

Intonation and Sentence Type Conventions: Two Types of Rising Declaratives

Jeong, Sunwoo (sunwooj@stanford.edu)

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1 Introduction: A unified account of rising declaratives?

- (1) Heterogeneous examples of rising declaratives
 - a. A: Please apologize to him. / B: *I was wrong and I should apologize?* No way. Surprise question; contradiction
 - b. A: John went to pick up his sister. / B: *John has a sister?* Surprise question; incredulity
 - c. A: There's one flight to Helsinki. / B: *The flight leaves at 4pm?* Confirmative question (cf. Poschmann 2008)
 - d. A: Do you speak Spanish? B: *I speak Ladino?* Not sure about the metalinguistic issue (cf. Hirschberg and Ward 1995)
 - e. (In a restaurant) B: Hello! *My name is Anna? I'll be your waitress?* Polite; building rapport; eliciting uptake (cf. Levon 2016; Podesva 2011)

1.1 Previous approaches

- (2) Giving a unified account
 - a. Malamud and Stephenson (2015): add p to the projected commitment (of the speaker), as well as adding the metalinguistic issue $MLIP$ to the Table
 - b. Westera (2013): analyzes all instances of rising declaratives as a device that signals maxim-violation (quality, quantity, etc.)
- (3) Addressing a part of the data
 - a. Gunlogson (2001, 2004): focuses on questioning uses; analyzes them as committing the addressee to the proposition (attributive account)
 - b. Gunlogson (2008): again focuses on questioning uses, but this time more on IDQs (Initiating Declarative Questions) than echo questions; analyzes them as *obtaining* question interpretations when specific contextual conditions are satisfied (lower epistemic authority of the speaker than the addressee; *contingent* commitment)
 - c. Farkas and Roelofsen (2016): explicitly mention that they will only focus on questioning uses; couched within the inquisitive semantics framework; analyze them as having the same content as polar interrogatives that share the radicals, but associated with marked conventions of use that signals zero to low credence level of the speaker

1.2 Some problems

- (4) For unified approaches: Are there systematic differences in the conventional effects of different types of rising declaratives that would get glossed over by any kind of unified account?

- (5) For non-unified approaches: If there are more than one type of rising declaratives, where do we draw the line(s)? Do they differ in intonational form? If not, how do speakers and listeners distinguish/disambiguate different types of rising declaratives?
- (6) More generally: How can commitment based accounts deal with extreme cases of incredulous rising declarative questions, e.g. (1a) or (1b)? Aren't there two dimensions to the relevant bias we should be looking at?
- a. In terms of discourse effects, (1a) and (1b) do not seem to commit the speaker to the proposition at all.
 - b. There seems to be two dimensions to the bias that can be marked by rising declaratives (cf. Sudo 2013; Romero and Han 2004)
 - i. epistemic bias (private belief of the speaker) towards the negative answer
 - ii. evidential bias (public evidence, usually provided by the addressee) towards the positive answer

2 Hypothesis: Two types of rising declaratives

2.1 Tracking their discourse effects

- (7) Are there fundamental differences in their discourse effects?:
inspired by Gunlogson (2008)'s *Oh vs. Yes* diagnostics
- a. *Oh*: dependently commits the speaker (i.e. the speaker is not a source) to the previous speaker's (usually the addressee's) commitment → presupposes full commitment from the previous speaker
 - b. *Yes*: independently commits the speaker as a source (cf. Farkas and Bruce 2010)
- (8) **'Assertive' rising declaratives**
- a. Metalinguistic uncertainty
(cf. Hirschberg and Ward 1995; Malamud and Stephenson 2015)
 - i. A: Do you know if John has a close female relative?
B: (Um...) *John has a sister?*
A: *Oh*, I didn't know that.
 - b. Sociolinguistic, perlocutionary politeness (cf. Podesva 2011; Levon 2016)
 - i. A: Hello, *my name is Wendy?* I'll be your tour guide today?
B: *Oh*, hi Wendy. Nice to meet you.
- (9) **'Inquisitive' rising declaratives**
- a. Surprise question (cf. Gunlogson 2004, 2008; Farkas and Roelofsen 2016)
 - i. A: John went to the airport to pick up his sister.
B: (What?) *John has a sister?*
A: *Yes*, he does. Didn't you know?
(cf. #C: Oh, I see. I didn't know that.)
 - b. Confirmative question (cf. Poschmann 2008)
 - i. A: (talking to a stage director) So, *my name is Wendy?*
B: *Yes*, we changed it from Molly, because we thought Wendy sounds friendlier.
- (10) One may be able to give unified accounts of different shades of assertive rising declaratives ((8a) and (8b)) and different shades of inquisitive rising declaratives ((9a) and (9b)); however, there still seems to exist an irreducible distinction between 'assertive' and 'inquisitive' rising declaratives → distinct discourse effects, which in turn reflect difference in the perceived commitment status of the speaker associated with each rising declarative.

2.2 Hypothesis

- (11) Two types of rising declaratives: ‘inquisitive’ vs. ‘assertive’ rising declaratives; each associated with distinct conventional effects and fundamentally different speech acts (which in turn evoke different canonical alternatives):
 - a. ‘inquisitive’ rising declaratives: marked way of inquiring (cf. polar interrogatives)
 - b. ‘assertive’ rising declaratives: marked way of asserting (cf. falling declaratives)
- (12) The distinction between inquisitive vs. assertive rising declarative is cognitively real, despite the partly overlapping intonational forms they may share (cf. Fletcher et al. 2005; Warren 2005).
- (13) *Depending* on a listener’s interpretation of a given rising declarative (between inquisitive vs. assertive interpretations), distinct conventional effects will arise: i.e. certain types of epistemic, interactional, and social meanings will be shown to arise only when a given rising declarative token is construed as an assertive rising declarative, and not when it is construed as an inquisitive rising declarative, and vice versa.
- (14) Expected conclusion: listeners do disambiguate between inquisitive vs. assertive interpretations of a given rising declarative in a given context at a given moment in time; this disambiguation crucially gives rise to a host of distinct conventional effects associated with them.
- (15) Will aim to establish certain co-dependent functional effects of rising declaratives via experimental data.

3 Experimental studies

Please refer to the supplementary slides which report the experimental designs/results in detail.

3.1 General procedure

- (16) Stimuli were created by manipulating recordings of 6 native speakers of American English: **falling declarative, rising dec 1, rising dec 2, rising dec 3, polar interrogative**
- (17) The following questions were posed in all three experiments (except for the slight modification in Q1 for experiment 3):
 - Q0. Please type in what you just heard. (verification)
 - Q1. (**Interpretations on speech acts**)
What is the most likely interpretation of the utterance? (forced choice)
 - i. The speaker is **giving out information** (Assertion)
 - ii. The speaker is **seeking information** (Question)
 - iii. The speaker is **inviting** (only for experiment 1)
 - iv. The speaker is **requesting** (only for experiment 1)
 - Q2. (**Speaker’s epistemic certainty on p**)
How certain is the speaker that p ?
 - Q3. (**Speaker’s inference on addressee’s epistemic certainty on p**)
How certain is the speaker that the addressee knows whether p ?
 - Q4. (**Speaker politeness**)
How polite did the speaker just sound?
 - Q5. (**Speaker authority**)
How authoritative did the speaker just sound?
 - Q6. (**Optional free response**)
Any other comments?

- (18) Experiment 3 varied only in its Q1. Instead of being asked to choose the most likely illocution, participants were asked to choose the most likely follow-up response between:
- Oh, I didn't know that.
 - Yes, didn't you know?

3.2 Participants and Platform

Links to all three experiments can be found at: <https://github.com/sunwooj/risingdec>. 1200 native speakers of American English were recruited as participants (400 for each experiment).

3.3 Stimuli

- (A) **Set I** (experiment 1, 2, and 3)

target sentences	general likelihood
(1) <i>Ellen is married !/?</i> (M1, F1)	high
(2) <i>Eleanor is Annie's mom !/?</i> (M2, F2)	high
(3) <i>Laura met president Obama !/?</i> (M2, F1)	low
(4) <i>Maria was in a spaceship to the moon !/?</i> (M1, F2)	low

- (B) **Set II** (experiment 2 and 3)

target sentences	general likelihood
(1) <i>Is Ellen married?</i> (M1, F1)	high
(2) <i>Is Eleanor Annie's mom?</i> (M2, F2)	high
(3) <i>Did Laura meet president Obama?</i> (M2, F1)	low
(4) <i>Was Maria in a spaceship to the moon?</i> (M1, F2)	low

- (C) **Set III** (experiment 1)

target sentences	speaker knowledge	addressee knowledge
(5a) <i>I'm from Yemen !/?</i> (F2)	high	low
(5b) <i>You're from Yemen !/?</i> (F2)	low	high
(6a) <i>Lenny's from Yemen !/?</i> (F2)	mid	mid
(6b) <i>Is Lenny from Yemen !/?</i> (F2)	low	high

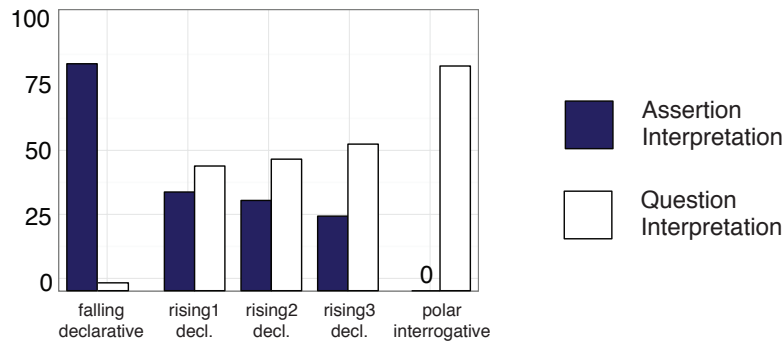
- (D) **Set IV** (experiment 1)

target sentences	general knowledge	likely illocution
(7a) <i>It's raining !/?</i> (M1)	mid	info-g/s
(7b) <i>Armadillos are mammals !/?</i> (F1)	low	info-g/s
(8a) <i>We should go get beer !/?</i> (F1)	n/a	invitation
(8b) <i>You need to mow the lawn !/?</i> (M2)	n/a	request

3.4 Results

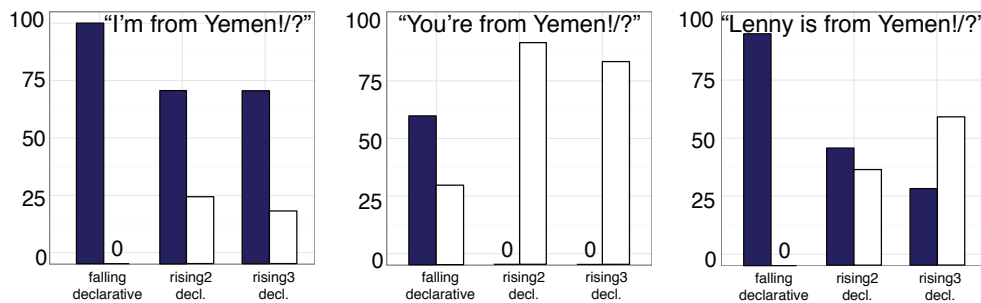
- (19) Intonational effect: steeper rising slopes were significantly more likely to signal 'inquisitive' rising declaratives, and less steep (or high rising; i.e. the starting point of the rise is higher, thus rendering the slope weaker) rising slopes were significantly more likely to signal 'assertive' rising declaratives.
- Some evidence towards difference in forms between the two types of rising declaratives
 - The effect of intonation is not categorical → Other factors may conspire to fully disambiguate between the two interpretations

- (20) **Figure 1:** The effect of intonation on the interpretation of rising declaratives



- (21) Content/context effect: content and context, particularly relating to inferred speaker vs. addressee knowledgeability on the proposition, were very strong predictors of participants' assertive vs. inquisitive interpretations of rising declaratives. (cf. Gunlogson 2008)

- (22) **Figure 2:** The effect of conte(n/x)t on the interpretation of rising declaratives

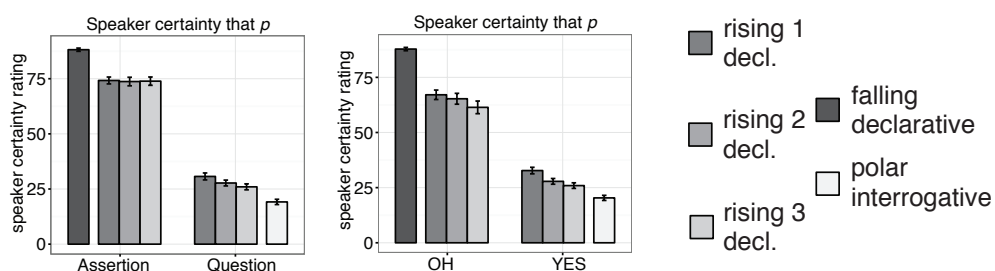


- (23) Speaker epistemic certainty¹: corroborating the initial hypothesis, there was a four-way distinction in how **speaker epistemic certainty** was marked, ordered as follows:

falling dec > assertive rising decs > inquisitive rising decs > polar int

- 'assertive' rising declaratives were attributed with significantly *higher* speaker epistemic certainty than 'inquisitive' rising declaratives; however, they were also attributed with significantly *lower* speaker epistemic certainty than their canonical alternative, falling declaratives.
- 'inquisitive' rising declaratives were attributed with significantly *lower* speaker epistemic certainty than 'assertive' rising declaratives; however, they were also attributed with significantly *higher* speaker epistemic certainty than their canonical alternative, polar interrogatives.
- Differences in respective baselines bringing about opposite effects with respect to signaling epistemic authority

- (24) **Figure 3:** Ratings on speaker epistemic certainty on *p*: mean and standard errors



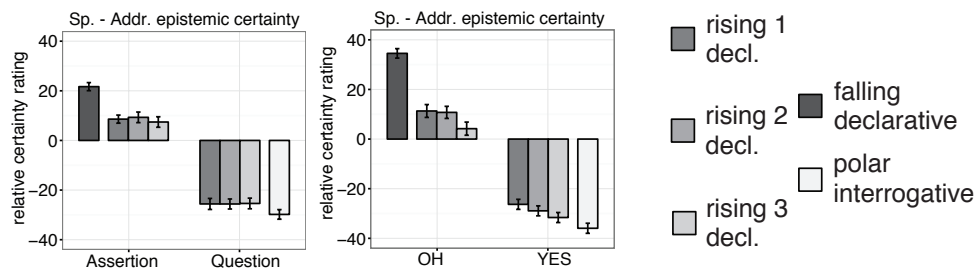
¹Statistical analyses for all the results can be found at: <https://github.com/sunwooj/risingdec>

- (25) Thus, the two types of rising declaratives have the function of equipping speakers with more granulated ways of marking epistemic certainties in questions and assertions, enabling them to signal more nuanced speech acts such as tentative assertions and biased questions.
- (26) Addressee epistemic certainty (inferred by the speaker): there was also a four-way distinction in how relative addressee epistemic certainty (as construed by the speaker) is marked, ordered as follows (inverse of (23)):

polar int > inquisitive rising decs > assertive rising decs > falling dec

- a. Provides empirical evidence to previous theoretical studies that emphasized the notion of ‘relative epistemic authority’ of the addressee in explaining certain types of rising declaratives (Gunlogson 2008; Farkas and Roelofsen 2016).

- (27) **Figure 4:** Ratings on relative addressee epistemic certainty on *p*: mean and standard errors

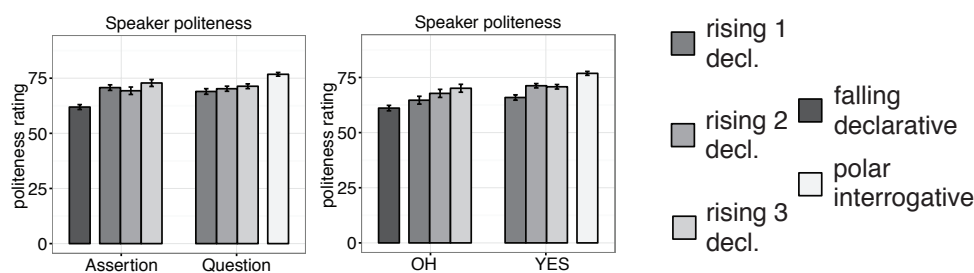


- (28) Speaker politeness: There was a three-way distinction in how speaker politeness is marked, ordered as follows (cf. similar kind of distinction in how speaker authority was marked):

polar int > inquisitive and assertive rising decs > falling dec

- a. Highlight the role of canonical alternatives in bringing about potentially different perlocutionary and social meanings to the two types of rising declaratives.

- (29) **Figure 5:** Ratings on speaker politeness: mean and standard errors



3.5 Discussion

- (30) Summary of the experimental findings II

Intonation and Sentence Type	Speech Acts	Sp. epistem Authority	Rel. Addr. epi Authority	Sp. Polite	Sp. Perl. Authority
cf) Falling Declaratives	Assertion	Very high	Very low	Low	High
‘Assertive’ Rising Declaratives		High	Low	High	Low
‘Inquisitive’ Rising Declaratives	Question	Low	High	High	Very low
cf) Polar Interrogatives		Very low	Very high	Very high	Very low

- (31) The results on epistemic, perlocutionary, and social meanings associated with the two types of rising declaratives seem to definitively establish the existence of fundamentally different sets of functional effects associated with the two types of rising declaratives.
- (32) The distinction between the two types of rising declaratives thus becomes important, because the two types seem to signal opposite conventional effects:
- a. **inquisitive**: more certain, less polite (as a question)
 - b. **assertive**: less certain, more polite (as an assertion)
- (33) Different dimensions of markedness
- a. **inquisitive**: question but declarative
 - b. **assertive**: assertion but rising

4 Theorizing about the experimental results

4.1 A new account with distinct conventions for two separate rises

- (34) Two types of rising intonation, RISING 1 and RISING 2 (cf. experimental results from (20)). The two do not have to be categorically distinct in terms of their acoustic manifestations, as ambiguity in the signal can be efficient due to the following reasons:
- a. Different people have different baselines in pitch range and variability
 - b. In real life conversation, content and/or context will easily disambiguate which of the two rises the speaker intended (cf. experimental results from (22))
- (35) Abstracting away from the results on perlocutionary effects of rising declaratives for now (cf. they can be explained by positing independent perlocution-oriented intonational conventions (Jeong and Potts 2016)), the two types of rising intonation seem to create two fundamentally different types of rising declaratives, which can be analyzed to have the following distinct conventional effects:
- (36) RISING 1 (shallow rise; H* H-H%) DEC: Takes p as the content and does everything a falling declarative would do with respect to the commitment status of the speaker (contra analyses such as Malamud and Stephenson (2015), which construe rising declaratives as incurring projected commitments). As a marked sentence-type, it is associated with the special conventional effect (cf. Farkas and Roelofsen 2016) of adding p to the *projected Table* (cf. Farkas and Bruce 2010), instead of the actual Table (based on the experimental results from (24)). In short, it has the effect of inquiring to the addressee, ‘Shall we talk further about this or not?’ (cf. Malamud and Stephenson (2015)’s treatment of metalinguistic issue) Importantly, speaker’s commitment to the proposition itself is categorical.
- a. Add p to the projected Table
- (37) RISING 2 (steep rise; L* H-H%) DEC: Does two things. First, it acts as a kind of \llbracket INT \rrbracket operator that takes p as an argument and outputs $\{p, \neg p\}$. Then, as a kind of marked sentence-type, it activates the special conventional effect of adding p to the *projected commitment set of the addressee* (based on the experimental results from (27)). The approach is thus reminiscent of the attributive/contingent approach proffered by Gunlogson (2004, 2008). With the right kind of assumption about when commitments can be attributed to the addressee, it can account for confirmative, non-echo questions as well (e.g. (1e)), contra Poschmann (2008)’s claim.
- a. $\lambda p [p \vee \neg p]$
 - b. Add p to the projected commitment of the addressee

- (38) ‘Assertive’ rising declaratives (RISING 1 DEC) are thus essentially declaratives with added conventional effects, whereas ‘inquisitive’ rising declaratives (RISING 2 DEC) are essentially interrogatives, with added conventional effects.
- (39) Since inquisitive rising declaratives (RISING 2 DEC) are analyzed as *not* incurring any speaker commitments (according to (37)), the analysis can account for examples like (1a), (1b), and (7); commitment based approaches would have a hard time accommodating these examples.
- (40) Since assertive rising declaratives (RISING 1 DEC) are analyzed as incurring full speaker commitments (according to (36)), the analysis can easily account for examples like (1d), (1e), and (8); approaches focusing on questioning uses of rising declaratives would have a hard time accommodating these examples.
- (41) The negative epistemic bias of certain inquisitive rising declaratives (mentioned in (6b)) is derived automatically, rather than being stipulated by a separate convention. The inference that the speaker is biased towards the negative answer $\neg p$ arises only when the speaker’s question seems redundant given addressee’s commitments up to the discourse. The perceived redundancy leads to the additional inference that the speaker had reason to question addressee’s publicized commitment towards p , i.e. the speaker has reason to believe that $\neg p$.
- (42) The above approach can predict why such an inference (the speaker is biased towards the negative answer $\neg p$) arises primarily when the addressee has explicitly said p or has clearly presupposed p , i.e. why it arises most often as echo questions ((1a) or (1b)). It can also predict that such an inference will not arise in confirmative questions such as in (1c), in which the addressee is only construed to have authority about the matter, but has not yet explicitly committed to either p or $\neg p$.

5 Conclusion

Terminal contours such as rising intonation may have systematic effects on the discourse in more than one way. Their interaction with content, context, and sentence type conventions needs to be carefully examined, in order to avoid conflating potentially distinct phenomena. An adequate construal of intonational conventions shows that their effect is systematic and predictable.

Data, codes, experiments, and mixed effects models can be found at:

<https://github.com/sunwooj/risingdec>

Direct links to the three experiments:

Experiment 1: <https://stanford.edu/~sunwooj/experiments/mainexp-ver4.html>

Experiment 2: <https://stanford.edu/~sunwooj/experiments/rdecexp2-mturk.html>

Experiment 3: <https://stanford.edu/~sunwooj/experiments/rdecexp2-mturk2.html>

Please email sunwooj@stanford.edu if you are interested in reading a draft of my paper on this project! :)

6 Acknowledgements

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A Appendix: Adapting existing approaches

A.1 Adapting Malamud and Stephenson (2015)'s approach

- (43) The original approach (based on Farkas and Bruce (2010)): A utters p with an NI-rise (cf. q is already in the CG)

	Previously	After A's move (uttering p with NI-rise)
DC_A	$\{\}$	$\{\}$
DC_{A^*}	$\{\{\}\}$	$\{\{p\}\}$
DC_B	$\{\}$	$\{\}$
DC_{B^*}	$\{\{\}\}$	$\{\{\}\}$
Table	$\langle \rangle$	$\langle MLI^p, \{p\} \rangle$
CG	$\{q\}$	$\{q\}$
CG*	$\{\{q\}\}$	$\{\{q, R1\}, \{q, R2\}\}$

- The proposition gets added to the *projected* commitment of the speaker A , DC_A
- The metalinguistic issue MLI^p gets added to the Table
- R1 and R2 are possible resolutions to the metalinguistic issue

- (44) A new approach

Part I: A utters an **assertive rising declarative** p

	Previously	After A's move (uttering an assertive RD p)
DC_A	$\{\}$	$\{p\}$
DC_{A^*}	$\{\{\}\}$	$\{\{\}\}$
DC_B	$\{\}$	$\{\}$
DC_{B^*}	$\{\{\}\}$	$\{\{\}\}$
Table	$\langle \rangle$	$\langle \rangle$
Table*	$\langle \rangle$	$\langle p[RD1]; \{p\} \rangle$
CG	$\{q\}$	$\{q\}$
CG*	$\{\{q\}\}$	$\{\{q, p\}\}$

- The proposition is added to the *full* commitment of the speaker, not the projected commitment; it also gets added to the projected common ground
- The proposition is also added to the projected Table, Table*.

Part II: A utters an **inquisitive rising declarative** p

	Previously	After A's move (uttering an inquisitive RD p)
DC_A	$\{\}$	$\{\}$
DC_{A^*}	$\{\{\}\}$	$\{\{\}\}$
DC_B	$\{\}$	$\{\}$
DC_{B^*}	$\{\{\}\}$	$\{\{p\}\}$
Table	$\langle \rangle$	$\langle p[RD2]; \{p, \neg p\} \rangle$
Table*	$\langle \rangle$	$\langle \rangle$
CG	$\{q\}$	$\{q\}$
CG*	$\{\{q\}\}$	$\{\{q\}\}$
Perlocution	$\{\}$	$\{A \text{ is being less polite and more certain}\}$

- The content of RDs can be considered to be the same as polar interrogatives; it gets added to the current Table, not the projected one
- p gets added to *addressee's* projected commitment \rightarrow attributive property; reflecting experimental results on addressee epistemic certainty; however, p does not get added to the projected common ground (to explain cases of contradictory questions)

A.2 Adapting Farkas and Roelofsen (2016)'s approach

- (45) The original approach: When a discourse participant utters a rising declarative φ , expressing the proposition $\llbracket\varphi\rrbracket = \{\alpha, \bar{\alpha}\}^\downarrow$, the discourse context is affected as follows:
- a. Basic effect: The proposition expressed by φ , $\llbracket\varphi\rrbracket$ is added to the **Table**; the informative content of φ , $\bigcup\llbracket\varphi\rrbracket$ is added to **commitments**(x)
 - b. Special effect: $\langle\alpha, [\text{zero}, \text{low}]\rangle$ is added to **evidence**(x)
- (46) A new approach

Part I: When a discourse participant utters an **inquisitive rising declarative** φ , expressing the proposition $\llbracket\varphi\rrbracket = \{\alpha, \bar{\alpha}\}^\downarrow$, the discourse context is affected as follows:

- a. Basic effect: The proposition expressed by φ , $\llbracket\varphi\rrbracket$ is added to the **Table**; the informative content of φ , $\bigcup\llbracket\varphi\rrbracket$ is added to **commitments**(x) (Same)
- b. Special effect: $\langle\alpha, [\text{moderate}, \text{high}]\rangle$ is added to **public evidence**(x)
cf. assumption: addressee authority is taken as a type of public evidence

Part II: When a discourse participant utters an **assertive rising declarative** φ , expressing the proposition $\llbracket\varphi\rrbracket = \{\alpha\}^\downarrow$, the discourse context is affected as follows:

- a. Basic effect: The informative content of φ , $\bigcup\llbracket\varphi\rrbracket$ is added to **commitments**(x) (Same, minus addition to the **Table** part)
- b. Special effect: The proposition expressed by φ , $\llbracket\varphi\rrbracket$ is added to the **Projected Table**, instead of the current **Table**.