

# Aren't there multiple causes of bias in polar questions?\*

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## Abstract

I develop two distinct theories of speaker bias in polar questions based on empirical asymmetries between two kinds of biased polar questions—*high negation questions* (HNQs) and *polarity focus questions* (PFQs). I show that bias in PFQs is context sensitive while bias in HNQs is context insensitive. I argue that PFQ bias derives from the fact that they are frequently used in conversational contexts in which an answer to the question has already been asserted by an interlocutor, thus expressing doubt about the prior assertion. This derivation explains their context sensitivity, and the fact that similar bias arises from polar questions that lack polarity focus. I also provide novel evidence that HNQs lack propositional negation, and thus only have an outer negation reading (cf. e.g. Ladd, 1981; Romero & Han, 2004; Krifka, 2017; AnderBois, 2019; Frana & Rawlins, 2019; Jeong, 2020). Based on the denotation of HNQs and competition with their positive polar question alternatives, I derive speaker bias in HNQs as a conversational implicature. Roughly, if the speaker is ignorant, then a positive polar question will be more informative, so a use of an HNQ conveys that the speaker is not ignorant. The denotation of the HNQ then makes clear which way the speaker is biased. The result divorces high negation from verum focus, and I argue that it is more parsimonious and has better empirical coverage than VERUM accounts (Romero & Han, 2004; Frana & Rawlins, 2019).

## 1 Background and outline

The polarity of a polar question imposes felicity restrictions, despite that classic theories of questions like Hamblin 1973 and Groenendijk & Stokhof 1984 predict positive and negative polar questions to denote the same set of positive and negative answers,  $\{p, \neg p\}$  (cf. Büring & Gunlogson, 2000; Van Rooij & Šafářová, 2003; Romero & Han, 2004; AnderBois, 2011; Sudo, 2013; Frana

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& Rawlins, 2019). I will review the relevant empirical facts, drawing some distinctions with prior characterizations, and then outline the rest of the paper.

## 1.1 HNQs convey speaker bias; LNQs do not

(1) is a neutral context in the sense that A has no expectations about the answer to the polar question, and there is no current contextual evidence supporting one answer or another.

- (1) A has just walked in the front door, and she would like to find her roommate Moira. She doesn't know whether Moira is home or not, but their mutual roommate B is, so A says to B:
- |                        |                                      |
|------------------------|--------------------------------------|
| a. Is Moira home?      | <i>positive polar question (PPQ)</i> |
| b. #Is Moira not home? | <i>low negation question (LNQ)</i>   |
| c. #Isn't Moira home?  | <i>high negation question (HNQ)</i>  |

In the context of (1), a PPQ like (1a) is perfectly acceptable, while both kinds of negative questions in (1b) and (1c) are unacceptable. Now consider a non-neutral context.

- (2) A has just gotten home, and she is expecting Moira to be there. But she looks all around the house and is surprised that she can't find Moira anywhere. However, A does find B in the last room that she checks. A says to B:
- |                       |
|-----------------------|
| a. Is Moira not home? |
| b. Isn't Moira home?  |

Both (2a) and (2b) are acceptable. However, their acceptability depends on independent features of the context: HNQs necessarily require the speaker to have an expectation that the proposition under the negation is true; LNQs don't. To see this, consider two contexts in which there is evidence for the negative answer, but the speaker has no prior expectations:

- (3) A has no expectations about whether Moira is home or not, but she has just gotten home and is looking for her. She looks all around the house and can't find her anywhere. However, A does find B in the last room that she checks. A says to B:
- |                       |
|-----------------------|
| a. Is Moira not home? |
| b. #Isn't Moira home? |

- (4) A has been in a windowless, basement computer lab for the last eight hours. Given her background knowledge, it is equally likely that it could be nice out or not. Then B walks in rubbing her hands together and stamping her feet, and says, “I hate the weather in this town!” A replies:
- a. Is it not nice out?
  - b. #Isn’t it nice out?

While the LNQs (3a) & (4a) are acceptable, the HNQs (3b) & (4b) aren’t. The following generalization about HNQs can be extracted:

- (5) *HNQ bias condition:*  
 HNQ-*p* is felicitous only if the speaker is biased for *p*

“HNQ-*p*” is shorthand for a high negation question with a propositional core *p*. The propositional core is the denotation of the sentence radical that the question is formed from. For example, the propositional core of the PPQ (1a) is *that Moira is home*, while for the LNQ (1b), it is *that Moira is not home*. For reasons that will become clear in section 4, the propositional core of the HNQ (1c) is *that Moira is home*. Thus (5) says that (1c) is only felicitous if the speaker is biased for the positive answer.

No speaker bias condition parallel to (5) holds for LNQs (cf. similar claims in e.g. Romero & Han, 2004; Sudo, 2013; Domaneschi et al., 2017; AnderBois, 2019; Frana & Rawlins, 2019). Romero & Han further demonstrate that this asymmetry between HNQs and LNQs holds in several languages besides English, including Modern Greek, Spanish, Bulgarian, Korean, and German (see also Hartung 2009 on German HNQs). The generalization also holds in Hungarian (Gyuris, 2017) and Turkish Sign Language (Gökgöz & Wilbur, 2017).<sup>1</sup> Why is there a correlation between negation, preposing, and speaker bias in polar questions? Since the phenomenon is crosslinguistic, we should aim for an explanation that derives the bias from the preposed negation.

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<sup>1</sup>In Japanese, the distinction between “high” and “low” negation is usually indicated via prosody rather than syntactic position (Ito & Oshima 2014; Shimoyama et al. 2019). Frana & Rawlins (2019) demonstrate HNQ-type bias in Italian negative polar questions, despite that there is no overt syntactic distinction between high and low negation.

## 1.2 The LNQ evidence condition does not apply to HNQs

Büring & Gunlogson (2000) establish the following generalization for LNQs:

- (6) *LNQ evidence condition:*  
LNQs require compelling contextual evidence in favor of  $\neg p$ .

For support of (6), consider that the LNQ was unacceptable in the neutral context of (1), but acceptable in contexts providing evidence for the negative answer, e.g. (2), (3), and (4).<sup>2</sup>

Northrup (2014) and Trinh (2014) claim that (6) applies to HNQs as well. (7) tests this claim by lacking the contextual evidence required to satisfy (6), but having the speaker bias to satisfy (5) (see also [redacted]):

- (7) A asks B what she is up to tonight, and B says that she is going to the Alabama Shakes concert. A has previously heard that the opening act for this concert will be The Moon and You. There is no contextual evidence to the contrary. A replies: Oh yeah, I heard about that show...
- a. #Are The Moon and You not opening?  
b. Aren't The Moon and You opening?

The LNQ (7a) is not felicitous while the HNQ (7b) is because only the former is subject to (6). Trinh (2014, 243-244) offers the following defense against similar counterexamples: (7b) is felicitous because contextual evidence for  $\neg p$  can be accommodated. For example, B's failure to mention that The Moon and You is opening in (7) in combination with the assumed relevance of that fact could be taken by A as contextual evidence for  $\neg p$ . However, this explanation incorrectly predicts (7a) to be felicitous as well. Since it isn't, HNQs cannot be subject to (6).

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<sup>2</sup>For Büring & Gunlogson (2000, 7), compelling contextual evidence for a proposition  $p$  is "evidence that has just become mutually available to the participants in the current discourse situation," that "would allow the participants to assume  $p$ ". Goodhue & Wagner (2018, 17) revise this by treating evidence for  $p$  as "a change in the context that increases the likelihood that  $p$  is true," since relatively weak evidence for  $\neg p$  could license a LNQ even if it wouldn't enable the speaker to assume  $\neg p$  (cf. Büring's (2003, 517 & 541) probabilistic definition of answerhood).

Van Rooij & Šafařová (2003), Romero & Han (2004) and Sudo (2013) point out that LNQs are not only licensed by contextual evidence for  $\neg p$ , but also by relevance of  $\neg p$  to the QUD, or speaker interest in  $\neg p$ . Therefore, it seems likely that (6) will ultimately be subsumed under a more general condition, one that I expect will follow from the markedness of negation.

### 1.3 There is no HNQ evidence condition

Meanwhile Büring & Gunlogson (2000) Sudo 2013 have claimed that HNQs are subject to their own, weaker evidence condition:

- (8) *HNQ evidence condition:*  
HNQ- $p$  is incompatible with contextual evidence for  $p$ .

Restated, (8) says that HNQs are only compatible with evidentially neutral contexts and contexts in which there is contextual evidence for  $\neg p$ . (7) and (2) respectively have already demonstrated that HNQs are acceptable in each of these kinds of contexts. But we haven't yet seen that HNQs are unacceptable in contexts with evidence for  $p$ . Since we know that HNQ- $p$  requires the speaker to be biased for  $p$ , the most obvious context to use to try to establish this is one in which the speaker is biased for  $p$  and there is contextual evidence for  $p$ . For example:

- (9) A believes that Jane is left handed. Then A and B see Jane writing with her left hand. A says to B:  
a. #Isn't Jane left handed?  
b. #Is Jane left handed?

(9a) is infelicitous, as predicted by (8). But (9a) could be infelicitous for a different reason, namely A already believes  $p$  and the evidence supports  $p$ , so A has no need to ask this question (Domaschi et al. (2017, 8) make a similar point). The fact that (9b) is equally infelicitous in (9) supports the latter view. So while (9a) fits the generalization in (8), it does not require us to develop a theory specifically aimed at explaining (8).

There is an exceptional case when there is evidence for  $p$  and an HNQ- $p$  is felicitous: if  $p$  involves a predicate of personal taste.

- (10) a. A and B walk outside into a beautiful sunny day.  
A: Isn't it nice out?  
b. B: It's nice out.

A: Isn't it?

Since each example provides contextual evidence for  $p$ , (8) incorrectly predicts the HNQs to be infelicitous.

Here is another context that is meant to support (8), inspired by Sudo 2013, 280, ex. (9). Here,  $p$  is the proposition *that Jane is left handed*,  $\neg p$  is the proposition *that Jane is right handed*.

- (11) A believes that Jane is right handed (bias for  $\neg p$ ). Then A and B see Jane writing with her left hand (evidence for  $p$ ). A says to B:
- |                             |               |
|-----------------------------|---------------|
| a. #Isn't Jane left handed? | HNQ- $p$      |
| b. Isn't Jane right handed? | HNQ- $\neg p$ |

In (11), the evidence and the belief conflict, providing motivation for A's question. The propositional core of the HNQ is still restricted in that (11a)'s core  $p$  is aligned with the contextual evidence, and so is predicted by (8) to be infelicitous, while (11b)'s core  $\neg p$  is predicted to be felicitous. Thus Sudo (2013) claims that such examples support (8).

However, the contrast in (11) can also be explained by the bias condition in (5) alone, since the speaker is not biased for  $p$ , the propositional core of (11a), but is biased for  $\neg p$ , the core of (11b). This explanation is more parsimonious: The bias condition in (5) is motivated by the infelicity of (3b), (4b) and (7), and all of these examples meet the purported (8), so (5) is motivated independently of (8). Thus it is simpler to explain the contrast in (11) on the basis of (5), and avoid postulating (8) altogether.

The conclusion that there is no separate HNQ evidence condition dissolves a puzzle raised by Büring & Gunlogson (2000) and echoed by Sudo (2013): Both seek—but fail to find according to them—a satisfying unified account of evidence conditions holding on all kinds of positive and negative polar questions including HNQs. The search for a unified account including HNQs can be abandoned. With HNQs out of the way, I believe an explanation for the evidential asymmetry between PPQs and LNQs will follow straightforwardly from the markedness of negation, though a detailed discussion is beyond the scope of this paper.

## 1.4 Summary and outline

In this section, I have been crossing two contextual factors—speaker bias and contextual evidence—to observe their effects on the acceptability of polar questions. The findings are summarized in Table 1 (cf. Domaneschi et al. 2017, 23).<sup>3</sup>

Table 1: The relationship between speaker bias, contextual evidence, and the felicity of positive and negative polar questions

	Bias for $p$	no bias	Bias for $\neg p$
Evidence for $p$	1. HNQ- $p$ (10)	2. PPQ	3. HNQ- $\neg p$ /PPQ (11)
No evidence	4. HNQ- $p$ /PPQ (7)	5. PPQ (1)	6. HNQ- $\neg p$
Evidence for $\neg p$	7. HNQ- $p$ /LNQ (2)	8. LNQ (3), (4)	9. empty

The HNQ bias condition in (5) is clearly reflected in Table 1: HNQs are only felicitous in the second and fourth columns in which the speaker is biased toward the propositional core of the HNQ. One of the key questions motivating this paper is, why must HNQs convey bias toward the propositional core (rather than bias toward the negation of the propositional core or no bias at all)?

In pursuit of an answer, I turn in section 2 to demonstrating novel empirical asymmetries between HNQs and another kind of biased question they have been linked to by Romero & Han (2004), verum/polarity focus questions (PFQs). I show that, unlike in HNQs, bias in PFQs is context sensitive, which leads me to argue in section 3 that PFQ bias derives from general pragmatic principles in combination with the conversational contexts that PFQs happen to frequently ap-

<sup>3</sup>I have left out examples of cells in Table 1 not crucial to the main narrative. An example of cell 2 can be found in Buring & Gunlogson 2000, 7, ex. (18). Cell 6 can be found in Romero & Han 2004, 619, ex. (28). PPQs for cells 3 and 4 can be found by considering that “Is Jane left handed?” and “Are the Moon and You opening?” would be felicitous in (11) and (7) respectively.

Table 1 is used to make both positive and negative claims. E.g. cell 8 contexts allow LNQs to be used felicitously, but not PPQs or HNQs. These claims are a bit idealized in some cases, e.g. the PPQ “Is Moira home?” might be felicitous in the context of (2). Should PPQ therefore be added to cell 7? I have the feeling that such behavior is acceptable only because it seems possible to imagine A ignoring the contextual evidence and perhaps her bias, thus turning the example into one that properly belongs in cell 4 or 5. Such nuances deserve further attention, but I set them aside given the present focus on HNQs (and how they differ from LNQs). I take Table 1 to provide a detailed and complete picture of the use of HNQs, which can only appear in cells 1, 3, 4, 6, and 7.

pear in. I compare the results of this account to VERUM accounts of PFQs.

Then, to understand the role of preposed negation in HNQs, I deploy a battery of tests for negation in polar questions in section 4. The tests reveal that the sentence radical of HNQs cannot be negated, contra the position of many researchers who have argued that negation in HNQs can scope low. This leads me to conclude that the only position for negation in HNQs “is somehow outside the proposition” (Ladd, 1981). In section 6, I argue that high negation scopes over a doxastic speech act operator (cf. Romero, 2015; Krifka, 2017; Frana & Rawlins, 2019). This structure denotes an unbalanced partition, consistent with previous proposals (Romero & Han, 2004; Krifka, 2017).

In section 7, I develop a novel account of the necessary inference that the speaker is biased for the core of the HNQ. In brief, the HNQ competes with a PPQ alternative that is in a sense stronger. I argue that a speaker ignorant of  $p/\neg p$  should prefer the stronger PPQ; thus if they use the HNQ, they must not be ignorant. Finally, the manner in which the HNQ is unbalanced resolves their bias for  $p$ . Prospects for combining this account with other recent analyses of HNQs are briefly explored in section 8.

## 2 Asymmetries between polarity focus and high negation

Romero & Han (2004) observe that both high negation questions (HNQs) like (12) and polarity focus questions (PFQs) like (13) convey that the speaker is biased for the answer with opposite polarity from that of the question.<sup>4</sup>

- (12) A: Ok, now that Stephan has come, we are all here. Let’s go!  
B: Isn’t JANE coming?  
     $\rightsquigarrow$  B previously believed that Jane is coming (Romero & Han, 2004, 610)
- (13) B: Ok, now that Stephan has come, we are all here. Let’s go!  
A: Wait, Jane’s coming too.

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<sup>4</sup>‘ $\rightsquigarrow$ ’ marks an implication while remaining agnostic about what kind of implication it is.



B: IS Jane coming?  
 $\rightsquigarrow$  B previously believed that Jane isn't coming

Given the strikingly similar bias of these two question types, Romero & Han pursue a unified analysis of high negation and verum/polarity focus (Höhle, 1992). They propose that an epistemic conversational operator VERUM is introduced to the LF by both high negation and verum/polarity focus. It plays a crucial role in the derivation of speaker bias, and is subject to discourse constraints meant to explain the restricted distributions of both kinds of questions. Subsequent research has built directly on this VERUM operator framework (Repp, 2013; Romero, 2015; Romero et al., 2017; Frana & Rawlins, 2019; Jeong, 2020), while other work has accepted the claimed connection between verum focus and biased questions, and sometimes also high negation, even though it does not directly build on Romero & Han's particular VERUM operator (AnderBois, 2011, 2019; Gutzmann et al., 2020; Samko, 2016; Taniguchi, 2017; Silk, 2020; Bill & Koev, 2021).

There are explanatory and empirical challenges to this approach. The explanatory challenge: We would like to have a principled explanation for the crosslinguistic fact that preposed negation triggers speaker bias. But the introduction of VERUM by preposed negation is a stipulation in Romero & Han's (2004, 613) account, and so the link between preposed negation and speaker bias remains unexplained (cf. AnderBois 2011, 223, who raises the same challenge).

The empirical challenge is that there are two asymmetries between HNQs and PFQs that speak against a unified account. Regarding the first asymmetry: Focus marked expressions require an antecedent in which backgrounded (non-focused) material is given (cf. Kratzer, 1991; Rooth, 1992; Schwarzschild, 1999, i.a.). Verum/polarity focus in PFQs is no different in this regard. For example, in (13), B's use of polarity focus is licensed by A's utterance, which provides the required antecedent for the prominence shift. Compare this to (12), repeated below with added example sentences, in which the antecedent for polarity focus is missing from the context.

- (14) A: Ok, now that Stephan has come, we are all here. Let's go!
- a. B: Isn't JANE coming? (Romero & Han, 2004, 610)
- b. B: # ISN'T Jane coming?



a speaker bias, while the speaker bias conveyed by PFQs is context sensitive. While the PFQ in (13) displays a speaker bias, (16a) demonstrates a PFQ that is felicitous but does not convey any bias.

- (16) B wants to know whether Jill will be at a meeting for members. But B lacks an opinion about whether Jill is a member.  
 B: Will Jill be at the meeting?  
 A: If she's a member, she will.
- a. B: IS she a member?  
 $\nearrow$  B believes she isn't a member
- b. B: # ISN'T she a member?  
 $\leadsto$  B believes she is a member

Despite that the context of (16) stipulates that B lacks a bias about whether Jill is a member, the PFQ in (16a) is perfectly felicitous. The HNQ in (16b) on the other hand is infelicitous in this context, presumably because the bias it necessarily conveys clashes with the context. If both of these question types introduce a *VERUM* operator that triggers speaker bias, as Romero & Han (2004) claim, then this asymmetry is unexpected.<sup>5</sup>

(17) is another example demonstrating the felicitous but unbiased use of a PFQ:

- (17) The interviewee is a Californian rancher whose ranch was engulfed by a wild fire.  
 Interviewee: Some of the horses, you know, they're used to being in their stalls, and they're a little afraid to come out, too, [...] so we had to make sure they'd get out of the barn in time.  
 Journalist: DID they all make it out of the barn in time?  
 Interviewee: I hope so, I don't know if all the horses made it or not, I know a lot of them did, I hope they did. (Kelly, 2017, @1:31)

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<sup>5</sup>A reviewer points out that Romero & Han (2004, 624ff.) first introduce the *VERUM* operator relative to certain uses of the adverb *really*, and asks if my criticisms and positive proposals are meant to apply to it. Note that the question "Is she really a member?" would be infelicitous in (16). Intuitions for *really* diverge from polarity/*verum* focus in other ways. For example, if you ask if I got a haircut, I can reply, "I DID get a haircut," whereas "I really did get a haircut" would be infelicitous (see also Gutzmann et al. 2020, 17, fn. 7, who provide a context in which *really* is felicitous in a polar question while polarity/*verum* focus is not). I conclude that *really* is a distinct phenomenon from polarity/*verum* focus. I suspect that *really*'s lexical semantics denotes something close to what Romero & Han (2004) and Frana & Rawlins (2019) propose for *VERUM*. In fn. 10 below, I show how this in combination with the account I will give of context sensitive bias in section 3 offers an explanation of speaker bias in *really*-Qs. What I am challenging at various points in this paper is the appropriateness of a *VERUM* account for the empirical phenomena of polarity/*verum* focus and high negation.

Suppose the journalist intends not to convey any bias via her PFQ in (17). Intuitively, the PFQ is perfectly felicitous. Compare this to the use of the HNQ *Didn't they (not) all make it out of the barn in time?*, which clearly can only convey a positive bias (or negative bias with the added parenthetical *not*).

The central fact about HNQs is that they *always* convey a bias for the propositional core of the question, as laid out in (5). Meanwhile, examples like (16) and (17) show that it is an equally crucial fact about PFQs that they do not always convey a speaker bias, but that that bias instead seems to be conditioned by the particular context in which they appear.

In summary, the unified VERUM operator account of HNQs and PFQs is too weak to accurately predict the distribution of PFQs, and it predicts bias in PFQs too strongly. To deal with the first challenge, a defender of the VERUM account could assume that, while both HNQs and PFQs feature VERUM operators and are subject to restrictions on their use, only PFQs are in addition subject to general restrictions on focus marking. To deal with the second challenge, the VERUM theorist could argue that not all instances of prosodic prominence on the auxiliary indicate the presence of VERUM, some merely indicate polarity contrast (Romero & Han, 2004, 630). On this view, the VERUM account has to stipulate that VERUM is present in biased PFQs, and absent in unbiased PFQs. Both of these solutions are unparsimonious, requiring the VERUM account to be bolstered with auxiliary theories and stipulations, and so will be dispreferred if alternative theories can be given that explain the same data without appealing to VERUM. I have already offered an account of the distribution of verum/polarity focus entirely in terms of a general theory of focus in Goodhue accepted (see also Wilder 2013 and Samko 2016). If this account holds, and if an account that predicts the context sensitivity of PFQ bias can be developed, then the VERUM operator is not needed to account for any aspect of verum/polarity focus. I will develop such an account of PFQ bias in section 3.

### 3 Why some polarity focus questions are biased

In this section, I develop an account of bias in PFQs due entirely to the kinds of conversational contexts they happen to frequently appear in, in combination with general pragmatic principles. In a nutshell, PFQ bias arises when an interlocutor asserts, commits to, or otherwise implies some proposition  $p$ , and then the speaker questions  $p$  via a polar question, thereby casting doubt on  $p$  and expressing bias for  $\neg p$ . I will explore predictions of this account, key among them that polarity focus is not required in order for bias to be derived, and that the polarity of the bias need not oppose the polarity of the question. Then I compare the result to VERUM accounts.

#### 3.1 Account of speaker bias in PFQs

Consider the following biased PFQ:<sup>6</sup>

- (18) A: Dinah likes Ivy.  
B: DOES Dinah like Ivy?  
 $\rightsquigarrow$  B believes that Dinah does not like Ivy

Let  $p$  be the proposition *that Dinah likes Ivy*. Using “ $\Box$ ” to represent “B believes that”, we can abbreviate the goal of our bias derivation as  $\Box\neg p$ . Let’s examine the various pragmatic principles in play to see how they might lead to this bias inference. First, A asserts  $p$ . Given Grice’s (1989, 27) maxim of quality, “Try to make your contribution one that is true,” including the first submaxim, “Do not say what you believe to be false,” A conveys that she believes  $p$ . According to Stalnaker’s (1978) theory of assertion and common ground, A also intends her interlocutor to accept  $p$  as true, and to update the common ground with  $p$ . The common ground is a set of propositions representing the mutual beliefs of the interlocutors. The context set  $c$  is the conjunction of these propositions, the set of all worlds compatible with all of the interlocutors’ mutual beliefs.

If B were to accept A’s assertion, she would update the common ground with  $p$ . The context set  $c$  would be updated with  $p$  by reducing the worlds it contains to just those in which  $p$  holds.

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<sup>6</sup>The account laid out in this section has been previously described in Goodhue 2018b,a.

But this is not what happens in (18). Instead, B asks  $?p$  (*Does Dinah like Ivy?*). Crucially, there are constraints on asking questions: both Roberts (1996/2012, 14) and Buring (2003, 541) propose versions of a principle that I will call *interrogativity* that is related to Stalnaker's (1978) informativity principle:<sup>7</sup>

- (19) *Interrogativity principle:*  
Ask a question  $?p$  only if the context set  $c$  does not entail a complete answer to  $?p$ .

If  $p$  were mutually believed, then the common ground would have been updated with  $p$ ,  $c$  would entail  $p$ , and  $?p$  would be infelicitous by (19). Thus, by asking  $?p$ , B signals that  $c$  does not entail  $p$ , that  $p$  is not mutually believed. Since it is mutually believed that A believes  $p$  as a result of A's assertion, the reason that  $c$  does not entail  $p$  must be that B does not believe it,  $\neg\Box p$ .<sup>8</sup>

So far we are only part way to our goal, since the speaker bias inference in (18) is something stronger than  $\neg\Box p$ , namely  $\Box\neg p$ . This gap can be bridged using an idea familiar from the quantity implicature literature that derives strong or secondary implicatures from weak or primary implicatures (Sauerland 2005; Fox 2007; Geurts 2010; also used in explanations of neg-raising in Bartsch 1973; Horn 1989). The inference  $\neg\Box p$  is strengthened to  $\Box\neg p$  only when the context supports the assumption that the speaker is *opinionated* about  $p$ , which is to say that she either believes  $p$  or  $\neg p$ , i.e.  $\Box p \vee \Box\neg p$ . Combining  $\neg\Box p$  and  $\Box p \vee \Box\neg p$ , the bias inference  $\Box\neg p$  is produced.<sup>9</sup>

This account makes several predictions that are explored in the remainder of this section.

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<sup>7</sup>Stalnaker's (1978, 88) informativity principle constrains when a proposition can be asserted relative to the context set:

- (i) *Informativity principle:*  
A proposition asserted is always true in some but not all of the possible worlds in the context set.

<sup>8</sup>There is an alternative way of getting to  $\neg\Box p$ , namely requiring that a speaker who asks  $?p$  is ignorant (or lacks an opinion) about the answer. If we represent ignorance as  $\neg\Box p \wedge \neg\Box\neg p$ , then  $\neg\Box p$  follows anytime a speaker asks  $?p$ . However, this is a nonstarter because ignorance obviously conflicts with the bias inference  $\Box\neg p$  that we are trying to derive in (18). More generally, there are uses of questions that are incompatible with a blanket ignorance requirement, e.g. exam questions (cf. Krifka, 2012).

<sup>9</sup>See Reese (2007) for a similar explanation for bias in other kinds of questions that contain prominence shifting, though not polarity focus.

### 3.2 PFQ bias correlates with speaker opinionatedness

Given the role of opinionatedness in section 3.1, the more likely that a speaker is opinionated about  $p$  in a context, the more likely we are to infer that their PFQ conveys a bias. For example, if we know that B in (18) is very close with both Dinah and Ivy, then it is highly likely that B has an opinion about whether Dinah likes Ivy, and so we feel that the speaker's PFQ gives rise to the bias inference  $\Box \neg p$ . On the other hand, if we know that B is not close with Dinah and Ivy, then it is not likely that B has an opinion about whether Dinah likes Ivy, and it is plausible to imagine B using the PFQ in (18) without conveying the bias inference, but instead conveying something weaker, like surprise. These two different inferences can be brought out by possible continuations of (18). In the first context, B can follow her PFQ with, "I don't think she does." In the second context she can follow the PFQ with, "I didn't know that."

Here is another example demonstrating a lack of opinion leading to a weaker, surprise inference:

- (20) A is telling B about a new club she has joined. Both know that B knows little about it.  
A: And Jill is a member too.  
B: IS she? That's nice!  
 $\nearrow$  B believes that Jill isn't a member.

In (20), A asserts  $p$ , but B is not opinionated about  $p$ , so strong speaker bias is not derived.

### 3.3 PFQ bias depends on whether the focus antecedent conveys commitment to the proposition questioned

Consider again (16), in which the PFQ conveys no bias, repeated here:

- (16) B wants to know whether Jill will be at a meeting for members. But B lacks an opinion about whether Jill is a member.  
B: Will Jill be at the meeting?  
A: If she's a member, she will.  
B: IS she a member?

$\nrightarrow$  B believes she isn't a member

This context is lacking two crucial conditions for the bias derivation laid out above. The first is that no one expresses a belief in the propositional core of the question,  $p$ . A's mention of  $p$  that licenses B's use of polarity focus is embedded in the protasis of a conditional. The second is that B lacks an opinion about  $p$ . As a result, the bias derivation outlined above cannot get off the ground, and we do not infer that B is biased. A similar example is demonstrated in [redacted].

This explains why bias arises from PFQs in some contexts and not others. It is just a coincidence that many contexts that license polarity focus also feature an interlocutor asserting  $p$  plus an opinionated speaker.

### 3.4 Bias without polarity focus

Another prediction of this theory is that, if we can find a context that provides all of the necessary inputs for a bias derivation but that does *not* license polarity focus, then bias should still be derived. This is indeed what we find.

- (21) A and B are planning a potluck.  
A: Mark is bringing a salad, and Jane baked a pie.  
B: Wait. Is Jane coming?  
 $\rightsquigarrow$  B believes that Jane isn't coming.

In (21), B can take A's utterance to imply that Jane is coming ( $p$ ). If the context set  $c$  entailed  $p$ , then by (19) B shouldn't be able to ask  $?p$ . So since she does, B conveys that  $c$  does not entail  $p$ , and this is because  $\neg \Box p$ . Finally, if B is taken to be opinionated, we derive the bias implicature,  $\Box \neg p$ . Despite this speaker bias, B's polar question in (21) would be severely degraded with polarity focus because the proper antecedent for a prominence shift is absent. Instead, prominence appears most naturally appear on *Jane*, though it could also land on *coming* (cf. biased questions in which prominence lands on the verb in Frana & Rawlins 2019). So speaker bias can arise even in the absence of polarity focus, as predicted.



### 3.5 Bias for the propositional core of the question

In all examples we have seen so far, the polarity of the bias is always opposite from that of the question, i.e. the bias is always against the propositional core of the question. This is one of the common features between HNQs and PFQs identified by Romero & Han (2004). Insofar as we think of HNQs as negative, this generalization is correct for HNQs: HNQs always convey a bias toward the propositional core embedded under the high negation. However, (22) shows that this generalization is not correct for all biased polar questions.

- (22) Jane is not present:  
A: Everyone's here, let's go!  
B: Wait. Is Jane coming?  
 $\rightsquigarrow$  B believes that Jane is coming.

In (22), A's assertion along with Jane's absence implies that A believes that Jane is not coming ( $\neg p$ ). Like for (21), if  $c$  entailed  $\neg p$ , then by (19) B shouldn't be able to ask  $?p$ . So since she does, B conveys that  $c$  does not entail  $\neg p$ , and this is because  $\neg \Box \neg p$ . Finally, if B is taken to be opinionated, we derive the bias implicature,  $\Box p$ . Again, polarity focus would be infelicitous here because the proper antecedent is missing, but the bias can be derived independently, as predicted.

Interestingly, the polarity of the bias in (22) is identical to the polarity of the polar question. (22) shows that question bias does not have to oppose the polarity of the question. This is because the polarity of the bias inference is conditioned by the context—specifically, the bias depends crucially on the proposition  $p$  that was previously implied and is now being questioned. Regardless of whether the question has the same polarity as the previous implication  $p$  or the opposite, the bias derived will always oppose that implication.

Here is why the bias usually has opposite polarity from the question's sentence radical: The biased question is frequently questioning a proposition for which there is salient evidence in the context, especially in the form of an assertion of that proposition. When this is the case, the question is subject to an evidential condition, like (6) for LNQs and its positive question counterpart

(see e.g. Büring & Gunlogson 2000; Sudo 2013; Trinh 2014; Roelofsen & Farkas 2015 for evidence that PPQs are incompatible with contextual evidence for  $\neg p$ ). These evidential conditions force the question to have the same polarity as the proposition being questioned. The result is that the polarity of the bias opposes the polarity of the question asked. (22) is a rare example in which the evidence for the proposition being questioned is relatively implicit, implicit enough to allow the evidential condition to be obviated. Note that the question could have been phrased negatively, e.g. “Is Jane not coming?”. In that case, the question would have conveyed the same bias.

### 3.6 Comparison to VERUM accounts

In recent work, Frana & Rawlins (2019) revise Romero & Han’s (2004) account of bias in questions, building on ideas in Repp 2013 and Romero 2015. The result clarifies the pragmatic derivation, and Jeong (2020) subsequently adopts Frana & Rawlins’s account of HNQs. I will point out a similarity between my and Frana & Rawlins’s derivation of bias. Then I will point out a few diverging predictions that I think speak in favor of my account.

Frana & Rawlins assume that PFQs introduce a common ground management operator VERUM, which has roughly the semantics of Romero & Han’s (2004, 627) operator, except that, building on an innovation in Romero 2015, VERUM makes a presuppositional, rather than at-issue, contribution:

$$\begin{aligned}
 (23) \quad & \llbracket \text{VERUM} \rrbracket^{c,w} = \lambda p_{\langle s,t \rangle} \cdot p \\
 & \text{Defined for } p, c, w \text{ only if} \\
 & \quad \forall w' \in \text{Epi}_x(w) [\forall w'' \in \text{Conv}_x(w') [p \in \text{CG}_{w''}]] \\
 & \quad \text{“}x \text{ is sure that, in all worlds satisfying their conversational goals, } p \text{ is CG.”} \\
 & \hspace{15em} (\text{Frana \& Rawlins, 2019, 32})
 \end{aligned}$$

$x$  is fixed to a contextually provided individual by the illocutionary force of the utterance ( $x$  = speaker in assertions,  $x$  = addressee in questions). Frana & Rawlins follow Romero & Han in assuming that utterances containing VERUM are meta-conversational, and so their distribution is restricted by a principle of economy, which says not to use a meta-conversational move unless

necessary to resolve a Quality dilemma. Frana & Rawlins further assume that there are only two kinds of Quality dilemmas: Epistemic conflict, in which the speaker has a preexisting bias that the context (especially the addressee) contradicts; and lack of evidence, in which the speaker has a preexisting bias, but not enough evidence to assert it, and the context doesn't provide enough evidence to settle the issue.

With these ingredients, here is how Frana & Rawlins explain bias in a PFQ like (18): A asserts  $p$ , and then B chooses to ask a question  $?p$  that contains VERUM instead of a simpler question without it. Thus B must be facing a Quality dilemma. The VERUM operator presupposes that A has indicated certainty for adding  $p$  to the CG, so the dilemma cannot be lack of evidence, but must be epistemic conflict. Thus B must have a bias that A has contradicted. Since A asserted  $p$ , B's bias must be for  $\neg p$ , which matches intuitions for (18).

What this bias derivation shares with the one I developed above is that it depends on conflict between an interlocutor's previous assertion (or implication) and the speaker's choice to then use a certain kind of question, leading to the inference that the speaker's bias must oppose the interlocutor's commitment.<sup>10</sup> However, Frana & Rawlins's use of a presuppositional VERUM operator creates a few challenges in explaining some of the data captured by my account (the following challenges apply equally to Romero & Han's (2004) account). One is that, while my account explains why examples like (16) and (20) lack bias despite prominence on the auxiliary, Frana & Rawlins are forced into the same position as discussed for Romero & Han at the end of section 2, namely they need to stipulate that VERUM is absent, despite the presence of the usual prosodic marker.<sup>11</sup>

A second challenge is posed by examples like (21) (as well as (22)): Frana & Rawlins follow Romero & Han in assuming that VERUM is introduced by just a few grammatical markers

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<sup>10</sup>In fn. 5, I mentioned that something like a VERUM semantics in (23) may be appropriate for the adverb *really*. If that is right, then my account will predict bias to arise from a *really*-Q, without claiming that the move is meta-conversational and subject to a principle of economy. Just by virtue of raising the question  $?p$  while presupposing the addressee's commitment to add  $p$  to the CG, my account predicts bias to arise from normal conversational dynamics. Moreover, it does so while avoiding a unification of the empirical phenomena of *really*-Qs, PFQs, and HNQs. I see this as a welcome result, given empirical asymmetries between them in fn. 5.

<sup>11</sup>Frana & Rawlins focus only on cases in which prosodic prominence lands on the main verb or negation, though, as Romero & Han make clear and as is widely assumed elsewhere, it can also land on the auxiliary).

in English, namely high negation, the adverb *really*, and verum focus prosodic prominence. The challenge posed by (21) is that prosodic prominence is very natural on the subject *Jane*, a position that has never been argued to trigger the presence of VERUM in English. And yet, the question conveys the kind of speaker bias typical of verum/polarity focus questions. While my account provides a unified explanation of these examples and more classic cases of verum/polarity focus, on Romero & Han’s and Frana & Rawlins’s VERUM accounts, this bias will either need to be explained by an auxiliary theory distinct from VERUM, or VERUM will need to be untethered from certain grammatical markers and allowed to be present in a wider array of sentences than previously thought.

Suppose we go the latter route and assume that VERUM is present in examples like (21) and (22) despite the lack of relevant markers. Even then, two further challenges arise. First, VERUM presupposes that “*x* is sure that, in all worlds satisfying their conversational goals, *p* is CG”. But in (21) and (22), A’s prior utterance only weakly implies the relevant proposition *p*, thus it is not obvious that A is certain that they want to add *p* to the CG, and so it is not obvious that the presupposition is met. Frana & Rawlins (2019, 34) exploit this fact to explain the infelicity of VERUM in their Good Manners example, but in the context of (21) and (22), this is a bug rather than a feature.

The second challenge is posed by (22) in particular, in which the polarity of the bias matches the polarity of the question. If VERUM were present in (22)B, it would operate on its complement, the proposition *that Jane is coming*, and presuppose that A is sure that, in all worlds satisfying A’s conversational goals, *that Jane is coming* is CG. But given A’s utterance “Everyone’s here, let’s go!”, and the fact that Jane is not present, this presupposition clearly would not be met. Moreover, if it somehow were met, then Frana & Rawlins’s VERUM account would incorrectly predict B to have a negative bias. Romero & Han’s account differs in its details, but runs into the same problem in that it always predicts the speaker of the question to be biased for a proposition other than the one they pronounce in uttering the question. In other words, VERUM accounts are incapable of predicting same polarity bias.

In the face of these two further challenges, the VERUM account would need to claim that examples like (21) and (22) lack VERUM. This is good in that it does not radically proliferate the availability of VERUM operators. But it is another strike against VERUM from theoretical parsimony, which is brought into relief by the simpler unified account of the preceding data that I have proposed in this section.

Despite the challenges I have raised for VERUM accounts, I suggest in section 8 that my account of HNQ bias in section 7 could be combined with such operators. What I have objected to here is the unification of PFQ bias and HNQ bias, and the application of VERUM to the empirical phenomenon of polarity/verum focus. In section 4, I will further object to the view that VERUM gives rise to a scope ambiguity with negation in HNQs, and in section 5, I will raise challenges for the FALSUM view of HNQs.

### **3.7 Section conclusion**

With this account of speaker bias in PFQs in hand, we now have a partial explanation for why biased questions convey the biases that they do: For PFQs, the bias conveyed does not depend directly on unique aspects of their prosody or syntax. Rather, the speaker bias of these questions is derived entirely via independent pragmatic principles. Semantically and syntactically (F-marker notwithstanding), PFQs are no different from polar questions that lack polarity focus. The account proposed allows us to keep a classic semantics for polar questions in place, and it accurately predicts that questions that lack polarity/verum focus can also convey bias.

I turn now to HNQs and their invariable bias. Unlike for PFQs, I will propose that HNQs have a syntax and semantics all their own that plays a direct role in the speaker bias they convey.

## **4 The sentence radical of the HNQ is not negated**

Given the correspondence between negation, preposing and bias in high negation questions, we want to understand where negation is in the structure of HNQs, and what effect it has on interpre-

tation. In declarative sentences, negation reverses truth values. But since polar questions don't have truth values, determining the position and effect of negation will require other diagnostics.

#### 4.1 Most polarity items are a poor diagnostic of negation in polar questions

Ladd (1981) claims that HNQs are ambiguous between an inner negation reading in which propositional, sentential negation is present, and an outer negation reading in which negation “is somehow outside the proposition...” Another way he states the ambiguity is that (24a) questions  $p$ , while (24b) questions  $\neg p$ . Ladd uses the polarity items *either* and *too* to bring out the two supposed readings:

- |      |    |                           |                |
|------|----|---------------------------|----------------|
| (24) | a. | Isn't Jane coming too?    | outer negation |
|      | b. | Isn't Jane coming either? | inner negation |

Many speakers find (24b) infelicitous; more on that shortly. Whatever intuitive contrast there is between (24a) and (24b), it's not immediately clear whether it's due to the scope of negation or the polarity items. As AnderBois (2011, 2019) notes, claims of ambiguity between outer and inner negation are almost always demonstrated via examples with polarity items. For example, Frana & Rawlins (2019, 23) demonstrate inner and outer readings using *too* and *either*.<sup>12</sup> Sudo (2013) does likewise, and claims that the inner reading requires contextual evidence for  $\neg p$  while the outer reading does not (Jeong (2020) echoes this claim, as discussed in section 4.5 below). However,

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<sup>12</sup>Frana & Rawlins (2019, 23-25) further argue that Italian negative polar questions, which have only one syntactic position for negation *non*, exhibit the same outer/inner ambiguity on the basis of the PPI/NPI pair *anche* “also”/*neanche* “neither”. However it is at least possible that the ambiguity observed is not inner/outer, but rather an HNQ/LNQ ambiguity. Frana & Rawlins seem to acknowledge this possibility, since the LF they propose in their ex. (66c), p. 32,  $Q [ \text{VERUM} ] [ \neg [ p ] ]$ , suggests that VERUM is optional. At the same time, they claim that Italian negative polar questions can only be felicitous when the speaker has positive bias, which would suggest that, on their theory, VERUM *must* be present. A test of this that to my knowledge has not yet been reported would be to consider Italian NPQs in contexts in which English LNQs are felicitous despite a complete lack of speaker bias, e.g. (3), (4), or the Rosa Montero example (Romero & Han 2004, 613-614, Frana & Rawlins 2019, 20). If Italian negative polar questions are felicitous in contexts in which there is no speaker bias, it may suggest that the ambiguity brought out by *anche/neanche* is not outer/inner, but high/low. Cf. Goodhue (2018b, 117-120), who makes the argument that similar polarity items in Spanish demonstrate a high/low distinction rather than an outer/inner one.

Rullmann (2003) observes that *either* itself imposes a licensing condition that requires evidence for the falsity of *either*'s complement clause. He then demonstrates that *either* can even appear in positive polar questions, but notes that there is always a negative implication. For example:

(25) Nixon's not very bright, but does Agnew have any brains either? (Rullmann, 2003, 347)

Given this fact, perhaps *either* is not bringing out an ambiguity in HNQs, but having an effect itself (a point AnderBois (2019) also raises).

This issue cannot be settled until we have a complete understanding of *either*, especially its licensing condition. Rullmann (2003, sec. 3.3) points out several challenges for his own proposed licensing condition. Moreover, many native speakers of American English, including AnderBois (2019), myself, and all other native speakers of American English I have consulted, find HNQs with *either* such as (24b) to be either infelicitous or at least severely degraded. This fact is demonstrated experimentally by Hartung (2006) as well as Sailor (2013).<sup>13</sup> At the same time, informal discussion with a small number of British English speakers suggests that HNQs with *either* such as (24b) are acceptable in at least some dialects. Furthermore, Frana & Rawlins (2019, 22, fn. 18) report that the English speakers they have consulted fall into two dialect groups by whether they have the inner/outer negation ambiguity in HNQs, and that this is responsible for the conflicting judgments for HNQs with *either*. However, since the data Frana & Rawlins use to establish the inner/outer ambiguity involves polarity items, and since my discussion with British English speakers was restricted to HNQs with *either*, more work is needed on this variation to determine if it is due to the interpretation of HNQs or polarity items.

We could try to use other NPI/PPI pairs to bring out Ladd's purported ambiguity, for example *yet/already* (cf. Romero & Han 2004, 610 and Frana & Rawlins 2019, 23). I start with contexts in which only PPQs are felicitous, in order to demonstrate the effects that *yet* and *already* have on

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<sup>13</sup>While this experimental work suggests that HNQs with *either* are severely degraded, note that they are not at floor. This might be partially responsible for the intuitive controversy, and it might also be an explanandum for a complete theory of *either*. One possible explanation is that *either*'s licensing requirement that *p* is false conflicts with the positive bias of the HNQ.

them.

- (26) B is dog-sitting for A this weekend. A is about to leave, and she is telling B everything B needs to know: Fido eats twice a day, at 7 am and 5 pm; after Fido eats, the dish is washed and left drying in the drying rack until the next meal; etc. It is 4:50 pm. A asks B if she has any questions, and B notices one of Fido's dishes on the floor with some traces of dog food in it. Pointing to the dish, B says:
- a. B: Did Fido eat dinner already?
  - b. B: ? Did Fido eat dinner yet?

There is a mild contrast between (26a) and (26b). Given that it seems like A already fed Fido, the use of *already* is appropriate, while the use of *yet* seems to suggest the  $\neg p$  possibility in a way that is inappropriate given the contextual evidence.

- (27) The context is identical to (26), except now when A asks B if she has any questions, B notices one of Fido's dishes in the drying rack, clean. Pointing to the dish, B says:
- a. B: ? Did Fido eat dinner already?
  - b. B: Did Fido eat dinner yet?

With the change in context, the intuition flips. The point of (26) and (27) is to demonstrate that *already* and *yet* in polar questions have an effect on intuitions that is entirely independent of high negation. Now consider that when the context makes the HNQ appropriate, *already* and *yet* have similar effects to those just observed:

- (28) A and B live together, and Fido is their dog. B is on her way home, she knows that A is home, and it is well after Fido's dinner time, so B expects Fido to have been fed. When B walks in the front door, Fido is acting like he hasn't been fed. But B sees Fido's dish on the floor with some traces of dog food in it. B says to Fido:
- a. B: Didn't you eat dinner already?
  - b. B: ? Didn't you eat dinner yet?
- (29) The context is identical to (28), except now B sees Fido's dish in the drying rack, clean. A rarely cleans Fido's dish after feeding him. B says to Fido:
- a. B: ? Didn't you eat dinner already?
  - b. B: Didn't you eat dinner yet?



(28) and (29) provide B with the appropriate bias to use HNQs. The manipulation of context has the same mild effect on the acceptability of *already* vs. *yet*. Given that *already* and *yet* are acceptable in PPQs and display the same meaning effects as they do in HNQs, any distinction between the HNQs in (28) and (29) could be about the polarity items, not an inner/outer negation ambiguity.

Romero et al. (2017) claim to demonstrate that prosody exhibits the inner/outer ambiguity in English (see also Arnhold et al. 2021). The production experiment is designed to capture the prosody speakers produce when their HNQ- $p$  is double-checking  $p$  or  $\neg p$ . This is done by producing contexts in which the character participants play has a  $p$  bias, confronting them with conflicting evidence for  $\neg p$ , and then explicitly telling the participant either that they are still convinced they are right about  $p$  and want to check their  $p$  assumption, or that they are now becoming convinced that  $\neg p$  and want to check their  $\neg p$  assumption. Participants were more likely to produce a shallower final rising intonation in the checking- $p$  condition, while they were more likely to produce a steeper final rise in the checking- $\neg p$  condition. I believe the most straightforward explanation for this result is the following: Steepness of question intonation is independently known to signal increased emotional activation, which correlates with surprise (Gussenhoven, 2004; Bänziger & Scherer, 2005; Westera, 2017; Goodhue, 2021). The character participants played in the checking- $\neg p$  condition is surprised because they are now becoming convinced that their original  $p$ -bias was mistaken. In the checking- $p$  condition, there is less to be surprised about—they previously believed  $p$  and they still do. This explanation of the results does not depend on assuming that HNQs have an inner/outer negation ambiguity, as a speaker can use an HNQ in a context in which there is new evidence suggesting  $\neg p$  without the question having an inner negation.<sup>14</sup>

To get a handle on negation in HNQs, a larger set of diagnostics is needed. In the following,

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<sup>14</sup>Romero et al. (2017)/Arnhold et al. 2021 argue that their participants speak an uptalk variety of English, and hypothesize that the shallower rises they found would be final falls in non-uptalk dialects of American English, and thus that in non-uptalk dialects, the prosodic distinction is actually final rise for checking- $\neg p$  and final fall for checking- $p$ . A challenge for this view is that, even in non-uptalk varieties of American English, the most natural way to produce examples above that clearly check  $p$ , like (7), is with a final rise, not a fall.

I use expressions that contribute projecting content such as presuppositions and conventional implicatures, expressions that are sensitive to aspect, and polar particle responses to test for negation.

## 4.2 Projecting content

Not-at-issue content projects out of questions. *Again* presupposes that the proposition denoted by its complement has happened before (von Stechow, 1996; Pedersen, 2015). For example:

- (30) Did Danielle come to class again?  
*presupposes*: Danielle has come to class before

If *again*'s complement contains negation, then negation can be part of the presupposition. For example:

- (31) Did Danielle not come to class again?  
*presupposes*: Danielle did not come to class at least once before.

Interestingly, the presupposition projecting from the HNQ in (32) cannot include negation, unlike (31). Instead it patterns with (30).

- (32) Didn't Danielle come to class again?  
*presupposes*: Danielle has come to class before.

These effects can be demonstrated in context:

- (33) B knows that A is worried because their student Danielle did not do her first assignment. The second assignment was due today. A gets home from teaching and says, "I don't know what to do about Danielle." B replies:
- a. B: # Did she do the assignment again?
  - b. B: Did she not do the assignment again?
  - c. B: # Didn't she do the assignment again?

What these examples show is that the presuppositional operator *again* can scope over a propositional negation in LNQs but not in HNQs. See Goodhue 2018b, 106-107 for similar effects with *also*.

As-parentheticals provide another test. On one reading, the content of the claim in the *as*-parenthetical in (34) includes negation (it could also exclude it).

- (34) Ames did not steal the documents, as the senators claimed.  
*can implicate*: The senators claimed that Ames did not steal the documents (Potts, 2002, 625)

Potts shows that the complement of the *as*-parenthetical projects through various presupposition holes including questions:

- (35) Is it said that, as Joan claims, you are an excellent theremin player?  
*implicates*: Joan claims that you are an excellent theremin player (Potts, 2002, 652)

As above, we can check to see whether the content that projects out of LNQs and HNQs can contain negation:

- (36) Did Zoe not win, as Joy predicted?  
*can implicate*: Joy predicted that Zoe did not win
- (37) Didn't Zoe win, as Joy predicted?  
*cannot implicate*: Joy predicted that Zoe did not win

Again, we find that the projected content can contain negation in a LNQ, but not a HNQ. These facts suggest that *again* and *as*-parentheticals cannot scope over high negation.

### 4.3 Negation sensitivity

*Until*- and *for*-adverbials only combine with clauses that have durative rather than punctual aspect (de Swart, 1996):

- (38) Punctual aspect:
- a. #Liv discovered the thief until 9.
  - b. #The ball hit the ground for two minutes.

Negating a verb with punctual aspect creates durative aspect:

- (39) Durative aspect:
- a. Liv didn't discover the thief until 9.
  - b. The ball didn't hit the ground for two minutes.

Turning to negative questions, LNQs license *until*- and *for*-adverbials:

- (40)
- a. Did Liv not discover the thief until 9?
  - b. Did the ball not hit the ground for two minutes?

However, HNQs do not:

- (41)
- a. #Didn't Liv discover the thief until 9?
  - b. #Didn't the ball hit the ground for two minutes?

These facts again suggest that certain expressions, *until*- and *for*-adverbials, cannot scope above high negation.<sup>15, 16</sup>

## 4.4 Responses to negative sentences

While *yes/no* responses to PPQs as in (42) convey unambiguous answers, they are interchangeable in response to LNQs, as in (43) (Krifka 2013; Roelofsen & Farkas 2015; Goodhue & Wagner 2018).

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<sup>15</sup>It has been debated whether *until* is sensitive to negation because the latter changes punctual aspect to durative, or if it is because *until* is ambiguous between a durative version and a strong NPI version (Karttunen, 1974; Mittwoch, 1977; de Swart, 1996; Giannakidou, 2002; Gajewski, 2011). Whatever effect this debate has on the *until*-data above, it will have no effect on the *for*-data, since *for*-adverbials are not thought of as NPIs.

<sup>16</sup>The empirical facts examined so far demonstrate that the relevant operators cannot scope above negation in HNQs. But rather than claim that this is due to high negation scoping into the speech act layer, perhaps normal preposing with the auxiliary is enough to put negation out of reach of these operators. For evidence against this view see Goodhue 2018b, §3.5.3 or Goodhue 2019, §3.3. The data in section 4.4 also speaks against this view.

- (42) A: Is Jane here?  
 a. B: Yes (*can only mean* She is here)  
 b. B: No (*can only mean* She is not here)

- (43) A: Is Jane not here?  
 a. B: Yes (*can mean either* She is here *or* She is not here)  
 b. B: No (*can mean either* She is here *or* She is not here)

Existing accounts of these facts differ in interesting ways, however all agree that a crucial component of the explanation for the contrast between (42) and (43) is that the sentence that B responds to in (43) is negative, i.e. it contains propositional negation, while that in (42) is not.

Krifka (2017) points out that responses to HNQs pattern with (42) rather than (43):

- (44) A: Isn't Jane here?  
 a. B: Yes (*can only mean* She is here)  
 b. B: No (*can only mean* She is not here)

Whatever the negative morpheme in the HNQ is doing, it clearly is not contributing the propositional negation necessary to condition the interchangeable behavior of *yes* and *no* as seen in (43).

Further evidence along similar lines is produced based on an example from Grimshaw (1979, 294).

- (45) A: Is Jane here?  
 B: It's possible. (*can only mean* It's possible Jane is here)

The null complement clause of B's response has to have the content *p*, not  $\neg p$ . Compare this to (46):

- (46) A: Is Jane not here?  
 B: It's possible. (*can only mean* It's possible Jane is not here)

Now the null complement clause has to have the content  $\neg p$ , not  $p$ .

Responses to HNQs again pattern with PPQs, not LNQs, suggesting that HNQs do not contribute a propositional negation.

- (47) A: Isn't Jane here?  
B: It's possible. (*can only mean* It's possible Jane is here)

## 4.5 *even*-HNQs

Despite the preceding evidence, perhaps a well placed NPI can force an inner reading, which in combination with one of the tests from above will reveal a propositional negation. For example, consider recent work by Jeong (2020): Stressed NPIs and *even* plus low scalar items and minimizers have been observed to convey negative bias in polar questions in prior work (Lahiri, 1998; Guerzoni, 2004). Given this, Jeong explores the kinds of biases that arise when HNQs contain such items (abbreviated collectively as *even*-HNQs). Via a series of experiments, Jeong uncovers several interesting facts, including that *even*-HNQs simultaneously convey positive and negative speaker bias, and, most relevantly here, that they also require contextual evidence for the negative answer, such as that required by LNQs in (6). Jeong argues that since positive questions with stressed NPIs or *even* plus low scalar items and minimizers don't require contextual evidence for the negative answer, high negation must be the culprit. She further assumes that if HNQs have an inner negation reading, this reading will require contextual evidence for the negative answer (cf. Sudo (2013)). Thus she argues that we need a theory of HNQs that accounts for Ladd's inner vs. outer ambiguity, and that *even*-HNQs necessarily have a lower, inner negation that is responsible for the negative evidential bias. To achieve this, she assumes Frana & Rawlins's (2019) VERUM/FALSUM account of HNQs.<sup>17</sup>

If Jeong is right that *even*-HNQs necessarily have an inner negation, then the tests deployed earlier in this section should show that there is indeed an inner negation present. But the tests

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<sup>17</sup>Jeong seems assume that all English speakers exhibit an inner negation reading relative to *even*-HNQs, *pace* Frana & Rawlins's (2019, 22, fn. 18) view that there are two dialect groups.

do not show this. Compare the results of the test using the negation sensitive operator *until* in the following HNQs with their LNQ counterparts.

(48) *minimizer (plus even)*

- a. Did Liv not (even) lift a finger to help until 9?
- b. #Didn't Liv (even) lift a finger to help until 9?

(49) *even plus low scalar item*

- a. Did Liv not even discover a single theorem until 9?
- b. #Didn't Liv even discover a single theorem until 9?

(50) *Stressed NPI*

- a. Did Liv not discover ANYTHING until 9?
- b. #Didn't Liv discover ANYTHING until 9?

If the *even*-HNQs in (48)-(50) contained a lower, inner negation, as Jeong (2020) claims, then the (b) sentences should be just as felicitous as the (a) sentences, but they are not. Projecting content tests reveal the same result. Jeong's demonstration that *even*-HNQs seem to require contextual evidence for the negative answer is an important discovery that sheds new light on the complex interactions of bias in polar questions. But the theoretical conclusion that *even*-HNQs contain an inner negation conflicts with the evidence here.

## 4.6 Section conclusion

The various data points in this section demonstrate that HNQs pattern with PPQs to the exclusion of LNQs. What this boils down to is that LNQs contain a propositional negation within the core of the question, while HNQs—like PPQs—do not, contrary to what some authors have previously claimed (e.g. Ladd 1981; Buring & Gunlogson 2000; Van Rooij & Šafářová 2003; Romero & Han 2004; Trinh 2014; Romero et al. 2017; Jeong 2020; and Frana & Rawlins 2019 on one dialect).

## 5 Against analyzing high negation as a discourse particle

One kind of analysis that could capture the bias generalization in (5) along with the data from section 4 is that high negation does not contribute negation, but instead a discourse particle that contributes a non-at-issue bias meaning. The high negation morpheme  $n't_{\text{high-neg}}$  might be analyzed as follows:

$$(51) \quad \llbracket n't_{\text{high-neg}} \rrbracket^c = \lambda p_{\langle s,t \rangle} . \lambda w_s : \text{the speaker in } c \text{ is biased for } p . p(w)$$

(51) contributes no negation, but is instead an identity function that adds speaker bias to the question (while remaining agnostic about how to flesh out the non-at-issue content “the speaker is biased for  $p$ ”). (51) would pass the proposition  $p$  up the structure to a  $Q$ -morpheme, which would produce the denotation of a polar question. This approach would explain the data from section 4 while providing the bias meaning.

Some examples of accounts along these lines: Hartung (2009) treats high negation in German as a pragmatic operator that adds  $p$  to the speaker’s commitments in a Farkas & Bruce (2010) style formal pragmatics. Northrup (2014) analyzes utterances of HNQs as having the not-at-issue discourse effect of committing the speaker to  $p$  on the basis of prior, weak evidence. Taniguchi (2017) treats high negation as an operator that removes  $p$  from the common ground and puts it in the speaker’s discourse commitments set.

While such approaches provide a precise formal characterization of the discourse effects of HNQs, it is not clear that they provide insight into the phenomenon beyond empirical generalizations of it. In particular, they leave at least two questions unanswered: Why does the combination of negation and preposing trigger bias crosslinguistically, and why is the bias for  $p$  and not  $\neg p$ ? Taking these questions in reverse order, if high negation were a discourse particle that directly conveys bias, then there would be no reason in principle why the bias couldn’t be against the propositional core of HNQ- $p$  rather than for it. After all, the purported bias particle is morphologically linked to negation. It would be possible to imagine that it developed out of negative



questions that convey evidential bias for  $\neg p$  (as LNQs do), so that when it turned into a discourse particle, the bias would be for  $\neg p$  instead of  $p$ . But no such language is known to exist. Second, the fact that it is preposed negation that leads to bias in multiple languages suggests that preposing and negation play a key role. Yet a discourse particle theory has little to say about the roles they play.

Now consider the *FALSUM* operator, employed by Repp (2013), Romero (2015), and Frana & Rawlins (2019) in denials and negative polar questions (thanks to a reviewer for pointing out the need for a discussion of this approach). *FALSUM* is distinct from the kind of brute force discourse particle I have in mind above in that it is a species of illocutionary negation, proposed by Repp (2013) as a common ground management operator that is the negative counterpart of Romero & Han’s (2004) *VERUM*. Frana & Rawlins (2019) develop the most complete treatment of its use in negative polar questions. They analyze some HNQs as having the LF  $[Q [FALSUM [p]]]$ , and provide the denotation for *FALSUM* in (52) (cf. their denotation for *VERUM* in (23)):

$$(52) \quad \llbracket FALSUM \rrbracket^{c,w} = \lambda p_{\langle s,t \rangle} . \neg p$$

Defined for  $p, c, w$  only if

$$\forall w' \in Epi_x(w) [\forall w'' \in Conv_x(w') [p \notin CG_{w''}]]$$

“ $x$  is sure that, in all worlds satisfying their conversational goals,  $p$  is not CG.”

(Frana & Rawlins 2019, 32-33)

Both Romero (2015) and Frana & Rawlins (2019) claim that *FALSUM* doesn’t license NPIs because it is illocutionary denial rather than regular negation. While I agree that illocutionary denials won’t license NPIs, it isn’t clear why the operator in (52) wouldn’t license NPIs, after all it introduces a standard logical negation on the at-issue dimension with no intervening operator, which should produce the right licensing environment. More generally, the at-issue negation in (52) leaves the findings of section 4 unexplained.

Another challenge for the *FALSUM* account of HNQs is relative to “non-conflict” contexts like (7) and (15), in which the HNQ bias does not conflict with some contextual evidence (whether in

the form of an interlocutor’s claim/implication or something nonlinguistic).<sup>18</sup> The issue is that the HNQs in (7) and (15) are predicted by (52) to presuppose that the addressee is sure that, in all worlds satisfying their conversational goals, the following propositions respectively are not *CG*: *that the Moon and You are opening*, and *that Frege has not reviewed for us*. But this predicted presupposition is not met. It is true that, in each of these contexts, each of these propositions are not *CG* at the time the HNQ is uttered. But note that the presupposition does not require these propositions not to be *CG*; it requires them not to be *CG in the epistemically accessible worlds that are compatible with the addressees’ conversational goals*. But nothing about these contexts implies that the addressees’ conversational goals are such that these propositions aren’t *CG*. For all the speaker knows, the addressees’ conversational goals in each of these contexts could be such that each of these propositions **are** *CG*. Thus *FALSUM*’s presupposition is not met in non-conflict contexts for HNQs, and so (52) incorrectly predicts HNQs to be infelicitous in such contexts (*pace* Frana & Rawlins’s (2019, 35) discussion).

## 6 Speech act operators and unbalanced partitions

The goal is to find a theory of high negation questions in which negation and preposing play a role in producing bias for the propositional core of the question, while still explaining the lack of propositional negation in HNQs. Based on the evidence in section 4, I take for granted that high negation is “somehow *outside* the proposition” (Ladd, 1981) in all HNQs. To put flesh on the bones of Ladd’s idea, I analyze high negation as scoping over a high operator. Romero & Han (2004) were the first to pursue this kind of analysis by claiming that high negation scopes over their *VERUM* operator. A substantively different take on the same basic idea is put forth by Krifka (2017), who argues that high negation scopes above an *ASSERT* speech act operator defined in terms of a commitment space semantics. In this section, I will develop an account along these lines,

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<sup>18</sup>In the prior literature, these contexts would be referred to as “suggestion contexts” because the HNQ bias is often used to make a suggestion that resolves some relevant question like in (15) (as opposed to “conflict contexts” in which the HNQ bias conflicts with some contextual evidence, like in (2)). The label “suggestion context” is inaccurate in that HNQ bias can be used without conflict, but without suggesting an answer to a question either, like in (7). The relevant distinction is the presence/absence of conflict.

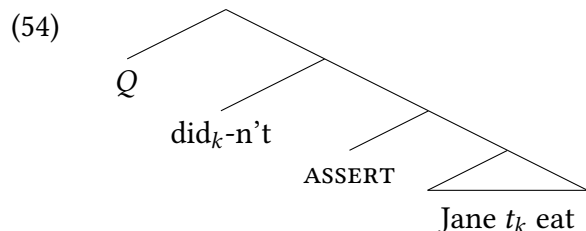
assuming the simplest operator possible for high negation to scope over. This will aid exposition in section 7 where I will show how the resulting interpretation of HNQs leads to speaker bias. In section 8, I will discuss the promising prospects for making use of more sophisticated operators.

I assume a doxastic ASSERT operator with the denotation in (53), following prior work that has proposed similar assertion operators for independent reasons (e.g. Krifka, 2001; Kratzer & Shimoyama, 2002; Chierchia, 2006; Alonso-Ovalle & Menéndez-Benito, 2010; Hacquard, 2010; Meyer, 2013; Buccola & Haida, 2019).

$$(53) \quad \llbracket \text{ASSERT} \rrbracket = \lambda p_{\langle s, t \rangle}. \lambda w_s. \forall w' \in \text{Dox}_x(w) [p(w') = 1]$$

$\text{Dox}_x(w)$  is the set of worlds compatible with  $x$ 's beliefs in  $w$ .  $x$  is a free variable for individuals whose value is contextually determined. Usually  $x$  is the speaker, but when ASSERT appears in a high negation question,  $x$  is the addressee.<sup>19</sup> In the following, I will frequently abbreviate  $x$ 's doxastic necessity with “ $\Box_x$ ” for ease of exposition.

Here is the structure I assume for a high negation question like “Didn’t Jane eat?”:



By scoping over ASSERT, high negation signals the operator's presence in the HNQ. Otherwise, I assume that ASSERT is not present in questions (cf. Meyer's (2013, 42) assumption that matrix K only appears in assertively used sentences).<sup>20</sup>

<sup>19</sup>Cf. Romero & Han 2004, 626, for a similar assumption about how operators are fixed to interlocutors in the context. This assumption is an idealization that would be resolved by moving to a more sophisticated theory of speech act operators, as discussed in section 8.

<sup>20</sup>A VERUM account could appeal to the same explanation for why high negation signals the presence of a VERUM operator in an HNQ, but only if it does not assume the existence of LFs in which VERUM scopes over negation, unlike Romero & Han's (2004) and Jeong's (2020) VERUM accounts, or one dialect of Frana & Rawlins's (2019) account. My aim is for my account to be general enough to work well with a variety of possible operators that high negation could scope over, including VERUM, see the discussion in section 8.

An advantage of analyzing high negation as scoping over ASSERT is that it explains the facts from section 4 if (i) the relevant phrases cannot scope above the speech act layer, and (ii) polarity particle responses are only sensitive to discourse referents introduced by constituents below the speech act layer, as argued by Krifka (2013, 2017).

Following Romero & Han (2004) and Dayal (2016), I assume the denotation for  $Q$  in (55), which, when combined with a proposition, provides the denotation for polar questions.

$$(55) \quad \llbracket Q \rrbracket = \lambda p_{\langle s,t \rangle} . \lambda q_{\langle s,t \rangle} . [q = p \vee q = \lambda w_s . \neg p(w)]$$

I assume that the auxiliary *did* is vacuous, and that *not/n't* is defined for propositions

$$(56) \quad \llbracket \text{not} \rrbracket = \llbracket \text{n't} \rrbracket = \lambda p_{\langle s,t \rangle} . \lambda w_s . \neg p(w)$$

Set-theoretically, negation returns the complement of the set of worlds characterized by the input proposition  $p$ , that is  $W \setminus p$ . With these lexical denotations in hand, the interpretation for (54) is demonstrated in (57).

$$(57) \quad \begin{aligned} \text{a.} \quad & \llbracket \text{Jane } t_k \text{ eat} \rrbracket = \lambda w_s . \text{jane ate in } w \\ \text{b.} \quad & \llbracket [\text{ASSERT } [\text{Jane } t_k \text{ eat}]] \rrbracket = \llbracket \text{ASSERT} \rrbracket (\lambda w_s . \text{jane ate in } w) = \\ & \lambda w_s . \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w'] \\ \text{c.} \quad & \llbracket [\text{did}_k\text{-n't } [\text{ASSERT } [\text{Jane } t_k \text{ eat}]]] \rrbracket = \\ & \llbracket \text{did}_k\text{-n't} \rrbracket (\lambda w_s . \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w']) = \\ & \lambda w_s . \neg \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w'] \\ \text{d.} \quad & \llbracket [Q [\text{did}_k\text{-n't } [\text{ASSERT } [\text{Jane } t_k \text{ eat}]]]] \rrbracket = \\ & \llbracket Q \rrbracket (\lambda w_s . \neg \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w']) = \\ & \lambda q_{\langle s,t \rangle} . [q = \lambda w_s . \neg \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w']] \\ & \vee q = \lambda w_s . \forall w' \in \text{Dox}_A(w) [\text{jane ate in } w']] = \\ & \{ \neg \Box_A \text{ that Jane ate, } \Box_A \text{ that Jane ate} \} \end{aligned}$$

The denotation for high negation questions produced in (57) is similar to Romero & Han’s proposed interpretation for their outer negation polar questions in that it yields what they call an unbalanced partition. Whereas a positive polar question presents a partition that is balanced between  $p$  and  $\neg p$ , a high negation question presents an unbalanced possibility space, partitioned between doxastic necessity for  $p$  ( $\Box_A p$ ), and a lack of doxastic necessity for  $p$  ( $\neg\Box_A p$ ). I follow Romero & Han in taking  $\neg\Box_A p$  to cover any other degree of belief in  $p$  besides belief in  $p$  itself (cf. a similar result in Krifka 2017, who refers to the negated cell  $\neg\Box_A p$  as one in which the addressee refrains from committing to  $p$ ).  $\neg\Box_A p$  is a weak claim in that it includes a wide range of situations, which can be further divided into two sorts (Geurts, 2010; Meyer, 2013).

1. Lack of belief either way, neither  $p$ , nor  $\neg p$   $(\neg\Box_A p \wedge \neg\Box_A \neg p)$
2. Belief that  $\neg p$   $(\Box_A \neg p)$

Despite that Romero & Han and Krifka both posit such unbalanced partitions, neither derives the speaker bias associated with high negation questions from the way in which the partition is unbalanced. The innovation in section 7 is that I derive the bias of high negation questions from the way in which the possibility space is unbalanced, with the speaker expressing bias for the more precise cell,  $\Box p$ .

## 7 Explanation of speaker bias in HNQs

Now that we have a structure and interpretation for high negation questions, I turn to explaining why it gives rise to a speaker bias. I will argue for a novel derivation of the bias as a conversational implicature.<sup>21</sup> The reasoning runs as follows. The speaker  $S$  has asked a high negation question with propositional core  $p$  (HNQ- $p$ ). If  $S$  were ignorant of whether or not  $p$  is true,  $S$  could have asked an alternative question that would have been better suited to remedy that ignorance,

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<sup>21</sup>See AnderBois 2011, §5.4, who also seeks to derive HNQ speaker bias via competition with PPQs. Anderbois proposes an inquisitive semantics for HNQs and PPQs that are distinct from the semantics proposed here; correspondingly, the pragmatic derivation is distinct, not taking the form of a special quantity implicature.

namely the positive polar question (PPQ). Since S did not do so, it must be the case that S is not ignorant of whether or not  $p$ —that is, S is biased or opinionated about whether  $p$  or  $\neg p$ . But which way is S biased, for  $p$  or for  $\neg p$ ? I will show that the direction in which HNQ- $p$  is unbalanced settles this: S is biased for  $p$ .

This implicature derivation bears some similarities to more familiar cases of quantity implicature, but differs in several ways, the most important of which is that the strength relation between competing alternatives is substantially different from straightforward semantic entailment.

Four steps are needed to flesh out this story. First, PPQs need to be shown to be alternatives to HNQs (section 7.1). Second, definitions of bias and ignorance need to be given (section 7.2). Third, we need an argument that, in the case of ignorance, the PPQ is more useful than the HNQ because it is more informative (section 7.3). Fourth, we need an argument that the direction of unbalance is only compatible with bias for the propositional core of the HNQ (section 7.4).

## 7.1 Alternatives

What we need is for PPQs like (58a) to be alternatives of HNQs like (58b).

- (58)    a.    Did Jane eat?  
           b.    Didn't Jane eat?

Katzir (2007) proposes an algorithm that identifies alternatives to a structure  $\phi$  by making deletions, contractions and replacements of constituents in  $\phi$ . Given the structure I proposed for (58b) in (54), this theory predicts (58a) to be a valid alternative. However I won't take a Katzirian approach to alternatives here. The issue is that Katzir's algorithm can derive alternatives by making changes to the sentence radical and so the propositional core of a question that would make incorrect predictions. For example:

- (59)    a.    Do you believe that Jane ate?  
           b.    Are you sure/certain that Jane ate?

The PPQ in (58a) is a Katzirian alternative to the questions in (59). The questions in (59) do not convey the speaker bias that HNQs are known for.<sup>22</sup> But the flat-footed denotations of these polar questions are either identical or very similar to the one I have assumed so far for the HNQ in (58b), namely:

$$(60) \quad \{\Box_A \text{ that } \textit{Jane ate}, \neg\Box_A \text{ that } \textit{Jane ate}\}$$

Given this denotational similarity, if the choice to say (58b) instead of (58a) is responsible for conveying speaker bias as I will argue below, then it seems that the choice to say (59a) or (59b) instead of (58a) should also convey an HNQ-like bias, but it does not.

I believe the reason for this is that (58a) is not an alternative of the relevant kind to the questions in (59). For the kind of competition relevant here, questions need to have the same sentence radical and therefore the same propositional core. (58b) shares the propositional core *that Jane ate* with (58a), while the polar questions in (59) have sentence radicals that contain the matrix attitudes, denoting *that you believe that Jane ate* and *that you are sure/certain that Jane ate*. In other words, for a question to count as an alternative here, it needs to be about the same proposition (cf. Rudin's 2018, 58ff., similar requirement for speech act alternatives). The questions in (59) are distinct in that they are overtly about A's beliefs and certainty level with respect to the proposition *that Jane ate*. Since they don't compete against (58a), the bias implicature never arises.

Finally, since both questions in (58) are about the proposition *that Jane ate*, I assume that whenever (58b) is relevant enough to utter, so is (58a). This is somewhat different from standard cases of quantity implicature, such as sentences containing *some* vs. *all* where the relevance of the weaker *some* alternative does not guarantee the relevance of the stronger *all* alternative. This

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<sup>22</sup>Note further that such matrix attitude predicates can be embedded under high negation, and then the questions do convey the familiar speaker bias that HNQs are known for, but the bias includes the overt attitude. For example:

- (i) a. Don't you believe that Jane ate?
- b. Aren't you sure/certain that Jane ate?

may explain why the bias implicature of HNQs is not cancellable.

## 7.2 Bias as belief

Here is the empirical generalization from section 1 to be explained:

- (5) *HNQ bias condition:*  
 HNQ- $p$  is felicitous only if the speaker is biased for  $p$

It is clear from the various examples of HNQs above that being “biased for  $p$ ” means either believing  $p$ , or at least taking  $p$  to be highly likely. Either formulation would work for the account developed below. For simplicity, I will take bias to be doxastic necessity, which I will write as follows using the “ $\Box_x$ ” abbreviation:<sup>23</sup>

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<sup>23</sup>The precise characterization of bias—whether as belief or merely credence above a high threshold—isn’t of primary interest. What is interesting is to explain why the unique structure and resulting denotation of HNQs is necessarily associated with bias, whichever way the latter is characterized.

That said, there is some evidence for treating bias as belief. At first glance, the bias conveyed by HNQs may feel “weaker”, in a pretheoretic sense, than assertions of the HNQ’s core. However, it is important to consider different possible sources for that intuition. While one is that the bias conveyed by a HNQ is just not as strong as the kind of belief that undergirds assertion, another is that the relative weakness of HNQs is due to the fact that they are questions. If the latter is correct, the speaker may believe the core proposition just as much as if they had asserted it, and the “weakness” just comes from the fact that the speaker presents the utterance as a question that seeks an answer or confirmation from the addressee. As proof of this, consider the following two examples, which show that the same sorts of evidence that support the kind of belief in  $p$  needed to license assertion also support the use of HNQ- $p$ :

- |  |  |
|--|--|
| <p>(i) A and B checked the weather forecast when they woke up, and it said the sun would come out and it would be a nice day. A couple hours later, they look out the window and see bad weather. B says, “It’s gross out.” A replies:</p> <p>a. A: I know. The forecast said it would be nice out.</p> <p>b. A: I know. Didn’t the forecast say it would be nice out?</p> | <p>(ii) A heard that the rock band Alabama Shakes are playing a concert tonight and that The Moon and You is the opening act. Then A runs into B, who says, “Did you hear that Alabama Shakes are playing a concert tonight?”</p> <p>a. A: Yeah. The Moon and You is opening.</p> <p>b. A: Yeah. Isn’t The Moon and You opening?</p> |
|--|--|

The contexts are held constant; nothing about A’s beliefs or evidence changes from one utterance to the next. A clearly believes  $p$  on the basis of her experience in (i) and (ii), and can assert it as in (ia) and (iia). However the contexts are such that A can also use HNQ- $p$  as in (ib) and (iib). This suggests that the belief supporting HNQ bias is as strong as the kind of belief that licenses assertion, and any asymmetry in our intuitions may simply be due to the fact that the speaker seeks confirmation of their belief only in the HNQ case.



- (61) *Bias:*  
 S is biased for  $p \Leftrightarrow \Box_S p$ <sup>24</sup>

I take ignorance to be a lack of belief either way, neither for  $p$ , nor  $\neg p$ :

- (62) *Ignorance*  
 S is ignorant of whether  $p$  or  $\neg p \Leftrightarrow \neg\Box_S p \wedge \neg\Box_S \neg p$

Ignorance includes a wide array of degrees of belief about  $p/\neg p$ . S may be leaning toward  $p$ , or toward  $\neg p$ , or be completely split between the two, and anything else in between. However, this variation is not relevant. What matters is that in none of these states of affairs is S leaning so far one way or the other as to exhibit belief in  $p$  or in  $\neg p$ —otherwise we would say that S is biased for  $p/\neg p$ , and the situation would not fall under the definition in (62).

### 7.3 Why HNQs imply that the speaker is not ignorant of the answer

With definitions for bias and ignorance, and with the assumption that PPQs are alternatives to HNQs in hand, we are ready to show how the two kinds of question relate to one another and thus the implicature that arises via the choice to use the HNQ instead of the PPQ. It will be helpful to briefly rehearse a standard case of quantity implicature for comparison.

Using **some** and **all** as abbreviations for alternative sentences containing these determiners, consider the conditional in (63a), restated symbolically in (63b), with ‘>’ standing for ‘more useful than’:

- (63) a. If S believes **all** (and other assumptions are met), then **all** is more useful than **some**.  
 b.  $\Box_S \mathbf{all} \rightarrow \mathbf{all} > \mathbf{some}$

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<sup>24</sup>Sometimes the bias associated with HNQs is described as a *previous* belief (e.g. Romero & Han, 2004). This observation is empirically accurate for many uses of HNQs, for example when the bias for  $p$  is contradicted by new, immediate contextual evidence such as (2), (11), and (12). In these examples, the speaker has a prior belief in  $p$ , but since they are confronted with evidence to the contrary, it’s plausible to think of their belief as loosening before the HNQ is asked, making their belief previous but not necessarily current. However, this cannot be a requirement on the use of HNQs, since they are also acceptable when there is no evidence to the contrary, as discussed for (7). In any case, it makes no difference to the following discussion whether we conceive of the bias as existing at a moment just prior to asking, or as persisting through the asking time.

When the purpose of a conversation is to cooperatively share information, stronger expressions are better than weaker ones, as long as the stronger expression is supported by belief. Thus **all** is more useful than **some**, conditional on the antecedent clause of (63) (which is roughly Gricean Quality), because **all** asymmetrically entails **some** (Gricean Quantity). When S asserts the weaker **some**, that implies that **all** is not more useful than **some**, which given (63) must mean that S does not believe **all**. That is, the utterance of **some** entails that the consequent of (63) is false, and so S implicates that the antecedent of (63) is also false.<sup>25</sup>

Returning to HNQs, I claim that the following conditional, analogous to that in (63), holds:

- (64) a. If S is ignorant of whether  $p$  or  $\neg p$ , then the PPQ with core  $p$  is more useful than the HNQ with core  $p$ .  
b.  $\neg \Box_S p \wedge \neg \Box_S \neg p \rightarrow \text{PPQ-}p > \text{HNQ-}p$

This conditional sets out ignorance as a *sufficient* condition on PPQs being more useful than their HNQ counterparts, but not a *necessary* condition.<sup>26</sup> I want to avoid postulating ignorance as a necessary condition because there are empirical counterexamples to it: PPQs can be used in exams and quizzes, they can be used rhetorically, and they can even be used when the speaker is biased for a particular answer as we saw above with PFQs in section 3.

(64) depends on a fact and two uncontroversial background assumptions. The fact is that given the denotations assumed above for PPQs and HNQs, the PPQ is more informative than its HNQ counterpart. Most of the rest of this subsection will be devoted to demonstrating this fact. The first background assumption is that the goal of ignorant speakers is to gain information (that they take to be relevant). The second is that utterances that help you achieve your goals are more useful than those that don't. Putting these together produces the conditional: When S is ignorant,

<sup>25</sup>As Geurts (2010) points out, this is an abductive, rather than a deductive, process. S not believing **all** is often the best explanation for S's choice to use **some**, but there are several other assumptions hidden in the reasoning here, the failure of which could also explain S's choice, e.g. **all** could be irrelevant, or S and A might not be in a cooperative informative exchange (cf. also discussion in Lauer 2013, 2014). In other words, the conditional in (63) isn't true on its own, and could have these assumptions in the protasis as additional conjuncts; the choice to use **some** merely implies that at least one of the conjuncts in the protasis is false.

<sup>26</sup>Of course, the relevance of the issue of whether or not  $p$  is the case also matters. I assume this is taken care of by normal conversational relevance constraints (Grice, 1989; Roberts, 1996/2012).

her goal is to gain information, and since the PPQ is more informative than the HNQ, the PPQ is more useful to S in achieving this goal, therefore if S is ignorant, the PPQ is more useful than the HNQ.

As a result of (64), S's choice to use the less informative HNQ triggers a kind of quantity implicature: If the stronger PPQ wasn't used, it must not have been more useful than the HNQ. By (64), if the PPQ was not more useful than the HNQ, then S must not be ignorant of whether  $p$  or  $\neg p$ , which is to say, S must be biased for either  $p$  or  $\neg p$ .<sup>27</sup>

The above reasoning depends on the claim that PPQs are more informative than HNQs. To evaluate the relative strength of PPQs and HNQs, I will compare the strength of their positive and negative answers. However, because the proposed structure for HNQs includes a doxastic ASSERT operator while that of PPQs does not, this can't be done directly based on their semantic denotations.

$$(65) \quad \llbracket \text{Did Jane eat} \rrbracket = \{ \text{that Jane ate}, \neg \text{that Jane ate} \}$$

$$(66) \quad \llbracket \text{Didn't Jane eat} \rrbracket = \{ \Box_A \text{ that Jane ate}, \neg \Box_A \text{ that Jane ate} \}$$

For example, the positive answer to (65) does not entail anything about the positive answer to (66) or vice versa, since any proposition can be true without A believing it, and A can believe any proposition without it being true.

However, at a pragmatic level of description, the answer sets can be compared. Moving to the level of pragmatics makes some sense given the discussion of alternatives in section 7.1—the competition here is not based on varying the propositional cores of the competing polar questions, but about differences at the speech act layer. S's choice between these competing questions will depend on the information that A's answers to those questions will produce for S. A's answers will be given in the form of A's assertions. (66) already builds the assertive component of A's

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<sup>27</sup>I believe the conditional in (64) is more reliable than (63), in part because HNQs and their PPQ alternatives are always relevant in the same contexts, as mentioned above. What this means is that, while there are several possible explanations for why S might choose **some** over **all**, there are fewer for why S might choose HNQ over PPQ, making the bias implicature more necessary than a standard quantity implicature.

answers into the partition. We can compare this to the way that the answer set in (65) will transit through A's assertions:

- (67) The set of answers to the PPQ "Did Jane eat?", as asserted by A:  
 $\{\Box_A \text{ that Jane ate}, \Box_A \neg \text{that Jane ate}\}$

With this assertive component added in, it is easy to see in what sense the PPQ is more informative than the HNQ. The positive answers in (66) and (67) are identical, A believes that Jane ate. But the negative answer in (67) asymmetrically entails that in (66); if A believes that Jane didn't eat, it entails that it's not the case that A believes that Jane ate, and not vice versa. Since the PPQ and the HNQ produce identical information for S in their positive answers, and the PPQ produces stronger information than the HNQ in their negative answers, the PPQ is stronger than its HNQ counterpart. Furthermore, assuming that S wants to take on A's beliefs as her own, S would learn from A's negative answer to the PPQ that Jane didn't eat. But S doesn't learn nearly so much from A's negative answer to the HNQ: since  $\neg\Box_A p$  is compatible with both A's lack of belief about  $p$  ( $\neg\Box_A p \wedge \neg\Box_A \neg p$ ), as well as A's belief in  $\neg p$  ( $\Box_A \neg p$ ), S would only learn that it's not the case that A believes  $p$ , and not why that is.

The above discussion relies on the informal assumption that we are comparing positive answers to positive answers and negative ones to negative ones, despite that answer sets are just unordered sets of sets of worlds. Here is a formal means of comparing such sets and determining that one is stronger than the other:

- (68)  $Q_1$  is more informative than  $Q_2$  iff the following two conditions are satisfied:
- a.  $\exists p \in Q_1 [\exists p' \in Q_2 [p \subset p']]$
  - b.  $\forall p \in Q_1 [\neg \exists p' \in Q_2 [p' \subset p]]$

(68) says that a question  $Q_1$  is more informative than another question  $Q_2$  if and only if two conditions are satisfied: First, some proposition in  $Q_1$  asymmetrically entails (is a proper subset of) some proposition in  $Q_2$ , and second, no proposition in  $Q_2$  asymmetrically entails (is a proper

subset of) any proposition in  $Q_1$ . According to (68), (67) is more informative than (66).

This is why the PPQ is more useful than the HNQ when S is ignorant, as stated in (64). Given her ignorance, her goal is to gain information, and the PPQ is better at helping her achieve that goal than the HNQ, in particular when comparing the negative answers to the two questions. So, if S is ignorant, then she should use the PPQ, not the HNQ. If S uses the HNQ instead, then she must not be ignorant. Thus, I have derived the fact that the use of an HNQ implies that the speaker is not ignorant, that is, that the speaker is biased for either  $p$  or  $\neg p$ .

(69) *Derivation of S's (non-directional) bias*

1.  $\neg \Box_S p \wedge \neg \Box_S \neg p \rightarrow \text{PPQ-}p \succ \text{HNQ-}p$  (the conditional in (64))
2.  $\text{PPQ-}p \not\succ \text{HNQ-}p$  (consequence of S choosing to use HNQ- $p$ )
3.  $\Box_S p \vee \Box_S \neg p$  (*modus tollens* & DeMorgan)

The bias that results in line 3 of (69) is non-directional, that is, S is biased, but nothing said so far tells us whether the bias is for  $p$  or  $\neg p$ . Empirically, an HNQ with core  $p$  always conveys that S is biased for  $p$ . So now we need to explain the direction of bias.

## 7.4 Explaining the direction of bias

S is either biased for  $p$  or for  $\neg p$ . Considering each of these in turn will show that the way in which the HNQ partition is unbalanced only fits with a  $p$  bias.

Here again is our example:

(66)  $\llbracket \text{Didn't Jane eat} \rrbracket = \{\Box_A \text{ that Jane ate}, \neg \Box_A \text{ that Jane ate}\}$

Suppose S were biased for  $\neg p$ , in this case,  $\Box_S \text{ that Jane didn't eat}$ . If A were to choose the positive answer in (66) ( $\Box_A \text{ that Jane ate}$ ), then it would convey a clear disagreement between S and A. But if A were to choose the negative answer in (66) ( $\neg \Box_A \text{ that Jane ate}$ ), then it would remain unclear how S's and A's beliefs about  $p$  relate to one another. This is because the negative answer

is consistent with both A's ignorance ( $\neg\Box_A \text{ that Jane ate} \wedge \neg\Box_A \text{ that Jane didn't eat}$ ) as well as A's belief in  $\neg p$  ( $\Box_A \text{ that Jane didn't eat}$ ). If the latter is the case, it would mean that A and S have an identical belief since they both believe that Jane didn't eat. But if A is ignorant, it would mean that A and S have conflicting beliefs since A's ignorance entails that it's not the case that A believes the very thing that S believes—that Jane didn't eat.

Now suppose that S were biased for  $p$ , in this case,  $\Box_S \text{ that Jane ate}$ . In this case, either answer in (66) will help S to determine how A's beliefs about  $p$  relate to her own. The positive answer conveys that they have the same belief, while the negative answer conveys that they do not.

Putting this all together, a HNQ with core  $p$  conveys that the speaker S is biased because if S had not been biased, then they should have used the alternative PPQ with core  $p$  as it would have been more informative. Furthermore, when S uses HNQ- $p$ , we assume that S has a *particular* bias, that is, that S is biased is for  $p$  and not for  $\neg p$ . This is because of the way that the HNQ partition is unbalanced: If S were biased  $\neg p$ , then the  $\neg\Box_A p$  cell would fail to settle whether A shares S's bias for  $\neg p$  or not. But if S's bias is for  $p$ , then either cell of the partition will usefully settle whether or not A shares S's bias.

What HNQs are useful for is determining whether an interlocutor shares the speaker's bias for the propositional core of the question. But there are different sorts of contexts in which an HNQ might be used to do this. In some contexts, there is contextual evidence that challenges  $p$  that may or may not come from the interlocutor: (2), (11), and (12) (see also Bledin & Rawlins (2020, 45, ex. (7)) demonstration of HNQs as resistance moves). In others, there is no evidence against  $p$ : (7), (10), and (15).

Note though that HNQs are still questions, thus they require the speaker to have some reason to ask them as opposed to just asserting  $p$ . For example, here's a variation of (7):

- (70) A bought tickets to see an Alabama Shakes concert tonight, and The Moon and You are opening. B asks A what she is up to tonight, and A says: I'm going to the Alabama Shakes concert...
- a. ??Aren't The Moon and You opening?
  - b. The Moon and You are opening.

Despite that A believes the propositional core, the HNQ is infelicitous because A has no reason to ask this question in this context. She is merely informing B about her plans, and so the assertion in (70b) is preferred.

At the same time, the fact that HNQs are questions can be exploited to convey politeness in a context in which the speaker is otherwise warranted to just assert  $p$ , as in (71).

- (71) Earlier, the boss, B, told Jane to work the grill and A to wait on the tables. B however can be forgetful at times, is embarrassed about it, and also has a bad temper.  
B: A, what are you doing?  
A: I'm getting ready to wait on the tables.  
B: Who's working the grill then?  
A: Isn't Jane working the grill?  
B: Oh right, Jane is doing it.

Instead of asserting  $p$ , A uses the HNQ to suggest that  $p$  answers B's question because of the social power imbalance between B and A, and B's temper, allowing B to save some face.

## 8 Conclusion

I began the paper by reviewing facts about negative polar questions established in prior research: that high negation questions require the speaker to be biased for the positive answer (the propositional core), while low negation questions do not; and that LNQs require contextual evidence in favor of the negative answer (or at least asker interest in that answer), while HNQs do not. From there, there were several novel results of this paper, both empirical and theoretical. First, the empirical:

1. Unlike LNQs, HNQs are not subject to any evidential condition (section 1).
2. HNQs and polarity focus questions are distinct phenomena: while HNQs necessarily convey speaker bias, the bias of PFQs is context sensitive; moreover, only PFQs require a focus antecedent (section 2).

3. The kind of bias arising from PFQs is not attached to polarity focus, but can appear in questions that lack any grammatical marker that has been linked previously to polarity/verum focus; moreover, the bias can have the same polarity as the question (section 3)
4. A battery of tests reveals that the sentence radicals of HNQs are not negated; attempts to use NPIs to produce evidence of inner negation relative to these tests fails (section 4).

These empirical results guided novel theoretical proposals:

1. The speaker bias of PFQs is derived from more general facts about asking questions in some contexts that happen to also license polarity focus. If polarity focus is licensed by an interlocutor's claim that  $p$ , then asking  $?p$  leads to a  $\neg p$  speaker bias. Since the derivation untethers speaker bias from polarity (verum) focus, it accurately predicts that some PFQs lack speaker bias, and that some questions that lack polarity focus convey PFQ-like speaker bias (section 3).
2. The lack of propositional negation in HNQs in section 4 supports the theoretical view that negation scopes over a high operator, keeping it outside of the question's sentence radical. A simple account of this operator as doxastic necessity yields an unbalanced partition (section 6), an idea in line with previous work (Romero & Han, 2004; Krifka, 2017).
3. The unbalanced partition is used to give a novel derivation of the necessary speaker bias associated with HNQs (section 7). The idea is to derive the bias as a special kind of quantity implicature depending on competition between the HNQ and the positive polar question with the same propositional core. The PPQ is stronger than the HNQ in the sense that the addressee's positive and negative answers to the PPQ entail the answers to the HNQ, but the weaker cell of the HNQ ( $\neg \Box_A p$ ) does not entail any answer to the PPQ. Therefore, if the speaker is ignorant of whether  $p$  or  $\neg p$ , they should use the more informative PPQ. It follows that in contexts in which the speaker chooses to instead use the HNQ, they must not be ignorant, which is to say, they must be biased for one of the answers. Finally, the



fact that the bias is always for the propositional core of the HNQ follows from the way in which the partition is unbalanced. If the speaker were biased for  $\neg p$ , then the weaker cell of the HNQ ( $\neg \Box_A p$ ) would not reveal whether the addressee shares the speaker's bias, since  $\neg \Box_A p$  is consistent not just with A's belief in  $\neg p$ , but also A's ignorance whether  $p$  or  $\neg p$ . If the speaker is biased for  $p$ , on the other hand, then either cell of the HNQ partition will resolve whether or not A shares that bias.

A limitation of the present account of HNQs is that the simple assumption in section 6 that the speech act operator is doxastic necessity may be open to criticism. One reason that Romero (2015) and Frana & Rawlins (2019) moved the primary effects of *VERUM* to a non-at-issue dimension is that *yes/no* responses do not seem to incorporate the meaning of the *VERUM* operator, and the account I have proposed is open to the same criticism. However, as our understanding of polar particles as propositional anaphora has developed (Krifka, 2013; Roelofsen & Farkas, 2015), it has become clear that speech act operators like *ASSERT* and common ground management operators like *VERUM/FALSUM* do not introduce the kinds of discourse referents that *yes* and *no* are sensitive to (see discussion in Krifka 2017).

Still, the particular *ASSERT* operator I have assumed may be open to many of the criticisms leveled at the performative hypothesis of Lakoff (1970) and Ross (1970) (see Levinson 1983, 251-263, for a thorough critique). Ultimately, the operator that high negation scopes over is likely to be more sophisticated than simple doxastic necessity, and thus not open to these criticisms. My goal here has not been to propose a sophisticated theory of the dynamic pragmatics of speech act/common ground management operators, but to demonstrate as clearly as possible how an unbalanced partition arising from negation scoping over a high operator can be used to derive the speaker bias that HNQs are known for, and the clearest way to do that is with simple doxastic necessity.

That said, I believe that the prospects for applying the derivation of HNQ bias in section 7 to other unbalanced partitions are bright. Due to space restrictions, I limit discussion here to commitment space semantics (Krifka, 2015, 2017), though bias could be derived from *VERUM* and

FALSUM operators as well (Romero & Han, 2004; Repp, 2013; Romero, 2015; Frana & Rawlins, 2019). A commitment state  $c$  is modeled as a set of interlocutor commitments, e.g.  $c = \{A \text{ is committed to } p, A \text{ is committed to } \neg q, B \text{ is committed to } p, B \text{ is committed to } q, \dots\}$ , and a commitment space  $C$  is modeled as a set of commitment states representing the future possible developments of the current commitment state, e.g.  $C = \{c, c', c'', \dots\}$ .<sup>28</sup> Speech acts are modeled as functions from commitment spaces to commitment spaces. The effect of a PPQ  $\{p, \neg p\}$  is to move from the current commitment space  $C$  to a new one  $C^{PPQ}$  in which all of the commitment states are such that the addressee  $A$  either commitments to  $p$  or to  $\neg p$ . Thus, the PPQ has the effect of removing all states in which  $A$  doesn't commit one way or the other, and the resulting  $C^{PPQ}$  can be partitioned into two sets of states, those in which  $A$  commits to  $p$ , and those in which  $A$  commits to  $\neg p$ . Meanwhile, HNQs are modeled so that a special speech act negation,  $\sim$ , scopes over an *ASSERT* operator. The effect of an HNQ on a space  $C$  is to remove all states  $c'$  in which  $A$  commits to the proposition embedded under *ASSERT* (essentially, the negation of the effect of  $A$  asserting and therefore committing to a proposition  $p$ ). By removing states in which  $A$  commits to  $p$ , the commitment states left over in the updated  $C^{HNQ}$  can be partitioned into two kinds, those in which  $A$  commits to  $\neg p$ , and those in which  $A$  commits to neither  $p$ , nor  $\neg p$ .  $A$  is then free to accept or reject this move; if  $A$  rejects it, then  $A$  chooses the complement of  $C^{HNQ}$  ( $C - C^{HNQ}$ ), and commits to  $p$ . This situation should look familiar from section 7: the cell of  $C^{PPQ}$  in which  $A$  commits to  $\neg p$  is a proper subset of (asymmetrically entails) the space  $C^{HNQ}$ . The cell of  $C^{PPQ}$  in which  $A$  commits to  $p$  is identical to the complement of  $C^{HNQ}$ . Thus the PPQ is predicted to be more informative about  $A$ 's commitments wrt  $p/\neg p$  than the HNQ, and the rest of the HNQ bias derivation can proceed as it does in section 7.

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<sup>28</sup>The assumption here is that if  $c$  is the current commitment state, then all possible future developments of it will be states in which new commitments are added, thus for any other  $c'$  in  $C$ ,  $c \subseteq c'$ .

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