Isn't there more than one way to bias a polar question?*

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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 a treatment of HNQs as denoting unbalanced partitions (Romero & Han, 2004), and competition with their positive polar question alternatives, I propose a novel derivation of speaker bias in HNQs as a conversational implicature. Roughly, if the speaker is ignorant, then a positive polar question will be more useful because it is 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 separates high negation from verum focus, and I argue that it is more parsimonious and has better empirical coverage than prior accounts.

1 Introduction

Romero & Han (2004) observe that both high negation questions (HNQs) like (1) and polarity focus questions (PFQs) like (2) convey that the speaker is biased for the answer with opposite polarity from that of the question.[1]

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[1] I use '⤳' to mark an implication while remaining agnostic about what kind of implication it is.

(1)   A: Ok, now that Stephan has come, we are all here. Let's go!
        B: Isn't Jane coming?
        ⤳ B previously believed that Jane is coming   (Romero & Han, 2004, 610)

(2)   B: Ok, now that Stephan has come, we are all here. Let's go!
        A: Wait, Jane's coming too.
        B: IS Jane coming?
        ⤳ 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 focus (Höhle, 1992).[2] They propose that an epistemic conversational operator VERUM is introduced to the LF by high negation in (1) and verum focus in (2). 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. Repp (2013) adds a negative version of VERUM, the FALSUM operator, and Frana & Rawlins (2019) develop a dual VERUM/FALSUM account of biased questions (see also Romero 2015, Romero et al. 2017, and Jeong 2020). Other recent work has adopted the claimed connection between verum focus and biased questions, and sometimes also high negation, even though it does not directly employ VERUM and FALSUM operators (AnderBois, 2011, 2019; Gutzmann et al., 2020; Samko, 2016; Taniguchi, 2017; Silk, 2020; Bill & Koev, 2021).

The question that motivates much of the research cited above also motivates this paper: Why do HNQs and PFQs convey the biases that they do? I will offer two distinct answers, one for HNQs like (1), another for PFQs like (2). The reason is that there are empirical asymmetries between HNQs and PFQs: bias in PFQs is context sensitive, while in HNQs it is not, as I will demonstrate in section 2. This leads me to formulate a novel account of PFQ bias in section 3, in which the bias derives from general pragmatic principles in combination with the conversational contexts

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[2]Romero & Han (2004) take verum focus to be an emphasis on the truth of a proposition that is distinct from simple polarity focus, i.e. focus on the positive or negative polarity of a clause. Ultimately, Romero & Han's VERUM bears no relationship to focus, and more recently, Gutzmann et al. (2020) defend this kind of analysis against a focus-based view (though with a different semantics for VERUM). Goodhue 2022, which is about the pragmatics of prosodic prominence shifting, argues that verum focus can and should be reduced to polarity focus and explained via a more general theory of focus; see especially p. 146ff. for a comparison with VERUM accounts. Thus I take questions like (2) to exhibit polarity focus and call them PFQs.

that PFQs happen to frequently appear in. This account does not make use of VERUM or FALSUM operators, but it also does not depend directly on the presence of focus marking. I compare my account with VERUM accounts of PFQ data.

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 prejacent 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 analyze high negation as scoping over a doxastic speech act operator. This structure denotes an unbalanced partition, similar to denotations proposed in Romero & Han 2004 and Krifka 2017.

In section 7, I develop a novel account of the necessary inference that the speaker is biased for the prejacent of the HNQ. In brief, the HNQ competes with a PPQ alternative that is, in a sense, more informative. I argue that a speaker ignorant of whether p or $\neg p$ should prefer the stronger PPQ; thus if they use the HNQ, they must not be ignorant, that is, they must be biased. Finally, the manner in which the HNQ is unbalanced leads to the inference that they are biased for the positive answer.

2   Asymmetries between kinds of polar questions

2.1   The asymmetry between HNQs and LNQs

Since Romero & Han 2004, high negation questions have been known to require the speaker to have a bias for the positive answer while their low negation counterparts do not. To appreciate Romero & Han's observation, compare (3), in which both the HNQ and the low negation question (LNQ) are acceptable, to (4) and (5) where only the LNQs are acceptable.

(3)   A expects her roommate Moira to be home, but she looks everywhere and can't find her. A does find their mutual roommate B in the last room that she checks. A says to B:

    a.   Is Moira not home?   *low negation question* (LNQ)

    b.   Isn't Moira home?   *high negation question* (HNQ)

(4)   A wants to find Moira, but has no expectations about whether she is home or not. She looks everywhere and can't find her. But A does find B, and says:

    a.   Is Moira not home?

    b.   #Isn't Moira home?

(5)   A has been in a windowless office for the last eight hours. 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?

In all three examples, there is compelling contextual evidence for the negative answer, which is one way to license a LNQ (Büring & Gunlogson 2000; see (14b) below), thus all of the LNQs are acceptable. But only in (3) does the speaker A have a prior expectation that the positive answer is true, and only in that context is the HNQ acceptable. Data like this has led researchers to posit the following generalization (Romero & Han, 2004; Sudo, 2013; Domaneschi et al., 2017; AnderBois, 2019; Frana & Rawlins, 2019):

(6)   *Speaker bias condition*:
    A HNQ with propositional content p below the negation (HNQ-p) is felicitous only if the speaker is or was recently biased for p

Romero & Han show that the generalization holds in several languages besides English, including Modern Greek, Spanish, Bulgarian, Korean, and German (see also Hartung 2009 on German HNQs). It has also been claimed in Hungarian (Gyuris, 2017) and Turkish Sign Language (Gökgöz & Wilbur, 2017).[3] Since the phenomenon is crosslinguistic, we would like to have a principled

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[3]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.

explanation for it. As AnderBois (2011, 223) notes, this poses a challenge for Romero & Han's account, since they stipulate that preposed negation introduces VERUM (p. 613), and so the link between preposed negation and speaker bias remains unexplained.

2.2 Two asymmetries between HNQs and PFQs

There are two asymmetries between HNQs and PFQs. First, focus marked expressions require an antecedent in which backgrounded (non-focused) material is given (cf. Kratzer, 1991; Rooth, 1992; Schwarzschild, 1999, i.a.). Polarity focus in PFQs is no different in this regard. For example, in (2), B's use of polarity focus is licensed by A's utterance, which provides the required antecedent for the prominence shift. Compare this to (1), repeated in (7) with added example sentences, in which the antecedent for polarity focus is missing from the context.

(7)   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?
    c.   B: # IS Jane coming?
    d.   B: Is JANE coming?

If we try to shift prominence to the auxiliary as in (7b), the HNQ becomes infelicitous. The PFQ (7c) is also infelicitous, even though the same question without polarity focus in (7d) is felicitous. This poses a challenge for VERUM/FALSUM accounts that unify the two kinds of questions: If we thought that the distributions of both HNQs and PFQs were regulated entirely by conditions on the use of VERUM/FALSUM, then their distributions should not come apart in this way.

The explanation for the asymmetry must be that polarity focus is a kind of focus, and so requires a focus antecedent. High negation on the other hand is not a kind of focus, thus it can be used even when there is no focus antecedent.

The second empirical asymmetry between HNQs and PFQs is that HNQs necessarily convey a speaker bias, while the speaker bias conveyed by PFQs is context sensitive. To see this, compare the biased PFQ in (2) to the PFQ in (8a), which is felicitous but unbiased.

(8)   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?
         ↛ B believed she isn't a member
   b.   B: # ISN'T she a member?
         ↝ B believed she is a member

Despite that the context of (8) stipulates that B lacks a bias about whether Jill is a member, the PFQ in (8a) is perfectly felicitous. The HNQ in (8b) 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 or FALSUM operator that triggers speaker bias, then this asymmetry is unexpected.[4]

The central fact about HNQs is that they *always* convey a bias for the propositional prejacent of the question, as laid out in (6). (8) shows that it is an equally crucial fact about PFQs that they do *not* always convey a speaker bias. Instead, PFQ bias seems to be conditioned by the context.

3   Why some polarity focus questions are biased

My account of bias in PFQs is based on the kinds of conversational contexts they happen to frequently appear in, in combination with general pragmatic principles.[5] In a nutshell, if an interlocutor implies some proposition p, then a speaker can cast doubt on p just by virtue of asking a polar question about whether p (abbreviated as ?p). In other words, the speaker *questions* the implied proposition p, thereby casting doubt on p. Via a further pragmatic process, this doubt can be strengthened into a bias for $\neg p$. One prediction of this account is that polarity focus is not

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[4]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 (8). Intuitions for *really* diverge from polarity 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/DID get a haircut" would be infelicitous. See further discussion in Gutzmann et al. 2020, 17, fn. 7, and Goodhue 2022, 154. I conclude that *really* is a distinct phenomenon from polarity focus. In fn. 13 below, I make a suggestion for the analysis of *really*-Q bias based on VERUM.

[5]The account laid out in this section has been previously described in Goodhue 2018b,a.

required in order for bias to be derived; there could be focus elsewhere in the sentence (e.g. the subject or the verb), or even no focus at all. Another prediction is that the polarity of the bias need not oppose the polarity of the question. I will compare my account to VERUM accounts.

3.1   Account of speaker bias in PFQs

Consider the following biased PFQ:

(9)   A: Dinah likes Ivy.
        B: DOES Dinah like Ivy?
        ⤳ B believed that Dinah does not like Ivy

Let p be the proposition *that Dinah likes Ivy*. Using "$\Box$" to represent doxastic necessity, we can abbreviate the goal of our bias derivation as $\Box\neg p$. In (9), 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 resulting context set c would then only contain p-worlds.

But this is not what happens in (9). Instead, B responds to A by asking ?p (*Does Dinah like Ivy?*). Crucially, there are general constraints on asking questions: both Roberts (1996/2012, 14) and Büring (2003, 541) propose what I will call the *interrogativity principle*:[6]

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[6]The interrogativity principle is related to Stalnaker's (1978, 88) informativity principle:

(i)   *Informativity principle*:
        Assert a proposition p only if the context set c does not entail or contradict p
        (i.e. p must be true in some but not all worlds in c)

(10)   *Interrogativity principle*:
         Ask a question Q only if the context set c does not entail a complete answer to Q.

I assume that p is a complete answer to $?p$ (Hamblin 1973, Karttunen 1977, Groenendijk & Stokhof 1984, among many others). So if p were mutually believed, c would entail p and $?p$ would be infelicitous by (10). 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, $\neg\Box p$.[7]

So far we are only part way to our goal, since the speaker bias inference in (9) 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. $\Box p \vee \Box\neg p$. But if she either believes p or $\neg p$, and we have concluded that it is not the case that she believes p, it follows that she believes $\neg p$. That is, the combination of $\neg\Box p$ and $\Box p \vee \Box\neg p$ entails the bias inference $\Box\neg p$.[8]

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

3.2   PFQ bias correlates with speaker opinionatedness

Given the role of opinionatedness in the derivation, 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 (9) 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

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[7]An alternative way to derive $\neg\Box p$ would be to require any speaker who asks $?p$ to be ignorant (or lack an opinion) about the answer. If we represent ignorance as $\neg\Box p \wedge \neg\Box\neg p$, then $\neg\Box p$ follows any time a speaker asks $?p$. However, this approach is a nonstarter because ignorance obviously conflicts with the bias inference $\Box\neg p$ that we are trying to derive for (9). More generally, there are uses of questions that are incompatible with a blanket ignorance requirement, e.g. exam questions (Krifka, 2012).

[8]See Reese (2007) for a similar explanation for bias in other kinds of questions that contain prominence shifting, though not polarity focus.

bias inference $\square\neg p$. 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 (9) without conveying the bias inference, but instead conveying something weaker, like surprise or lack of awareness.[9] These two different inferences can be brought out by possible continuations of (9). 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/unawareness inference:

(11)   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!
        ↛ B believed that Jill isn't a member.

In (11), A asserts p, but B is not opinionated about p, so strong speaker bias is not derived.

3.3   PFQ bias depends on whether an interlocutor conveys commitment to the proposition questioned

Consider again (8), in which the PFQ conveys no bias, repeated here:

(8)   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?
        ↛ B believed 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 prejacent 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

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[9]Thank you to a reviewer for *NLS* for suggesting the paraphrase in terms of awareness.

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 Goodhue 2018b, 100, ex. (24).

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.

(12)   A and B are planning a potluck.
A: Mark is bringing a salad, and Jane baked a pie.
B: Wait. Is Jane coming?
⤳ B believed that Jane isn't coming.

In (12), B can take A's utterance to imply that Jane is coming (p). If the context set c entailed p, then by (10) 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, $\Box\neg p$.[10] Despite this speaker bias, B's polar question in (12) 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 Romero & Han 2004 and Frana & Rawlins 2019). So speaker bias can arise even in the absence of polarity focus, as predicted.[11]

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[10]If we take B not to be opinionated, we derive a weaker reading, like that described in section 3.2.

[11]Given that focus marking plays no role in my account of bias, a reviewer asks why it seems to be obligatory in many biased questions, such as (9). The answer is that focus triggers a presupposition, and so is subject to the principle of maximize presupposition; see Goodhue 2022, p. 123 and references contained there.

3.5   Bias for the propositional prejacent 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 prejacent 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 prejacent embedded under the high negation. However, (13) shows that not all biased polar questions convey a bias that opposes the polarity of the question.

(13)   Jane is not present:
        A: Everyone's here, let's go!
        B: Wait. Is Jane coming?
        ⇝ B believed that Jane is coming.

In (13), Jane's absence plus A's assertion implies that A believes that Jane is not coming ($\neg p$). Like for (12), if c entailed $\neg p$, then by (10) 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, $\Box p$. Like for (12), polarity focus would be infelicitous in (13) because the proper antecedent is missing, but the bias can be derived independently, as predicted.

Interestingly, the polarity of the bias in (13) is identical to the polarity of the polar question. (13) 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 necessarily opposes the proposition q that was previously implied and is now being questioned. Regardless of whether the question has the same polarity as the previous implication q or the opposite, the bias derived will always oppose that implication. In (13), the implication q is $\neg p$ *that Jane is not coming*, and so the bias is for p.

Despite (13), question bias almost always opposes the polarity of the question. Here's why: 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 (based on Büring & Gunlogson 2000; Sudo 2013; Trinh 2014; Roelofsen & Farkas 2015; Domaneschi et al. 2017; Frana & Rawlins 2019):[12]

(14)   *Evidential condition on the polarity of polar questions*
   a.   Positive polar questions (PPQs) are incompatible with compelling contextual evidence for $\neg p$ (= compatible with evidence for p, or no evidence either way)
   b.   Low negation questions (LNQs) require compelling contextual evidence for $\neg p$

This evidential condition forces the question to have the same polarity as the proposition being questioned. Since the polarity of the bias opposes the polarity of the proposition questioned, the polarity of the bias opposes the polarity of the question asked. (13) is a rare example in which the evidence for the proposition being questioned is implicit enough to allow the evidential condition in (14) to be obviated. Note that the question could have been phrased negatively as "Is Jane not coming?", and the bias conveyed would have been the same.

3.6   Comparison to VERUM accounts

In recent work, Frana & Rawlins (2019) posit a VERUM operator with roughly the semantics of Romero & Han's (2004, 627) VERUM, except that, building on an innovation in Romero 2015, VERUM makes a presuppositional, rather than at-issue, contribution:

(15) $\llbracket \text{VERUM} \rrbracket^{c,\,w} = \lambda p_{\langle s,t \rangle} \, . \, p$
   Defined for p, c, w only if
      $\forall w' \in Epi_x(w)[\forall w'' \in Conv_x(w')[p \in CG_{w''}]]$
      "x is sure that, in all worlds satisfying their conversational goals, p is CG."
                                                                (Frana & Rawlins, 2019, 32)

x is fixed to a contextually provided individual by the illocutionary force of the utterance (x =

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[12]For Büring & Gunlogson (2000, 7), contextual evidence is compelling if it "has just become mutually available to the participants in the current discourse situation," and "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 & Šafářová (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 $\neg p$.

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. The relevant Quality dilemma here is an epistemic conflict in which the speaker has a preexisting bias that the context (especially the addressee) contradicts.

With these ingredients, Frana & Rawlins propose the following updated VERUM account of bias in PFQs: 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 an epistemic conflict. The VERUM operator presupposes that A has indicated certainty for adding p to the CG, so for there to be an epistemic conflict, B must be biased for $\neg p$, which matches intuitions for (9).

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.[13] However, whereas my account depends on an independently motivated pragmatics of question asking relative to the common ground, Frana & Rawlins's (and also Romero & Han's (2004)) depends on a principle of economy that is tailor-made for the VERUM view of biased questions, and so is less parsimonious.

My account also has broader empirical coverage than VERUM operator accounts (including Romero & Han 2004, Frana & Rawlins 2019, and Gutzmann et al. 2020). First, my account explains why bias is present in some PFQs like (2) and (9), and absent in other PFQs like (8) and (11). VERUM accounts on the other hand have to stipulate that VERUM is present in biased PFQs and absent in unbiased PFQs.

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[13]Romero & Han (2004) initially proposed the semantics for VERUM that (15) is based on for *really*. Suppose then that *really* denotes something like (15): 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 as described in section 3.1. 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 the empirical asymmetries between them pointed out in fn. 4.

A second challenge is that the VERUM operator is assumed to only be introduced by a few grammatical markers in English—high negation, the adverb *really*, and prosodic prominence on auxiliaries or verbs—but (12) and (13) lack such markers (prominence naturally lands on the subject *Jane*), yet they convey the kind of speaker bias typical of PFQs. While my account provides a unified explanation of these examples and PFQs, VERUM accounts need to either say that this bias is explained by an auxiliary theory distinct from VERUM, or that VERUM is present in hitherto unexpected sentences. The former route is unparsimonious, especially when compared to the simpler unified account I have proposed. The latter route makes two incorrect predictions for same polarity bias like in (13). First, with the semantics in (15), if VERUM were present in (13)B, it would operate on its complement, the proposition *that Jane is coming*, and the predicted presupposition would be that A is sure that, in all worlds satisfying A's conversational goals, *that Jane is coming* is *CG*. Second, B would be predicted to have a negative bias. Neither of these predictions are correct: B's bias is positive in (13), and if A is sure about anything related to Jane, it's that Jane is *not* coming.

Besides being subject to the challenges above, Gutzmann et al.'s (2020) account faces another challenge. For them, VERUM(p) means that the speaker wants to prevent the QUD from being downdated (=answered) with $\neg p$. They note that if VERUM operates on the question prejacent, then this would predict exactly the opposite bias from what is actually observed. Their solution (p. 40ff.) is for VERUM to operate on the true answer. Thus if the speaker thinks p is true, Gutzmann et al. predict that they want to prevent the QUD from being downdated with $\neg p$, while if the speaker thinks $\neg p$ is true, they predict the speaker wants to prevent the QUD from being downdated with p. These predictions are in line with intuitions. The problem is that this account doesn't derive the bias; it assumes the bias at the beginning by stipulating what the true answer to the question is.

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 PFQs.[14] 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

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 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 prejacent of the HNQ is not negated

Given the correspondence between negation, preposing and bias in high negation questions, the goal is to understand where negation is in the structure of HNQs, and what role it plays in interpretation. 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   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 some-

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[14]For a discussion focused on polarity/verum focus as focus, rather than its role in biased questions, see Goodhue 2022.

how outside the proposition…" Another way he states the ambiguity is that (16a) questions p, while (16b) questions $\neg p$. Ladd uses the polarity items *either* and *too* to bring out the two supposed readings:

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

Many speakers find (16b) unacceptable; more on that shortly. Whatever intuitive contrast there is between (16a) and (16b), 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, Sudo (2013) demonstrates inner and outer readings using *too* and *either*, and claims that the inner reading requires contextual evidence for $\neg p$ while the outer reading does not (Jeong (2020) echoes this claim).[15] However, 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:

(17)   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

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[15]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 [(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. (4), (5), 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.

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 (16b) to be either infelicitous or at least severely degraded. This fact is demonstrated experimentally by Hartung (2006) and Sailor (2013).[16] At the same time, informal discussion with a small number of British English speakers suggests that HNQs with *either* such as (16b) 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 of the polarity items themselves.

We must search for evidence beyond polarity items. 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, but is confronted with conflicting evidence for $\neg p$, and then the participant is explicitly told 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 has nothing to do with an inner/outer negation ambiguity: Steepness of question intonation is independently known to signal increased emotional activation, which correlates with surprise (Gussenhoven,

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[16]This experimental work suggests that HNQs with *either* are severely degraded, but 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 HNQ bias.

2004; Bänziger & Scherer, 2005; Westera, 2017; Goodhue, 2021). The character participants played in the checking-¬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.[17]

To get a handle on negation in HNQs, a larger set of diagnostics is needed. In the following, I use presupposition and conventional implicature triggers, 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:

(18)   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:

(19)   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 (20) cannot include negation, unlike (19). Instead it patterns with (18).

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[17]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-¬p and final fall for checking-p. First, I am skeptical that there is a distinction between uptalking and non-uptalking dialects of American English (all dialects include some amount of uptalk; cf. Shokeir, 2008, for evidence that this is not a new phenomenon). But second, in all varieties of American English I know of, the most natural way to produce any checking-p examples in the literature is with a final rise, not a fall. Importantly, checking-p HNQs should not be conflated with negative inversion exclamatives. The latter require a gradable item and are most natural with a fall (Wood, 2014).

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

These effects can be demonstrated in context:

(21)   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 (22) includes negation (it could also exclude it).

(22)   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:

(23)   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:

(24)   Did Zoe not win, as Joy predicted?
         can implicate: Joy predicted that Zoe did not win

(25) 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:

(26) 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:

(27) 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:

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

However, HNQs do not:

(29) 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.[18, 19]

4.4   Responses to negative sentences

While *yes*/*no* responses to PPQs as in (30) convey unambiguous answers, they are interchangeable

in response to LNQs, as in (31) (Krifka 2013; Roelofsen & Farkas 2015; Goodhue & Wagner 2018).

(30)   A: Is Jane here?

     a.   B: Yes (*can only mean* She is here)
     b.   B: No (*can only mean* She is not here)

(31)   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 compo-

nent of the explanation for the contrast between (30) and (31) is that the sentence that B responds

to in (31) is negative, i.e. it contains propositional negation, while that in (30) is not.

Krifka (2017) points out that responses to HNQs pattern with (30) rather than (31):

(32)   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 propo-

sitional negation necessary to condition the interchangeable behavior of *yes* and *no* as seen in

(31).

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[18]Many have argued that *until* is ambiguous between a durative version and a strong NPI version (Karttunen, 1974; de Swart, 1996; Giannakidou, 2002). 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.

[19]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.

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

(33)   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 (34):

(34)   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.

(35)   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 (14b). Jeong argues that high negation must be the

culprit, since positive questions with stressed NPIs or *even* plus low scalar items and minimizers do *not* require contextual evidence for the negative answer. She further assumes, following Sudo 2013, that if HNQs have an inner negation reading, this reading will require contextual evidence for the negative answer. 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.[20]

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

(36)   *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?

(37)   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?

(38)   *Stressed NPI*
     a.   Did Liv not discover ANYTHING until 9?
     b. #Didn't Liv discover ANYTHING until 9?

If the *even*-HNQs in (36)-(38) 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

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[20]Jeong seems to 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.

inner negation is contradicted by 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 prejacent of the question, while HNQs—like PPQs—do not, contrary to what some authors have previously claimed (e.g. Ladd 1981; Büring & Gunlogson 2000; Van Rooij & Šafářová 2003; Romero & Han 2004; Trinh 2014; Romero 2015; Jeong 2020; and Frana & Rawlins 2019 on one dialect).

5 Against analyzing high negation as a discourse particle

One way to capture the bias generalization in (6) and the data from section 4 is to claim that high negation does not contribute negation, but instead a discourse particle with a non-at-issue bias meaning:

(39) $[\![\text{n't}_{\text{high-neg}}]\!]^c = \lambda p_{\langle s,t\rangle}.\lambda w_s$: the speaker in c is biased for p . $p(w)$

(39) would add speaker bias, and pass the proposition p up the structure to a Q-morpheme, which would produce the denotation of a polar question. The non-at-issue content could be elaborated in various ways. For Hartung (2009) for example, German high negation adds p to the speaker's commitments in a Farkas & Bruce (2010) style formal pragmatics. For Northrup (2014), HNQs commit the speaker to p on the basis of prior, weak evidence. For Taniguchi (2017), high negation removes p from the common ground and puts it in the speaker's discourse commitments set.

While such approaches are formally precise, it is not clear that they provide insight into the phenomenon beyond empirical generalizations of it. For example, on these accounts, why is the bias for p and not $\neg p$? If high negation were a discourse particle that directly conveys bias, then there would be no reason in principle for the bias to be against the propositional prejacent 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, why does the combination of negation and preposing trigger bias crosslinguistically? Discourse particle theories have little to say.

Now consider the illocutionary negation, FALSUM (Repp, 2013):

(40) $[\![\text{FALSUM}]\!]^{c,\,w} = \lambda p_{\langle s,t\rangle} \, . \, \neg p$
        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)

Romero (2015) and Frana & Rawlins (2019) analyze some HNQs as having the LF [Q [FALSUM [p]]]. Both 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 (40) 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 (40) leaves the findings of section 4 unexplained.

Another challenge for the FALSUM account of HNQs is relative to "suggestion" contexts, or as I will call them *non-conflict contexts*:[21]

(41)   A tells B that she is going to an Alabama Shakes concert tonight. B has previously heard that the opening act will be The Moon and You.
        B: Oh yeah, I heard about that show. Aren't The Moon and You opening?

(42)   Dialog between two editors of a journal in 1900:
        A: I'd like to send this paper out to a senior reviewer, but I'd prefer somebody new.
        B: Hasn't Frege not reviewed for us? He'd be a good one.   (Romero & Han, 2004, 619)

The issue is that the HNQs in (41) and (42) are predicted by (40) to presuppose that the addressee

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[21]I rebrand them because unlike the classic (42), (41) does not involve suggesting an answer to an implicit QUD.

A 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 according to the addressees' conversational goals in the addressees' epistemically accessible worlds.* But nothing about these contexts implies this. For all we know, A's conversational goals in A's epistemically accessible worlds 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 (40) incorrectly predicts HNQs to be infelicitous in such contexts (*pace* Frana & Rawlins's (2019, 35) discussion).

6 Speech act operators and unbalanced partitions

Based on the evidence in section 4, I take it 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 adopt the view from prior work that high negation scopes over a high operator (VERUM in Romero & Han 2004, *ASSERT* in Krifka 2017). Here I treat it as a doxastic ASSERT operator with the denotation in (43).[22] As will become clear, my primary theoretical contribution to research on HNQs is the derivation of speaker bias in section 7. Given this, my reason for using simple doxastic necessity in (43) is that it will aid exposition of my primary novel contribution in section 7. In section 8, I briefly explore the prospects for replacing (43) with a more sophisticated operator.

(43) $[\![\text{ASSERT}]\!] = \lambda p_{\langle s,t \rangle}.\lambda w_s.\forall w' \in Dox_x(w)[p(w') = 1]$

$Dox_x(w)$ 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

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[22]For prior work that has assumed doxastic ASSERT operators to explain other phenomena, see Krifka 2001; Kratzer & Shimoyama 2002; Chierchia 2006; Alonso-Ovalle & Menéndez-Benito 2010; Hacquard 2010; Meyer 2013; Buccola & Haida 2019.

a high negation question, x is the addressee.[23] In the following, I will frequently abbreviate x's doxastic necessity with "$\square_x$".

Here is the structure I assume for an HNQ like "Didn't Jane eat?":

(44)
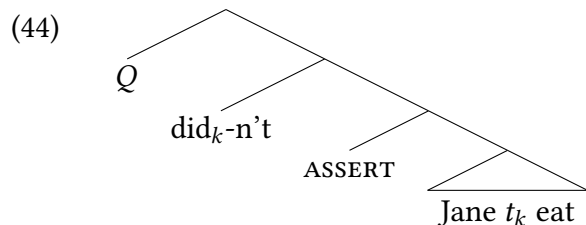
By scoping over ASSERT, high negation signals the operator's presence in the HNQ. Otherwise, I assume that ASSERT is not present in questions (cf. Meyer's (2013, 42) assumption that matrix K only appears in assertively used sentences).[24]

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 polar interrogative Q in (45), which, when combined with a proposition, provides the denotation for polar questions.

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

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

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

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[23]Cf. Romero & Han 2004, 626, for a similar assumption about how operators are fixed to interlocutors in the context.

[24]A VERUM account could appeal to the same explanation for why high negation signals the presence of VERUM in an HNQ, but *only if* it does not assume the existence of inner negation LFs in which VERUM scopes over negation. Thus the VERUM accounts in Romero & Han 2004, Frana & Rawlins 2019, and Jeong 2020 cannot appeal to this explanation.

With these lexical denotations in hand, the interpretation for (44) is demonstrated in (47).

(47) a. $[\![\text{Jane } t_k \text{ eat}]\!] = \lambda w_s.\ \textit{jane ate in } w$

   b. $[\![[\text{ASSERT } [\text{Jane } t_k \text{ eat}]]]\!] = [\![\text{ASSERT}]\!](\lambda w_s.\ \textit{jane ate in } w) =$

      $\lambda w_s. \forall w' \in Dox_A(w)[\textit{jane ate in } w']$

   c. $[\![[\text{did}_k\text{-n't } [\text{ASSERT } [\text{Jane } t_k \text{ eat}]]]]\!] =$

      $[\![\text{did}_k\text{-n't}]\!](\lambda w_s. \forall w' \in Dox_A(w)[\textit{jane ate in } w']) =$

      $\lambda w_s. \neg \forall w' \in Dox_A(w)[\textit{jane ate in } w']$

   d. $[\![[Q\ [\text{did}_k\text{-n't } [\text{ASSERT } [\text{Jane } t_k \text{ eat}]]]]]\!] =$

      $[\![Q]\!](\lambda w_s. \neg \forall w' \in Dox_A(w)[\textit{jane ate in } w']) =$

      $\lambda q_{\langle s,t \rangle}.\ [q = \lambda w_s. \neg \forall w' \in Dox_A(w)[\textit{jane ate in } w']$

         $\vee\ q = \lambda w_s. \forall w' \in Dox_A(w)[\textit{jane ate in } w']] =$

      $\{\neg \square_A \textit{ that Jane ate}, \square_A \textit{ that Jane ate}\}$

The denotation for high negation questions produced in (47) 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 ($\square_A\ p$), and a lack of doxastic necessity for p ($\neg \square_A\ p$) (cf. a similar result in Krifka 2017, who refers to the negated cell $\neg \square_A\ p$ as one in which the addressee refrains from committing to p). I follow Romero & Han in taking $\neg \square_A\ p$ to cover any other degree of belief in p besides belief in p itself. $\neg \square_A\ p$ 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 $\neg p$ $(\neg \square_A\ p \wedge \neg \square_A\ \neg p)$

2. Belief that $\neg p$ $(\square_A\ \neg p)$

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, $\square\, p$.

7   Explanation of speaker bias in HNQs

I will argue for a novel derivation of speaker bias in high negation questions as a conversational implicature.[25] The reasoning runs as follows: The speaker S has asked a HNQ with propositional prejacent 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, 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 prejacent of the HNQ (section 7.4).

7.1   Alternatives

What we need is for PPQs like (48a) to be alternatives of HNQs like (48b).

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[25] 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, his pragmatic derivation is distinct, not taking the form of a special quantity implicature.

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

Building on Rudin's (2018, 58ff.) analysis of alternatives for discourse moves, I assume that a question counts as an alternative to another only if they have the same sentence radical and therefore the same propositional prejacent. In other words, the questions need to be about the same proposition. (48a) and (48b) share the same sentence radical and therefore the same propositional prejacent, *that Jane ate*.

Let's briefly compare this approach to one using Katzir's (2007) algorithm, which identifies alternatives to a structure ϕ by making deletions, contractions and replacements of constituents in ϕ. This algorithm also predicts (48a) to be a valid alternative to (48b). However, Katzir's algorithm can derive alternatives by making changes to the sentence radical and so the propositional prejacent, which results in incorrect predictions. For example:

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

While the PPQ in (48a) is a Katzirian alternative to the questions in (49), the questions in (49) do not convey the speaker bias that HNQs are known for.[26] But the flat-footed denotations of these polar questions are either identical or very similar to the one I have assumed for the HNQ in (48b), namely:

(50) $\{\Box_A$ *that Jane ate*, $\neg\Box_A$ *that Jane ate*$\}$

Given this denotational similarity, if the choice to say (48b) instead of (48a) is responsible for conveying speaker bias, as I will argue below, then it seems that the choice to say (49a) or (49b)

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[26]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?

instead of (48a) should also convey an HNQ-like bias, but it does not. The reason that the questions in (49) lack bias is that (48a) has a different prejacent, is about a different proposition, and so is not an alternative of the relevant kind. Thus there is no competition between the questions in (49) and (48a) in the first place.

Also note, since both questions in (48) are about the proposition *that Jane ate*, I assume that whenever (48b) is relevant enough to utter, so is (48a). 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 may explain why the bias implicature of HNQs is not cancellable.

7.2   Bias as belief

Here is the empirical generalization from section 2.1 to be explained:

(6)   *Speaker bias condition*:
         A HNQ with propositional content p below the negation (HNQ-p) is felicitous only if the
         speaker is or was recently 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:[27]

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[27]The precise characterization of bias as either belief or just 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:

(51)   *Bias*:
       S is biased for $p \Leftrightarrow \Box_S\, p$

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

(52)   *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 (52).

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,

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(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:

   a.   A: I know. The forecast said it would be nice out.
   b.   A: I know. Didn't the forecast say it would be nice out?

(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?"

   a.   A: Yeah. The Moon and You is opening.
   b.   A: Yeah. Isn't The Moon and You opening?

The contexts are held constant; nothing about A's beliefs or evidence changes depending on whether they utter the assertion or the question. 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.

consider the conditional in (53a), restated symbolically in (53b), with '>' standing for 'more useful than':

(53) a. If S believes **all**, then **all** is more useful than **some**.
      b. $\Box_S$ **all** $\rightarrow$ **all** $>$ **some**

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 (53) (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 (53) must mean that S does not believe **all**. That is, the utterance of **some** entails that the consequent of (53) is false, and so S implicates that the antecedent of (53) is also false.[28]

Returning to HNQs, I claim that the following conditional, analogous to that in (53), holds:

(54) a. If S is ignorant of whether p or $\neg p$, then the PPQ with prejacent p is more useful than the HNQ with prejacent p.
      b. $\neg\Box_S\, p \land \neg\Box_S\, \neg p \rightarrow$ PPQ-p $>$ 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.[29] 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.

(54) depends on a fact and two uncontroversial background assumptions. The fact, which I

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[28] 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 (53) 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.

[29] 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).

will argue for in a moment, is that HNQs are less informative than their PPQ alternatives. The first background assumption is that the goal of ignorant speakers is to gain information. 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 about p, her goal is to gain information about it, 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 about p, the PPQ is more useful than the HNQ.

As a result of (54), 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 (54), 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 $\neg p$.[30]

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.

(55)   ⟦Did Jane eat⟧ = {*that Jane ate*, ¬*that Jane ate*}   (Hamblin, 1973)

(56)   ⟦Didn't Jane eat⟧ = {$\square_A$ *that Jane ate*, ¬$\square_A$ *that Jane ate*}

For example, the positive answer to (55) does not entail anything about the positive answer to (56) or vice versa, since any proposition can be true without A believing it, and A can believe any proposition without it being true.

In section 7, I will show that the commitment space semantics developed in Krifka 2017 produces representations for PPQs and HNQs that can be directly compared. But sticking with our

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[30]I believe the conditional in (54) is more reliable than (53), 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.

simpler representations for the moment, the answer sets can be compared if we move to a pragmatic level of description. Doing so makes some sense given the discussion of alternatives in section 7.1—the competition here is not based on varying the propositional prejacents 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. (56) already builds the assertive component of A's answers into the partition. We can compare this to the way that the answer set in (55) will transit through A's assertions:

(57)   The set of answers to the PPQ "Did Jane eat?", as asserted by A:
       $\{\Box_A$ *that Jane ate*, $\Box_A \neg$*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 (56) and (57) are identical. But the negative answer in (57) asymmetrically entails that in (56); 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. Put another way, S learns more from A's negative answer to the PPQ than the HNQ: A's negative answer to the PPQ informs S that $\neg p$. As for the HNQ, since $\neg\Box_A p$ is compatible with both A's lack of belief about p ($\neg\Box_A p \land \neg\Box_A \neg p$), 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 propositions. Here is a formal means of comparing such sets and determining that one is stronger than the other:

(58) 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. $\forall p \in Q_1 \, [\neg \exists p' \in Q_2 \, [p' \subset p]]$

(58) 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 (58), (57) is more informative than (56).

This is why the PPQ is more useful than the HNQ when S is ignorant, as stated in (54). 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 $\neg p$.

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

    1. $\neg \Box_S \, p \land \neg \Box_S \, \neg p \rightarrow$ PPQ-$p >$ HNQ-p (the conditional in (54))

    2. PPQ-$p \not> $ HNQ-p (consequence of S choosing to use HNQ-p)

    3. $\Box_S \, p \lor \Box_S \, \neg p$ (*modus tollens* & DeMorgan)

The bias that results in line 3 of (59) 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 prejacent 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:

(56)   ⟦Didn't Jane eat⟧ = {$\Box_A$ *that Jane ate*, $\neg\Box_A$ *that Jane ate*}

Suppose S were biased for $\neg p$, in this case, $\Box_S$ *that Jane didn't eat.* If A were to choose the positive answer in (56) ($\Box_A$ *that Jane ate*), then it would convey a clear disagreement between S and A. But if A were to choose the negative answer in (56) ($\neg\Box_A$ *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 ($\neg\Box_A$ *that Jane ate* $\wedge$ $\neg\Box_A$ *that Jane didn't eat*) as well as A's belief in $\neg p$ ($\Box_A$ *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, $\Box_S$ *that Jane ate.* In this case, either answer in (56) will help S to determine how A's beliefs about p relate to S's 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 prejacent p conveys that the speaker S is biased because if S had not been biased, then they should have used the alternative PPQ with prejacent 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 for $\neg p$, 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 prejacent 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: (1) and (3) (see also Bledin & Rawlins's (2020, 45, ex. (7)) demonstration of HNQs as resistance moves). In others, there is no evidence against p: (41) and (42).

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 (41):

(60)   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 prejacent, 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 (60b) 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 (61).

(61)   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 prejacent), while low negation questions do not. From there, there were several novel results of this paper, both empirical and theoretical. First, the empirical:

1. 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 2.2).

2. 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)

3. 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 the 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 prejacent. 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 ($\neg\square_A p$) 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 prejacent 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 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 clearly demonstrate 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 the proposed bias derivation could work with VERUM or 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 is committed to p, A is committed to $\neg q$, B is committed to p, B 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. $C = \{c, c', c'', \dots\}$.[31] 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 commits 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 inverse or 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 p is identical to $C - C^{HNQ}$. The cell of C^{PPQ} in which A commits to $\neg p$ is a proper subset of (asymmetrically entails) the space 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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[31]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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