

English rise-fall-rise: a study in the semantics and pragmatics of intonation

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Abstract This paper provides a semantic analysis of English rise-fall-rise (RFR) intonation as a focus quantifier over assertable alternative propositions. I locate RFR meaning in the conventional implicature dimension, and propose that its effect is calculated late within a dynamic model. With a minimum of machinery, this account captures disambiguation and scalar effects, as well as interactions with other focus operators like ‘only’ and clefts. Double focus data further support the analysis, and lead to a rejection of Ward and Hirschberg’s (Language 61:747–776, 1985) claim that RFR never disambiguates. Finally, I draw out connections between RFR and contrastive topic (CT) intonation (Büring, Linguist Philos 26:511–545, 2003), and show that RFR cannot simply be reduced to a sub-case of CT.

Keywords Rise-fall-rise · Intonation · Contrastive topic · Focus · Conventional implicature

1 Introduction

A long-standing observation about English is that intonation can disambiguate an otherwise ambiguous utterance (Jespersen 1933, p. 181). In this paper, I look at a specific intonation contour, *rise-fall-rise* (RFR), and its ability to disambiguate sentences like the following:

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- (1) All my friends didn't come. (2) I can't do anything.
 a. = None of my friends came. a. \approx I'm powerless.
 b. = Not all my friends came. b. \approx I'm not all-powerful.

By pronouncing these sentences with a RFR pitch contour,¹ a speaker will unambiguously convey the (b) readings. The narrow goal of this work is to develop an understanding of how exactly this disambiguation takes place.

Towards this end, Sect. 3 investigates the licensing conditions on RFR in general, leading to a proposal for its semantics. I analyze the contour as a focus sensitive quantifier, similar in effect to *only* (Rooth 1996b). Unlike *only*, however, I argue that the meaning of RFR is a conventional implicature, in the sense of Potts (2003). This explains both the intonation's independence of at-issue entailed content, as well as the fundamentally speaker-oriented nature of its contribution—a commitment to the unclaimability of alternative propositions. In cases of potential ambiguity, any readings where RFR quantifies *vacuously* are filtered, giving rise to the observed disambiguation effect. Thus, the basic mechanics of disambiguation work here as under Büring's (1997a) better known cases of scope inversion, although my technical implementation will be somewhat different.

The analysis is largely motivated by the infelicity of RFR on “alternative dispelling” foci, but simultaneously answers the questions of when and why the contour will disambiguate. Furthermore, the proposal handles double focus data, which have been a problem for past approaches, leading to the claim by Ward and Hirschberg (1985, p. 770) that intonation *cannot* disambiguate. I demonstrate that their data conform to my predictions, and more generally that double focus constructions can't be construed as evidence against the disambiguating potential of RFR.

With the puzzle of disambiguation resolved, Sect. 4 turns to larger questions for the formalization of RFR meaning. In addition to defending Ward and Hirschberg's classification of RFR as a conventional implicature, I argue that its context change potential must be calculated *late*—specifically after the context is updated with the content of the proposition to which the contour attaches. This order of evaluation allows for the simple characterization of RFR in (3), and captures otherwise mysterious interactions between RFR and focus sensitive material like clefts and focus quantifiers.²

- (3) $\llbracket \text{RFR } \varphi \rrbracket^{\text{ci}} = \forall p \in \llbracket \varphi \rrbracket^{\text{f}}$ s.t. p is assertable in C: the speaker can't safely claim p .

Section 5 addresses a host of remaining issues—connecting to previous work on RFR and related contours, as well as situating RFR meaning within a dynamic semantic model. Specifically, I discuss (a) the source of scalar and rhetorical effects, (b) the relation between RFR and Büring's contrastive topic (CT) contour, (c) the treatment of RFR as a conventional implicature, and (d) the interaction of RFR with other focus sensitive operators.

¹ Audio recordings of the examples in this paper are at: <http://semanticsarchive.net/Archive/jhmYT15M/>.

² Irene Heim was extremely helpful in suggesting a slightly different version of this denotation, which I have adapted. Note, $\llbracket \cdot \rrbracket^{\text{ci}}$ represents the conventional implicature dimension of meaning, and C, the context of utterance. The (non-)effects of RFR on ordinary and focus-semantic values are discussed in Sect. 5.4.

2 Identifying rise-fall-rise

2.1 What is rise-fall-rise?

The rise-fall-rise contour has gone under various names, including (Ward and Hirschberg 1985, 1988) ‘ $^{\circ}2-4-3$ contour’, ‘ $2^{\circ}32\uparrow$ ’, ‘Tones III and V’, ‘Tone 4’, ‘a subset of Bolinger’s Accent A’, ‘Bolinger’s Accent B’, ‘contrastive stress within contradiction contour’, ‘A-rise’, ‘fall-rise’ and ‘rise-fall-rise’. In more recent work (Büring 2003; Oshima 2008), the contour has been associated directly with CT. However, this presupposes a semantic and prosodic unification of RFR and the “full” CT contour, consisting of both topic and focus marking. For specific challenges to this approach, see Sect. 5.3.

I adopt the term “rise-fall-rise” for two reasons. First, it is prosodically transparent—more so than the once favored “fall-rise”, in which the prominent rising pitch accent on the stressed syllable of the focus goes unmentioned. Second, the term is semantically neutral, picking out a prosodic element without making reference to its function.

Under the ToBI system for transcribing intonation (Silverman et al. 1992), RFR has usually been identified as [$L^{*+H} L- H\%$].³ Consider the following example of RFR, with focus on the word *expecting*:

- (4) A: Why isn’t the coffee here?
 B: I don’t know. I was expecting there to be coffee...
- L^{*+H} $L-$ $H\%$

The contour is made up of three pieces. First, there is a focused constituent, in this case the single word *expecting*, which bears a rising accent (L^{*+H}) on its stressed syllable.⁴ Second, a low phrase tone ($L-$) associates with the stretch of material between the focus and the intonational phrase boundary.⁵ Finally, the boundary tone ($H\%$) aligns to the end of the phrase. Note that this low-rising tone is anchored to the far right of the phrase, even when the final syllable carries no word stress, as in the *-fee* of *coffee* above. Also, since RFR is only specified for one boundary tone, it must occur entirely within a single intonational phrase.

Rather than provide full ToBI style transcription throughout, I’ll simply mark the focus and scope of the contour “in-text” as I’ve done in (4) above, according to the key in (5). Examples of rise-fall-rise in action are given in (6–9).

³ Ward and Hirschberg (1985, 1988, 1992) argue that [$L+H^{*} L- H\%$] must be treated as a separate contour, Bing’s (1979) A-rise. Oshima (2002) transcribes contrastive topics (Ione or otherwise) as [$(L+)H^{*} L- H\%$], but is chiefly concerned with the semantics of the contour.

⁴ At the phonetic level, the rising pitch accent may spread over two or even three syllables, provided that this doesn’t impinge on the space for following tones. Thus, if *Elizabeth* bears an RFR accent phrase-finally, the L^{*+H} will likely be realized across two syllables. However, if *Mary* appears in the same position, the entire pitch accent will fall on the stressed syllable.

⁵ The extent of this low tone is variable, according to the distance between the focus and the phrase boundary. However, the low target persists, even if the stressed syllable of the focus occurs finally within the phrase. Thus, we may find the entire [$L^{*+H} L- H\%$] realized on a single syllable, as in “I guess...”. From preliminary production studies, it appears that under-articulation is especially common in these cases.

- (5) Transcription Key
- Underline marks the semantically focused constituent.⁶
 - Italics mark the locus of *main stress* within the focus.
 - An ellipsis ‘...’ marks the low-rise boundary tone.
- (6) I like *most* kinds of cheese... (but not all).
- (7) She’s *sad*... but she’s not *miserable*...
- (8) I heard the doorbell ring... are you sure nobody’s there?
- (9) Well, at least you didn’t *flunk* the test...

It should be emphasized that this transcription conveys information that is absent in the speech signal. Specifically, the placement of stress (italicized) may not fully determine the extent of the semantic focus (underlined). The following homophonous structures (adapted from Selkirk 1995) illustrate:

- (10) a. She bought a book about *bats*... (but she didn’t buy one about anything else).
 b. She bought a book about *bats*... (but she didn’t buy anything else).
 c. She bought a book about *bats*... (but she didn’t do anything else).
 d. She bought a book about *bats*... (but nothing else happened).

Conversely, given a semantic focus, it is non-trivial to predict which word within the focus will carry the main phonological stress and thus come to bear the initial rise of the contour. However, this problem of main stress assignment is in no way specific to RFR intonation, and has been discussed at length in the literature (Jackendoff 1972; Selkirk 1995; Büring 2006; Kratzer and Selkirk 2007).

2.2 What isn’t rise-fall-rise?

A complicating factor in the study of RFR is the presence of similar, sometimes even homophonous contours which differ in effect. In the following examples, the focus has been double-underlined, to signal these as contours that I argue are semantically distinct from RFR:

- (11) A: So I guess you like; [æ]pricots then?
 B: I don’t like [æ]pricots — I like [ei]pricots!
 L*(+H) L- H%
- (12) A: John finally managed to solve the problem.
 B: He didn’t manage to solve it — it was easy for him!
 L*(+H) L- H%
- (13) A: So, I guess you really loved the movie then, huh?
 B: Loved it!? I hated it!
 L*(+H) L- H%

In each of these examples, B’s response is “metalinguistic” (Horn 1985), in the sense of reflecting or commenting on a particular linguistic item. Consequently, these uses

⁶ The semantic focus is the constituent marked with alternative-generating focus in the sense of Rooth (1985), as explicated in Sect. 3.1.

of intonation are marked by at least three features that distinguish them from “standard” RFR.

First, the proposition to which the contour attaches is “called off” by the intonation. In (11), for example, B is not committing to the proposition *I don’t like apricots*. Rather, she is objecting to a linguistic occurrence—the pronunciation of the word *apricots*—and then goes on to say that she does in fact like apricots. This contour is unlike RFR then, which always adds an independent contribution, never “interfering” with the proposition it attaches to (see Sect. 5.4 for more on the independence of RFR from at-issue content).

Second, these metalinguistic uses differ prosodically from RFR in the optionality of the rising portion of the pitch accent. That is, (11–13) convey roughly the same meaning whether the pitch accent is L*+H or just L*. This is a stark contrast with the examples presented in (6–9), which can’t support the L* accent without shifting to the metalinguistic interpretation. If the metalinguistic uses are classified under Liberman and Sag’s (1974) *contradiction contour* (identified as [L* L– H%] by Wolter 2003), the only extension we need to make is allowing that contour to have an optionally rising accent. On this view, the fact that the [L*(+H) L– H%] of contradiction or incredulity overlaps with RFR is an accident of phonology.⁷

Finally, in just these metalinguistic cases, the accented focus requires an overt linguistic antecedent. For example, in (13) above—a case of Ward and Hirschberg’s (1988) incredulous retort—B’s response becomes infelicitous when the preceding discourse is modified only slightly, by replacing the word *love* with *enjoy*:

- (14) A: So, I guess you really enjoyed the movie then, huh?
 B: #Loved it!? I hated it!
 L*(+H) L– H%

While this anaphoric relationship may in some cases be established through “rough” identity, as in (15) below, the dependence on the preceding discourse is still notable when compared to a non-metalinguistic case of RFR like (16).

- (15) A: I thought the movie was pretty good. And my husband liked it too.
 B: John liked it!? I thought he hated action movies.
- (16) A: Did your friends like the movie?
 B: John liked it... the rest of them hated it.

These three common features shared by (11–13)—“calling off” the propositional content, optionality of the rising accent, and dependence on a linguistic antecedent—point to a unitary contour [L*(+H) L– H%], with a metalinguistic effect covering Ward and Hirschberg’s incredulous retorts and Liberman and Sag’s contradictions. That non-metalinguistic uses of RFR lack each of these three features is strong evidence for keeping the two contours separate, despite their optional phonological

⁷ Plausibly, there is a semantic thread tying these various contours together. However, it should be no surprise to find lexical ambiguity in the domain of intonation, as we find it in other corners of the lexicon. Whether languages apart from English collapse incredulity, contradiction, and “true” RFR (which we might call a non-resolution contour) is a question worthy of further investigation.

overlap. For further reasons to avoid the collapse of RFR and the contradiction contour, see Ladd (1980, pp. 147–152) and Ward and Hirschberg (1985, p. 753). To my knowledge the claim that incredulity and RFR must be kept apart in the semantics is new, and runs against Ward and Hirschberg’s (1988) attempt to unify the two.

In addition to all of the above distinctions between RFR on the one hand, and the contradiction or incredulity contours on the other, we will see shortly that RFR differs in resisting “alternative dispelling foci” as defined in Sect. 3.3. Since this feature is integral to the coming analysis of RFR—and at the root of the disambiguation effect—it is important that we can keep the metalinguistic cases distinct.

Throughout the paper, I use “RFR” and the *accent* notation to refer only to the non-metalinguistic uses, where the rising pitch accent can’t alternate with a low tone. Since my aim is just to account for the licensing of RFR, I mark as infelicitous utterances for which only the metalinguistic reading is available. For example:

(17) #All my friends came...

Another contour I will keep distinct from RFR is the CT contour, as discussed by Büring (1997a, b, 1999, 2003). This contour typically describes utterances consisting of two intonational phrases—the first containing a rising CT accent, and the second containing a falling focus accent:

- (18) A: What about Fred? What did he eat?
 B: [[Fred]_{CT}]_{IntP} [ate the [beans]_F]_{IntP}
 (L+)H* L- H% H* L- L%

While the CT contour appears to be related to RFR in both form and meaning, there are differences between the two that preclude complete unification at this time. I address some consequences of this potential collapse in Sects. 5.3–5.4.

3 The meaning and licensing of rise-fall-rise

The desire to attach a meaning to RFR goes back at least as far as Pike (1945), who describes the contour as a combination of “introspection with close attention to some single item”.⁸ Other researchers attribute to the intonation a sense of reservation (Halliday 1967), incompleteness (Bolinger 1982), or focusing within a set (Ladd 1980).

Ward and Hirschberg (1985) analyze RFR in terms of scalar speaker uncertainty. On their account, RFR conveys one of three types of uncertainty:

- (19) I. Uncertainty about whether it is appropriate to evoke a scale at all.
 II. Uncertainty about which scale to choose, given that some scale is appropriate.
 III. Given some scale, uncertainty about the choice of some value on that scale.

In Sect. 5.1, I show how both speaker uncertainty and complex scalar behavior fall out from the claim that RFR is a conventionally implicating quantifier over alternative propositions, evaluated late within a dynamic model. This generalization, in addition to being simpler to state, is independently motivated by the distribution of RFR on

⁸ This brief history of RFR is reproduced from Ward and Hirschberg (1985).

different types of focus. I begin by reviewing Rooth's semantics for focus interpretation, and go on to define a class of focus that is incompatible with RFR: the "alternative dispelling" focus.

3.1 Focus, alternatives, and *only*

Rooth (1985) presents a formal "alternative semantics" for focus. The key feature of this semantics is the creation and manipulation of alternative propositions, which are "roughly those obtainable from making substitutions in the focus position" (Rooth 1996a).

Perhaps the quintessential focus-sensitive operator is *only*. Treatments of *only*, dating back to Horn (1969), make crucial reference to alternatives in some form or other. Following Rooth (1996b), *only* quantifies over alternative propositions as follows:⁹

- (20) *only* combining with a clause yields the assertion that all alternative propositions are false (and presupposes the proposition denoted by the clause).

This meaning captures the contrast in the pair below, which differ only with regard to the focus position, marked prosodically with a falling (H*) pitch accent. In (21a) the alternatives are of the form *Mary introduced X to Sue*, whereas in (21b) they are *Mary introduced Bill to X*. Since *only* quantifies over these alternatives, the sentences have different truth conditions.

- (21) a. Mary *only* introduced [Bill]_F to Sue.
b. Mary *only* introduced Bill to [Sue]_F.

While focus structure delimits the shape of possible alternatives, the choice of which alternatives make it into *only*'s domain is context-dependent. As (22) illustrates, the criterion for selection is limited only by the imagination.

- (22) A: Which animals do you like that start with the letter P?
B: I *only* like [Pomeranians]_F.

This general problem of determining the relevant domain of quantification is addressed by von Stechow (1994), for a wide range of quantifiers, including *only*. In von Stechow's analysis, quantifier domains are free variables at the semantic level, bound by an anaphoric link to the discourse context. It is reasonable, then, to think that in (22), *only*'s domain of quantification (i.e. the alternative set) will be determined through a pragmatic link to the preceding question.

For our purposes, what's important is that not all propositions fitting a particular focus structure will be realized in the alternative set. This point will be especially relevant in Sects. 5.2–5.3 where we find RFR focus on an entire utterance, leaving no syntactic restriction on the alternatives. In such cases, the link to previous discourse

⁹ Technically, since the proposition denoted by the clause is also a member of the alternative set, we need to prevent *only* from asserting its falsity. Rooth (1996b, p. 277) achieves this as follows (where I have corrected an apparent typo):

(i) *only* combining with a clause φ yields the assertion $\forall p [(p \in [\varphi]^f \wedge \forall p) \rightarrow (p = [\varphi]^o)]$.

(and in particular, a preceding question) is crucial in deciding which alternatives are salient enough to be in the domain of RFR quantification.

3.2 RFR vs. *only*

At first glance, the contribution of RFR is similar to that of *only*:

(23) A: Did your friends like the movie?

- B: a. *John* liked it...
b. Only John liked it.

Both examples leave us with the impression that the other friends didn't like the movie. However, the following pairs show that RFR is weaker in effect:

(24) A: Did your friends like the movie?

- B: a. *John* liked it... I don't know about the rest of them.
b. Only John liked it. #I don't know about the rest of them.

(25) A: Did your friends like the movie?

- B: a. *John* liked it... the rest of them didn't show up.
b. Only John liked it. #The rest of them didn't show up.

In each case, the alternative propositions are of the form *X liked it*. Since *only* quantifies over alternatives to the effect of their falsity, it's incompatible with speaker uncertainty regarding these alternatives, as (24b) shows. Similarly, when the alternatives are undefined (in the sense that *Mary liked the movie* can't be true or false if Mary didn't go to the movie) *only* is equally bad, as in (25b). RFR, on the other hand, occurs naturally in these contexts, showing compatibility with uncertainty and non-definition.

For the time being, it will suffice to make the following tentative proposal. Both *only* and RFR quantify over alternative propositions.¹⁰ While *only* asserts that alternatives are false, RFR asserts merely that alternatives can't safely be claimed. There are many reasons for not wanting to claim something—known falsehood, lack of evidence, or meaninglessness (non-definition). In this sense, RFR is weaker than *only*, in that the speaker's motive for not claiming the alternatives is left open.

3.3 Alternative dispelling foci

We saw above that while RFR and *only* differ as to the strength of their quantification, they are parallel in what they quantify over. Thus, it is unsurprising to find that both elements are sensitive to the following restriction: RFR and *only* are illicit on "alternative dispelling" foci.

- (26) a. The food was *good*...
b. The food was *only good*.

¹⁰ Note that by analyzing RFR as a focus quantifier, I am assuming that its association with focus is obligatory. That is, as with *only*, the alternative propositions that RFR quantifies over are constrained to be among those alternatives generated by the focus marking.

- (27) a. #The food was *perfect*...
 b. #The food was only perfect.

Intuitively, (27a) and (27b) are infelicitous because, while *perfect* is the best the food could have been, the use of intonation or *only* implies that it could have been even better. To capture this intuition more formally, it will help to define a few terms.

- (28) A proposition p **resolves** a proposition q iff either $(p \rightarrow q)$ or $(p \rightarrow \neg q)$
- (29) A proposition p is **assertable** with respect to a common ground c iff *both*:
- (a) $c \cap p \neq c$ p is “informative”
 (b) $c \cap p \neq \emptyset$ p is “consistent”

This sense of assertability is due to Stalnaker (1972), and can be understood as one of a proposition’s prerequisites to being added to the common ground. Note also that if p resolves q , then adding p to the common ground (that is, asserting p) renders q unassertable in the resulting context, regardless of the prior discourse.

- (30) The focus of clause φ is **alternative dispelling** iff the proposition denoted by φ resolves all alternative propositions generated by the focus. Using Rooth’s notation: The focus of φ is alternative-dispelling iff $\forall p \in \llbracket \varphi \rrbracket^f : \llbracket \varphi \rrbracket^o$ resolves p .

Under this definition, *perfect* in (27) is alternative dispelling, whereas *good* in (26) is not. In each case, alternative propositions take the form *The food was X*. Assuming, that *perfect* and *good* invoke alternatives along a scale of quality,¹¹ we can see how *perfect* dispels its alternatives. Any alternative proposition *The food was* { *good* | *mediocre* | *bad* } is resolved by the main assertion that the food was perfect. On the other hand, in (26), the fact that the food was good doesn’t resolve a relevant alternative like *The food was perfect*. Thus, *good* is not alternative dispelling in this context.

Büring (1997a, pp. 187–188) provides a similar account, in which a sentence with topic marking will be ‘unpragmatic’ when it implies or contradicts all of its alternatives.¹² However this leads to a more general assessment (p. 190) that unavailable readings occur *only* with extreme elements that mark the end of some scale ordered by entailment.

It’s worth emphasizing, then, that alternative dispelling foci, as defined above are not necessarily endpoints on a scale (or scalar in any sense). To be alternative dispelling means simply to resolve all alternatives, whether positively or negatively, and makes no reference to scales. Take the following example:

¹¹ Though here again, we have to control for the context-dependence of the alternative set. For example, in the sentence “The food was *perfect*... but was it really worth driving to Alaska for?”, the context provides a salient alternative to *perfect* which remains unresolved, and RFR is thereby licensed.

¹² More specifically, the infelicity derives from Büring’s (1997a, p. 178; 1997b, pp. 69–72) requirement that an utterance A containing a topic have an alternative that is still ‘under consideration’ or ‘disputable’ after A is uttered. Note that on Büring’s (2003) revised theory, this constraint is dropped, and also that for Büring, the alternatives are “topic alternatives”, which are computed by a different procedure than regular focus alternatives. Nevertheless, the mechanics of the account are much the same as the one I have provided. See Sect. 5.3 for further comparison of RFR and topic intonation.

- (31) A: Isn't John's car white?
 B: #It's *purple*...

In this case, RFR is illicit because *purple* has negatively resolved its alternatives. The fact that the car is purple implies that it's not white (or green, or any other color), thereby closing the issue of the car's color. Moreover, *purple* can't easily be construed as the extreme element on a scale. Thus, the extreme foci that Büring discusses are only a subset of alternative dispelling foci. In general, focus quantifiers appear to be sensitive to the presence of assertable alternatives, and resist a focus that dispels its alternatives by any means. Formally, a focus can dispel an alternative either by rendering it uninformative, or else by rendering it inconsistent.

While alternative dispelling foci aren't necessarily scalar endpoints, there is nevertheless a sense in which they are maximal. To be alternative dispelling, a focus must be maximally informative. By resolving all salient alternatives, either positively or negatively, an alternative dispelling focus can be said to have closed the issues raised implicitly by the focus structure.

An illustrative contrast to (31) above is the following:

- (32) A: Isn't John's car some crazy color like orange?
 B: a. It's *purple*... (= Is that crazy enough?)
 b. It's *only purple*. (= Purple is not crazy enough.)

In this context, *purple* is no longer alternative dispelling, due to introduction of the salient alternative 'some crazy color like orange'. Since logically speaking, purple may or may not be such a crazy color, the alternative proposition *It's some crazy color like orange* remains unresolved. On our hypothesis, the contribution of RFR is that the speaker can't safely claim the alternatives. Thus, (32a) expresses uncertainty as to whether purple is as crazy of a color as orange. On the other hand, *only* in (32b) commits the speaker to the falsity of the alternatives, resulting in the claim that the car is not some crazy color like orange, and consequently the sense that purple is less crazy than orange.

The following examples illustrate a variety of alternative dispelling foci, contrasted in each case with a non-dispelling member of the same alternative set:

- (33) a. Most of my friends liked it... (34) a. John liked it...
 b. #All of my friends liked it... b. #No one liked it...
- (35) a. John or Mary liked it... (36) a. My bike is okay...
 b. #John and Mary liked it... b. #My bike is purple...
- (37) a. I saw a dog... (but I don't know if it was your dog).
 b. #I saw the dog...¹³

¹³ Deriving the alternative dispelling character of *the* raises a number of issues I won't address here. However, it seems initially plausible that by virtue of narrowing the domain to contain a uniquely identifiable dog, *I saw the dog* would resolve not only alternatives like *I saw a dog*, but also *I saw your dog*, and *I saw all dogs*.

Can the fact that RFR resists alternative dispelling foci be derived from more basic assumptions? Suppose, as per the discussion above, that the effect of RFR is to mark alternative propositions as unclaimable. In (33), the focus structure restricts alternatives to have the form *X of my friends liked it*. But note that many propositions of this form are already rendered unassertable once we update the context with the content of the main assertion. For example, if I just told you that most of my friends liked the movie, it would be uninformative for me to go on and tell you that some of my friends liked it, and contradictory for me to tell you that none of them liked it. These alternatives are *trivially* unclaimable in the sense that the main assertion already resolves them. In the case of (33a), we still have alternatives like ‘All of my friends liked it’ that remain assertable, and thus the intonation makes a real contribution by saying that even these alternatives are not things the speaker can claim. However, in (33b), all the alternatives are trivially unclaimable, and so the meaning contributed by RFR is vacuous.

The fact that RFR resists alternative dispelling foci is evidence that the contour cannot make a trivial or redundant contribution. If we analyze RFR as a quantifier over alternative propositions, this restriction falls out naturally as just one instance of a general ban against vacuous quantification, which can also be observed in typical quantifiers like *every* and *most*.¹⁴ On this view, the restriction we’re seeing is just that RFR cannot have an empty domain. This in turn suggests an elegant formulation on which RFR quantifies over *assertable* alternatives, and the quantification takes place after the main assertion has been evaluated. By ordering the evaluation of RFR meaning late within a dynamic model, we allow for the possibility that the main assertion resolves the entire alternative set, leaving RFR with an empty domain.¹⁵

Regardless of implementation, we can conclude this section with the descriptive observation that RFR quantifies over just those alternatives which remain assertable after the main proposition is evaluated. Thus, we can say that RFR is a quantifier over “post-claim assertable” or simply “post-assertable” alternative propositions.

4 Predictions and results

At this juncture, we’ve developed a simple theory of rise-fall-rise’s contribution, which makes predictions about where the contour will be licensed. Specifically, we take RFR to quantify non-vacuously over post-assertable alternative propositions, to the effect that none of these propositions can safely be claimed. In this section, I explore the consequences of this analysis on a wider range of data, including cases of

¹⁴ Heim and Kratzer (1998, pp. 162–172) cite arguments that a quantifier’s need for a non-empty domain is presuppositional. On this view, cases of RFR on an alternative dispelling focus would be treated as a presupposition failure. From there, to capture disambiguation data (as discussed in Sect. 4.2), we could say that any logical form of an ambiguous utterance is filtered if it results in presupposition failure, where another available LF does not.

¹⁵ A similar dynamic account could be given for *only*, with the added complication that *only*’s contribution feeds back into the recursive semantics. Assuming an embedded proposition is evaluated in a temporary context, an embedded use of *only* would quantify over alternatives assertable in that context, and then feed back into the composition. This seems in line with a presuppositional analysis of *only* like Horn (1969), in which the main proposition is a prerequisite on the context to which *only* contributes.

disambiguation. The intonation's ability to disambiguate will fall out directly from the licensing conditions already discussed. The core mechanism for disambiguation is not novel; it is the same mechanism proposed by Büring (1997a, b) and discussed by Oshima (2008) for cases of CT marking.

Beyond the disambiguation facts, the proposal thus far is also sufficient to predict scalar effects, rhetorical effects, and complex interactions between RFR and other focus sensitive operators. I discuss these results in Sect. 5.

4.1 Downward entailing contexts

Intuitively, an item like *perfect* is “fully informative” in that if something is perfect, there's nothing else we need to know about it. More formally, *perfect* is fully informative because it resolves its alternatives in a default context (one in which the usual order of entailment holds).¹⁶ However, it's not the case that fully informative items are always alternative dispelling. Specifically, in a downward entailing context (Ladusaw 1979), entailments are reversed, and a focus like *perfect* no longer resolves its alternatives. For example, “The food wasn't perfect” doesn't resolve an alternative like *The food wasn't good*, since *perfect* occurs under negation—a downward entailing operator. In general, it can be shown that fully informative foci are never alternative dispelling in downward entailing contexts. This fact is derived formally in the appendix.

According to our present analysis then, rise-fall-rise intonation should be able to focus *perfect* in any downward entailing context. In precisely these cases, *perfect* will leave unresolved alternatives, thereby providing RFR a substantive base to quantify over. This prediction is borne out by the following data, in which *perfect* occurs as RFR focus in a variety of downward entailing contexts.¹⁷

- (38) He's not perfect... (negation)
- (39) I doubt he's perfect... (inherently negative verb)
- (40) Few people are perfect... (D.E. argument of a quantifier)
- (41) If he's perfect I'll marry him... (antecedent of a conditional)
- (42) Perfect men are easy to live with... (subject of a generic statement)

Just as a maximal focus like *perfect* ceases to be alternative dispelling in downward entailing contexts, there are foci that become alternative dispelling in these environments. For example, while *edible* is relatively uninformative (with respect to food, at least) in a default context, *not edible* could be construed as maximally informative:

¹⁶ Alternatively, we could define informativity of a predicate in terms of cross-categorical entailment. A fully informative predicate cross-categorically entails all alternative predicates.

¹⁷ To be precise, (41) and (42) are not strictly downward entailing. However, they are Strawson-downward-entailing (see von Stechow 1999), and these contexts are known to pattern with downward entailing contexts, with respect to NPI licensing, for example. Thank you to Kyle Rawlins for pointing this out to me.

(43) The food wasn't *perfect*... (but it was good.)

(44) The food wasn't *good*... (but it was edible.)

(45) #The food wasn't *edible*...

4.2 How does RFR disambiguate?

We just saw that “fully informative” items like *perfect* are alternative dispelling only in default (upward entailing) contexts. Putting this together with the fact that RFR resists alternative dispelling foci, we can now elegantly account for disambiguation of a sentence like (46) below. Intonation aside, (46) would have the two potential logical forms in (47,48). However, with RFR focus on *all*, the sentence only has reading (48)¹⁸:

(46) All my friends didn't come...

(47) \forall friends-of-mine, x [\neg (x came)] “None of my friends came”

(48) \neg [\forall friends-of-mine, x (x came)] “Not all my friends came”

Disambiguation falls out directly from what we already know about RFR, by the following chain of reasoning. First, *all* is “fully informative”, since it entails each of its alternatives in the cross-categorical sense—*all* \subset *most* \subset *some*. Next, recall that fully informative foci cease to be alternative dispelling in downward entailing contexts. Since negation is one such context, we expect that *all* will be alternative dispelling on reading (47), but not reading (48). This prediction is verified when we construct the alternative propositions for each reading:

(47a) for { *most* | *some* | ... } friends-of-mine, x [\neg (x came)]

(48a) \neg [for { *most* | *some* | ... } friends-of-mine, x (x came)]

Reading (47) resolves all its alternatives in (47a)—that is, *None of my friends came* resolves all propositions *X of my friends came*. However, reading (48) does not resolve the alternatives in (48a). As a trivial example, *Not all my friends came* doesn't resolve whether or not *Most of my friends came*.

Finally, we saw in Sect. 3.3 that RFR requires unresolved alternatives to quantify over. Having predicted, and verified that *all* dispels its alternatives on reading (47), we can understand why this reading is unavailable. Reading (48), however, in which

¹⁸ A reviewer questions whether the wide-scope reading (48) is still unavailable in a context like (i). Informants have confirmed the judgment given below, that the use of RFR is indeed impossible in this case. To the degree that there is variation in this judgment, I suspect that any judgments of felicity stem from an ability of listeners in the face of a prosodically anomalous stimulus to reconstruct a contour different than the one they heard. Thus, in elicitation, it may be helpful to over-articulate the contour to the point where it is unmistakable.

(i) A: You're overreacting, just because your best friends didn't come to our party doesn't mean nobody likes you.

B: #*All* of my friends didn't come... (... Maybe I'm not overreacting at all.)

RFR's quantificational demands are satisfied, is permitted, and thus is the only available interpretation.

While this argument is fairly straightforward, there are two points of connection with larger theoretical issues that deserve special emphasis. First, it is crucial for this account that alternative propositions are calculated separately for each potential logical form. An alternative is not, as one might intuit, "something else that could have been said", given by entering different words into the focus position. Rather, alternatives are formal, structured entities, produced by direct manipulations to a fixed logical form.

Second, the design of grammar must allow for semantic/pragmatic well-formedness to act as a filter on logical form, as proposed in Büring (1997a). Specifically, the need of RFR for post-assertable alternatives is enough to rule out a logical form as "unpragmatic".

This account may also be extensible to ambiguous questions and conditionals, as in the following:

- (49) Can John answer any question about Algeria?
 a. \approx Can John answer *every* question about Algeria?
 b. \approx Can John answer *even one* question about Algeria?
- (50) If John can answer any question about Algeria, I'll give you a dollar.
 a. \approx If John can answer *every* question about Algeria...
 b. \approx If John can answer *even one* question about Algeria...

For many speakers, intonation can disambiguate a conditional like (50), suggesting its integration under the above account.¹⁹ However, there are two obstacles to the inclusion of these data. First, it isn't obvious how we would expect the RFR contour to be realized phonologically within a question or a conditional. Since these constructions have their own distinctive intonation, RFR would plausibly be affected or even obliterated by the existing contour.²⁰ Second, a prerequisite to analyzing (49,50) above is an understanding of *any* sufficient to assign logical forms to the readings in question. In light of continuing debate on the number of *any*'s and their semantics (see Horn 2006), I defer this investigation to future research.

¹⁹ The relevant contours, corresponding to readings (50a) and (50b) respectively would be:

- (a) If John can answer any question about Algeria... I'll give you a dollar.
 L^*+H $\text{L}-$ $\text{H}\%$
- (b) If John can answer any question about Algeria I'll give you a dollar.
 H^* $\text{L}-$ $\text{L}\%$

²⁰ Büring (2003, p. 519 ff. 7) suggests that contrastive topic contours (of which he aims to treat RFR as a sub-type) do not occur in questions. If so, it would be interesting to see whether this could stem directly from the contour's pragmatics. An alternative is to say that CT *does* show up in questions and conditionals, but with a distinct phonetic profile. This would parallel the oft-noted (e.g. Pierrehumbert and Hirschberg 1990) variation in focus accents between assertions (H^*) and polar questions (L^*) in American English. A good candidate for CT within a question would be the example below. Also, for evidence of questions with CT marking in Czech, see Sturgeon (2006, §2.7).

(i) Okay, we know Fred ate the beans, but what about *Elizabeth*? What did *she* eat?

4.3 But can RFR *really* disambiguate?

The fact that rise-fall-rise intonation can resolve scope ambiguity has been observed by Jespersen (1933, p. 181), Jackendoff (1972, p. 352), Ladd (1980, p. 146), Horn (2006, p. 183), and others. However, the claim that RFR reliably disambiguates has been called into question by Gussenhoven (1983, pp. 77–81), and later by Ward and Hirschberg (1985, pp. 770–772).

Recall from the previous section that in sentences with a universal quantifier and negation, RFR focus was licensed on the quantifier only when it scoped under negation. The fact that this disambiguation was guaranteed by our theory of RFR is strong evidence in its favor. Conversely, it would not seem to bode well for our analysis if RFR were found to be licensed on an undominated universal quantifier.

Following Gussenhoven's lead, Ward and Hirschberg argue that it's context, rather than intonation, that has the power to disambiguate. Their case rests on precisely the examples we hoped never to find—examples where RFR is unexpectedly licensed on the high scope reading of a universal quantifier. From Ward and Hirschberg (1985):

(51) A: The union rep wants to know which union meeting some of the men missed.

B: All of the men didn't go to the last one...

(52) $\forall \text{ men}, x [\neg (x \text{ went to the last one})]$

On its most natural reading, B's response in (51) has the logical form indicated in (52). The subsequent claim is that this instance of RFR on a high scoped universal closes the book on the possibility that intonation *ever* disambiguates—a result that would leave us wondering where so much previous work had gone wrong.

Implicit in this argument is the view that, if RFR disambiguates at all, it was somehow “born to disambiguate”. Indeed, if all the contour did was to resolve scope ambiguity, then we would be hard pressed to explain a single case of its failure to do so. However, on our current understanding, disambiguation is a mere side effect of the contour's quantification over alternatives. Thus, it isn't a given fact that this side effect will take place across the board.

The missing piece of the puzzle is the overlooked (but mandatory) second focus on *last* in (51).²¹ This double focus structure generates alternatives of the form shown below:

(53) { *most* | *some* | ... } of the men didn't go to the { *first* | *second-last* | ... } one.

To resolve all of these alternatives, a proposition would have to convey exactly how many of the men came to each meeting. In the case of (51), it turns out that the combination of *all* and *last* isn't alternative dispelling on either scope reading. We can paraphrase the two potential readings as follows:

²¹ As a reviewer points out, it is unlikely that Ward and Hirschberg intended the example to have two accents, since they aim for it to disprove Jackendoff's narrow claim that scope disambiguation is obligatory in sentences with a *single* rising accent. However, as native speakers reliably confirm that the single-accented version is infelicitous in this context, I restrict my attention to the double-accented version. Note that Büring (1997b, p. 147) presents a similar explanation of Ward and Hirschberg's example in terms of double focus, although it is unclear whether he assumes that *last* receives a pitch accent.

(54) It isn't true that all of the men went to the last meeting.

(55) None of the men went to the last meeting.

Intuitively, it's clear that (54) is relatively uninformative. In particular, it resolves *none* of the alternatives in (53) above. The interesting fact though, is that due to the complexity of the alternative set, even (55) fails to resolve more than a fraction of the alternatives. For example, *None of the men went to the last meeting* doesn't resolve whether or not *Some of the men went to second-last one*.

Since neither reading of (51) is alternative dispelling, RFR is licensed in both cases, and neither logical form is filtered. The contour's "failure to disambiguate" here is better understood simply as the focus structure's provision for *some* post-assertable alternatives on each reading. Since RFR has its quantificational needs met, there is no reason either reading would be ruled out.

In (51), as in any case of true structural ambiguity, the listener relies heavily on the context for resolution. This may explain Ward and Hirschberg's intuition that disambiguation is a matter of context. However, the following example shows that the context can only be seen as a "last resort" measure. Whenever RFR does disambiguate, no amount of context can overpower the intonation (producing nonsense at best):

(56) It's not just that some of my students didn't sign the petition...
 #All of them didn't sign... Not a single one!

But, just as the second focus in (51) remedied RFR on the reading where *all* scopes over *not*, a second focus can easily license RFR on *all* even in the complete absence of a downward entailing context:

(57) A: How many of your students signed the petition?
 B: All of them wanted to...

Here, *wanted to* presumably gives rise to the highly salient alternative *did*, or in semantic terms, the property of having signed the petition. In this double focus structure, as before, *all* ceases to be alternative dispelling. Specifically, *All of them wanted to* doesn't resolve the issue of whether or not *All of them did*. Generally speaking, what we're seeing is that the more foci are introduced, the richer the alternative set becomes—to the point where it becomes difficult to resolve every alternative. Nevertheless, double foci can still dispel all of their alternatives, just in case each focus is individually alternative dispelling. For example:

(58) A: Who went to which meetings?
 B: a. #Everyone went to all the meetings...
 b. #Nobody went to any of them...

To summarize, these double focus data illustrate a new pattern of RFR distribution, which nevertheless conforms entirely to the analysis of RFR laid out in Sect. 3. The contour's need for post-assertable alternatives predicts a tight connection between RFR licensing and focus structure, accounting for the otherwise anomalous behavior of double focus constructions. Furthermore, these findings demonstrate that RFR isn't

inherently tied to the “task” of disambiguation. Rather, the disambiguating effect is reflex of a general filter against vacuous quantification. Any logical form which “yields unreasonable implicatures” is filtered (Büring 1997a, p. 176).

That said, we have been able to resolve the debate as to whether RFR can or can’t disambiguate. The answer is this—RFR, by virtue of the requirements it places on the alternative set, can but does not always force a particular reading of an ambiguous sentence.

4.4 Interim conclusions

Thus far, I’ve accounted for the potential of RFR to resolve scope ambiguity in terms of independently motivated licensing conditions on the contour’s use. These licensing conditions, in turn can be derived from the meaning of RFR. In fact, a strikingly small number of claims is needed to capture the contour’s complex distribution. These indispensables are the following:

- (59) a. RFR is a focus quantifier over assertable alternatives.
 b. RFR resists vacuous quantification.
 c. RFR quantification takes effect after the main proposition is evaluated.

Combining (59a) and (59b), we find that RFR needs *some* alternatives to quantify over. Adding in (59c), we see that these alternatives must remain assertable, through the evaluation of the main proposition—that is, they can’t be resolved by it. This grounds RFR’s need for post-assertable alternatives, and explains the unique behavior of alternative-dispelling foci.

While RFR shows sensitivity to whether its focus is a scalar endpoint, I’ve shown that nothing inherently “scalar” needs to be stipulated in its semantics. Scalar behavior falls out from the general facts of focus and alternative resolution.

With the above licensing condition, we get disambiguation of any sentence whose focus is alternative dispelling on only one of multiple readings. On this view, RFR is in no way “tied to disambiguation”; rather the capacity to disambiguate is a side effect of the contour’s general requirements on logical form. Finally, because disambiguation is epiphenomenal, nothing special has to be said about double focus constructions to capture their seemingly exceptional status.

5 Related work and remaining work

5.1 Scalar uncertainty

Ward and Hirschberg (1985) present a pragmatics for RFR which is inherently scalar. The crux of their analysis is that RFR conventionally implicates speaker uncertainty with respect to some scale. In Sect. 5.4, I’ll argue that RFR is indeed a conventional implicature. However, in this section, I show that the alternative-based account of RFR already predicts scalar effects, and (when necessary) uncertainty, thereby

removing the need to stipulate these features directly. As an example of the contour's scalar behavior, take the following:²²

- (60) A: We need someone really good. Is your GPA above 3.5?
 B: a. It's a 3.4 ...
 b. #It's a 4.0 ...
 c. #It's a 1.0 ...

On Ward and Hirschberg's analysis, speaker B conveys (type III) uncertainty as to "the choice of some value on a scale". Specifically, in (60a) B is uncertain whether 3.4 qualifies as "good enough", on the scale of GPA's. In (60b,c) however, there would be no reason for uncertainty—4.0 is clearly good enough, while 1.0 clearly is not. Thus, the contour is unlicensed.

To see how these facts fall out under the alternative-based account, we need to first calculate the alternative propositions to (60a,b,c)—in each case, the set of propositions *It's X*, where *it* is understood as B's GPA. Since this set is virtually unconstrained, we need to look for *salient* alternatives. In this case, the context provides one highly salient alternative of this form—something like *It's good enough*.²³ If we take this to be the sole alternative, the response in (60a) conveys both that 3.4 *might* be good enough (or else the alternative would be dispelled by the proposition), and simultaneously that B can't claim 3.4 is good enough—whence uncertainty. In (60b,c) however, it isn't clear what salient issue of the form *It's X* remains disputable with such a high or low GPA.

While the alternative-based account captures the uncertainty in the case above, it doesn't treat uncertainty as an integral part of RFR meaning. This turns out to be an advantage when it comes to data like the following, adapted from Oshima 2008:

- (61) A: Did your friends pass the test?
 B: Charles passed... Patrick and Ginevra flunked.

Here, it seems that B has all relevant information, and provides it to A in a straightforward manner. Thus, it is unclear where we would locate the uncertainty Ward and Hirschberg stipulate as an essential feature of RFR. On the present theory, the intonation in B's response is just a committal to the unclaimability of salient alternatives of the form *X passed*. In this case, it is B's *certainty* about the other friends having flunked that makes alternatives like 'Patrick passed' unclaimable.

5.2 Non-resolving answers and rhetorical effects

Can our theory of RFR developed so far capture the following distribution?

²² In fact, (60b) does have a licit but rude interpretation. It would have to mean something like "It's a 4.0. Is that good enough for you?". We'll return to this rhetorical device in Sect. 5.2.

²³ A reviewer questions whether the use of an alternative like *good enough* goes against the conventional idea of what an alternative can be. While there is an intuitive sense in which *good enough* and "3.4" are not of a kind, the use of such alternatives is nevertheless orthodox. On Rooth's (1985) widely adopted alternative semantics, focus alternatives are only restricted to be the same semantic type as the focused phrase; they do not necessarily come from a fixed lexical set, or even instantiate a fixed syntactic category.

- (62) A: Is it going to rain tomorrow?
 B: a. Maybe...
 b. # Yes...
 c. # No...

Rooth's alternative semantics tells us little about such cases. If an entire utterance is focused, we predict no structural restriction on the alternative set. This leaves the choice of alternatives entirely in the hands of the pragmatics—whichever propositions are “salient”.

Rather than digress into a general theory of saliency, it will suffice for our purposes to recall the clear effect of a preceding question on alternative selection, as previewed in Sect. 3.1. Thus, in (62) above, the salient alternatives will be the two propositions raised by the question—that it will rain tomorrow, and that it won't. Given this, our current understanding of RFR can easily capture the difference between (62a,b,c). Since the *yes* and *no* answers are alternative-dispelling, they can't bear RFR. However, *maybe* leaves the alternative unresolved, so RFR is licensed.

In general, RFR is licensed on what we might call “non-resolving” answers. By this I mean simply any response that leaves a part of a larger question unresolved. This sense is distinct then from Groenendijk and Stokhof's (1984, p. 235) “partial answers”, in that a non-resolving answer need not bring us any closer to a complete answer. Also, non-resolving answers are not necessarily “relevant” in Büring's (2003, pp. 517, 541) sense of shifting the probabilistic weights among the propositions denoted by the question. While answers like “Presumably” (Büring 2003, p. 517 ff. 6) satisfy this requirement, a response of “Maybe” doesn't affect the likelihood of positive or negative resolution.²⁴

Given the distribution above, it is somewhat surprising to find RFR permitted on a response like the following:

- (63) A: Why don't you talk to Michael about it?
 B: Wait, isn't he in Togo?
 A: I had lunch with him twenty minutes ago...

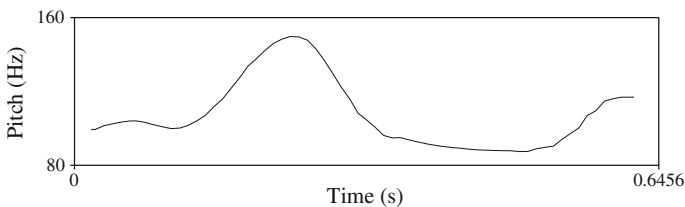
Here, A's final response could be taken as complete commitment to the fact that Michael is not in Togo. Is it problematic then that RFR is licensed on this seemingly resolving answer? Examples like these show a rhetorical use of non-resolution. While we can easily infer from A's answer that Michael isn't in Togo, the propositional content does not strictly speaking entail this, and in fact the intonation marks the answer as noncommittal. In this case, speaker A's choice to explicitly not resolve the issue at hand has the effect of raising an implicit rhetorical question—something like “... is that enough evidence for you?”. In general, purely rhetorical uses of RFR provide sufficient information to resolve an issue, but push the resolution itself onto the interlocutor. This explains the fundamentally condescending nature of RFR on an apparently complete answer.

²⁴ At the same time, we need to rule out RFR on answers like “It's not important” which not only fail to resolve the question under discussion, but aim to shift the discourse away from the question entirely. To be precise then, we could say that RFR is licensed on *interested* non-resolving answers.

If (63) is best understood rhetorically, the same explanation extends perfectly to cases like the following:

- (64) A: Is it going to rain tomorrow?
 B: a. Obviously...
 b. Duh...

In both responses, B is completely committed to its raining tomorrow, leaving the issue open only for rhetorical effect. While the effect of (64a) is condescending, it is still judged as “less committal” than the non-RFR counterpart—“Obviously!”, pronounced with falling intonation. *Duh*, on the other hand, appears to be lexically specified for RFR, as evidenced by the following pitch track of the recorded pronunciation guide for *duh* in Webster’s online dictionary:



As the relevant meaning of *duh*, Webster’s offers this: “Used derisively to indicate that something just stated is all too obvious, or self-evident”. This meaning is directly compatible with the pragmatics hypothesized above. A speaker uses *duh*, not to commit to an answer, but rather to imply that the listener should be able to figure it out on their own.

With this rhetorical effect in mind, we can also understand otherwise mysterious uses of RFR on seemingly alternative dispelling foci:

- (65) A: <obliviously> Oh, is Mary sad?
 B: She’s miserable...

According to our theory of RFR licensing, we would expect B’s response to be licit only if *miserable* didn’t entail *sad*. Yet, this appears to be exactly the common sense knowledge that B is rhetorically calling into question. The effect of the utterance is chiding, as if to say: “She’s miserable... is *that* sufficient for you to conclude she’s sad?”. Perhaps B’s purpose here is to reproach A’s obliviousness—Mary is clearly miserable, but A hasn’t even noticed she’s sad.

In some cases, the availability of this rhetorical device can give rise to subtle ambiguities, where a response could be interpreted as either genuinely non-resolving, or else merely non-resolving for rhetorical effect. The following homophonous forms illustrate:

- (66) A: Is John home?
 B: a. His lights are on... (= probably)
 b. His lights are on... (= obviously)

All in all, the rhetorical effects discussed here, while puzzling at first, can be seen as a natural extension of RFR's non-resolution into the realm of hyperbole.

5.3 Büring's contrastive topics

In this section, I discuss the possibility of treating rise-fall-rise as a special case of the CT contour, as described in Büring 2003. Since RFR could be argued to share both a semantic and phonological core with CT, this collapsing of the two contours is attractive. However, the path to this goal also presents certain challenges, as we will see. At the present, I cannot offer satisfactory solutions to all of these challenges, and so it seems that we must maintain separate analyses of RFR and CT.

Büring (1997a, b, 1999, 2003) looks at CT in German and English, and is primarily concerned with "full" CT contours, containing both a topic and a focus element. Typically, the topic accent precedes the focus (F) accent,²⁵ giving schematically CT + F. Translated into ToBI for English, these accents are as follows (though note that each "accent" actually defines an entire intonational phrase, consisting of pitch accent, phrase tone, and boundary tone):

$$(67) \text{ CT} = (\text{L+})\text{H}^* \text{ L- H\%}$$

$$\text{ F} = \text{H}^* \text{ L- L\%}$$

- (68) A: What about Fred? What did he eat?
 B: [Fred]_{CT} ate the [beans]_F.
 (L+)H* L- H% H* L- L%

The foundation of Büring's (2003) proposal is that CT marks a special type of congruence between an utterance and a move in a discourse tree (d-tree)—a hierarchical representation of the questions, sub-questions and answers making up a discourse. Formally, CT-congruence is as follows:

(69) CT-congruence (Büring 2003)

An utterance U containing a contrastive topic can map onto a move M_U within a d-tree D only if U indicates a strategy around M_U in D .

U indicates a strategy around M_U in D iff there is a non-singleton set Q' of questions such that for each $Q \in Q'$ — (i) Q is identical to or a sister of the question that immediately dominates M_U , and (ii) $[[Q]]^o \in [[U]]^{ct}$.

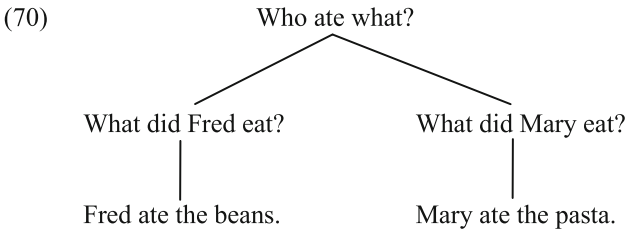
Informally, CT marks a response to a question which is part of a larger strategy (a set of questions) delimited by the CT-value of the response. The CT-value of an utterance, in turn, is the set of alternatives given by making substitutions in both the focus and the topic positions.

To take a concrete example, the CT-value of "[Fred]_{CT} ate [the beans]_F" is the set of questions *What did X eat*.²⁶ The utterance will therefore only be licit in a discourse

²⁵ In Jackendoff's (1972) terms, this would be a B accent followed by an A accent.

²⁶ Büring is careful to have the F-values vary "before" the CT-values, giving a set of questions sorted by topic. This ensures, for example, that "[Fred]_{CT} ate [the beans]_F" and "[Fred]_F ate [the beans]_{CT}" will have different CT-values, reflecting their differing discourse functions. The first signals a strategy composed of questions *What did X eat*, while the second signals the strategy *Who ate X*.

containing a multi-question strategy within this set. Represented as a d-tree, such a discourse would look something like this:

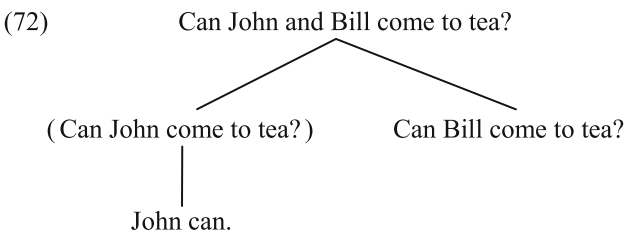


Strikingly, German doesn't allow CT marking without a following F accent (Büring 2003). However, Büring mentions that English does allow these cases, as in (71). Here I transcribe redundantly with both CT and RFR notation, ignoring the difference in pitch accent, which we will return to shortly.

- (71) A: Can John and Bill come to tea?
 B: [John]_{CT} can...
 (L+)H* L- H%

A major question is whether the pragmatics of lone CT can, in general, be accounted for using the d-tree technology designed for CT + F patterns. I turn now to a few potential problems for this approach, some of which appear to have satisfying solutions, and others of which appear to run deeper.

For (71) above, B's response does indeed map onto a highly plausible d-tree:



Note that the sub-questions here are contained in the CT-value of B's response—namely, $\llbracket [\text{John}]_{\text{CT}} \text{can} \rrbracket^{\text{ct}} = \{\{\text{John can}\}, \{\text{Bill can}\}\}$.²⁷ Furthermore, since the strategy-initial question “Can John come to tea?” is implicit in this case, Büring would predict (correctly, to a first approximation) that CT marking is mandatory in (71).

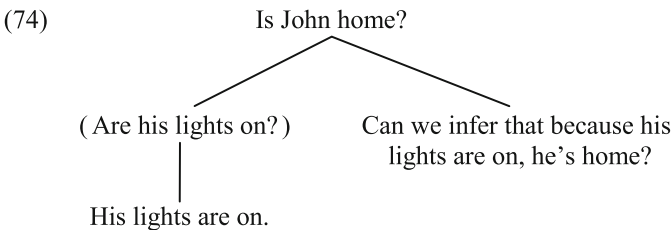
However, a puzzling aspect of Büring's proposal is that the corresponding German pattern “[Johan]_{CT} [kann]_F” will differ not just prosodically, but also semantically from the English case above, getting a topic value of $\{\{\text{John can}, \text{John can't}\}, \{\text{Bill can}, \text{Bill can't}\}\}$. As English CT+F and lone CT are in complementary distribution, it is unclear why German would lack not only the prosodic, but also the semantic counterpart to English lone CT.

²⁷ Here, Büring assumes (unconventionally) that the meaning of a polar question is the singleton set containing its literal meaning—e.g. $\llbracket [\text{Can John come?}]^{\text{p}} \rrbracket = \{\text{John can come}\}$.

Because CT and F marking each occupy an entire intonational phrase, the CT + F pattern of Büring's interest limits his investigation to cases of CT marking an entity- or event-denoting constituent (syntactically a DP) within a larger utterance. Expanding our view to lone CT marking, we would also expect to find proposition-denoting CT.²⁸ These examples, as in the following, provide another important test case for the d-trees theory:

- (73) A: Is John home?
B: [His lights are on]_{CT}...

Here, B's response clearly does answer a sub-question within a larger strategy aimed at determining whether John is home. We could tree one possible discourse as follows:



At first glance, it appears unlikely that the two disparate sub-questions above could be contained within the strategy-defining CT-value of B's utterance. However, recalling that the entire CT-marked constituent is to be varied, we actually find complete freedom in the alternative set—[[His lights are on]_{CT}]^{ct} = *all propositions*.²⁹ Thus, examples like these could be argued to constitute a degenerate case of CT-congruence, and can thereby be captured on Büring's theory. With no restriction on the form of the strategy, CT marking would seem to indicate nothing more than the existence of other sub-questions—that the marked response is not, in itself, a complete answer to the question under discussion.

An open prediction of Büring's is that since English allows lone CT's, it will also allow CT+CT patterns (with no focus). If each pitch accent in a RFR construction is taken to be a CT, then the double focus data discussed in Sect. 4.3 could instantiate this pattern. However, recall that these double focus examples contained two pitch accents within a single intonational phrase. Thus, Büring's direct association between CT and [(L+)H* L- H%] would need to be weakened to state that a CT is an optionally rising accent (L+)H* within *some* low-rising phrase (L- H%).

One larger problem for the unification of CT and RFR is their differing potential for closing a strategy. Büring (1997b, §3.2.2; 1999, pp. 150–151) claims that a sentence with CT marking requires a topic alternative to remain disputable *after* utterance—remarkably similar to our condition on RFR! However, the possibility of CT on the final move in a strategy shows that this constraint is not correct:

²⁸ It isn't clear in what sense "His lights are on" is topical in (73). Since theories of contrastive topic weren't designed with propositional CT's in mind, the terminology is misleading when extended to them.

²⁹ To be precise, the CT-value here is the set containing all singleton sets of propositions, or in other words, the set of all polar questions.

- (75) A: What did John and Bill do yesterday?
 B: [John]_{CT} [went dancing]_F. [Bill]_{CT} [stayed home]_F.

In later work, this problematic constraint is dropped from Büring's analysis. Thus, the d-trees account (2003) will allow CT marking on *Bill* above, requiring nothing more than some *sister* question within the strategy (delimited by the utterance's CT-value), regardless of its linear precedence. RFR (or a single CT), on the other hand, does appear to be sensitive to linear order:

- (76) A: Can Elizabeth and Persephone come over tomorrow?
 B: [*Elizabeth*]_{CT} can...
 C: a. # [*Persephone*]_{CT} can...
 b. # [*Persephone*]_{CT} can too...
 c. [*Persephone*]_{CT} can [too]_F.

The need for a third speaker in this example stems from the conditions we've already seen on RFR. Specifically, B's response implies the speaker's inability to claim the alternative *Persephone can*. Thus, the prediction is that even (76c) would be illicit as a continuation for B (barring a sudden recollection between one utterance and the next).

These data show us that RFR is licensed on a non-final response within a strategy but not on a final one. However, adding F-marked *too* as in (76c) produces a "full-fledged" CT contour (with both topic and focus accents), which can stand as the closing response to a strategy.³⁰ This indicates that RFR has stricter licensing requirements than Büring 2003 would predict for a single CT—so that English speakers are forced to a German-style CT+F pattern when providing a strategy-final response containing a semantic topic but no semantic focus.

The issue of finality within a strategy warrants a closer look at the distribution of boundary tones. Note that in general, the final item of a list receives falling intonation:

- (77) A: What do you want from the store?
 B: Broccoli... asparagus... and artichokes.
 L* H- H% L* H- H% H* L- L%

If this fact about listing generalizes to prosodically complex responses within a discourse strategy, it would shed light on the infelicity of RFR (which, by definition has a rising boundary tone) on a strategy-closing response. Similarly, the tendency for a rising boundary tone on a non-final list element would be a welcome explanation for not only the licensing of RFR, but also for the prosodic variability of traditional CT in mid-strategy positions:

- (78) [*Elizabeth*]_{CT} ate [the gazpacho]_F, and [*Persephone*]_{CT} ate [the tamales]_F.
 a. (L+)H* L- H% H* L- L% (L+)H* L- H% H* L- L%
 b. L*(+H) L*(+H) L- H% (L+)H* L- H% H* L- L%

While associating CT with [(L+)H* L- H%] predicts (78a) as the only possible reading, a more natural rendering would be (78b), where a rising topic and a low or rising focus are squeezed into one intonational phrase. This "atypical" CT contour

³⁰ Although remarkably, English doesn't allow "[Persephone]_{CT} [can]_F" here—presumably because *can* isn't being contrasted with *can't*.

highlights the importance of the boundary tone in determining the shape of pitch accents within a phrase. Within a compositional model of intonation³¹ (e.g. Pierrehumbert and Hirschberg 1990 or Steedman 2008), we could specify CT as a rising accent within a rising phrase, and let the distribution of rising and falling phrases fall out from potentially unrelated factors. Plausibly, (78b) is preferable since it “makes use” of an existing rising phrase (licensed by non-finality), rather than building an extra intonational phrase.

One final obstacle to unifying CT and RFR lies in the alignment of the rising pitch accent. On the one hand, RFR is specified for a late-aligned L^*+H accent, where the low tone aligns with the stressed syllable. This accent has been argued by Ward and Hirschberg (1985), Pierrehumbert and Hirschberg (1990) and Steedman (2008), among others, to be distinct from early-aligned rising accents $L+H^*$ (aligned to the high tone), and high accents H^* . CT, on the other hand, do not support the late-aligned L^*+H accent, as we can see clearly in examples where the topic is more than one or two syllables long:

- (79) A: What about Elizabeth? What did she eat?
 B: ??Elizabeth ate the beans.

L^*+H L- H% H* L- L%

On the whole, providing a unitary account of RFR and CT may be a promising path for future research. Both contours contain a rising accent within a rising intonational phrase, and both convey that the utterance is non-resolving of a larger issue in the discourse. However, any such work will have to address fundamental distinctions between the contours as well. For example, the requirement that alternatives remain disputable *following* the intonation marked utterance is unique to RFR, and must be better understood before CT and RFR can be leveled.

5.4 Rise-fall-rise as a conventional implicature

Throughout, I’ve maintained that rise-fall-rise quantifies over “post-assertable” alternative propositions. This provides a simple explanation for why the contour resists alternative dispelling foci, and disambiguates away from any logical form without post-assertable alternatives. However, this minimal analysis leaves open a number of questions:

- (80) A. What class of meaning does RFR’s quantification contribute?
 B. What is the force of its quantification (\forall , \exists , ...)?
 C. What is the “effect” of its quantification (its nuclear scope)?

Because it’s difficult to answer any one of these questions independently of the others, let’s adopt for the moment the answers to (B) and (C) from Sect. 3.2—namely, that RFR conveys that all the alternative propositions can’t be safely claimed. Now, we can ask, is this meaning an at-issue entailment, a presupposition, or an implicature?

³¹ I suggest a compositional model here in the hopes that H% distribution can derive from its independent meaning. However, it isn’t clear that either of the models cited will support the dependence of a pitch accent on its containing phrase type for phonetic realization. The underlying assumption of these authors is that pitch accents, phrase tones, and boundary tones are both semantically and phonologically orthogonal.

Previous work on RFR and the related CT contour (Büring 2003) has disagreed as to the class of the intonational meaning. Ward and Hirschberg (1985, pp. 773–775) argue that RFR contributes a conventional implicature (CI). Oshima (2008), who aims to unify RFR and CT, concludes that the contour contributes a presupposition. Finally, both Lee (2003, §4.1) and Oshima (2008, §3.3) argue against a third position, which they associate with Büring’s work, that the contour contributes a conversational implicature. Clearly, this problem of meaning class deserves a closer look.

We can start by examining the connection to conversational implicatures. While Büring (2003) does not directly address the question of CT’s meaning class, he argues (p. 523) that the presence of CT can trigger a conversational implicature. The claim is that on hearing a CT contour, the listener makes certain logical deductions about the speaker’s choice of utterance, as compared to other potential utterances, based on the maxims of conversation (Grice 1975). This explanation aims at capturing the fact that on hearing (81), we can infer that other people ate *different* things:

(81) [Fred]_{CT} ate the [beans]_F.

The logic behind this deduction is as follows. First, on Büring’s model, the CT marking will require this statement to be part of a larger discourse aimed at answering what other people ate as well. We can reason that in such a discourse, if any of the others ate the beans as well, it would have been more economical for the speaker to say something like “Fred and Elizabeth ate the beans.” Since the speaker didn’t say this, we can conclude that others did not eat beans. However, as a conversational implicature, this inference is easily cancelable:

(82) A: Who ate what?

B: [Fred]_{CT} ate the [beans]_F. [Elizabeth]_{CT} ate the beans [too]_F.

Importantly, Büring is not claiming that the basic meaning of CT is a conversational implicature. In Büring 2003, the contribution of CT is formulated as a congruence condition between CT marked utterances and corresponding moves in a d-tree—the condition we saw in Sect. 5.3. However, this leaves open the question of how the requirement of CT-congruence should be situated within a formal semantics, if at all. On the d-trees theory, the CT-congruence condition lies in the interface with pragmatics, and is not explicitly treated as a semantic entailment, presupposition or implicature.

Oshima (2008), in moving to collapse CT and RFR, challenges the conversational implicature line, on the grounds that this type of implicature (as an inference of the listener) should be deniable by the speaker, whereas the contribution of RFR is not³²:

(83) Most of my students passed the test. In fact, all of them did.

(84) [*Most*]_{CT} of my students passed the test... #In fact, all of them did.

³² It should be noted that (84) is permissible, just in case the speaker’s memory has been suddenly jogged between one sentence and the next. However, as (83) is subject to no such restriction, the contrast remains. In general, RFR is illicit when, *at the time of utterance*, the speaker can safely claim the alternatives.

The intonation in (84) commits the speaker to a claim that was only conversationally implicated in (83)—that not all students are known to have passed (or, if we take the speaker to be well informed, that not all the students passed). This is indeed strong evidence that RFR contributes something stronger than a conversational implicature.³³

If RFR produced an at-issue entailment, we would expect its meaning to interact compositionally with its surroundings—for example it could be interpreted under negation.

(85) *John* didn't come... $\neq \neg [\textit{John} \textit{ came...}]$

(86) It's not true that *John* came... $\neq \neg [\textit{John} \textit{ came...}]$

While (86) is a clear example of the RFR focus appearing in a syntactically embedded context, neither of these sentences shows semantic embedding of the intonation's meaning. If this compositionality were available, we would expect (85) to mean something like *It's not true that [John came and I can't claim the others came]*. These truth conditions would be satisfied in a context where it's known that everyone came. Not only is (85) infelicitous in such a context, but tellingly, even (86), a frame supporting metalinguistic negation (Horn 1985), doesn't allow this reading.

The pair in (87,88) below reiterates RFR's inability to scope under negation, illustrating a contrast with *only*, which contributes to the building of at-issue entailed meaning. The reader can also confirm that the facts are parallel under verbs of propositional attitude and speech report.

(87) It's not true that only John came... other people came too!

(88) It's not true that *John* came... #other people came too!

At this point, we can safely conclude that RFR doesn't take part in the composition of at-issue meaning. Another option, following Oshima (2008), would be to say that RFR contributes a presupposition. But while the presuppositional analysis is largely consistent with the observations above (uncancelability, and unembeddability under negation), there are two major problems for it.

First, by definition, a presupposition is a prerequisite to the interpretation of at-issue content. For example, *Mary stopped smoking* can't be evaluated as true or false until we acknowledge that Mary used to smoke. This is different from the situation with RFR:

(89) *John* liked it...

³³ Note that Büring's theory handles such data without recourse to conversational implicatures. Regardless of Grice's maxims, the intonation in (84) makes the utterance congruent only with a discourse strategy consisting of sub-questions of the form *X of my students passed the test*. The problematic follow-up in (84) can never satisfy CT-congruence given Büring's "principle of highest attachment" (2003, p. 534), which states that an answer to a sub-question cannot single-handedly resolve an entire strategy. At the same time, Büring casts a wary eye over the principle, stating that he "sees no particular reason why it should hold". As such, it seems undesirable that this principle should be the only thing preventing CT from marking a scalar endpoint under the d-trees theory.

The main content of (89) can be extracted and evaluated without first accepting the “extra” meaning—that others can’t be claimed to have liked the movie. What we have is a case of multi-dimensionality, in the sense of Potts (2005), where separate meanings have been conveyed along separate channels.

Secondly, from Karttunen (1973) we know that presupposition projection is subject to filtering properties of the subordinating predicate. For example, *know* lets presuppositions through, while *say* is a “plug”. If RFR meaning were a presupposition we would expect it to be blocked by plugs. However, this isn’t the case, as the intonational meaning (the unclaimability of alternatives) surfaces uninhibited in the following³⁴:

(90) John said that Mary came...

Crucially, there is no reading of (90) on which the unclaimability of alternative propositions is something we attribute to John. As for what the relevant alternative propositions are, there is in fact variability. One possibility is that RFR takes matrix scope, giving alternatives of the form *John said that X came*, and hence conveying that apart from Mary, I can’t make any claims that John said anyone came. However, it is equally possible that RFR quantifies over alternatives to the embedded clause. For example, in the following discourse, the unclaimable alternatives are propositions of the form *X came*³⁵:

(91) A: Who came to John’s party?

B: John said that Mary came... (but I don’t know who else came.)

Examples like this highlight that RFR can take embedded scope, as expected on the view that RFR is a focus operator, and as suggested independently by Ladd (1980, p. 151).³⁶

³⁴ For Oshima (2008), a CT-marked sentence presupposes that at least one of the alternative propositions does not follow from the interlocutors’ common ground. While this meaning is different from what I posit for RFR, the arguments against the presuppositional account given in (89–91) go through in either case.

³⁵ Interestingly, the embedded RFR reading of (91) seems to only be available if John is a trusted source of information. That is, for the purposes of the conversation, John’s saying that Mary came is tantamount to her having come. It remains to be seen whether this discourse-equivalence of the matrix and embedded clauses is a prerequisite to embedded readings of RFR in general. Irene Heim (p.c.) points out that something must prevent RFR from embedding in *if* antecedents like (i). This use of RFR is infelicitous (assuming *bearable* is construed as the minimal positive quality), but would be predicted to be acceptable if RFR quantified over alternatives of the form *He’s X*, none of which are resolved by the utterance. Similarly, in (ii), brought up by a reviewer, RFR can only take wide scope, implicating that I can’t make other claims of the form *John doubted that X came*.

(i) #If he’s bearable I’ll marry him...

(ii) John doubted that Mary came...

³⁶ While RFR can embed in the sense of quantifying over alternatives to a subordinate clause, it is not obvious whether the intonational contour can ever be prosodically embedded. A reviewer asks specifically whether a non-restrictive relative clause as in (i) could be analyzed as containing RFR within a larger contour. While the prosody seems compatible with this analysis, the sentence lacks the trademark non-resolution we expect from RFR. There is no alternative of the form *Lance Armstrong lives in X*, or any other form, that is implied to be unassertable. By contrast, (ii) does exhibit the usual RFR meaning, implying an inability to claim that the speech admitted mistakes outright. Overall, this suggests an overlap between RFR and the comma intonation marking supplements (cf. Potts 2005, §4.6.3), whereby surface forms are ambiguous as to the underlying presence or absence of RFR.

(i) Lance Armstrong, who lives in Texas, was accused of doping.

(ii) The second speech, which at least implied that mistakes had been made..., was better received.

However the important observation for the present discussion is that while RFR is embedded in the sense of quantifying over alternatives to the embedded proposition, the meaning *contributed* by RFR is nevertheless attributed to the speaker (not John), and thus has not been caught by the presupposition plug *say*. This is further evidence then that RFR meaning is not presuppositional.

At this point, we've determined that RFR is neither a conversational implicature, nor an at-issue entailment, nor still a presupposition. Our last hope, it seems, is that class of meanings 'born into neglect' (Potts 2005, p. 8)—the conventional implicature (CI). Conventional implicatures, as discussed in Potts (2005), have these defining properties:

- (92) a. CI's are commitments arising from lexical meaning.
 b. CI's are always speaker oriented.
 c. CI's are logically and compositionally independent of at-issue entailments.

As we've already seen, the unclaimability of alternative propositions conveyed by RFR has each of these properties. First, it is an indefeasible commitment (arising from the lexical meaning of an intonational morpheme). Second, as Ward and Hirschberg (1985) observe, RFR is always speaker oriented. And finally, the speaker's inability to claim the alternatives always surfaces uninhibited by syntactic embedding—that is, RFR meaning is evaluated independently of at-issue content. In all of these regards, RFR patterns with more familiar CI-conveying elements like parentheticals or expressives like *damn*, as analyzed by Potts (2005).³⁷

From these findings, I conclude, with Ward and Hirschberg (1985), that RFR is a conventional implicature. Unlike Ward and Hirschberg, however, I connect RFR to a class of focus sensitive operators. Thus, for example, *only* and RFR have access to the same alternatives generated by focus structure. In the next section, we'll see that this tight connection captures interactions between RFR and other focus operators. But, even on abstract grounds, it seems preferable to collapse RFR with "known" operators, rather than to stipulate its meaning entirely through a complex licensing condition. Similarly, saying that both *only* and RFR are quantifiers, one in the at-issue dimension, and one in the CI dimension, is simpler than designing a new framework where intonation constrains the mapping from utterance to discourse. Put simply, if intonation can be treated within existing frameworks, it should.

Finally, we reach the question of whether RFR quantification is universal or existential. In support of the existential line, Oshima (2008) points out that RFR is licensed on any number of consecutive responses, save for the final one:

- (93) A: How did Elizabeth, Persephone and Antonio do on the test?
 B: Elizabeth passed... (?) Persephone passed... # Antonio passed...

On the surface, this seems to indicate that "Elizabeth passed..." doesn't imply that *all* others aren't known to have passed, but just that *someone* isn't known to have passed.

³⁷ A reviewer points out that unlike other elements introducing CI meaning, RFR appears to only ever attach to the end of an utterance. In Wagner 2009, this is attributed to RFR taking an assertion as its argument, which predicts it will attach outside speech-act-sized constituents. However this would seem to rule out embedded uses like (91). Additionally, to see whether this generalization holds, we need to first rule out the possibility that full CT+F contours like "[Fred]_{CT} ate the [beans]_F" contain a RFR component, realized on the sentence-initial topic constituent. Resolving these issues is beyond the scope of this article.

However, I submit that B’s use of RFR on *Persephone* above is highly restricted, depending on a sudden recollection during the pause between one clause and the next. In this case, we can maintain that RFR commits to the unclaimability of all alternatives, and simply allow for changes in what a speaker is willing to claim over time.

Note that the sense of B speaking and recollecting simultaneously in (93) is absent from (94), where the pitch accents have been changed to low targets (though the rising boundary tone still rules out the final item of the list):

- (94) A: How did Elizabeth, Persephone and Antonio do on the test?
 B: Elizabeth passed, Persephone passed, # Antonio passed.
 L* H– H% L* H– H% L* H– H%

Another potential hazard—this time to both the existential and universal camps—is the repetition of RFR throughout an entire list, as in the following example:

- (95) A: Did John pass the test?
 B: Elizabeth passed... Persephone passed... Antonio passed...
 I’m sure he did fine.

However, in this case, the issue under discussion is restricted to just whether *John* passed. The items in B’s list are presented as evidence that John passed—marked in each case by RFR as being non-resolving as to the issue at hand. As long as we maintain that alternatives only make their way into the alternative set by discourse salience (as argued for previously), these data pose no problem.

While I’ve argued that RFR is universal in force, it’s worth recalling that none of the analysis presented up until now rested on this point. In particular, the contour’s distribution on differing focus types, the disambiguation behavior, and the interaction with focus operators (discussed in the next section) all stem just from the need for post-assertable alternatives, not from the specifics of quantification.

For the sake of explicitness, I provide below a denotation for RFR that could be used in a compositional system. Here $[\cdot]^o$ and $[\cdot]^f$ stand for the ordinary and focus semantic values of Rooth’s (1985) system, while $[\cdot]^{ci}$ represents the conventional implicature dimension of meaning (cf. Potts 2005). Clause (a) ensures that RFR has no effect on the ordinary semantic computation, while (b) resets the focus semantic value, so that the RFR focus is not accessible to higher focus operators. Finally, clause (c) encodes the speaker’s commitment to the unclaimability of all alternative propositions that are both assertable in the context of utterance, and contained within the focus value of RFR’s complement.³⁸

- (96) a. $[\text{RFR } \varphi]^o = [\varphi]^o$
 b. $[\text{RFR } \varphi]^f = \{[\varphi]^o\}$
 c. $[\text{RFR } \varphi]^{ci} = \forall p \in [\varphi]^f$ s.t. p is assertable in C:
 the speaker can’t safely claim p .

³⁸ The rendering in (96) doesn’t yet incorporate the observation that only contextually salient alternatives are quantified over. This could be achieved by recasting the domain of quantification as a free-variable, whose interpretation is restricted by Rooth’s \sim operator to be a subset of the focus value $[\varphi]^f$. Beyond excluding non-salient alternatives, this approach falls in line with Rooth’s (1985) goal of assigning a uniform interpretation to focus.

At the same time, I would like to raise the question of whether it is desirable to posit a compositional semantics for an item that does not interact compositionally. As a conventional implicature, RFR meaning is never “picked up” by any other element—for example, it can’t be embedded under negation or an attitude predicate. While the alternatives that constitute the input to RFR are formed within the syntax and semantics, its output is never reincorporated by these modules. Thus, if RFR makes a structured contribution to any component of the grammar, this would seem to be a pragmatic component, not a purely semantic one.

5.5 The interaction of RFR with other focus sensitive operators

The demand of RFR for post-assertable alternative propositions predicts various interactions between RFR and other focus sensitive operators. In this section, I point out a few such interactions, and discuss the implications of these findings for the placement within a dynamic semantics of RFR specifically, and conventionally implicated meanings in general.

We saw before that *only* contributes to the composition of at-issue entailed meaning by negating all salient alternative propositions. Of course, this leaves open a number of important questions as to the semantics of *only*. For example, the issue of which parts of *only*'s meaning are presupposed, entailed or implicated is still widely debated (Roberts 2006 provides a useful characterization of this debate, and argues that *only*'s prejacent is a conventional implicature). Yet, regardless of its precise denotation, it's clear that *only* has access to alternative propositions *during* the process of regular semantic composition. Recall, for instance, that *only* can be interpreted under negation, whereas RFR cannot.

As a conventional implicature, we know that RFR is an independent, speaker oriented commitment, which always takes widest scope. However, we might still wonder *when* this implicature is evaluated, under a dynamic model such as Heim's (1983) file change semantics.

Earlier, we saw one good reason to think that RFR is in fact evaluated *after* the proposition it attaches to—namely, RFR is sensitive to the existence of alternatives which remain assertable after the proposition's context change is calculated. Thus, within a dynamic model, the simplest approach is to hypothesize that RFR takes effect after the main propositional content is already incorporated into the common ground. Consequently, the domain of RFR quantification can be minimally stated as “assertable alternative propositions”.

One way to test this theory is to combine RFR with operators that would resolve all alternative propositions “prematurely”, leaving RFR nothing to quantify over. For instance, our ordering hypothesis finds support in the interaction of *only* and RFR in the following example³⁹:

³⁹ Here, as usual, we have to ignore metalinguistic readings (in this case, the incredulous retort). Additionally, as a reviewer points out, we must ensure that the focus of RFR is construed as just the subject, rather than the whole sentence. On the current proposal, we might expect the homophonous broad focus reading “*Only John liked it...*” to be a felicitous non-resolving answer to a question like “Was the movie any good?”. To rule out any such broad readings, we can elicit judgments of (97) in response to the question “Which of your friends liked the movie?”.

(97) #Only *John* liked it...

Here, since *only* forms part of the proposition's at-issue entailed meaning, we predict that RFR quantification must take place after *only*'s quantification. However, if this is the case, then *only* by negating the alternatives will render RFR vacuous, giving infelicity. If, on the other hand RFR were allowed to take effect first, then *only* would be licensed, since it resolves the alternatives that RFR leaves merely unclaimable. In fact, we see a more direct confirmation of the proposed ordering of events in a pair like this⁴⁰:

- (98) a. *John* liked it... Only John liked it.
 b. Only John liked it. #*John* liked it...

Cleft constructions provide another testing ground for our investigation of RFR's dynamic effect. Specifically, the exhaustivity imposed by a cleft on its focus could be expected to dispel alternative propositions much like *only*, thereby ruling out RFR focus on the clefted element. This prediction is borne out in the following data:

(99) #It was *John* who ate the gazpacho...

(100) #What John ate was *the gazpacho*...

Without embarking on a full-scale investigation of clefts, we can hypothesize that wherever a cleft's exhaustivity takes effect, it's early enough to dispel the alternatives that would license RFR on the focus. This would be compatible, for instance, with an analysis of cleft exhaustivity as presuppositional. For other implementations of cleft exhaustivity, see Vallduví (1990, pp. 167–168).

Here, one could imagine a counter-argument—that RFR and clefts are in some more fundamental conflict (perhaps a prosodic conflict), aside from their competition over alternative propositions. However, the example below shows that a clefted item *can* get RFR focus, just in case there is a second focus later in the utterance. This parallels the cases of a second focus licensing RFR on a maximal focus in Sect. 4.3, highlighting once again the close connection between RFR and alternative structure. As before, the second focus enriches the alternative set to the point where resolving all alternatives is not easily accomplished. In (101), due to Rebecca Tamara (p.c.), the cleft is no longer alternative dispelling, and RFR is licensed on the cleft focus:

- (101) A: I can't believe the atrocities going on in Nicaragua.
 B: Well, it was *us* who *gave them their weapons*...

Here, the predicted meaning of B's response is something like "We were the (unique) ones who gave them their weapons, but I remain unresolved as to whether we or other people did other salient (presumably bad) things". While this meaning is vague, it explains the sense that the speaker isn't claiming that we're entirely at fault for the atrocities, or is at least leaving the issue open rhetorically. This further example of a second focus licensing RFR on an otherwise alternative-dispelling element is a

⁴⁰ One technical note about (97–98) is that the domains of RFR and *only* quantification must be the same—otherwise, we would predict their licit co-occurrence in the case that RFR's domain contained some element that *only* had failed to quantify over. I do not have a formal account of this restriction, but see von Stechow (1994, §2.3) for relevant discussion.

welcome confirmation of the analysis of double focus data given in Sect. 4.3, and strengthens the broader claim that RFR is a focus operator.

Returning to the larger picture, we've seen that a variety of causes can be at the root of RFR infelicity—yet what these sources have in common is their resolution of the alternative propositions which RFR would quantify over. A maximally informative focus like *perfect* will be inherently alternative dispelling when it occurs in an upward entailing context. An at-issue focus operator like *only* will, through its own quantification, dispel alternatives. Finally, a cleft, by virtue of its perhaps presuppositional requirement of exhaustivity, will demand a context in which the alternatives are already resolved. Symmetrically, in each of these cases, the addition of a second focus augments the alternative set to the point where the “dispeller” is no longer able to resolve all alternatives, so RFR is licensed.⁴¹

To reiterate, all of these effects are automatic, on the assumption that RFR (a) quantifies over assertable alternatives, and (b) quantifies after at-issue content is evaluated. Having identified this late evaluation as a key feature of RFR, a natural question to ask next is this—can/must all conventional implicature meaning be evaluated late within a dynamic model?

6 Conclusions

Previous accounts of English rise-fall-rise intonation including those of Ward and Hirschberg (1985) and Büring (2003) are “inventive”—designing novel tools to capture the contour's distribution and pragmatic effect. I have argued, however, that RFR is best understood in familiar terms: as a focus sensitive quantifier over assertable alternatives, taking its effect in the conventional implicature dimension.

If the conventional implicature is calculated late in a dynamic model, this minimal analysis immediately covers a great deal of ground. First, the contour is predicted to resist a focus that resolves its own alternatives, since this would leave the quantifier with an empty domain. Not only will this account handle scalar endpoints like *all* and *none*, but it extends to the infelicity of RFR on a negatively resolving focus like *purple*. Second, we are led to expect a complex pattern of RFR distribution on maximally informative elements. Specifically, occurring either in a downward entailing context or with a second focus will keep these elements from dispelling their alternatives, thereby licensing RFR.

In turn, this distribution gives us the potential for disambiguation. In cases of scopal ambiguity between two operators, whenever only one scope configuration is alternative dispelling, the use of RFR will disambiguate towards the inverse scope relation. More generally, the effect is the filtering of any logical form whose domain of RFR quantification is empty. Tangentially, this finding underscores the fundamentally semantic nature of alternatives—since these must be calculated independently per logical form.

⁴¹ The only case we haven't seen so far is a second focus licensing RFR on the focus of *only*, as in:

- (i) A: Are the parties here always this packed?
- B: Only *Elizabeth* came to the *last* one...

Through double focus data we see most clearly that disambiguation is a side effect, and not a “function” of RFR. With this understanding, on the one hand we’re no longer surprised to see cases of ambiguity left unresolved by RFR. On the other hand, being able to predict when the contour disambiguates allows us to hold by the claim that RFR *can* disambiguate, lending credence to a long line of intonational research.

To get the benefits of the alternative-based analysis, I’ve shown it’s necessary to first distinguish the contours of contradiction and incredulity, which appear similar to RFR on the surface. This separation is driven crucially by these contours’ compatibility with an alternative dispelling focus, and closer inspection also revealed a range of supporting distinctions.

While the analysis doesn’t stipulate scalar behavior or speaker uncertainty directly, these effects are captured through the meaning of RFR quantification—that alternative propositions can’t be claimed. Furthermore, this meaning predicts the sensitivity of RFR to the linear ordering of the discourse, which is a problem if we try to adapt theories of CT to RFR data.

The deep ties between RFR and CT are hard to overlook, and certainly warrant further investigation (see Wagner 2009 for recent work in this line). Yet, as they stand, models of CT don’t account for the full distribution of RFR. Thus, much work remains to be done. One promising research path is to isolate the effect of final boundary tones, so that they can be factored out of the equation. For example, since the prosody of RFR demands an utterance-final rise, we might reasonably expect additional restrictions on its distribution. With these issues in mind, the common core of RFR and CT may become more apparent.

Still, without taking on this larger project, it is remarkably effective to treat RFR as a “regular” conventional implicature. The profile is perfect—a speaker oriented commitment, semantically unembeddable, undeniable, and independent of at-issue content. Then, in addition to offering support for the reintroduction of CI’s into semantic theory, we can maintain a simple focus-oriented account of RFR itself.

Appendix

Proof: Fully informative foci are never alternative dispelling in downward entailing contexts.

Suppose we have a fully informative focus x , with a distinct alternative y .

(If the focus doesn’t have a distinct alternative, there’s no need for focus.)

- [0] Definition: A context f is downward entailing (D.E.) iff for any $\alpha \subset \beta$, $f(\alpha) \supset f(\beta)$.
- [1] A fully informative focus resolves all its alternatives in a “default” (= non-D.E.) context.
- [2] Therefore, either $x \subset y$, or $x \supset \neg y$ (where ‘ \subset ’ stands for cross-categorical entailment).

Case A: $x \subset y$

- [3] For f a downward entailing context, $f(x) \supset f(y)$, by the definition of D.E.
- [4] Therefore $f(x)$ doesn’t resolve $f(y)$.

Case B: $x \subset \neg y$

- [3] For f a downward entailing context, $f(x) \supset f(\neg y)$, by the definition of D.E.
 [4] Therefore $f(x)$ doesn't resolve $f(\neg y)$, and consequently doesn't resolve $f(y)$.
 [5] Thus, in a downward entailing context, x is not alternative dispelling.

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