Oh*. However, falling declaratives also seem to allow more implicit confirmations than ARDs. For instance, the falling declarative *John has a sister.* can be more easily followed by a subsequent question, *How about Harry? (Does he have a sister too?)*, in which *A* implicitly agrees with *B*'s proposition that John has a sister, but does not mark this agreement explicitly. Such implicit confirmations seem less felicitous as a follow-up to an ARD, *John has a sister?*. The present analysis can capture this intuition. Falling declaratives create a CG* of the type $\{s_1 \cup \{p\}\}$, as p is on top of the stack. Since affirming p is an expected (projected), unmarked trajectory of conversation, following this trajectory can be signaled implicitly (Farkas & Bruce 2010). On the other hand, ARDs don't create parallel kinds of CG*, as already seen in (21); they seem to project *multiple* possible resolutions to the metalinguistic issue (an underlying assumption here is that the MLI^ps added by ARDs standardly have inquisitive content; see section 7.1.4 for more discussion). Consequently, the addressee is led to reply with explicit confirmations to clarify whether r or $\neg r$. In sum, the analysis in (18) can predict the uptake-eliciting nature of ARDs.

(22)   A: Does John have any female relatives? t_1
           B: *John has a sister?* t_2
           A: I meant cousins or nieces. Does he have any? t_3'
           A: cf. #How about Harry? t_3''

	A utters $f?$ in t_1	*B* utters p in t_2	*A* utters *I meant $q?$* in t_3'
Table	$\langle\{f, \neg f\}\rangle$	$\langle MLI^p\rangle, \langle\{p\}\rangle$	$\langle\{q, \neg q\}\rangle$
DC_B		$\{p\}$	$\{p\}$
DC_B*			
DC_A			
DC_A*			
CG	s_1	s_1	$s_1 \cup \{\neg r\} = s_{2'}$
CG*	$\{s_1 \cup \{f\},$ $s_1 \cup \{\neg f\}\}$	$\{s_1 \cup \{r\},$ $s_1 \cup \{\neg r\}\}$	$\{s_{2'} \cup \{q\}, s_{2'} \cup \{\neg q\}\}$

7.1.4 *Remaining issues*   We have seen that the present analysis succeeds in capturing the full range of experimental data and the core examples involving ARDs. However, a few unresolved issues still remain. For instance, are there any systematic constraints on the scope

of possible MLI^ps that can be added by ARDs? If any issue pertaining to p can become a viable MLI^p, then the analysis may run the risk of not having enough predictive power.

Following Malamud & Stephenson (2015), we have so far defined MLI^p as a metalinguistic issue about p that can be reasonably inferred or recovered by the addressee from the context. The concrete examples we saw above as well as the paper's experimental data give us some additional guidelines in capturing the exact nature of these MLI^ps. First, we may explicitly constrain MLI^ps as having inquisitive contents of type $\{r, \neg r\}$.[22] Having this constraint allows us to predict the uptaking-eliciting nature of ARDs noted in section 7.1.3, via CG*s involving multiple resolutions. It also tightens the connections between the analysis and the experimental results. In particular, the observed speaker tentativeness (reflected in speaker epistemic certainty ratings) is easily captured: the move of adding an *inquisitive MLI^p* naturally gives rise to inferences about the speaker having some kind of reserve or uncertainty about p (although depending on the precise nature of the inquisitive issue and the context, exceptions like (20) are also predicted).

Second, Westera's (2013; 2017) work may be used to come up with a taxonomy of commonly evoked MLI^ps. As noted earlier, Westera (2013) gave a unified account of rising declaratives by treating them as signaling potential violations of Gricean conversational maxims. These violations can be mapped straightforwardly onto different types of inquisitive MLI^ps: Is p relevant enough? (relevance), Was p spoken in the right way, with the correct pronunciation, etc.? (manner), Is p a good enough answer, or an answer of the right granularity, to your question? (quantity). These can in turn be adopted to explain many of the observed uses of ARDs.

Finally, we may want to make more explicit the assumption that 'metalinguistic' issues comprise not just strictly linguistic issues but more general social concerns about adding p to the Table in a given conversation. Thus, the following types of MLI^ps are all expected to be viable candidates given the right kinds of contexts: *Am I in the right social position to add p to the Table?*, *Is this an appropriate social situation to add p to the Table?*, etc. Having them within the scope of possible MLI^ps enables us to straightforwardly derive a wide range of social meanings commonly associated with the so-called 'uptalk' instances of ARDs (McLemore 1991; Podesva 2011; Levon 2016; a.o.).

The additional hypotheses entertained so far have been exploratory in nature. Closer inspections of diverse contextual conditions that license ARDs, as well as patterns of possible addressee responses are needed to more directly address this issue. For space reasons, these tasks are postponed for another occasion.

7.2 *IRDs*

Let us now turn to IRDs. The present analysis associates them with the following context updating conventions. First, IRDs add their content to the Table. The paper follows the studies by Farkas & Roelofsen (2017) and Truckenbrodt (2012), and contrasts with the studies by Gunlogson (2008), Westera (2013), and Malamud & Stephenson (2015), in assuming that the content of the questioning uses of rising declaratives (using this paper's terminology, IRDs) is equivalent to the content of polar interrogatives with the same radical. IRDs thus have content of type $\{p, \neg p\}$ and add it to the current Table. In this respect, they

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22   This seems to be implicitly assumed by Malamud & Stephenson (2015) as well.

are associated with the same basic conventions and content as polar interrogatives. The relevant inquisitive content can be derived via a few different mechanisms. Here, the paper will posit that RISE-I used in IRDs (which is the same intonational contour used in polar interrogatives) contributes a kind of $[\![\text{INT}]\!]$ operator (23c) that generates the desired content, as well as creating a marked sentence type that is associated with the specific conventions. This is inspired by, and analogous to, Farkas & Roelofsen's (2017) compositional treatment of the rising intonation, except that it is not couched in an inquisitive semantics framework. After the presentation of the main analysis, the paper will illustrate more in detail why assuming such content is necessary if we want to maintain some core assumptions relating to the CG* and its systematic effects on follow-up responses.

In addition to the basic conventions, IRDs are also associated with the marked convention of adding the positive answer p to the addressee's projected commitment set. In this respect, they differ from polar interrogatives that do not add anything to the interlocutors' projected commitment set (and thus only raise an issue in a more neutral way).[23] The two conventions associated with IRDs are summarized in (23). For the sake of comparison, the conventions posited for polar interrogatives (Farkas & Bruce 2010) are summarized in (24).

Part (23b) of the analysis that posits projected addressee commitment is an amalgamation of Gunlogson's earlier account (Gunlogson 2003) and her later account (Gunlogson 2008), both of which emphasized the notion of 'addressee epistemic authority' in one way or another. According to (b), the commitment to p is addressee-oriented (Gunlogson 2003), but the status of this commitment is non-categorical (Gunlogson 2008). This addressee-oriented but contingent account takes the best of both worlds in Gunlogson's two accounts, while overcoming their weaknesses noted in section 6.2.

In comparison, (23b) is where the account diverges significantly from Farkas & Roelofsen's (2017) analysis, which, as noted earlier, argues that p is added to the list of 'evidenced' possibilities of the speaker. This decision has been motivated partly from the desire to have the notion of 'speaker presumption about the addressee' (section 2.1) play a more central role in the analysis and partly from the desire to maintain a family of projected components (CG*, DC_X*, etc.) as contextual primitives, rather than substituting them with the notion of evidenced possibilities. However, the current account and Farkas & Roelofsen's (2017)

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23 At first glance, the conventions proposed for IRDs seem identical to the ones proposed by Malamud & Stephenson (2015) for positive tag interrogatives, such as *He's handsome, is he?*; the latter is also analyzed as having an effect of adding p to the addressee's projected commitment. However, note that even if we accept both analyses, the two marked sentence types are still predicted to differ in their overall discourse effects. This is because the two differ crucially in their content and consequently, the type of issue that they add to the Table. While the current analysis of IRDs predicts that they will add an issue of type $\{p, \neg p\}$ to the Table (i.e. they have an effect of raising an inquisitive issue, in addition to projecting a positive answer to the addressee), Malamud & Stephenson's (2015) analysis of positive tag interrogatives predicts that these will add a non-inquisitive issue of type p to the Table. The latter thus anticipates a single resolution for CG* (i.e. that of adding p to the CG; this contrasts with IRDs that entertain multiple possible resolutions for CG*). Although a more in-depth comparison (which we do not have space for here) is needed, this seems in alignment with our general intuition that positive tag interrogatives end up signaling stronger speaker bias toward p than IRDs. See section 7.2.5 for a related discussion.

analysis end up making roughly the same empirical predictions for IRDs, leading us to more general, unresolved theoretical questions. See section 7.2.5 for a discussion.

(23) IRDs (content: $\{p, \neg p\}$)
    a. Add $\{p, \neg p\}$ to the current **Table**.
    b. Add p to the addressee's projected commitment set, $DC_{Ad}*$.
    c. cf. $[\![\text{RISE-I}]\!] = [\![\text{INT}]\!] = \lambda p \, \lambda q \, [\, q = p \, \vee \, q = \neg p \,]$

(24) Polar interrogatives (content: $\{p, \neg p\}$)
    a. Add $\{p, \neg p\}$ to the current **Table**.
    b. cf. $[\![\text{POLAR-INT}]\!] = [\![\text{INT}]\!] = \lambda p \, \lambda q \, [\, q = p \, \vee \, q = \neg p \,]$

IRDs pick out the uses of rising declaratives noted in (1a), (1b), (1c) and (4), as well as the experimental data that elicited 'Question' or 'Yes' responses for Q1. The analysis in (23) again succeeds in accounting for all of these data.

7.2.1 *An account of the core examples*   First, the analysis succeeds in reconciling the contradictory/incredulous vs. confirmatory uses of IRDs noted in (1a), (1b) and (1c). It predicts that there would be a variety of reasons as to why a discourse participant may want to add the positive answer p to the projected commitment set of the addressee, while raising the issue of $\{p, \neg p\}$. For instance, in the case of confirmative questions such as (1c) *The flight leaves at 4pm?*, the motivation for these moves likely stems from the speaker herself having some reason to believe p, and construing the addressee (in this case, the flight attendant) as having more epistemic authority than her in confirming that p, and resolving the issue of $\{p, \neg p\}$. However, in the case of (1c) and (1a): *John has a sister?* and *I should apologize?*, the motivation likely stems from the speaker's desire to elicit further justification from the addressee (who seems to think that p), as the speaker herself still has some reserve about accepting p as the resolution to the issue $\{p, \neg p\}$. As will be elaborated in more detail in section 7.2.3, listeners can easily reconstruct these diverging speaker motivations depending on the principled differences in the contexts in which the same moves occurred.

The analysis also predicts the infelicity of *Oh* responses noted in (4). As IRDs are analyzed as not incurring any speaker commitment (instead, their main function is to put the inquisitive issue on the Table), the addressee *cannot* latch onto any speaker commitment; thus *Oh* is correctly predicted to be an infelicitous response to IRDs. Relatedly, the analysis can easily predict the felicity of contradictory follow-up responses such as *No way* by the speaker of an IRD, even after the addressee has confirmed p. As the content of the IRD is considered to be parallel to that of polar interrogatives, putting this content on the Table predicts that not just p but also $\neg p$ will be projected as possible resolutions to the issue (both will be added to the projected set, CG*), anticipating the speaker's negative response.

7.2.2 *An account of the experimental results*   The analysis in (23) also explains the full range of experimental results presented in section 5. First, the account can explain why IRDs are associated with a low degree of speaker epistemic certainty on p (in particular, lower than that of the addressee), as well as with the response *Yes*. Since IRDs do not incur any speaker commitment to the proposition p, they are expected to be often associated with

a low degree of speaker epistemic certainty on p,[24] as well as a follow-up response that is compatible with the absence of previous speaker's commitment such as *Yes*. Relatedly, as putting an inquisitive issue of the type $\{p, \neg p\}$ on the Table is a move that is most stereotypically associated with questions, IRDs are naturally expected to elicit illocutionary inferences of question. In addition, since IRDs are analyzed as putting p to the *addressee*'s projected commitment set, they are naturally expected to be associated with a high degree of addressee epistemic certainty on p (higher than that of the speaker; either because the addressee has already committed to or implied p, or because the addressee is in a position of authority about the matter at hand).

At the same time, the account can also explain why the speaker epistemic certainty associated with IRDs is significantly higher than that of polar interrogatives. Adding the positive answer p to the projected commitment of the addressee often also ends up signaling that the speaker is not neutral with respect to the expected answer either. As we saw earlier, this speaker non-neutrality may go in either directions (biased toward p for confirmative questions; biased toward $\neg p$ for contradictory questions). However, as the experimental setting was characterized by the absence of specific prior contexts, the rising declaratives are likely to have more often been interpreted as out of the blue, confirmatory questions rather than contradictory or incredulous questions which do require specific prior contexts (see section 7.2.3 for more details). It is expected then, for the IRDs in the experiment to be associated with higher speaker epistemic certainty on p than polar interrogatives: polar interrogatives do not end up signaling any bias toward p or $\neg p$ (as they do not have any effect on the projected commitment sets of the participants), but confirmatory IRDs often end up signaling weak speaker bias toward p via the inferential process described above (and elaborated further in section 7.2.3).

7.2.3 *A sample demonstration*   To get a better handle on the conventional effects of IRDs, let us examine their dynamic effects in conjunction with a range of different contexts that precede them. The same core conventions posited in (23) interacting with different contexts is shown to systematically derive diverse flavors of IRDs: confirmatory vs. contradictory. Consider first the contradictory IRD we saw in (1a), adapted below. Let us assume that p denotes the proposition that B should apologize. The sequential changes to the context created by each step of the conversational exchange in (25) are captured in each column of the table in (25).

(25) A: You should apologize to Sam. t_1
      B: *I was wrong and I should apologize?* t_2
      A: *Yes*, that's the right thing to do. t_3
      B: No way. You don't know the whole story. t_4

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24 This is a natural expectation to have for the range of controlled stimuli used in the experiment. However, lack of commitment does not always give rise to inferences about low degree of speaker epistemic certainty. For instance, in an exam context the examiner is expected to have a high degree of epistemic certainty about the answers but will carefully avoid commitments to them. I thank an anonymous reviewer for pointing this out. See also Farkas & Roelofsen (2017) for related examples.

	A utters p in t_1	B utters p? in t_2	A utters *Yes* in t_3	B utters *No way* in t_4
Table	$\langle\{\boldsymbol{p}\}\rangle$	$\langle\{\boldsymbol{p}, \neg\boldsymbol{p}\}\rangle$	$\langle\{\boldsymbol{p}\}\rangle$	$\langle\{\neg\boldsymbol{p}\}\rangle$
DC$_A$	$\{\boldsymbol{p}\}$	$\{p\}$	$\{\boldsymbol{p}\}$	$\{p\}$
DC$_A$*		$\{\{\boldsymbol{p}\}\}$		
DC$_B$				$\{\neg\boldsymbol{p}\}$
DC$_B$*				
CG	s_1	s_1	s_1	s_1
CG*	$\{s_1 \cup \{\boldsymbol{p}\}\}$	$\{s_1 \cup \{p\}, s_1 \cup \{\neg\boldsymbol{p}\}\}$	$\{s_1 \cup \{\boldsymbol{p}\}\}$	$\{s_1 \cup \{\neg\boldsymbol{p}\}\}$

In the context provided in (25), A is already publicly committed to p at the time in which the rising declarative is uttered by B, that is in t_2. Applying the analysis in (23), the rising declarative by B has the effect of adding $\langle\{p, \neg p\}\rangle$ to the current Table and adding p to the projected commitment of the addressee (DC_A*). Given the state of the Table and the projected set (CG*) at t_1, updating the Table has the effect of updating the relevant issue to include $\neg p$ as another possible resolution, which in turn expands the CG* from just $\{s_1 \cup \{p\}\}$ at t_1 to $\{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$ at t_2. This is a welcome consequence, as it better anticipates B's subsequent challenge to A's commitment to p. In addition, given the state of the current and projected commitment set at t_1, the latter move (adding p to the addressee's projected commitment) has the effect of signaling redundancy (as A has already categorically committed to p), which in turns triggers the pragmatic reasoning that B has a reason to elicit further explanation or justification from the addressee (namely, because B believes that $\neg p$).

Let us take a moment to further clarify the inferential process that can derive the speaker bias toward $\neg p$ in contradictory or incredulous uses of IRDs. These uses standardly arise as echo questions, in which the addressee has already publicly committed to or presupposed p and the speaker subsequently asks whether p. When p is already known to be in the current commitment set of the addressee, putting p in a kind of demoted (weaker) set, that is the *projected* commitment set of the addressee, as well as reopening up the issue of $\{p, \neg p\}$, naturally gives rise to the inference that the speaker believes that $\neg p$ (or at least still has some reserve about accepting p). In addition, since propositions in the projected commitment sets require ratification from the addressee in order for them to be added to the categorical commitment sets, these moves also succeed in signaling that the speaker wants further explanations or justifications from the addressee.

Moving on to the next stage of the conversation, B's move at t_2 is standardly followed by an explicit explanation or reconfirmation from A, such as *Yes, it's the right thing to do*. By reaffirming p, A again shrinks the CG* to contain just the positive answer, $\{s_1 \cup \{p\}\}$, reverting the CG* at t_3 back to the one at t_1. By putting p in A's projected commitment (via the IRD), B had essentially given A an additional opportunity to explain herself; however, A's reconfirmation at t_3 does not seem to have provided a satisfactory answer to B's reserve about p. B is thus led to explicitly add $\neg p$ to her commitment set at t_4 by uttering a falling declarative (*No way*). In sum, this rather extended *pas de deux* involving a contradictory IRD showcases how the core conventions for IRDs can be used to negotiate the projected CG in a non-abrupt way.

Let us now consider an example of confirmatory IRDs, the same one we saw in (1c) repeated in (27). Let us assume that q denotes the content of A's falling declarative, *There's*

one flight to Helsinki in the afternoon; $\{p, \neg p\}$ denotes the content of *B*'s IRD *The flight leaves at 4pm?*; and *r* denotes the content of *B*'s falling declarative *I'd like to book the flight*. The context in which the IRD occurs is very different from the one in (25). Most notably, *A* is not publicly committed to *p* at t_2, and neither the projected set (CG*) nor the Table contains *p* at t_1. In this context, *B*'s IRD has the same contextual effects as in (25): $\{p, \neg p\}$ is added to the Table and *p* is added to addressee's projected commitment set (DC_A*). However, given the difference in the prior context, these same contextual effects create vastly different additional inferences for (27) compared to (25).

Most notably, *B*'s move of adding *p* to *A*'s projected commitment set results in the inference that (a) *B* has some reason to believe that *p* is the more likely answer, and that (b) *A* is in a better position (i.e. in a position of more epistemic authority) to confirm that *p*. Let us again make more explicit the reasoning process that results in these two inferences. First, the core contextual information that enables the derivation of weak *speaker* bias (i.e. *B*'s bias toward *p*) is the absence of publicized addressee (*A*'s) commitment or strong bias toward *p*. Even though *A* has not yet shown clear indication that she is strongly biased toward *p*, *B* nevertheless seems to think that *A* will likely confirm *p* (given *B*'s move of adding *p* to *A*'s projected commitments).[25] This must be because *B* herself thinks that *p* is a more likely resolution to the issue she raised than $\neg p$. Second, *B*'s move of attributing a projected commitment only to *A*, instead of (or in addition to) *B* herself, gives rise to the inference that *B* thinks that what is more relevant/at stake in the current discourse is *A*'s commitment to *p*, not *B*'s (in this specific context, this is in turn because *B* presumes *A* to have more epistemic authority to confirm *p* than *B* herself; see also section 7.2.4).

(27) A: There's one flight to Helsinki in the afternoon. t_1
     B: *The flight leaves at 4pm?* t_2
     A: *Yes*, it does. At gate B. t_3
     B: Great. I'd like to book the flight. t_4

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25 The move of adding *p* to the addressee's projected commitment set does not need to imply that the speaker genuinely believes that the addressee will confirm *p* (although such speaker belief will be present in most canonical cases). This move can sometimes be used rhetorically or sarcastically, to achieve a variety of goals from the part of the speaker. For instance, in (26), *B* clearly does not believe that *A* will confirm that '*A* is *C*'s father'. Nevertheless, *B* can put this proposition in *A*'s projected commitment as a rhetorical move, as this would put *A* in a position where he has to actively wrangle out of a false (projected) attribution that he is the father of *C*, thus enabling the latter to see how absurd and out-of-proportion his concern for *C* is.

(26) (*A*, who is well-off, is talking to his therapist *B* about his neighbor's son *C*, who is not well off)
      A: *Should I help him pay his loans?*
      B: *You are his father?* (used as a rhetorical question; adapted from Farkas & Roelofsen 2017)

In short, the note of sarcasm in (26) is achieved precisely because *B* is deliberately making use of: (i) the mutual understanding that *A* is *not* the father of *C* and (ii) *B*'s rhetorical move that indicates that *B* has a reason to believe that *A* will be led to confirm that he is indeed the father of *C*, this reason being the absurd amount of concern that *A* has demonstrated for *C* so far.

	A utters q t_1	B utters p? t_2	A utters *Yes* t_3	B utters r t_4
Table	$\langle\{q\}\rangle$	$\langle\{p,\neg p\}\rangle$	$\langle\{p\}\rangle$	$\langle\{r\}\rangle$
DC$_A$	$\{q\}$	$\{q\}$	$\{p,q\}$	$\{p,q\}$
DC$_A$*		$\{\{p\}\}$		
DC$_B$		$\{q\}$	$\{q\}$	$\{r,p,q\}$
DC$_B$*				
CG	s_1	$s_1 \cup \{q\} = s_2$	s_2	$s_2 \cup \{p\} = s_3$
CG*	$\{s_1 \cup \{q\}\}$	$\{s_2 \cup \{p\}, s_2 \cup \{\neg p\}\}$	$\{s_2 \cup \{p\}\}$	$\{s_3 \cup \{r\}\}$

In sum, the context of (27) crucially differs from that of (25), in that p is not yet in the current commitment set of A. Therefore, adding p to A's projected commitment set signals a kind of promotion rather than a demotion, thereby giving rise to the inference that B is biased toward p, as well as the inference that B thinks that A is likely to confirm this bias.

The contextual contrast demonstrated in (25) and (27) leads to a welcome prediction that the inference about speaker bias toward $\neg p$ will arise (for IRDs) only when the addressee has publicly committed to, has presupposed, or is demonstrably biased toward p, which is exactly the type of contextual condition that contradictory (echo) questions are argued to have (Gunlogson 2003, Farkas & Roelofsen 2017). It also predicts that inferences about weak speaker bias toward p will generally arise in the remaining cases (in which the addressee has not yet publicly committed to p), which again seem to be the type of contextual conditions that confirmatory questions demonstrate (cf. Gunlogson 2003, Gunlogson 2008).

As a side note, many implicit acceptances occurred in (27). For instance, the projected CG at t_1 (in which q is added) becomes the actual CG at t_2 via B's implicit acceptance of q; likewise, the projected CG at t_3 (in which p is added) becomes the actual CG at t_4 via B's implicit acceptance of A's answer. Maintaining the initial observation by Farkas & Bruce (2010), the nature of the CG* at t_1 and t_3, containing just a single projected CG, that is $\{s_1 \cup \{q\}\}$ and $\{s_2 \cup \{p\}\}$, respectively, seems to have enabled B's acceptance of q and p to be left implicit. Contrast this with A's follow-up responses to B's IRDs in (25) and (27). A's follow-up response needs to be an explicit yes or no, which is expected given our analysis. In both cases, IRDs result in projected sets of type $\{s_2 \cup \{p\}, s_2 \cup \{\neg p\}\}$ at t_2, in which more than one possible CG is projected.

This line of observation is at the heart of positing an inquisitive content of type $\{p, \neg p\}$ for IRDs. One may be able to build an account that gets at roughly similar predictions delineated above, while positing the content equivalent to falling declaratives, for example p. For instance, one may be able to argue that IRDs have p as its content and have the sole conventional effect of adding p to the projected commitment set of the addressee. However, such an account would call for significant adjustments to a few fundamental assumptions about how contextual elements such as Table, projected set (CG*), etc. operate (cf. Rudin 2017).[26] If one is to stipulate that an IRD does not add anything to the Table, or rather

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26 It would also render the conventions for IRDs identical to the ones proposed for positive tag interrogatives (see also footnote 22), if we want to maintain Malamud & Stephenson's (2015) analysis of the latter.

assume that it adds the content of type p to the Table, then one cannot arrive at a CG* that anticipates more than one kind of resolution: p and $\neg p$. This does not seem to align with the actual range of responses allowed for IRDs (addressee's explicit yes/no, as well as the possibility of speaker contradiction via $\neg p$). One would thus have to either give up the connection between the Table and the CG* and/or the assumption that the status of the CG* systematically determines the range of available uptakes (as seen above, the CG* with more than one possible CG elicits explicit answers, whereas the CG* with just one potential CG does not need such explicit confirmations), which made many intuitively sound predictions.

7.2.4 *Rising declaratives and rising tag interrogatives*   As in the case of ARDs, the current analysis of IRDs had the central aim of capturing the core examples and the experimental data presented in the first half of the paper. We have so far seen that the analysis succeeds in this respect. However, additional considerations emerge once the effects of other marked sentence types (which have often been argued to have close parallels with IRDs; Farkas & Roelofsen 2017) are introduced into the picture. For instance, can the analysis also capture the subtle differences in discourse effects between IRDs on the one hand, and other marked sentence types such as negative tag interrogatives on the other? While providing a comprehensive answer to this question would take us too far afield, a few targeted comparisons are worth conducting, as they can further clarify the key underlying assumptions behind the current analysis, as well as expand its empirical coverage.

One of the main intuitions that has been successfully captured by the current analysis is that IRDs sometimes signal speaker bias toward p (the positive answer to the issue raised), given particular contexts (that elicit confirmatory uses). Comparisons with other marked sentence types further reveal that this bias is systematically weaker than the one signaled by other expressions such as (rising) negative tag interrogatives. Examples in (28)–(29) from the study by Farkas & Roelofsen (2017) capture this intuition.

In contexts like (28) where the speaker A has already presupposed p in the previous utterance but still wants to elicit addressee confirmation that p in the subsequent utterance, the negative tag interrogative is felicitous but the IRD isn't. Likewise, in contexts like (29) involving taste predicates where A wants to check for alignments in personal tastes between herself and B, the negative tag interrogative is felicitous but the IRD isn't. Both contexts are characterized by expectations of fairly strong speaker bias toward the relevant propositions (given the speaker presupposition in (28) and the common assumption that the speaker herself is likely to have, and be motivated to publicize, her own opinion about the sunset in (29)). These seem to be the driving force behind the infelicity of rising declaratives and the felicity of negative tag interrogatives.

(28)   A: *You should ask your sister to help with the translation.*
         A: *# You have a sister? / You have a sister, don't you?*

(29)   (A and B are looking at a sunset; A to B)
         A: *#This is a beautiful sunset? / This is a beautiful sunset, isn't it?*

Can the current account of IRDs also predict this difference, combined with an appropriate analysis of the negative tag interrogatives? The answer is yes, provided that we clarify a few general pragmatic assumptions.

Under the account by Malamud & Stephenson (2015), which assumes roughly the same types of contextual components as the current analysis (i.e. a family of projected

components), negative tag interrogatives are analyzed as having the content of type p and having the effect of adding p to the Table (and consequently, the CG*) and to the projected commitment set of the *speaker*. These effects are naturally predicted to signal stronger speaker bias than IRDs (as analyzed by the present paper), which instead add an inquisitive issue $\{p, \neg p\}$ to the Table (and consequently project multiple resolutions for the CG*), and add p to the projected commitment set of the *addressee*.

More specifically, the projected speaker commitment incurred by the tag interrogatives enables p to be automatically added to the speaker's actual commitment set, upon a ratification from the addressee. In contrast, the only update that an addressee ratification incurs for IRDs is to put p in the *addressee*'s actual commitment set. Similarly, the CG anticipated by the tag interrogatives (in CG*) clearly favors p as the more likely resolution, whereas the CGs anticipated by the IRDs remain more neutral with respect to the subsequent state of the discourse. Due to this contrast, IRDs come to signal weaker speaker bias toward p than negative tag interrogatives, as the latter provide a shorter path toward adding p to the speaker's commitment, in addition to more explicitly anticipating p in the CG*. Rising declaratives are therefore predicted to be infelicitous in contexts like (28)–(29) that call for manifestations of stronger speaker bias than the one warranted by them.

The crucial underlying assumption here is that listeners actively reason about alternative discourse moves, as well as the speaker's motivation behind choosing certain discourse moves (and expressions that trigger them) over others.[27] This assumption seems to follow directly from general pragmatic principles rather than having to be stipulated separately. Its corollary that seems to be active in (28)–(29) can also be formulated more explicitly as follows: when a set of moves seems to better achieve the communicative goals of the speaker than another set of moves in a given context, the expression that gives rise to the latter is predicted to be infelicitous, or is predicted to give rise to additional marked inferences.

For example, in the case of (29), the primary goal of the speaker is likely to be as follows: (i) convey that she herself thinks it is a beautiful sunset and (ii) elicit explicit agreement from the addressee with respect to this aesthetic value judgment. Since negative tag interrogatives are ideally suited for achieving these goals (e.g. projected speaker commitment conveys stronger speaker bias than the one that can be signaled by projected addressee commitment

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27 An informal application of this was already present when deriving the dual biases associated with IRDs (weak speaker bias toward p vs. strong speaker bias toward $\neg p$) in section 7.2.3. It can be reformulated in light of the new discussion, as follows: when the context is already marked with an addressee commitment to p, choosing to expand the CG* with an inquisitive issue $\{p, \neg p\}$ and choosing to put p in a demoted, projected commitment set of the addressee (when the speaker could just as well have implicitly accepted p and the CG* proposed by the addressee) give rise to the inference that the speaker is biased toward $\neg p$ and seeks further addressee justification. When the context does not yet indicate an addressee commitment to p, choosing to put p in the projected commitment set of the addressee instead signals a promotion and gives rise to the inference that the speaker is biased toward p (as the speaker could just as well have stopped at raising the issue of $\{p, \neg p\}$ and remained neutral), and that the speaker thinks that it is the addressee's commitment to p (rather than the speaker's) that is more relevant to resolving whether p. Crucially, the resulting speaker bias toward p in this case is correctly predicted to be very weak (much weaker than the one signaled by tag interrogatives, as shown in (28)–(29)), as the speaker is still unsure enough to add an inquisitive issue to the Table (thereby projecting multiple possible resolutions) and to choose not to signal any conditional (projected) speaker commitment yet, by choosing to use the IRD (instead of e.g. a negative tag interrogative).

(i) and also elicits explicit addressee ratification (ii)), the suboptimal IRDs are predicted to be infelicitous. Another way of summarizing this state of affairs would be to say that the context and the likely goal of the speaker in (28) and (29) call for at least a conditional, projected, speaker commitment toward p (which the IRDs cannot produce).

This line of explanation has the advantage of predicting that the use of apparently suboptimal discourse moves may sometimes result in additional marked inferences, instead of judgments of infelicity. For instance, one may imagine a marked context that is compatible with the rising declarative in (29), as outlined in (30). The crucial setup here is that B is known to have rather eccentric aesthetic tastes, such that it has become a running joke to correctly guess B's judgment of various visual stimuli.

(30)   (A and B are looking at a sunset; B is known to have eccentric aesthetic convictions)
        A says to B: *This is a beautiful sunset?*

The use of an IRD in this context sounds felicitous and seems to give rise to the inference that the speaker's taste in the sunset is irrelevant; it is only the addressee's taste that matters in this particular context (unlike the canonical cases involving predicates of personal taste such as (29), in which the speaker's opinion about the sunset also matters). This is naturally predicted by the current analysis of IRD, which associates it only with the projected commitment of the addressee, but not with that of the speaker.

In sum, the path toward extending the current analysis of rising declaratives to comparisons with other sentence types seems promising. The core mechanism that predicts the emerging differences between them is a general pragmatic reasoning process that derives systematically different additional inferences from the distinct sets of conventions (associated with each sentence type) interacting with diverse contexts.

7.2.5 *Contextual primitives in discourse models*   Before closing the section on IRDs, it is worth pointing out one unresolved theoretical issue. The present analysis made a choice of actively utilizing the notion of projected commitments (following the steps of Malamud & Stephenson 2015) in capturing the rising declaratives data. In comparison, approaches like Farkas & Roelofsen (2017) do away with projected components altogether and instead posit other primitives such as the evidenced set of possibilities (marked with different intervals of credence level) of the speaker. It seems that at least for the case of IRDs, the core data and the evidence (including the experimental results in this paper) underdetermine the choice between these alternatives (i.e. the two result in similar empirical predictions).

For instance, both accounts have been shown to succeed in reconciling the contradictory vs. confirmatory uses of IRDs. For Farkas & Roelofsen (2017), the main explanatory load is put on clarifying the contextual conditions under which zero credence (as opposed to low credence, associated with confirmatory uses) can be signaled by IRDs: these are contexts in which the speaker has authority over whether p, and p is already in the addressee's commitment set. For the current analysis, the main burden is put on clarifying the pragmatic reasoning processes that derive the two diverging biases from the same abstract move of adding p to the addressee's projected set, depending on the systematic difference in the context (elaborated in detail in section 7.2.3). Similarly, both accounts can capture the subtle differences between IRDs and negative tag interrogatives, as outlined in section 7.2.4.

A theoretical question remains then, as to what kinds of contextual primitives one should posit in modeling the behavior of rising declaratives (and other marked sentence types, more generally). Providing an answer to this question is left for another occasion, as it would

require gathering additional evidence from a broader range of data that go beyond rising declaratives. The discourse effects of diverse intonational contours, marked and unmarked sentence types, discourse particles, etc., are predicted to provide good testing grounds for addressing this issue.

7.3 Recap of the accounts

The present analysis posited that ARDs (declaratives with RISE-A intonation) are essentially declaratives, in that they have the same basic effect as falling declaratives of adding their content p to the current commitment set of the speaker. They differ from the canonical falling declaratives however, in that they bring about the marked effect of also adding MLI^p to the Table. In a parallel fashion, the analysis posited that IRDs (declaratives with RISE-I intonation) are essentially interrogatives, in that they have the basic effect of adding their content $\{p, \neg p\}$ to the current Table (the RISE-I intonation participating in the compositional semantics as an $[\![\text{INT}]\!]$ operator). They differ from the canonical polar interrogatives however, in that they bring about the marked effect of adding the positive answer p to the addressee's projected commitment set.

Since ARDs are analyzed as incurring full speaker commitments, the analysis can easily capture the felicity of *Oh* responses as well as the experimental results demonstrating high speaker epistemic authority and low relative addressee epistemic authority for ARDs. At the same time, since IRDs are analyzed as *not* incurring any speaker commitments (projected or otherwise), the analysis can easily capture the infelicity of *Oh* responses as well as the experimental results demonstrating low speaker epistemic authority and high relative addressee epistemic authority for IRDs. Finally, by attributing each type of rising declarative with the relevant marked effects that differ from canonical falling declaratives and polar interrogatives, respectively, the analysis can capture the experimental results that demonstrated systematic four-way distinctions between falling declaratives, ARDs, IRDs, and polar interrogatives with respect to epistemic certainty ratings. In sum, by teasing apart assertive and inquisitive rising declaratives and analyzing them as distinct phenomena, the analysis is able to reconcile seemingly contradictory observations made in previous work which focused either on assertive or on inquisitive rising declaratives.

8 CONCLUSION

This paper examined the dynamic discourse effects of English rising declaratives. It demonstrated that the phenomena of English rising declaratives actually comprise two distinct marked sentence types, ARDs and IRDs. The two types of rising declaratives were experimentally shown to be associated with different intonational contours (RISE-A vs. Rise-I) as well as with distinct discourse effects. Based on the experimental results, the paper developed a formal analysis of inquisitive and assertive rising declaratives, in which each type of rising declarative was associated with a distinct set of context updating conventions. The analysis was shown to be able to account for the full range of experimental data, as well as resolve a few outstanding puzzles surrounding the heterogeneous effects of rising declaratives.

The current study demonstrates the usefulness of experimental studies in conducting controlled comparisons between different marked sentence types, as well as testing specific hypotheses on intonational effects. The study also suggests that terminal contours that closely resemble each other may need to be carefully distinguished in order to avoid

conflating potentially distinct semantic phenomena. Finally, it shows that an adequate construal of relevant context-updating conventions can systematically derive a wide range of seemingly irreconcilable effects associated with rising declaratives, as long as we establish a fundamental distinction between assertive and inquisitive rising declaratives.

APPENDIX

A. *Sentences used in the experiment*

Set I
Ellen is married !/?
Eleanor is Annie's mom !/?
Lenny's from Yemen !/?
Laura met president Obama !/?
Maria was in a spaceship to the moon !/?

Set II
Is Ellen married?
Is Eleanor Annie's mom?
Is Lenny from Yemen?
Did Laura meet president Obama?
Was Maria in a spaceship to the moon !/?

Set III
I'm from Yemen !/?
You're from Yemen !/?
Lenny's from Yemen !/?
Is Lenny from Yemen?

Set IV
It's raining !/?
Armadillos are mammals !/?
We should go get beer !/?
You need to mow the lawn !/?

B. *Summary of Fixed Effects*

Models in 1–2 all have 'Rising 1 Declarative' and 'spaceship' sentence as reference levels for the independent variables: intonation/sentence-type and content radical. Models in 3–4

all have 'ARDs (assertive rising declaratives)' as the reference level for the independent variable: type+tune.

1. Choices on speech acts or follow-up responses (Q1): intonational effect

Experiments 1 and 2

	Coef.	S.E.	z val.	$p <$
intercept	0.19	0.10	1.84	0.07
FallingDec	−2.98	0.13	−21.81	0.001
Rise2Dec	0.30	0.08	3.46	0.001
Rise3Dec	0.59	0.08	6.71	0.001
Rise3PolarQ	3.09	0.24	12.38	0.001

Experiment 3

	Coef.	S.E.	z val.	$p <$
intercept	0.46	0.16	2.78	0.01
FallingDec	−2.70	0.18	−14.33	0.001
Rise2Dec	0.05	0.15	0.33	0.73
Rise3Dec	0.35	0.15	2.29	0.05
Rise3PolarQ	1.64	0.20	8.06	0.001

2. Choices on speech acts or follow-up responses (Q1): content effect

Experiment 1 (minimal triplets)

	Coef.	S.E.	z val.	$p <$
intercept	−0.22	0.25	−0.88	0.37
FallingDec	−5.02	0.75	−6.62	0.001
Rise2Dec	0.19	0.27	0.69	0.48
Rise3Dec	0.70	0.27	2.53	0.05
PronounYou	4.74	0.73	6.48	0.001
PronounI	−1.14	0.30	−3.80	0.001

3. Speaker epistemic certainty on p

Experiment 2

	Coef.	S.E.	t val.	$p <$
intercept	71.95	1.60	44.72	0.001
FallingDec	14.86	1.34	11.04	0.001
IRD	−43.32	1.26	−34.35	0.001
PolarQ	−51.56	1.34	−38.23	0.001

Experiment 3

	Coef.	S.E.	*t* val.	*p* <
intercept	62.77	1.62	38.56	0.001
FallingDec	23.90	1.50	15.93	0.001
IRD	−33.12	1.39	−23.76	0.001
PolarQ	−40.76	1.50	−27.18	0.001

4. Relative addressee epistemic certainty on *p*

Experiment 2

	Coef.	S.E.	*t* val.	*p* <
intercept	−8.09	1.50	−5.38	0.001
FallingDec	−13.02	2.13	−6.11	0.001
IRD	33.33	1.90	17.47	0.001
PolarQ	36.57	2.13	17.16	0.001

Experiment 3

	Coef.	S.E.	*t* val.	*p* <
intercept	−8.51	1.92	−4.41	0.001
FallingDec	−22.22	2.43	−9.12	0.001
IRD	37.41	2.17	17.23	0.001
PolarQ	42.04	2.43	17.26	0.001

C. *Experiments and Data*

Data, codes, experiments and mixed effects models can be found at: https://github.com/sunwooj/risingdec

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