On Asking and Answering Biased Polar Questions

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Three Conversations in Amsterdam
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Abstract

This dissertation explores how the interpretation of polar questions and answers to them is affected by prosody and negation. Phenomena analyzed include polar questions with polarity focus (prominence on the auxiliary), negative polar questions, *yes*/*no* responses to positive and negative polar questions, and the intonations used in such *yes*/*no* responses.

Chapter 2 examines the phenomenon of prominence shifting to the auxiliary, which is sometimes called *polarity focus* and other times called *verum focus*. The data is drawn primarily from English with connections to German. I argue that in these languages, prominence shifting to the auxiliary is caused by syntactic F-marking of the polarity head. Discourse restrictions on this focus-marking are explained by the general theory of focus marking assumed in work such as Rooth 1985, 1992; Kratzer 1991. I review earlier accounts of such prominence shifts as polarity focus (Richter, 1993; Wilder, 2013; Samko, 2016a), demonstrating challenges they face, and then I address those challenges. I also review accounts that rely on a special VERUM operator, and that claim that the general theory of focus has no role to play in explaining the phenomenon (Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Gutzmann et al., submitted). I demonstrate how apparent evidence for this view is in fact compatible with the more parsimonious account that relies on the general theory of focus and other independently motivated pragmatic principles that together explain the pragmatic effects of polarity focus.

Chapter 3 considers the fact that certain kinds of polar questions imply an *epistemic bias*, i.e., that the speaker has prior beliefs about the correct answer to the question. In particular, questions with preposed negation (high negation questions) and questions with auxiliary prominence (polarity focus questions) give rise to the implication that the speaker believes or expects that the answer with polarity opposite from the polarity of the question is true. Despite the similarity of the bias

inferences that are drawn from these two kinds of questions, I demonstrate that there are empirical asymmetries in their distribution. In particular, the bias in polarity focus questions is context dependent while the bias in high negation questions is context insensitive. Moreover, since polarity focus questions exhibit focus shifting, they require the proper discourse antecedent in order to be licensed. High negation questions do not require discourse antecedents in this way. I develop an account of epistemic bias in polarity focus questions that depends on independently motivated pragmatic principles (Grice, 1989; Stalnaker, 1978; Roberts, 1996/2012), and that predicts subtle facts of the observed context dependency. For high negation questions, I build on the analysis in Krifka 2015, 2017, which follows Ladd 1981 in arguing that high negation is "outside of the proposition" by claiming the preposed negation is not propositional negation, but is a special negation that appears above a speech act operator. This high position of negation enables an explanation of epistemic bias that predicts its context insensitivity, and also explains why high negation cannot license n-words in Spanish.

Chapter 4 explores the fact that English polar particles *yes* and *no* are interchangeable in response to negative sentences, that is, either one can be used to convey both positive and negative responses. A critical discussion of recent research into this phenomenon (Kramer & Rawlins, 2009; Krifka, 2013; Roelofsen & Farkas, 2015; Holmberg, 2016) leads to three questions: Does the intonation produced on *yes* and *no* depend on whether the response is positive or negative, and can intonation affect the interpretation of bare polar particle responses? Which particles do speakers prefer to use when? Are preference patterns sensitive to the polarity of preceding sentences in the context? A series of experiments demonstrate that the contradiction contour (Liberman & Sag, 1974) is an intonation that is commonly produced on positive responses to negative sentences, and that it affects hearers' interpretations of bare particle responses. A new analysis of the contradiction contour that builds on Liberman & Sag's is offered. Beyond intonation, the experimental results add new evidence regarding speakers' preferences for using *yes* and *no* in response to negative polar questions and rising declaratives. Finally, the results suggest that preference patterns are not sensitive to the polarity of context sentences.

Résumé

Cette thèse explore comment l'interprétation des questions polaires et des réponses à celles-ci est affectée par la prosodie et la négation. Les phénomènes analysés incluent des questions polaires avec une focalisation de polarité, des questions polaires négatives, des réponses *yes/no* aux questions polaires positives et négatives, et les intonations utilisées dans un tel *yes/no* réponses.

Le chapitre 1 examine le phénomène de déplacement de la proéminence vers l'auxiliaire, qui est parfois appelé *polarity focus* et d'autres fois appelé *verum focus*. Les données proviennent principalement de l'anglais avec des connexions vers l'allemand. Je soutiens que dans ces langues, la proéminence passant à l'auxiliaire est causée par le marquage F syntaxique de la tête de polarité. Les restrictions de discours sur ce marquage de focalisation sont expliquées par la théorie générale du marquage de focalisation supposée dans le travail comme Rooth 1985, 1992; Kratzer 1991. Je passe en revue les comptes précédents de tels changements de proéminence comme polarity focus (Richter, 1993; Wilder, 2013; Samko, 2016a), en montrant les défis auxquels ils sont confrontés, puis en s'attaquant à ces défis. J'examine aussi les comptes de tels changements de proéminence qui reposent sur un opérateur VERUM spécial, et qui prétendent que la théorie générale du focus n'a aucun rle à jouer dans l'explication du phénomène (Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Gutzmann et al., submitted). Je démontre que la preuve apparente de cette opinion est en fait compatible avec le compte plus parcimonieux qui repose sur la théorie générale de la concentration et d'autres principes pragmatiques motivés indépendamment qui expliquent ensemble les effets pragmatiques de l'orientation de la polarité.

Le chapitre 2 considère le fait que certains types de questions polaires impliquent un *biais épistémique*, c'est-à-dire que le locuteur a des croyances antérieures sur la bonne réponse à la question. En particulier, les questions à négation préposée (questions de haute négation) et les

questions à proéminence auxiliaire (questions de polarité) donnent l'impression que le locuteur croit ou s'attend à ce que la réponse avec la polarité opposée à la polarité de la question soit vraie. Malgré la similitude des inférences de biais tirées de ces deux types de questions, je démontre qu'il existe des asymétries empiriques dans leur distribution. En particulier, le biais dans les questions de polarité est dépendant du contexte tandis que le biais dans les questions à forte négation est insensible au contexte. De plus, étant donné que les questions de polarisation mettent l'accent sur le changement de focalisation, elles nécessitent l'antécédent approprié du discours pour pouvoir obtenir une licence. Les questions de haute négation ne nécessitent pas d'antécédents discursifs de cette manière. Je développe un compte-rendu du biais épistémique dans les questions de polarité qui dépend de principes pragmatiques indépendamment motivés (Grice, 1989; Stalnaker, 1978; Roberts, 1996/2012), et qui prédit des faits subtils de la dépendance au contexte observée. Pour les questions de haute négation, je me base sur l'analyse de Krifka 2015, 2017, qui suit Ladd 1981 en affirmant que la négation haute est "en dehors de la proposition" en affirmant que la négation préposée n'est pas négation propositionnelle, mais est une négation spéciale qui apparat au-dessus d'un opérateur d'acte de langage.Cette haute position de négation permet une explication du biais épistémique qui prédit son insensibilité au contexte, et explique aussi pourquoi la haute négation ne peut pas autoriser les mots n en espagnol.

Le chapitre 3 explore le fait que les particules polaires anglais *yes* et *no* sont interchange-ables en réponse à des phrases négatives, c'est-à-dire que l'une ou l'autre peut être utilisée pour transmettre des réponses positives et négatives. Une discussion critique des recherches récentes sur ce phénomène conduit à trois questions: L'intonation produite sur *yes* et *no* dépend-elle de la réponse positive? ou négatif, et l'intonation peut-elle affecter l'interprétation des réponses de particules polaires nues? Quelles particules les locuteurs préfèrent-ils utiliser quand? Les modèles de préférences sont-ils sensibles à la polarité des phrases précédentes dans le contexte? Une série d'expériences démontre que le contour de contradiction (Liberman & Sag, 1974) est une intona-tion qui est généralement produite sur des réponses positives à des phrases négatives, et qu'elle affecte les interprétations des auditeurs des réponses de particules nues. Une nouvelle analyse

du contour de contradiction basé sur Liberman & Sag est proposée. Au-delà de l'intonation, les résultats expérimentaux ajoutent de nouvelles preuves concernant les préférences des locuteurs pour l'utilisation de *yes* et *no* en réponse à des questions polaires négatives et des déclarations en hausse. Enfin, les résultats suggèrent que les modèles de préférence ne sont pas sensibles à la polarité des phrases contextuelles.

Contents

Acknowledgements

At the beginning of my graduate career, attempting to produce novel research was like being blind and digging in a field full of both buried treasure and mines. I had no idea how to tell the two apart. Sometimes I would return from the field proudly hoisting a hunk of metal, only to hear my advisors cry, "Gah! Mine!" Other times I would be on the verge of chucking out a solid brick of gold, when they would notice and say, "Wait a minute, what are you doing? That's pure gold!" And yet other times, I would think that some gold was surrounded by mines, unreachable, and they would say, "No, no, those aren't mines, just some rocks. Walk right by them and get the gold." Sometimes I was guilty of trying to hide my blindness. Did they know how blind I was? Surely they did. It's hard to miss the blindness of others when you yourself can see. Completing my Ph.D. has meant gaining a modicum of sight. If they hadn't worked so hard to lead me through the field, it's certain that I would have blown myself up long before I ever attained any vision. So I am deeply indebted to each of them, and I say thank you for the gift of sight.

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knowing how language works, just as knowing how to drive a car does not entail knowing how engines function (the simile is imperfect; what makes language more striking than the car is that language's "engine" is entirely in the brain of the "driver"; and yet despite/because of this, we drivers have no clue how the engine functions, even though we use it to drive around all day long). Looking back now, this astounding realization was the crucial first step in my linguistics education. After that, one turns to the study of language prepared to be puzzled by the linguistic facts they already subconsciously know.

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I also found her painting above inspiring in its subject matter. After particularly difficult sessions deep in the weeds of linguistic theory, I would often look at it to remind myself what the real project of this thesis has been: to explain the magic that happens when two people lean their heads together, perhaps at a crowded bar in Amsterdam, and ask and answer each other's questions.

Preface

The chapters of this thesis were written as separate manuscripts, to be published separately. I am the sole author of chapter 2 and chapter 3. Chapter 4 was co-authored with Michael Wagner and is published in *Glossa* (Goodhue & Wagner, 2018).

Chapter 2 examines previous attempts to account for polarity focus within the broader theory of focus, identifies challenges that earlier proposals face, and then addresses those challenges. It also argues that a focus account of polarity focus is preferable to an operator account.

Chapter 3 demonstrates that separate accounts are needed for the kinds of bias conveyed by polarity focus questions, high negation questions, and low negation questions. It offers new accounts of epistemic bias in polarity focus questions and high negation questions. It also provides new evidence for the structure of high negation questions. Evidence for Spanish polar questions with *tampoco* was developed in collaboration with Luis Alonso-Ovalle.

Chapter 4 examines and improves upon accounts of polar particles and the contradiction contour, and then presents the results of six experiments that explore polar particle responses and the intonations with which they are produced. It is coauthored with Michael Wagner. The original germ of the idea for the study was my own, however the project has been several years in the making, and Dr. Wagner and I collaborated on every step. We each contributed many ideas, and many ideas were born in discussion between us. We also both contributed to the experimental design and to statistical data analysis.

Chapter 1

Introduction

This thesis investigates aspects of the syntax, semantics, pragmatics, and prosody of biased polar questions and responses to them. I present empirical evidence that polarity focus questions are distinct from high negation questions, which are in turn distinct from low negation questions. This evidence suggests that different theories of each of these phenomena are required. I then present the results of several experiments that investigate the behavior of polar particles in response to positive and negative polar questions. Several of these experiments also collect information on the intonations that speakers use in such responses, and how hearers interpret both the intonations and the polar particles themselves.

The thesis is comprised of three separate articles:

- Chapter 2: Polarity focus, verum focus, and the theory of focus. This chapter examines previous attempts to account for polarity focus within the broader theory of focus, and carries this project forward by addressing open questions.

- Chapter 3: Epistemic bias in polar questions. This chapter argues that separate accounts are needed for the kinds of bias conveyed by polarity focus questions, high negation questions, and low negation questions, and develops accounts for the first two.

- Chapter 4: Intonation, *yes* and *no*. This chapter examines and improves upon accounts of polar particles and the contradiction contour, and then presents the results of six experiments

that explore polar particle responses and the intonations with which they are produced. It is coauthored with Michael Wagner.

1.1 Chapter 2: Polarity focus, verum focus, and the theory of focus

Utterances like (1) exhibit what I will call *polarity focus*.

(1)   A: Did you buy yogurt?
        B: I DID buy yogurt.

Note that polarity focus cannot be used out of the blue. That is, the felicity of (1)B seems to depend at least in part on the presence of A's polar question, which provides an antecedent for the prominence shift. Second, polarity focus utterances such as B's have been claimed to emphasize the truth of the proposition that B is asserting.

I claim that polarity focus in English is prominence shifting to the auxiliary which indicates F-marking on the polarity head of the sentence. While many researchers seem to assume that polarity focus exists, there have been only a few attempts to assimilate the phenomenon to contemporary theories of focus marking (e.g. Wilder, 2013; Samko, 2016a).

On the other hand, there is a strand of research beginning with Höhle (1992) that refers to the phenomenon as *verum focus*, and claims that the prominence shift contributes an operator at LF with a special semantics that explains both the distribution of verum focus and its effect on interpretation (e.g. Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Repp, 2013).

Romero & Han (2004) observe that both polarity focus questions and high negation questions convey epistemic bias, which means that the speaker has a previous belief that the answer with opposite polarity from the question is true. For example:

(2)   A: Ok, now that Stephan has come, we are all here. Let's go!

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B: Isn't JANE coming?

⤳ B previously believed that Jane is coming   (Romero & Han, 2004, 610)

(3)   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

They seek to explain this common bias by arguing that both kinds of questions introduce a VERUM operator at LF, which is responsible in part for epistemic bias. Many researchers since have at least assumed that there is some connection between polarity focus, high negation, and epistemic bias, even if their research has only focused on a subset of these phenomena (Gutzmann & Castroviejo Miró, 2011; Repp, 2013; Frana & Rawlins, 2015; Romero, 2015; AnderBois, 2016; Samko, 2016a).

In this chapter, I argue that the simplest account of polarity focus is one that assimilates it to the broader theory of focus. I review the accounts of Richter (1993), Wilder (2013), and Samko (2016a), and demonstrate challenges for each. Then I build on them to meet these challenges. I couch the account in the framework of Rooth's (1992) theory of focus, which I use to explain the distributional restrictions of polarity focus. Then I offer a pragmatic explanation of why polarity focus intuitively emphasizes the truth of the proposition it appears in. In a nutshell, the information structure of polarity focus utterances draws explicit attention to the opposing alternative to the polarity focus utterance. The polarity focus utterance entails the falsity of this alternative. Since the interlocutors are explicitly attending to this false alternative, the truth of the uttered alternative is emphasized.

I compare the account I develop to the operator accounts in Romero & Han 2004 and Gutzmann & Castroviejo Miró 2011; Gutzmann et al. submitted, demonstrating various shortcomings of the operator account approach. I argue that an account of polarity focus within the theory of focus is more parsimonious.

Finally, I demonstrate a remaining puzzle for the theory of focus that polarity focus raises, and suggest that it should be solved by allowing focus and givenness deaccenting to be separate

mechanisms in grammar.

1.2   Chapter 3: Epistemic bias in polar questions

The polar questions in (4) all ask roughly the same question, whether or not Moira is here, but they also all convey different shades of meaning.

(4)   a.   Is Moira here?
      b.   Is Moira not here?
      c.   Isn't Moira here?
      d.   IS Moira here?

(4b) seems to require contextual evidence in favor of $\neg p$. (4c) conveys that the speaker has a previous belief or expectation that p is true. (4d) seems to convey the opposite bias, an expectation that $\neg p$ is true. The question is, how should we account for these differences in meaning? There is fairly wide spread agreement in the literature that the kind of bias conveyed by (4b) is empirically distinct from the bias conveyed by (4c) and (4d). Since (4b) requires contextual evidence for the negative answer, the speaker who uses it seems to convey that the negative answer is likely. We could call this *evidential bias*, following Sudo (2013). Note that the evidential bias is toward the answer that has the same polarity as the question itself, assuming the question in (4b) has negative polarity.

Both (4c) and (4d) can also be used in contexts in which there is evidential bias in favor of the answer with the same polarity as the question, thus for $\neg p$ and p respectively (assuming for the moment that (4c) has negative polarity, an assumption I will ultimately reject below). However, as mentioned above, both (4c) and (4d) convey another bias that corresponds to a previous, potentially private, belief that the answer with opposite polarity is true or expected, p and $\neg p$ respectively. This bias has been referred to as *epistemic bias* since Romero & Han (2004). Evidential bias and epistemic bias have generally been taken to have different sources and to require separate explanations, and I follow received wisdom on this point.

After distinguishing the two kinds of bias, I focus solely on epistemic bias in high negation questions like (4c) and polarity focus questions like (4d) in this chapter. Romero & Han (2004) are the first to have identified the similarity between the biases arising from these two types of questions, and they seek to explain them with a single unified theory. Several authors since have either built on this account or at least accepted the claim that there is some important connection between these two phenomena, even if they only focus on one or the other of them (Gutzmann & Castroviejo Miró, 2011; Repp, 2013; Frana & Rawlins, 2015; Romero, 2015; AnderBois, 2016; Samko, 2016a).

I identify two empirical asymmetries between high negation questions and polarity focus questions. The first is already explored in chapter 2. Polarity focus, being a focus phenomenon, requires a certain kind of antecedent in order to be licensed. High negation does not.

(5)   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?

(5a) is a felicitous example of a high negation question from Romero & Han 2004. (5b) demonstrates that prominence cannot be shifted to the auxiliary in this context. The proper antecedent for such a focus shift is missing.

The second empirical asymmetry is that polarity focus questions do not necessarily require the speaker to be epistemically biased, while high negation questions do. For example:

(6)   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 believes she isn't a member
      b.   B: # ISN'T she a member?
           ⤳ B believes she is a member

The context of (19) stipulates that B has no prior beliefs or opinions about whether Jill is a member. Keeping this fact in mind, we find that the polarity focus question in (6a) is felicitous and does not convey a bias, while the high negation question in (6b) is infelicitous, and the infelicity is due to the fact that B is not supposed to be biased, but the question conveys that she is.

I argue that accounts of these two kinds of questions have to account for these asymmetries. The first asymmetry is already explained by assuming that polarity focus is a focus phenomenon while high negation is not. I explain the second asymmetry in this chapter by developing a context sensitive account of the bias in polarity focus questions using general pragmatic principles governing conversation.

High negation questions on the other hand must give rise to epistemic bias as a direct consequence of their syntax and semantics. Therefore, in order to develop an account of bias in these questions, we need to know exactly how they are constructed. It has been claimed since Ladd 1981 that high negation questions are ambiguous between an inner negation reading and an outer negation reading. The readings are supposed to be brought out by the use of PPI *too* and NPI *either*. Since *either* is a strong NPI, it requires a propositional negation in the prejacent of the question to license it. However, the intuitions about whether high negation questions with *either* are even acceptable have been disputed. Sailor (2013) demonstrates experimentally that American English speakers find such questions severely degraded.

In an effort to settle this issue, I use several different kinds of tests to present new evidence that high negation questions do not contain propositional negation. For example, presuppositions project out of questions. If a question contains propositional negation, and the presuppositional operator scopes over the entire prejacent of the question, then the presupposition that projects out should contain a propositional negation. Consider, for example, the presuppositional operator *again*:

(7)   B knows that A's student Danielle did not do the first assignment this semester, and that A is worried about her. B also knows that 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?

B's low negation question in (7b) is clearly felicitous in the context and presupposes that Danielle did not do an assignment before. (7a) conveys the opposite presupposition, that she did the assignment before. Since this presupposition is not met in the context, the utterance is clearly infelicitous. If high negation questions had a reading in which the morpheme *n't* is interpreted low, as a propositional negation, then (7c) should have a reading identical to (7b), but it does not. Instead, it clearly patterns with (7a).

At the very least, evidence like that in (7) shows that *again* cannot scope above high negation. Using it in conjunction with other evidence, I argue that high negation questions do not contain propositional negation. Krifka's (2017) account of high negation questions explains this fact, while also giving a negation-like role to high negation by analyzing it as denegation of a speech act. Building on this structure of high negation questions, I develop an account of epistemic bias.

1.3   Chapter 4: Intonation, *yes* and *no*

The use of polar particles *yes* and *no* is affected by whether the polar question they answer is positive or negative. For example:

(8)   A: Is Jane coming?

    a.   B: Yes, she is.

    b.   B: #No, she is.

    c.   B: #Yes, she isn't.

    d.   B: No, she isn't.

In response to a positive polar question like in (8), if B means to say that Jane is coming, she uses *yes*, not *no*. If she means to answer that Jane isn't coming, she uses *no*, not *yes*. But consider responses to a low negation polar question:

(9)　　　A: Is Jane not coming?

　　　a.　B: Yes, she is.
　　　b.　B: No, she is.
　　　c.　B: Yes, she isn't.
　　　d.　B: No, she isn't.

There are some nuances in the intuitions that are explored in the experimental results reported in this chapter, but it is clear that (8b) and (8c) contrast with (9b) and (9c) in that the latter are much more acceptable.

In this chapter, we explore recent theories of polar particle responses (Kramer & Rawlins, 2009; Holmberg, 2013, 2016; Krifka, 2013; Roelofsen & Farkas, 2015). We distill these accounts down to their explanations for the interchangeability of polar particles in response to negative sentences and compare them. Then we introduce new data and claim that the best explanation takes some insights from each of these accounts.

In the second half of the paper, we report on six experiments probing the following questions:

1. **Intonation**: Does a special intonation appear on positive *yes/no* responses to negative PQs, as claimed in previous studies? If so, how does it affect the interpretation of bare particles?

2. **Preference patterns**: When responding to a negative sentence, which particles do speakers prefer to use when giving a response with negative polarity? With positive polarity? How are bare polar particle responses to negative sentences interpreted?

3. **Context sensitivity**: If the negative sentence that the polar particle responds to is itself responding to a negative sentence, are preference patterns affected, and in particular is *yes* now more acceptably interpreted as a negative response, e.g. "she didn't"?

Question 1 reflects the fact that all researchers who have worked on polar particles have claimed that the intonation of a response would likely affect its interpretation and felicity. However, there hasn't been agreement on how intonation might affect interpretation, or which intonations are relevant. We report on three production experiments in which participants are recorded producing

polar particle responses. The recordings were then annotated for intonation. We also report on a perception experiment testing how the interpretation of bare particle responses is affected by intonation.

Our experimental results reveal the importance of one particular intonation in such responses, the contradiction contour. We examine this intonation closely, and develop a new account of its semantics that builds on Liberman & Sag 1974. We then show how this account can be used to explain our results. In particular, we claim that the contradiction contour requires the presence of contextual evidence against the proposition that the contour appears with.

Consider the following dialogue which is one of the stimuli from the perception experiment:

(10)   **Context**: Taylor and Mark are coworkers. Their boss is giving a presentation at 4 pm that they are both supposed to attend. Mark is running a bit late, and on his way to the presentation at 4:05, he notices Taylor is on the phone and hasn't gone to the presentation yet either. The following dialogue ensues:
Mark [Heard through headphones]: Are you not coming to the presentation?
Taylor [Heard through headphones]: Yes

Participants listened to dialogues like this. The polar particle response was varied between *yes* and *no*, and between contradiction contour and declarative falling intonation. The key intonational result is that the contradiction contour drastically increased the likelihood that the participant would interpret the response as conveying a positive sentence, in this case *I am coming to the presentation*. This result is expected given the meaning for the contradiction contour that we provide. The contradiction contour requires evidence against the proposition that it appears with. The negative polar question conveys that there is evidence for the negative answer *I am not coming to the presentation*. Since this is the most obvious evidence for the contradiction contour to be reacting to, the polar particle is interpreted as meaning the positive answer.

The experimental results also demonstrate the interchangeability of polar particles in response to negative questions, while adding some nuance. In particular, when producing polar particle responses, participants find using both *yes* and *no* to convey a positive response highly natural. However, when interpreting bare polar particle responses, participants are more likely to inter-

pret *yes* as conveying a positive response than *no*. The first result is predicted by Roelofsen &
Farkas (2015) but not Krifka (2013), while the second result is predicted by Krifka (2013) and not
Roelofsen & Farkas (2015). This clash of results and predictions is interesting and unexpected.
It suggests that we may need different theories for the naturalness of responses as judged by the
producers, and for the interpretation of responses by the listeners. At present, no theory makes
such fine-grained predictions.

Chapter 2

Polarity focus, verum focus, and the theory of focus

2.1 Introduction

The other day, I came home from a trip to the grocery store, and the following exchange ensued between my wife and me.[1]

(1)   A: Did you buy yogurt?
        B: I DID buy yogurt.

In my response I shifted focus prominence to the auxiliary. There had been no preceding discussion about buying yogurt, not even before I went to the store. The buying of yogurt is not a contentious issue in our household, or something that I forget to do on a regular basis. Nor was there discussion about not buying something else just before the dialogue in (1) took place. Thus I don't think my use of the prominence shift can be explained as settling some prior dispute about getting yogurt, nor can it be taken as contrasting with an overt negation in the context. Instead, it feels like a

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[1]Capital letters indicate the word that bears the nuclear, or final, pitch accent, except in a few rare cases where the sentence contains two pitch accents, each corresponding to a separate F-marker. In such cases, both words will be capitalized though only the second word bears the nuclear pitch accent.

perfectly normal way of using focus in response to a question—an instance of what is sometimes called "answer focus" or "information focus". Compare it to a more typical example of answer focus:

(2)   A: Who bought yogurt?
        B: IVY bought yogurt.

In (2), focus prominence is shifted to the subject *Ivy*, the constituent that corresponds to the position of the WH-word *who* in A's question.

    Another "kind" of focus discussed frequently in the literature is so-called "contrastive focus". A typical example:[2]

(3)   A: Ivy bought yogurt.
        B: No, DINAH bought yogurt.

Focus on the auxiliary can be used in a similar way.

(4)   A: Dinah bought yogurt.
        B: No, she DIDN'T buy yogurt.

(5)   A: Dinah didn't buy yogurt.
        B: No, she DID buy yogurt.

    In light of such examples, it seems obvious that the focus prominence on the auxiliary in these examples indicates *polarity focus*,[3] which can be explained by theories of focus that are designed

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[2](3) and (4) might be referred to more narrowly as "corrective focus", which could be seen as a subtype of contrastive focus. Focus can be used contrastively without being used correctively:

(i)   Jane saw DINAH, and then she talked to IVY.

Polarity focus can be used this way too.

(ii)   I DON'T like FAKE syrup, but I DO like REAL syrup.

[3]In fact, sometimes prominence on the auxiliary indicates focus on something other than polarity, such as tense.

to explain focus shifting more generally (e.g. Rooth, 1985, 1992; Kratzer, 1991; Schwarzschild, 1999; Büring, 2016). This is exactly what I will argue. In particular, I will claim that there is an abstract syntactic polarity head (following Laka, 1990, a.o.) that can be F-marked (Jackendoff, 1972; Rooth, 1992), leading to prosodic prominence being shifted to the auxiliary or negation. Such utterances are only felicitous in certain contexts, thanks to antecedence requirements imposed by a focus presupposition (Rooth, 1992).

Despite that the account I just outlined might seem obvious to those familiar with theories of focus, there are at least three complications that merit deeper exploration. The first is that there are some idiosyncrasies that at first glance make polarity focus look different from run of the mill examples of focus, and that may make one wonder if polarity focus is somehow special (in fact, some researchers have argued that it is; more on that in a moment). In particular, polarity focus seems to be optional in at least some cases, for example in response to polar questions, whereas other kinds of answer focus seem to be obligatory. Moreover, polarity focus seems to impart special emphasis on the truth of the proposition it appears with in assertions, which is why some have called the phenomenon *verum focus*. Researchers who have offered previous accounts of polarity focus in terms of focus semantics (Richter, 1993; Wilder, 2013; Samko, 2016a) have not dealt with these idiosyncrasies or have not offered fully explicit integrations of polarity focus with theories of focus semantics (discussed in section 2.2). One of my goals here is to offer a complete theory of polarity focus as focus that deals with these issues (section 2.3).

The second complication, already hinted at in the last paragraph, is that there is a semantics literature on verum focus that claims that verum focus is not focus at all, but instead introduces a special operator at LF (Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Repp, 2013; Gutzmann et al., submitted). On this view, verum/polarity focus is unique among prominence shifts, and does not fit in with an otherwise unified theory of the semantic and pragmatic effects

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(i)   A: Dinah is buying yogurt.

      a.   B: No, she WAS buying yogurt.
      b.   B: No, she (already) DID buy yogurt.

In the following, we will restrict our attention only to instances of polarity focus.

of focus prominence shifting. I will argue that these accounts are dispreferred on the basis of theoretical parsimony, and more importantly because they make incorrect predictions (section 2.4).

The third complication comes from the novel observation that a straightforward application of alternative semantics makes incorrect predictions for one class of examples. This puzzle touches on the relationship between focus marking and givenness marking. I will argue that polarity focus provides an argument in favor of the claim that focus and givenness are distinct features of the grammar, that is a theory of focus marking cannot completely account for givenness deaccenting and vice versa (section 2.5).

Before continuing, a note on terminology: Many of the authors of the research I discuss use the term *verum focus*. Some of them claim that verum focus is the same as polarity focus, others claim that it isn't. My claim is that there is only one empirical phenomenon under discussion, which I will call *polarity focus* and abbreviate as PF.[4] I'll only use the term *verum focus* when discussing the work of authors who use that term to the exclusion of *polarity focus*, and sometimes I will write *verum/polarity focus*. "VERUM" will only be used to refer to operators proposed in some theories. In general, I disprefer the term *verum focus* because it takes its name from PF's so-called "emphasis on truth", which I will demonstrate in section 2.3 is a secondary pragmatic effect of using PF. I take the core of the phenomenon to be focus marking on polarity heads.

2.2   Previous accounts of polarity focus as focus

In the following, I will review both the empirical observations and the theoretical proposals of Richter (1993); Wilder (2013); Samko (2016a). In each subsection I will point out crucial insights and limitations of these theories, and I will also add further empirical observations.

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[4]However, some researchers (see especially Romero & Han, 2004) group polarity focus together with other phenomena such as high negation in questions and the adverb *really*. I will discuss these below, but I take verum/polarity focus to only be about prominence shifting to auxiliaries and negation.

2.2.1 Richter 1993

Höhle (1992) introduced the term *verum focus* when discussing German sentences in which the nuclear pitch accent appears on auxiliaries, verbs and complementizers. Höhle is primarily concerned with the syntax of such sentences, but he observes that they seem to have the intuitive semantic/pragmatic effect of emphasizing the truth value of the sentence (hence the name *verum*). In unpublished work, Richter (1993) makes one of the first attempts to analyze verum/polarity focus in terms of contemporary theories of focus semantics. Richter confines his attention entirely to German; observations about English are my own.

The initial observation comes from German sentences such as (6).

(6)   Karl SCHREIBT ein Buch
            Karl writes   a   book
            "Karl is writing a book."   (Richter, 1993, 2)

(6) could be used in at least two different contexts. In one, the content of the verb *schreibt* is contrasted with that of another contextually salient verb, such as *lesen*, the German verb for *read*. (6) can also be used in a context in which a dispute over whether or not Karl is writing a book is salient. For example, A claims Karl is writing a book, B claims he isn't, and then A replies with (6). This latter use exhibits polarity focus. In English, the two different contexts elicit different prominence patterns, (7a) for PF and (7b) for focus on the content of the verb.

(7)   a.   Carla IS writing a book
            b.   Carla is WRITING a book

A sentence with past tense demonstrates that epenthetical *do* appears and bears prominence in a polarity focus context, as in (8a). *Do* does not appear in a context appropriate for contrastive focus on the verb, as in (8b).

(8)   a.   Carla DID write a book
            b.   Carla WROTE a book

In German, if an auxiliary is present for independent reasons (such as past tense), the auxiliary has to be stressed for a PF interpretation, as in (9a). Stressing the verb in sentence final position only leads to contrastive focus on the verb, as in (9b).

(9)   a.   Ich HABE einen Roman geschrieben
                I   have   a   novel   written
                "I HAVE written a novel."
    b.   Ich habe einen Roman GESCHRIEBEN
                I   have a   novel   written
                "I have WRITTEN a novel."   (Richter, 1993, 3)

So polarity focus in English has to appear on auxiliaries, and even relies on epenthetical *do* when no auxiliary is present. In German, it can appear on the main verb, but only if it is in V2 position. That such asymmetries exist is unsurprising given that English and German have different clause structures. What is noteworthy is that PF prominence seems to have to appear high in the structure. This already points to an analysis of polarity focus in which some constituent high in the structure is focussed or *F-marked* (Jackendoff, 1972).

As with other kinds of focus prominence shifting (see e.g. Rooth, 1992; Schwarzschild, 1999; Büring, 2016), PF prominence shifted utterances cannot be used "out of the blue". Default prominence in these languages, which is to say the prominence used when uttering a sentence without prior context related to that sentence, is to place the nuclear pitch accent on the final open class element, such as *Buch* or *book*.[5] Richter observes that polarity focus seems to require the propositional content of the utterance to be previously given in the context. For example as described above, in order for (6) to have a PF interpretation, the speaker has to be in the midst of an argument

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[5]Default prominence placement is more complex than this. In particular, every syntactic phrase has to contain a pitch accent on an open class element, and there is some optionality about where to place pitch accents before the nuclear pitch accent. The nuclear pitch accent is generally utterance final in English. However, since German is head final, default prominence often appears non-finally. For example, default prominence for (9) is:

(i)   Ich habe einen ROMAN geschrieben

See Büring 2016, sec. 1.2 for more details. In this paper, default prominence in English examples will almost always have an utterance final nuclear pitch accent.

over whether Karl is writing a book or not. In such a context, the propositional content *that Karl is writing a book* will be given. By *given in the context* I mean explicitly mentioned or otherwise contextually salient. As we will see, explaining precisely how polarity focus is licensed by contextual antecedents is a thorny issue.

The antecedent requirements that PF places on the discourse context are further demonstrated by the English examples in (10) (Richter provides similar examples in German). The object, verb and subject have to be given, and it seems that arguments cannot be modified:

(10) a. A: I think Carla is writing a letter.
     B: # Carla IS writing a book.
   b. A: I think Carla is reading a book.
     B: # Carla IS writing a book.
   c. A: I think Carla is reading a book.
     B: # Jane IS reading a book.
   d. A: I think Carla is reading a book.
     B: # Carla IS reading a book by Neal Stephenson.

In a moment, I will demonstrate that the givenness requirements of PF extend to negation. But first, it is important to note that in German, the complementizer *dass* can bear prominence in order to indicate that the clause it embeds has PF as in (11b):

(11) a. A: Ich hoffe, Karl schreibt nicht etwa ein Buch
      I   hope Karl writes   not   about a   book
     "I hope that Karl isn't writing a book."
   b. B: Anna sagte mir, DASS er nicht an einem Buch schreibt
      Anna says me that   he not   at a   book writes
     "Anna told me that he ISN'T writing a book."   (Richter, 1993, 8)

Now consider (12), in which A's antecedent utterance does not contain negation *nicht*, but both of B's PF utterances in (12a) and (12b) do.

(12) A: Ich hoffe, Karl schreibt endlich ein Buch
    I   hope Karl writes   finally   a   book
    "I hope that Karl is finally writing a book."

a.   B: Aber Anna sagt, er SCHREIBT nicht an einem Buch.
         but   Anna says he writes   not   at a   book
         "But Anna says that he ISN'T writing a book."
b.   B: # Aber Anna sagt, DASS er nicht an einem Buch schreibt.
         but   Anna says that   he not   at a   book writes
         "But Anna says that he ISN'T writing a book."   (Richter, 1993, 7)

Richter claims that the reason that (12a) is felicitous while (12b) is not is that negation *nicht* takes

scope above the constituent bearing PF prominence *schreibt* in (12a), but that in (12b), *nicht* cannot

take scope over the PF bearing constituent *dass*. As Richter puts it, there is a negation "in the scope

of the PF" in (12b) that is not given, while everything "in the scope of PF" in (12a) is given.

   I believe that the following examples demonstrate the same basic effect in English.[6]

(13)   A: I think that Dinah likes Ivy.
         a.   B: She does NOT like Ivy.
         b.   B: # She DOES not like Ivy.

The observation is that PF prominence can land on the negation *not* itself, as in (13a), but it cannot

appear on the auxiliary above *not* in (13b). That this is because *not* is not given in A's utterance,

and not because there is something else wrong with the pattern in (13b) can be seen by the fact that

it is perfectly felicitous in the context of the correct antecedent in (14).

(14)   A: I think that Dinah does not like Ivy.
         B: She DOES not like Ivy.

   So there are two semantic/pragmatic effects of polarity focus to be explained. First, we have

seen evidence that polarity focus cannot be used out of the blue, but instead requires a particular

context in order to be felicitous. Second, Höhle (1992) claims that polarity focus emphasizes the

truth of the proposition it appears with. However, regarding this second effect, Richter (1993) notes

that PF can appear in questions, in which case, he claims the semantic effect is that the question

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[6]PF cannot be represented on the complementizer *that* in English. Moreover, I abstract away from embedding
entirely, as it seems unnecessary to make the point in English.

asks for an unequivocal answer.

(15)   HAT er das Buch jetzt gelesen?
         has   he the book now read
         "DID he read the book?"   (Richter, 1993, 4)

English questions can also have prominence on the auxiliary, as in the translation in (15).[7]

Richter attempts to account for the antecedent requirements of PF by applying a tripartite structure which contains an operator, a domain restriction and a scope, following Partee (1991) and Krifka (1991). The claim is that the illocutionary speech act operator (e.g. ASSERT or RE-QUEST) plays the role of operator, and the topic or background of PF is the domain restriction. PF signals that the entire proposition is backgrounded (given), which explains its distributional restrictions in discourse.

The remaining question is, what is the scope, i.e. what new information does a PF utterance provide? Richter's answer to this question is meant to explain the second fact about PF, that it emphasizes the proposition. He writes, "...the proposition of a sentence with verum focus, which is basically also its topic, is not merely confirmed but especially emphasized by expressing the opinion that it is false to confirm its negation" (Richter, 1993, 18). Thus the new information conveyed by a PF utterance of p is that $\neg p$ is false. Of course, if a speaker asserts p, that $\neg p$ is false is entailed, so on the face of it there is no distinction between this analysis of PF and a regular assertion of p, except that normally implicit inferences are turned into an explicit part of the semantics. Richter is not alone in facing this issue. Other attempts to create an explicit (non-focus based) semantics for verum/polarity focus tend to have similar issues, the reason being that the object of study is a special assertion of p that emphasizes what regular assertions of p already

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[7]Romero & Han (2004) note a third empirical fact about polarity focus: Polar questions with polarity focus convey that the speaker is epistemically biased toward the answer with opposite polarity from the prejacent of the question. This effect will be taken up in chapter 3. But to already give the reader a taste of the account, my claim is that polarity focus plays no role in the derivation of epistemic bias in polar questions. Instead, I argue that epistemic bias is derived entirely from independent principles of conversational pragmatics. There is merely an accidental correlation between the sorts of contexts that license PF in polar questions, and the sorts of contexts that trigger epistemic bias in polar questions. Once we understand this, we can manipulate contexts to license PF but not epistemic bias and vice versa.

do: claim that p is true (and thus that $\neg p$ is false).[8]

Nevertheless, Richter's insight into the meaning of polarity focus utterances is not without merit. The key insight is that PF emphasizes the propositional content of an assertion by somehow drawing explicit attention to the falsity of its negation. This is roughly the view I will ultimately take, but the question is, how does this work? I will argue that emphasis is achieved formally through the use of normal focus semantics and run-of-the-mill pragmatic inference.

2.2.2 Wilder 2013

Despite writing that, "It is not my goal to attempt a full-blown theory of verum focus" (Wilder, 2013, 152), Wilder offers a fairly complete analysis of verum focus as polarity focus in terms of Schwarzschild's (1999) theory of givenness. I will demonstrate challenges for this implementation. Wilder's main empirical insight about PF is that it requires a salient focus alternative as antecedent. We start with the insight.

Wilder shows that p can be a presupposition of the conversation and yet still bear PF:

(16)   A: If only Sue hadn't left her husband.
        B: I was surprised that she DID leave her husband.   (Wilder, 2013, 153)

While p is clearly presupposed by A and B, B's utterance still clearly has the hallmarks of PF: It requires a certain discourse antecedent, and it emphasizes p in distinction to $\neg p$. To paraphrase Wilder, B's utterance conveys contrast between B's expectation that Sue wouldn't leave her husband and the fact that she did, which causes B's surprise.

Building on this observation, Wilder (2013, 154) further observes that an antecedent utterance containing p cannot, by itself, license a PF utterance with content p. That is, while Richter demonstrated that PF requires each constituent of p to be given, the following examples demonstrate that

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[8]See e.g. Romero & Han 2004 whose semantics for verum/polarity focus is (roughly) that the speaker is sure that p should become common ground, or Gutzmann & Castroviejo Miró 2011 whose semantics says that the speaker wants to settle the question $?p$ with p. It's not clear that normal assertions of p do not already have these meanings (whether in the semantics or via pragmatic inference). These accounts will be discussed in more detail in section 2.4.

p being given is not enough to license a PF utterance p_{PF}. Instead, p_{PF} seems to require $\neg p$ or $?p$ as antecedent. First, consider the dialogue without any context. Then we will add contexts to demonstrate the effect.

(17)   A: I'm glad that Sue is writing a book.

    a.   B: So she IS writing a book.

    b.   B: So she is WRITING a book.   (based on Wilder, 2013, 154)

(17) is reminiscent of examples (6) and (7). (17a) conveys PF while (17b) conveys contrast with an alternative to the lexical content of the verb, such as *reading*. But this example is different in that the entire content of p, *that Sue is writing a book*, is given in A's utterance. This fact matters when we consider two different licensing contexts for (17):

(18)   B has been wondering if Sue is writing a book. She often catches her scribbling away, but when she asks Sue, Sue denies it. Then A says, "I'm glad that Sue is writing a book."

    a.   B: So she IS writing a book.

    b.   B: # So she is WRITING a book.

(19)   B expected to see Sue at the party this evening, but she isn't there. She asks C why, and C says that it's because Sue is busy reading a book. Later, A says, "I'm glad that Sue is writing a book."

    a.   B: # So she IS writing a book.

    b.   B: So she is WRITING a book.

(18) sets up the proper context for PF, while (19) sets up the proper context for contrastive focus on the verb. What's interesting is that (19) is able to render (19a) infelicitous. After all, all of the propositional content of the PF utterance is given by A in (19). Consider for example that PF can be used to emphasize agreement:

(20)   A: Sue is writing a book.
        B: (That's true) She IS writing a book.

21

On the basis of examples like (20) alone, one might think that PF merely requires p to be given. (17)-(19) demonstrate clearly that this isn't so. PF seems to require either $\neg p$ or at least the question $?p$ to have been previously salient. This is further demonstrated with the following examples, which have double prominence on the subject and the polarity head.

(21) a. Bill doesn't have a lot of patients, but ...
            (i)   MARY DOES have a lot of patients.
      b. Bill has a lot of patients, and ...
            (i)   #MARY DOES have a lot of patients (TOO).
            (ii) MARY has a lot of patients.   (Wilder, 2013, 157-158)

Wilder notes that the sentence *MARY DOES have a lot of patients* implies that there is an alternative to Mary who does not have a lot patients. This is because PF requires contrast with the opposing polarity. Thus (21a) is felicitous, while PF has to be dropped when the polarity contrast is not available, as in (21b).

     The point is also made by comparing the following two examples.

(22) A: Yesterday, Jolene pitched the tent. What happened today?
      a. B: Jolene pitched the tent.   (Klassen & Wagner, 2017, 309)
      b. B: # Jolene DID pitch the tent.

(23) A: Yesterday, Jolene didn't pitch the tent. What happened today?
      B: Jolene DID pitch the tent.

The proposition p is entirely given in A's utterance in (22). Building on an insight by Schwarzschild (1999), Klassen & Wagner (2017) demonstrate experimentally that the repetition of p by B receives default prominence, that is, broad focus, as in (22a). I add that, intuitively, (22b) is clearly infelicitous. Compare this with (23), in which A's utterance provides a $\neg p$ antecedent. Here, B's PF utterance is clearly felicitous. Taken together, the preceding examples seem to show that PF requires the focus utterance to contrast with its polarity alternative.

     Wilder makes the following remarks about the analysis of polarity focus:

> [...] the proposition expressed by an emphatic *do* utterance contrasts with its negation, even where the latter is not expressed in the preceding discourse; in other words, [...] emphatic *do* expresses polarity focus.
>
> This in turn suggests that a more complex discourse mechanism is involved in licensing emphatic *do*, beyond the relation between the *do* clause and the antecedent proposition. The proposition expressed by the antecedent utterance is not (necessarily) a focus alternative of the *do*-clause. Rather, the antecedent utterance, together with the rest of the discourse context, evokes a set of alternative propositions $\{p, \neg p\}$, one of which is the proposition expressed by the *do*-clause. This alternative set can be conceived of as corresponding to the meaning of a yes-no question, which the affirmative emphatic *do* assertion answers, eliminating its negative alternative. (Wilder, 2013, 154)

I largely agree with the conclusions Wilder draws from the data, and the basic idea that verum focus is polarity focus. In order to have a semantic account of polarity focus, one has to say what kind of semantic object polarity is. Wilder makes the natural assumption that positive polarity is the identity function, while negative polarity is negation. With these assumptions in hand, Wilder applies Schwarzschild's (1999) theory of GIVENness to model polarity focus. Given that Wilder refers repeatedly to the "focus alternative set" $\{p, \neg p\}$ that is evoked by polarity focus, using the theory in Schwarzschild 1999 is somewhat surprising since focus alternative sets play no role in it. Put otherwise, the theory in Schwarzschild 1999 applied to polarity focus does not follow through on Wilder's insight that PF requires contrast between polarity alternatives. "Contrastive focus" is not a primitive in Schwarzschild 1999, but is dissolved into givenness deaccenting and avoidance of F-marking. This will turn out to be a serious problem. In the following, I review Wilder's application of Schwarzschild 1999 to polarity focus to show precisely why it won't work.

Schwarzschild (1999) proposes the following two constraints to explain F-marking and givenness:

(24)   *GIVENness*
        A constituent that is not F-marked is GIVEN (defined below in (26)).

(25)   *avoidF*
        F-mark as little as possible, without violating GIVENness.

In combination, these constraints require non-F-marked constituents to be GIVEN, and they mini-mize the F-marking of GIVEN constituents. This ensures F-marking only when necessary. These constraints require the following two definitions:

(26)   *GIVEN*
        An utterance U counts as GIVEN iff it has a salient antecedent A such that, modulo $\exists$-type shifting, A entails the Existential F-Closure of U.

(27)   *Existential F-closure*
        Existential F-Closure of U $=_{def}$ The result of replacing F-marked phrases in U with vari-ables and existentially closing the result, modulo $\exists$-type shifting.

To see how these constraints and definitions are applied, consider (28a).

(28)   a.   A: John ate a green apple.
        b.   B: No, he ate a RED apple.

(29)   Existential F-closure of (28b):
        $\exists P$ [John ate a P apple]

(28a) entails (29), so according to (26), the entire utterance in (28b) is GIVEN, even though *red* is F-marked and discourse new. Moreover, all of the subconstituents of (28b) except for the adjective *red* are GIVEN because they are entailed by existentially type-shifted subconstituents of (28a). For example, the existentially type-shifted VP of (28a) is $\exists x$ [x ate a green apple]. This entails the existentially type-shifted VP of (28b), $\exists P \exists y$ [y ate a P apple], thus the VP of (28b) is GIVEN. Thus everything that is not F-marked in (28b) is GIVEN, respecting GIVENness in (24). The only constituent that is F-marked, the adjective *red*, is the only constituent that needs to be F-marked in order to keep from violating GIVENness, in accordance with avoidF in (25).

Wilder applies Schwarzschild's (1999) constraints and definitions above to the polarity focus example in (30).

(30)   A: Dr. Smith doesn't have a lot of patients.

   a.   B: (You're wrong...) He DOES have a lot of patients.   (Wilder, 2013, 156)

(31)   Existential F-closure of (30a):
         $\exists X$ [Dr. Smith X has a lot of patients]

X is a variable ranging over polarity heads. Thus, (31) is equivalent to $p \vee \neg p$, which is a tautology. Since anything entails a tautology, all (26) requires in order for (30a) to be GIVEN is any salient antecedent. This is the case in (30), so (30a) is GIVEN. It seems that PF itself places no restriction on the context besides requiring a salient antecedent of any kind.

Of course, the other subconstituents of the sentence have to be GIVEN as well, so the antecedent in (30) still does some work. That is, if (30a) were uttered in response to "It's a beautiful day!" Wilder's account would predict it to be infelicitous because there would be no antecedent that entails the various subconstituents of (30a). For example, the $\exists$-type shifted VP of (30a), $\exists x$ [x has a lot of patients], would have no antecedent. This isn't a problem in the context of (30) because each existentially type-shifted subconstituent of (30a) is entailed by an existentially type-shifted subconstituent of (30)A. Thus, Wilder claims that (30a) is predicted to be felicitous in the context in (30).

However, I will argue in a moment that (30a) is *not* predicted to be felicitous by the theory that Wilder advances. To get there, I'll start by entertaining the natural worry that Wilder's account of PF has the undesirable effect of overgenerating PF utterances. After all, the existential F-closure of a PF utterance is a tautology, so it requires a much weaker antecedent than other focus utterances such as (28b). I'll show that this is not a problem, but that instead Wilder's application of Schwarzschild 1999 to polarity focus massively *undergenerates* PF utterances.

First, reconsider B's utterance in (17a) in the context in which it is felicitous, (18), and in the context in which it isn't, (19).

(18)   B has been wondering if Sue is writing a book. She often catches her scribbling away, but
         when she asks Sue, Sue denies it. Then A says, "I'm glad that Sue is writing a book."

(17a)B: So she IS writing a book.

(17a) is intuitively felicitous in the context of (18) because B previously thought $\neg p$ was true, or at least had been considering the question $?p$.

(19)   B expected to see Sue at the party this evening, but she isn't there. She asks C why, and C says that it's because Sue is busy reading a book. Later, A says, "I'm glad that Sue is writing a book."
        (17a)B: # So she IS writing a book.

(17a) is intuitively infelicitous in the context of (19) because B was not previously entertaining $\neg p$ or $?p$. But even though the context in (19) does not license PF, note that a subconstituent of A's utterance entails the existential F-closure of (17a) in (32), which is a tautology:

(32)   Existential F-closure of (17a):
        $\exists X$ [so she X is writing a book]

Moreover, subconstituents of A's utterance in (19) entail each of (17a)'s subconstituents. So we might expect (17a) to be incorrectly predicted to be felicitous even when it is in the wrong context, such as (19). This is why we might worry that Wilder's account overgenerates.

However, Wilder's account does not predict (17a) to be felicitous in the context of (19). The reason is that A's utterance entails something much stronger than the F-closure in (32), it entails (17a) itself. Moreover, each $\exists$-type shifted subconstituent of (17a) is entailed by an $\exists$-type shifted subconstituent of A's utterance. Therefore, we say that the PF utterance in (17a) is *all-given*. Schwarzschild (1999, 171ff.) argues that if an all-given constituent must contain an F-marker for independent reasons, then a constraint on head-argument asymmetries requires the argument to bear the pitch accent rather than the head. Schwarzschild also assumes that every utterance bears at least one F-marker, since every utterance has to have some intonation or other. That is, F-markers do not just indicate context-sensitive focus prominence shifts, they also indicate

pitch accent placement in utterances with default prominence.[9] Therefore, if an entire utterance is all-given, then it is an all-given constituent that contains an F-marker. Regardless of where this F-marker is placed, a violation of avoidF in (25) is incurred, so avoidF does not tell us which prosody is preferred. The head-argument asymmetry constraint takes over and forces F-marking to land on the deepest argument rather than the polarity head. Thus Wilder's application of Schwarzschild's theory predicts (17a) in (19) to have broad focus rather than polarity focus.[10]

The worry we should have is that this theory of polarity focus *undergenerates*. That is, in the context (18) that renders (17a) intuitively felicitous, (17a) is all-given by a salient antecedent (A's utterance), and so F-marking on the polarity head should be eschewed in favor of broad focus.

In fact, as far as I can see, Wilder's application of Schwarzschild's theory predicts every positive polarity focus utterance to be infelicitous. The reason is that positive PF utterances are only intuitively felicitous in contexts in which the PF utterance is all-given. For example, reconsider (30) above where a positive PF utterance is used to disagree with a preceding negative utterance:

(30)   A: Dr. Smith doesn't have a lot of patients.

    a.   B: (You're wrong…) He DOES have a lot of patients.   (Wilder, 2013, 156)

The dialogue in (30) is intuitively felicitous, but notice that there is a subconstituent of A's utterance with the meaning of *p*, *that Dr. Smith has a lot of patients*, namely the constituent embedded under negation. Thus, every constituent of B's utterance is GIVEN by a salient antecedent, so the polarity head should not be F-marked. (33), based on examples from Wagner 2012b, provides independent evidence that the constituent embedded under negation in (30)A is indeed available as an antecedent.[11]

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[9]This is different from Rooth 1992, which I will discuss below. In that theory, F-markers (and ∼) are reserved for context-sensitive focus prominence shifts. Utterances with default prominence lack F-markers and ∼s.

[10]This prediction is incorrect as well, since the most natural prosody in the context of (19) is (17b), *So she is WRITING a book*. The problem I am identifying for Schwarzschild 1999 as applied to polarity focus is that the theory incorrectly predicts all all-given utterances to have broad focus. This turns out to not just be a problem for polarity focus, but for any felicitous utterance in which focus prominence is shifted despite that the utterance is all-given.

[11]Further evidence that constituents embedded under negation are available as discourse antecedents can be found in Krifka's (2013; 2017) theory of the interchangeability of English polar particles, which depends crucially on the presence of a discourse referent anchored to propositions embedded under negation. This is discussed in chapter 4.

(33)   A: Dr. Smith doesn't have a lot of patients.
        B: I never CLAIMED that Dr. Smith has a lot of patients.

Wilder's (2013) application of Schwarzschild 1999 to polarity focus incorrectly predicts broad focus in examples like (17a) and (30a). The problem is that by definition a constituent is GIVEN if any antecedent constituent present in the context entails it, and that all-given utterances are always predicted to have broad focus. The theory cannot explain how context manipulations affect the licensing of (17a). Obviously what is needed is a context dependent notion of focus antecedents, and some pressure to signal the presence of those antecedents via a prominence shift instead of using broad focus. Even if his implementation doesn't quite work, I will argue that Wilder's intuition that polarity focus is about contrast between p and $\neg p$ is on the right track.[12]

2.2.3 Samko 2016a

Samko (2016a) proposes to analyze polarity focus as focus on polarity heads using Rooth's (1992) theory of alternative semantics. Rooth (1992) proposes that a presuppositional operator, $\sim$, adjoins to a structure ϕ along with a variable (Γ for sets of semantic objects, or γ for individual objects) that gets its content from a discourse antecedent in the context.[13] Rooth further proposes that in addition to the ordinary semantic value of ϕ, it also have a focus semantic value, written $[\![\phi]\!]^f$. The focus semantic value $[\![\phi]\!]^f$ is calculated by replacing the F-marked constituent within ϕ with other constituents of the same semantic type, producing a set of focus alternatives. The presupposition of $\sim$ requires that this set of focus alternatives stands in a certain relation to the contextually provided content of Γ/γ. In particular, Rooth (1992) provides the following disjunctive presupposition for

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[12]Schwarzschild (1999) does not discuss polarity focus directly. There may be a minimal addendum to the theory that would predict PF to be possible despite the utterance being all-given. However such an addendum may give us good cause to return to the worry that the theory would overgenerate PF utterances. We don't want PF to be obligatory whenever the utterance is all-given, nor do we want PF to be possible whenever the utterance is all-given. We want to restrict PF to exactly the right kind of context, namely contexts like (18) but not (19). It is hard to see how to do this without giving contrastive focus antecedents some status in the theory. The definition of GIVEN in (26) seems ill-equipped for this purpose. I will argue that the theory in Rooth 1992 fares better since the focus antecedent is explicit in the grammatical representation, and broad focus utterances lack F-markers and $\sim$.

[13]$\sim$'s scope is determined by the node it adjoins to, and Rooth demonstrates that it can adjoin to various different nodes. Samko assumes that for polarity focus, $\sim$ always adjoins at a propositional level.

$\sim$.

(34) Rooth's (1992, p. 93) presupposition for $\sim$:

    a. $\phi \sim \Gamma$ presupposes that a contextually given Γ is a subset of the focus semantic value of ϕ ($\Gamma \subseteq \llbracket \phi \rrbracket^f$), and that Γ contains both the ordinary semantic value of ϕ and an element distinct from it.

    b. $\phi \sim \gamma$ presupposes that a contextually given γ is a member of the focus semantic value of ϕ ($\gamma \in \llbracket \phi \rrbracket^f$), and that γ is distinct from the ordinary semantic value of ϕ.

Samko claims that the polarity head can have one of three values, positive, negative, or null. With this assumption in hand, she demonstrates how the individual case presupposition in (34b) can be applied to disagreements such as (30), or the following example.

(35) He claimed that he didn't raise taxes, but, in fact,

    a.   he DID raise taxes [...]   (Samko, 2016a, 120)

Samko does not provide a semantics for polarity heads, however it is obvious enough how to proceed in these cases. The antecedent needs to differ from the PF utterance only at the location of F-marking, which is here positive polarity. The embedded clause *he didn't raise taxes* provides the proper antecedent. In particular, if we assume with Wilder (2013) that positive polarity is the identity function and negative polarity is negation, and that these are alternatives of one another (minimally because they are functions of semantic type $\langle st, st \rangle$, maximally because they are of the same type *and* they are of the same syntactic category, polarity heads), then the antecedent will be a member of the focus semantic value of the PF utterance (35a) that is distinct from its ordinary semantic value, satisfying the presupposition in (34b).

While this approach straightforwardly handles examples like (30) and (35a), Samko considers examples like (36) to be a challenge.

(36) A: [T]hey think they've caught the guy.
    B: They DID catch the guy.   (Samko, 2016a, 120)

The embedded clause of A's utterance *they've caught the guy* seems to have the same polarity as B's PF utterance, thus (34b) cannot be applied. In Samko 2016b, the solution offered is that embedded clauses do not actually have positive polarity, but instead have null polarity. The claim is that only asserted propositions that are not negative are positive, and thus (36)A and (36)B contrast in the relevant way to satisfy (34b).

However, because Samko does not make the semantics of null polarity explicit, it is not clear how to apply (34b). Suppose that null polarity means either that the polarity head is empty, or that there simply is no polarity phrase present at all (this seems to be more or less what Samko intends). Then the embedded clause in A's utterance denotes the proposition p. (34b) requires that the alternative be *semantically* distinct from the ordinary semantic value of B's utterance. Again, we can't be sure what Samko takes the semantics of positive polarity to be, but assuming it is the identity function, then B's utterance has the content of a proposition p. But this is identical to the proposition denoted by the embedded clause of A's utterance, even with null polarity as just defined above. Thus, positive polarity and null polarity do not contrast semantically, and so fail to satisfy (34b).

Samko (2016a, 122) abandons her earlier view for a different reason, namely that it is difficult to determine exactly which propositional constituents are asserted, and taking the position in Samko 2016b would require claiming that polarity is absent in a wide array of sentences. Ultimately, she argues that the antecedent for PF is always a (sometimes implicit) polar question. For example, in (36), A's utterance implicitly raises the QUD *Did they catch the guy?*, which then serves as antecedent to B's PF utterance in (36).

Given that polar questions $?p$ are frequently claimed to denote the set of their answers $\{p, \neg p\}$ (e.g. Hamblin, 1973), one might think that the idea is to use the set case presupposition in (34a). Instead, Samko (2016a) claims that polar questions have null polarity,[14] and she continues

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[14]It's not clear what Samko would say about the polarity of negative polar questions. Holmberg (2016) offers a more complete theory that also assumes that polarity heads can have one of three values, in which questions have null polarity (Holmberg calls it "open" polarity). For Holmberg, low negation polar questions are syntactically ambiguous between negative polarity, and null polarity with a lower constituent negation. Holmberg's motivation for this analysis is to explain the interchangeability of polar particles in response to negative polar questions in English. For summary and criticism of this theory, see chapter 4.

to apply the individual case presupposition: The polar question antecedent is a member of the focus semantic value of the PF utterance, and it is assumed to be distinct from the latter's ordinary semantic value because it has null polarity. As I just argued above, without a semantics for polarity heads, it is impossible to evaluate this claim, and under the most straightforward assumptions, the proposed account still does not work since propositions denoted by sentences that lack polarity do not differ from those denoted by sentences with positive polarity. Thus, the presupposition in (34b) is not met.

In section 2.3, I will explore the idea that a polar question serves as antecedent for polarity focus by satisfying Rooth's set case presupposition in (34a). Though this approach seems attractive at first, I will argue that it has to be abandoned due to an idiosyncrasy of polarity focus: It is optional in response to polar questions.

2.3   Capturing the semantics and pragmatics of polarity focus

Let's recap the empirical facts about polarity focus that the theory should explain. Richter (1993) demonstrates via examples like (10) that PF cannot be used out of the blue, but instead requires the proposition p that it appears in to be given. Wilder (2013) takes us a step further with examples like (17), demonstrating that givenness by itself is not enough. Instead, PF requires the polar question $?p$ to be salient. Wilder seeks to explain this in terms of Schwarzschild's (1999) theory of GIVENness, however we saw that this theory undergenerates because positive PF utterances are always all-given, and the theory predicts all-given utterances to have broad focus. Samko (2016a) also takes polar questions to be the antecedent for PF, and attempts to explain this in terms of Rooth's (1992) individual case presupposition, but the semantics of polarity heads, in particular null polarity, is left implicit, so we are unable to tell how this theory works. Under reasonable assumptions, it doesn't distinguish semantic alternatives. So the first empirical fact to explain about PF is that it requires a salient antecedent, like other kinds of focus prominence shifting. I will explore two theoretical options in section 2.3.1 and section 2.3.2. Along the way, we will

consider a second empirical fact to explain: The use of PF appears to be unexpectedly optional in some cases.

The third empirical fact to explain was first observed by Höhle (1992), and is given attention by Richter (1993), namely that PF utterances seem to emphasize the truth of the proposition p that they appear with. Some researchers such as Romero & Han (2004); Gutzmann & Castroviejo Miró (2011); Gutzmann et al. (submitted) have taken this as evidence that verum/polarity focus cannot be normal focus. However, focus marking can have pragmatic effects, so it is at least worth considering whether this emphasis can be explained as a result of focus marking polarity heads. I will argue that it can in section 2.3.3.

2.3.1 Polar questions as antecedents to PF utterances

I assume with Laka (1990); Roelofsen & Farkas (2015); Holmberg (2016) and others that the polarity of a sentence is encoded in a polarity head, a functional projection which c-commands the TP. The polarity phrase (PolP) can only be headed by either positive polarity ($+$) or negative polarity ($-$).[15] Positive polarity denotes the identity function from propositions to propositions, while negative polarity is negation.

(37)   a. $[\![+]\!] = \lambda p_{st}.\, p$
         b. $[\![-]\!] = \lambda p_{st}.\, \neg p$

As mentioned above (and in agreement with Wilder 2013 and Samko 2016a), I take polarity focus to be F-marking on the polarity head. Consider the dialogue below in which B's PF utterance felicitously answers A's polar question.

(38)   A: Does Dinah like Ivy?

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[15]Laka (1990) argues that PolP (her ΣP) sits just below tense, and that it is headed by either negation, *so* or an affirmative emphasis marker which I would analyze as PF on epenthetical *do*. Holmberg (2016) argues that PolP is the highest projection in the IP domain, and that it can be headed by one of three features, $+$, $-$ or open polarity. I combine these two analyses as follows: I assume PolP is above TP in the IP domain, and I assume that it can be headed by a positive polarity feature $+$ or a negative one $-$.
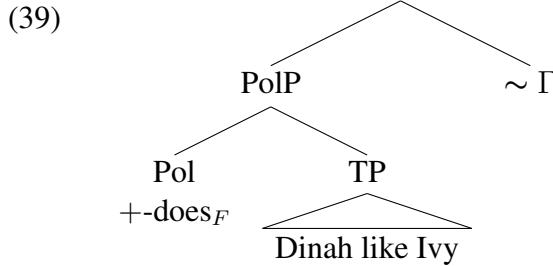
B: Dinah DOES like Ivy.

Suppose that the polar question itself is the antecedent that licenses the PF prominence shift. Following Hamblin (1973), I will assume a classic semantics of polar questions treating them as a set of two propositions, the positive answer and the negative answer, $\{p, \neg p\}$. Therefore, on the assumption that a polar question serves as the antecedent that determines the content of Γ in (34a) (reprinted below), the focus semantic value of B's polarity focus utterance needs to minimally be the set $\{p, \neg p\}$.

(34)   Rooth's (1992, p. 93) presupposition for $\sim$:

a. $\phi \sim \Gamma$ presupposes that a contextually given Γ is a subset of the focus semantic value of ϕ ($\Gamma \subseteq [\![\phi]\!]^f$), and that Γ contains both the ordinary semantic value of ϕ and an element distinct from it.

b. $\phi \sim \gamma$ presupposes that a contextually given γ is a member of the focus semantic value of ϕ ($\gamma \in [\![\phi]\!]^f$), and that γ is distinct from the ordinary semantic value of ϕ.

To explore how this might work, I will use the syntactic structure in (39) to represent (38)B:[16]

(39)

PolP $\sim \Gamma$

Pol   TP
$+$-does$_F$
        Dinah like Ivy

Following Rooth (1985, 1992), I assume that sets of focus alternatives are calculated by replacing the F-marked constituent with a set of objects of the same semantic type restricted by context, and then composing that set with its complement via pointwise function application, and doing further compositions up to the node with $\sim \Gamma$. For the moment, let's assume the set of alternatives to $+$-*does* is the domain of functions from propositions to propositions, $D_{\langle st, st \rangle}$, restricted down to just

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[16] To get linearization right, we need to assume that in the pronounced structure (the *phonetic form* representation), the subject raises to spec-PolP. I assume that at LF the subject reconstructs to its lower position. This will allow structures containing functions from propositions to propositions like negation be interpreted such that the function takes a proposition denoting constituent as complement, e.g. [*not* [ϕ]].

the polarity heads $+$ and $-$.[17] Letting p represent the proposition *that Dinah likes Ivy*, the resulting set of focus alternatives at the PolP node is $\{p, \neg p\}$. This set is identical to the denotation of A's polar question, and thus the presupposition in (34a) is met and (38) is predicted to be felicitous. This is how Rooth's (1992) set case presupposition in (34a) can be applied to polarity focus.

The problem for this tempting view that the antecedent for PF is always a corresponding polar question whether explicit or implicit (as argued in both Wilder 2013 and Samko 2016a), is that there is an unexpected asymmetry between answers to polar questions and WH-questions.

(40)   A: Who likes Ivy?
   a.   B: DINAH likes Ivy.
   b.   B: # Dinah likes Ivy.

In response to a WH-question such as in (40), focus prominence must be shifted to the constituent corresponding to the WH-word in the question. Hence, (40a) is felicitous while (40b) is not. This phenomenon is often referred to as question-answer congruence. One explanation for it in the literature (e.g. Wagner, 2005, 2006; Sauerland, 2005a) is that prominence shifting induces a presupposition, and Heim's (1991) principle of maximize presupposition in (41) makes the focus marked utterance preferable to the truth-conditionally equivalent but non-focus marked utterance, as long as the focus presupposition is met.

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[17]The claim that the only alternative to $+$ is $-$ and vice versa may require further support. For example, we could ask whether modals might be valid alternatives to polarity heads. See Samko 2016a for an argument that modal focus and polarity focus are distinct.

What *is* clear now is that the set of alternatives to polarity heads cannot include any function of type $\langle st, st \rangle$ imaginable, since many infelicitous dialogues would be predicted to be felicitous. For example:

(i)   A: Who does Dinah like?
       B: # Dinah DOES like Ivy.

B's utterance is clearly infelicitous. But suppose there are only three contextually relevant individuals, *Ivy, Moira* and *Aïda*, so A's question is the set of three propositions representing the three possible answers, $\{$*that Dinah likes* $x \mid x \in \{$*Ivy, Moira, Aïda*$\}\}$. Suppose also that the set of focus alternatives were calculated using the unconstrained set $D_{\langle st,st \rangle}$. This set contains many strange functions not found in natural language, for example, the function f that maps any proposition to the proposition *that Dinah likes Aïda*. Given such strange functions, the set representing A's WH-question would clearly be a subset of the focus semantic value of B's utterance, and thus (34a) would predict this dialogue to be felicitous. So the functions from $D_{\langle st,st \rangle}$ used to calculate the focus alternatives minimally have to be constrained to functions existing in natural language.

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(41)   *Maximize presupposition*:
         Make your contribution presuppose as much as possible!   (Heim, 1991, 28)

For example, by Rooth's set-case presupposition in (34a), (40a) presupposes that the set of propositions representing A's WH-question is a subset of the focus semantic value of (40a). (40b) lacks this presupposition, but otherwise the two utterances are truth-conditionally equivalent. According to more recent presentations of maximize presupposition (e.g. Percus, 2006; Sauerland, 2008), the theory says that if two utterances that are alternatives to one another are truth-conditionally equivalent, one is presuppositionally stronger than the other, and those presuppositions are met, then the presuppositionally stronger alternative must be used. Since (40a)'s presupposition is met in (40), maximize presupposition requires the speaker to use (40a) rather than (40b).[18]

Now consider possible responses to polar questions:

(42)   A: Does he work hard?

         a.   B: Yes.
         b.   B: (Yes,) he does.
         c.   B: (Yes,) he works hard.
         d.   B: ? (Yes,) he DOES work hard.   (Wilder, 2013, 169)

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[18]A's question in (40) could be answered felicitously with other, non-focus-marked utterances such as *I saw Dinah with Ivy at a restaurant last night*. While maximize presupposition correctly predicts (40b) to be infelicitous, doesn't it incorrectly predict such less direct answers to be infelicitous as well? I assume that such answers are not among the competing alternatives for maximize presupposition. One reason is that this answer is not truth-conditionally equivalent to those in (40), as is usually required for maximize presupposition alternatives (e.g. Percus, 2006). Thanks to Alan Bale (p.c.) for discussion on this point.

More generally, I assume a restricted set of maximize presupposition alternatives in cases of obligatory focus marking, namely a focus-marked utterance, such as (40a), and its non-focus-marked counterpart, such as (40b). (Strictly speaking, the set of alternatives should include other possible F-markings of the same structure, such as *DINAH likes IVY*. Under Rooth's theory, this overfocussed utterance will have a strictly weaker focus presupposition than (40a), and so would also be predicted to be infelicitous in the context of (40) by maximize presupposition.) That said, it's not clear how to generate this set of maximize presupposition alternatives for focus. In more well-studied cases, the alternatives for maximize presupposition are claimed to be determined by scales, e.g. ⟨*a, the*⟩, ⟨*think, know*⟩. In the case of focus, one member of the scale would have to be null, which seems undesirable. But Eckardt & Fränkel (2012) provide empirical precedent for competition with a null element in their use of maximize presupposition to analyze the competition between sentences with additive particles such as *too* and those that lack them. Moreover, Rouillard & Schwarz (2017) suggest that alternatives for maximize presupposition may not depend on scales at all but instead could be determined structurally (Katzir, 2007). Perhaps focus-marking may be thought of along similar lines, however more work is needed. Katzir's (2007) theory claims that stronger alternative structures are determined via substitutions or deletions, not additions. This works for overfocussing since the stronger alternative is the one with fewer F-markers. However the presuppositionally stronger (40a) requires the addition of an F-marker and ∼ Γ relative to the weaker (40b). I leave this issue to future work.

Wilder (2013) argues that PF is optional in response to polar questions, and even goes so far as to claim that for examples like (42d), PF is odd "unless specially motivated".[19] Gutzmann et al. (submitted) echo this point. My own intuition is that (42d) is not degraded, which I will discuss more in just a moment in section 2.3.1.1.

The upshot of these examples is this: Since focus induces a presupposition, by (41) one has to use a focus-marked utterance instead of its non-focus-marked counterpart if the context satisfies the focus presupposition. This explains the intuitions for (40). Therefore, if PF utterances are congruent to polar questions, it is surprising that PF is optional in response to overt polar questions as in (42). In other words, the fact that examples like (42c) are felicitous is a problem for Wilder's (2013) and Samko's (2016a) claims that the antecedent for PF is the corresponding polar question.

I will propose a solution to this puzzle in section 2.3.2. But first a brief aside.

2.3.1.1 Aside about the intuitions for PF responses to polar questions

I mentioned above that I dispute the intuition that (42d) is degraded. Note that the example that I began this paper with flies in the face of the claim from both Wilder (2013) and Gutzmann et al. (submitted) that PF responses to polar questions are degraded:

(1)   A: Did you buy yogurt?
       B: I DID buy yogurt.

B's utterance in (1) is perfectly felicitous, indeed it was observed occurring naturally, and it did not signal some previous dispute over buying yogurt.

Consider the following responses to a question that is more parallel to the WH-question dialogue considered in (40):

(43)   A: Does Dinah like Ivy?

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[19]This is a surprising claim, given that Wilder (2013, 154) says that the antecedent for PF is the set $\{p, \neg p\}$, and writes, "[$\{p, \neg p\}$] can be conceived of as corresponding to the meaning of a yes-no question, which the affirmative emphatic *do* assertion answers, eliminating its negative alternative." If that is what PF utterances do and how they are licensed, then it should be surprising for (42d) to be intuitively degraded.

     a.   B: (Yes,) Dinah DOES like Ivy.
     b.   B: (No,) Dinah DOESN'T like Ivy.
     c.   B: (Yes,) Dinah likes Ivy.
     d.   B: (No,) Dinah doesn't like Ivy.

My own intuition is that all of B's responses in (43) are possible. At the very least (43c) and (43d) are not nearly as dispreferred as the response without subject focus in (40b). So the first point is that these examples further demonstrate the optionality of PF in response to polar questions.

But second, I note that some speakers have reported to me that if any of the responses in (43) are degraded it is (43c) and (43d), not the PF responses in (43a) and (43b). This is the opposite of Wilder's (2013) claim about (42). So there is an empirical dispute over whether PF utterances like (42d) are infelicitous or degraded (I think they aren't), and moreover, some of the data might cut the other way.

Ultimately, this empirical dispute will have to be settled by empirical means. An experimental approach would be to run production experiments that elicit responses to polar questions, and perception experiments that ask participants to rate PF and non-PF responses to polar questions. Moreover, since dialogues such as (1) can be observed occurring naturally, another approach might be to search spoken corpora for PF responses to polar questions. I leave these empirical tests to future work.

In the meantime though, I would like to point out a potential source for the disputed intuitions. One cannot control for the amount of accentuation a theoretician imagines when considering a PF utterance, and this could have an effect on intuitions. That is, while I believe (1), (43a), (43b) and (42d) are all felicitous, if the stress on the auxiliary is over-accentuated—uttered with too much loudness and duration—then the utterances may sound strange or degraded. I don't think this is any different from over-accentuating subject focus in response to a WH-question such as (40a). Over-accentuation there may also lead to intuitions of infelicity. What I am claiming then is that prominence shifting is a binary distinction and is felicitous in a certain set of contexts, but once prominence is shifted, the amount of accentuation is a gradient phenomenon, and higher levels of accentuation may only be felicitous in a subset of those contexts that license the initial prominence

shift. This too is an empirical claim that can be tested, but that must await future work.

We can safely set the dispute over these empirical facts aside. The agreed upon fact that PF is not required in response to polar questions—that is, the fact that examples like (42c) are felicitous—is a challenge to any account of PF that claims that the antecedent for PF is just a polar question. I turn now to a different solution.

2.3.2 Contrasting alternatives as antecedents to PF utterances

In search of a way forward, let's consider the examples in (44), which demonstrate uncontroversially felicitous uses of PF answers to polar questions (CT stands for contrastive topic).

(44) a. A: I hear that he might not work hard. DOES he work hard?
          B: (Yes,) he DOES work hard.
      b. A: Is he a good candidate? Does he work hard?
          B: (Yes,) he DOES [WORK HARD]$_{CT}$ (but his results are miserable . . .)   (Wilder, 2013, 169)

What these examples have in common is that the use of PF is licensed by the presence of a salient alternative with contrasting polarity. In (44a), the possibility that he does not work hard is contextually salient thanks to A's use of polarity focus in the question. In (44b), the combination of PF and contrastive topic marking on *work hard* conveys that there is something else that the candidate does not do. In this case, he does not get good results. This points to the following hypothesis.

(45)   *PF licensing condition*:
        Polarity focus is licensed by contrast between the PF utterance and a focus alternative with opposite polarity salient in the context.

The goal in the end is for (45) to play no official role in the grammar. Instead, I aim to account for it using Rooth's (1992) individual case presupposition in (34b) (reprinted here).

(34)   Rooth's (1992, p. 93) presupposition for ∼:

a. $\phi \sim \Gamma$ presupposes that a contextually given Γ is a subset of the focus semantic value of ϕ ($\Gamma \subseteq [\![\phi]\!]^f$), and that Γ contains both the ordinary semantic value of ϕ and an element distinct from it.

b. $\phi \sim \gamma$ presupposes that a contextually given γ is a member of the focus semantic value of ϕ ($\gamma \in [\![\phi]\!]^f$), and that γ is distinct from the ordinary semantic value of ϕ.

The context needs to make available some antecedent γ that is a member of the set of focus alternatives that is distinct from the ordinary semantic value of ϕ. We saw above that the set of focus alternatives of a PF utterance is $\{p, \neg p\}$. Therefore, if the ordinary semantic value of ϕ is p, then the antecedent γ will need to be $\neg p$. When the context provides such an antecedent, PF is licensed. When such an antecedent is not salient, PF is infelicitous.

This application of Rooth 1992 to polarity focus makes the correct predictions for the examples that Wilder's (2013) application of Schwarzschild 1999 struggled with. Reconsider (18):

(18)   B has been wondering if Sue is writing a book. She often catches her scribbling away, but when she asks Sue, Sue denies it. Then A says, "I'm glad that Sue is writing a book."
(17a)B: So she IS writing a book.

The context provides a salient antecedent proposition, *that Sue is not writing a book*, that gives γ its content. (17a) contains $\sim \gamma$ at logical form, so by (34b), it presupposes that γ is a member of the focus semantic value of (17a) that is distinct from the latter's ordinary semantic. This is the case, so (17a) is predicted to be felicitous. The broad focus utterance *So she is writing a book* on the other hand lacks $\sim \gamma$, making it truth-conditionally equivalent to, but presuppositionally weaker than, (17a). By maximize presupposition, broad focus is dispreferred. Under this account, it doesn't matter that B's utterance is all-given. What matters is that the presuppositionally stronger PF utterance is felicitous thanks to the presence of the correct focus antecedent in the context. Maximize presupposition then applies the necessary pressure to make PF preferred over broad focus in the context.

Meanwhile, (17b), *So she is WRITING a book*, is correctly predicted to be infelicitous in (18), not because (17a) is presuppositionally stronger, but because the presupposition of (17b) is not met

in the context in the first place.

On the other hand, consider the context that renders (17b) felicitous, (19):

(19)   B expected to see Sue at the party this evening, but she isn't there. She asks C why, and C says that it's because Sue is busy reading a book. Later, A says, "I'm glad that Sue is writing a book."

(17b) B: So she is WRITING a book.

This context is correctly predicted to render (17a) infelicitous for the same reason that (18) rendered (17b) infelicitous: the context does not provide the correct contrasting antecedent to license polarity focus.

Finally, we can reconsider Wilder's example of a direct contradiction:

(30)   A: Dr. Smith doesn't have a lot of patients.

a.   B: (You're wrong...) He DOES have a lot of patients.   (Wilder, 2013, 156)

It does not matter that B's utterance is all-given. The context provides the proper contrasting antecedent, rendering the PF utterance in (30a) felicitous, and maximize presupposition provides the pressure needed to make this utterance preferable to broad focus.[20]

2.3.2.1   Addressing the optionality of polarity focus

Why is PF optional in some cases? For inspiration, let's look to the focus literature, which documents other examples of optional focus marking. Focus marking is optional in these cases because the context provides multiple possible antecedents to choose from.

(46)   A: John borrowed the book that Max had purchased

a.   B: No, MAX borrowed it.
b.   B: No, Max BORROWED it.   (Schwarzschild, 1999, 165)

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[20]Note that the account sketched above in section 2.3.1, in which the polar question $?p$ serves as the antecedent for polarity focus, satisfying Rooth's (1992) set-case presupposition in (34a), would also work hand-in-hand with maximize presupposition to explain the preceding set of facts.

In (46a), B's utterance takes the matrix clause as its antecedent, thus contrasts with someone else borrowing the book, namely *John*. In (46b), B's utterance takes the embedded clause as its antecedent, thus contrasts with Max doing something else, namely *purchasing the book*.

(47)   A: Yesterday, Jolene and Dolly pitched the tent. What happened today?
   a.   B: JOLENE pitched the tent.
   b.   B: Jolene pitched the tent.   (Klassen & Wagner, 2017, 310)

In (47), B can take their utterance to contrast with A's antecedent utterance, either because *Jolene* contrasts with *Dolly* or because *Jolene* contrasts with the entire conjunction *Jolene and Dolly*, either of which leads to the prominence shift in (47a). On the other hand, B can take the antecedent *Jolene pitched the tent* to be salient as a result of A's utterance, in which case broad focus is the only option. Klassen & Wagner (2017) demonstrate the existence of this ambiguity experimentally. They also demonstrate experimentally that repeated propositions normally bear broad focus using examples like (22a):

(22)   A: Yesterday, Jolene pitched the tent. What happened today?
   a.   B: Jolene pitched the tent.   (Klassen & Wagner, 2017, 309)

Klassen & Wagner (2017, 310) make the following general remarks about focus marking:[21]

> "[T]he use of prominence shifts reveals something about the alternatives entertained by the speaker, and hence about which type of meaning they try to convey. A prominence shift [as in (47a)] conveys a contrast to an alternative subject, while the lack of a prominence shift [as in (47b)] conveys that they consider the present utterance to not stand in contrast with the previous utterance. This should lead to different pragmatic inferences based on the pronunciations."

Building on this previous work, I propose that the explanation for the optionality of PF in response to polar questions is that polar questions make both p and $\neg p$ salient as antecedents for

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[21]Note that Klassen & Wagner's (2017) observation that broad focus conveys that the utterance does not stand in contrast with an antecedent may be thought of as an antipresupposition along the lines of Percus 2006, using the sketch of maximize presupposition as applied to focus above.

focus prominence. If the speaker is asserting p, and they take p to be contextually salient, they use broad focus. If they take $\neg p$ to be contextually salient, they use polarity focus.

Evidence for this view comes from comparing responses to polar questions with cases in which PF is obligatory. For example, PF in responses to assertions appears to be obligatory. We saw this in the discussion of (18) above. Here is another example.

(48)   A: Dinah likes Ivy.

    a.   B: Dinah DOESN'T like Ivy.
    b.   B: ?? Dinah doesn't like Ivy.

It's important to remember that the relevant contrast is between a PF utterance with otherwise standard declarative intonation in (48a) and a broad focus utterance with standard declarative intonation in (48b). The sentence in (48b) could bear other intonational tunes such as the contradiction contour (Liberman & Sag, 1974) which would render it felicitous despite lacking PF.[22] The observation is that the use of broad focus with falling intonation in (48b) is strange in the context. The reason for this is that A's utterance makes salient an antecedent that contrasts with B's in polarity, and no other antecedent is salient. It is the uniqueness of the antecedent coupled with the focus presupposition and the principle of maximize presupposition that makes the PF utterance in (48a) obligatory in this context.

We can also consider repetitions of assertions such as in (49).

(49)   A: Dinah likes Ivy.

    a.   B: ?? Dinah likes Ivy.
    b.   B: DINAH likes Ivy.
    c.   B: Dinah DOES like Ivy.

I just noted above that Klassen & Wagner (2017) demonstrate experimentally via examples like (22) that broad focus is normally preferred when an utterance is all-given in the context. So the infelicity of (49a) seems unexpected. However being given is not equivalent to being presupposed,

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[22]See chapter 4 for many examples of the contradiction contour, discussed at length there.

and there are independent constraints on asserting a proposition p that is presupposed. In particular:

(50)   *Informativity principle*:
        A proposition asserted is always true in some but not all of the possible worlds in the
        context set.[23]   (Stalnaker, 1978, 88)

In other words, if it is already common ground that p is true or that p is false, then p cannot be asserted. In (49), since A has just asserted p, A intends her interlocutor B to update the common ground with p. If B has no reason to object, B should perform this update. B can felicitously utter an agreement such as "That's true," but its quite strange for B to re-assert p as in (49a), and (50) explains why: p is already settled. Compare this with Klassen & Wagner's (22), where p is given but not presupposed. There, p can be asserted without violating (50), and thus it is felicitous. And then, since the utterance is all-given, the assertion bears broad focus.

What (49) demonstrates is that the informativity principle can be obviated, if the repeated assertion of p signals a contrast with some salient alternative. For example, (49b) is felicitous in the proper context, namely one in which there is a salient alternative that differs from B's utterance only in the subject position. For instance, perhaps B is implying that while Dinah likes Ivy, Moira does not, which A should recognize to be relevant. The resulting effect is that B emphasizes that Dinah likes Ivy in contrast to some other individual, in this case Moira. (49c) is felicitous in a similar kind of context, except that now the F-marker is on the polarity head, thus the salient alternative can only be *that Dinah does not like Ivy*. The resulting effect is that B emphasizes the dismissal of the PF alternative to p, $\neg p$, thus conveying her agreement with A. In other words, the only way to felicitously repeat a presupposed proposition is if it contrasts with a salient alternative, providing more evidence that the antecedent for polarity focus is the contrasting alternative.

Samko (2016a) claims that examples like (49c) are infelicitous, however in Samko 2016b, she admits that they can be felicitous in the right context:

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[23]The context set is a set of possible worlds that is determined by taking the intersection of all of the propositions in the common ground. The common ground is the set of propositions that are mutually believed by the interlocutors.

(51)   A: He was 11-for-16 on field-goal tries last season [...]. He hit a career-long 53-yarder
        against Washington.
        B: (That's right) He DID hit a career-long 53-yarder against Washington.   (Samko,
        2016b, 8)

Samko argues that (51) is infelicitous because the polarity of B's utterance does not contrast with

that of A's utterance. But she claims that if B has forgotten about the event, then the utterance is

felicitous. However, Samko doesn't explain why the addition of B's forgetfulness to the context

changes our intuitions. That is, if there is a problem in that B's utterance does not contrast with A's

at the polarity head, then it's not clear how B's forgetfulness solves this problem.

   I explain (51) in the same way I explained (49c). It is erroneous to claim that PF assertions

that are identical to preceding assertions are infelicitous. It's just that, *like all utterances with

focus prominence shifts*, they are only felicitous in certain contexts, in this case contexts in which

a contrastive antecedent is available. For example:

(52)   A and B are going to a dinner party where they are supposed to bring drinks.
        A: I brought Alaskan wine.
        B: You brought an ALASKAN wine! I didn't know that existed.
                                                            (Klassen & Wagner, 2017, 309)

Like in (49c) and (51), B asserts a proposition that A has just asserted. B's utterance is felicitous

because in (52) there are salient contrasting alternatives to *Alaskan wine*, such as *Californian wine*,

French wine, etc., thanks to world knowledge about where wine usually comes from.

   Polarity focus in (51) works the same way. The right context for a PF utterance is one in

which the utterance contrasts with a salient alternative with opposite polarity. Imagining that B

has forgotten the event helps us to construct the proper context because we imagine that B has

accidentally come to believe that he did NOT hit a career-long field goal against Washington. B's

PF utterance contrasts with this erroneous belief. While imagining that B has forgotten provides us

with one way to accept B's PF utterance, it is not the only way. All we need is some way to accept

that B intends their utterance of p to contrast with $\neg p$. This could simply be because B intends to

reinforce A's assertion of p by drawing attention to its contrast with $\neg p$, much in the way that (49c) above is licensed.

In this subsection, I have claimed that polarity focus on an utterance of p is only optional in contexts where the speaker can plausibly take either p or $\neg p$ to be the antecedent, such as responses to polar questions. When a contrasting alternative is the only available antecedent, we find that PF is obligatory, or at least that it is strongly preferable to broad focus. Here is how I showed this: In examples of disagreements like (48), an interlocutor directly asserts $\neg p$ making it the only available antecedent. In such a case the speaker has to use the presuppositionally stronger PF utterance. In examples like (49) and (51), an assertion of p renders repetition of p using broad focus infelicitous due to the informativity principle in (50). In such cases however, we find that PF renders an assertion of p felicitous again, but only because this forces an interpretation in which the PF utterance contrasts against a salient alternative, $\neg p$. This demonstrates that the true antecedent for polarity focus utterances on p is $\neg p$.

Having established this, we can then hypothesize that optional polarity focus in response to polar questions is caused by the salience of multiple possible antecedents. If both the p and $\neg p$ antecedents are available, then an assertion of p will only bear polarity focus if the speaker takes $\neg p$ to be the antecedent. That a polar question $?p$ makes both antecedents salient is plausible since it does not assert a single proposition p, but instead expresses interest in both p and $\neg p$. Just as in Klassen & Wagner's (2017) discussion of (47), making both antecedents salient renders the choice between PF or broad focus optional. If something is done to make the contrastive antecedent more salient, I predict this to increase the likelihood of PF. This is what we find in Wilder's (2013) example (44a), in which the polar question itself bears polarity focus, which makes the $\neg p$ antecedent more salient through negative bias (Romero & Han, 2004, to be discussed in chapter 3).

At this point, it is worth wondering why maximize presupposition allows this optional focus marking. If a context makes multiple possible antecedents available, and one of them supports making a presuppositionally stronger focus-marked utterance, shouldn't maximize presupposition

force the speaker to use focus? I believe that data such as polarity focus responses to polar questions and Klassen & Wagner's (2017) experimental results reveals the existence of contexts in which the speaker (and the intuition-giver) may or may not notice the relevant antecedent for focus marking. The idea is that the construction of contextual representations of discourse antecedents are subconscious and prior to a principle like maximize presupposition. There are some contexts, e.g. responses to WH-questions, where the antecedent is unavoidable, it must be part of the discourse representation. Intuitively, we feel that the context forces the speaker to note the antecedent via focus marking. Other contexts, e.g. responses to polar questions and the tent example (47), are edge cases in which the representation of the context may plausibly not include the relevant antecedent. It's not that the speaker's contextual representation includes both antecedents, and the speaker consciously picks one. It's that the speaker's discourse representation may or may not include the relevant antecedent to begin with, or so our intuitions suggest. If it does, maximize presupposition forces focus marking. But if not, then focus marking is not required.

This is why making the relevant antecedent more salient forces focus marking as in (44a). Another example of this is responses to *or not* questions, which produce an increased preference for PF relative to regular polar questions. Compare the following examples based on (42):

(53)   A: Does he work hard?
      a.   B: He works hard.
      b.   B: He DOES work hard.

(54)   A: Does he work hard or not?
      a.   B: ?? He works hard.
      b.   B: He DOES work hard.

Without offering a theory of *or not* questions, the point is that A's question in (54) makes the $\neg p$ antecedent more salient than A's polar question in (53) does. As it's harder to imagine that B's model of the context does not include a $\neg p$ antecedent, our intuition is that PF is preferable to a non-PF response, and the claim is that this intuition is caused by maximize presupposition once it

is taken for granted that the $\neg p$ antecedent is available.

2.3.2.2 A brief aside on the source of antecedents for focus marking

In the preceding discussion, we considered several examples that I argued depend on the salience of antecedents that are not overtly uttered. In particular, I claimed that polar questions are not themselves antecedents, but instead they make both p and $\neg p$ salient as antecedents, and I argued that repetitions of assertions do not find their antecedents in the previously occurring assertion, but instead depend on the salience of a non-uttered contrasting polarity alternative. This raises the difficult question of how exactly antecedents for focus are made available by context. That is, using Rooth's (1992) presupposition in (34), we know that focus requires the variable γ to have a certain content in order to be felicitous, but how does γ get its content? This is a difficult question to answer, and I won't settle it here. But I will demonstrate that it is not just a question for polarity focus. (49b) and (52) above already demonstrate that prominence shifts to other constituents can be licensed by non-overt antecedents. I engage in a fuller discussion of the issue in the following.

We know that focus can't just be marked out of the blue. For example, if A is going outside, B cannot say:

(55)   B: # It IS raining

We know that the source of the infelicity in (55) is due to unlicensed focus marking because the corresponding non-PF version would be felicitous in the context. Even if A is going outside without proper rain gear, perhaps leading B to infer that A thinks it isn't raining, (55) is still infelicitous.[24] Likewise, while B can come home at dinner time carrying a pizza and say *I got dinner* with broad focus, B cannot say, in the absence of further context:

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[24]It may be possible to render the PF utterance in (55) felicitous "out of the blue", but it takes a lot of contextual support. For example, suppose A and B live together, and A is older and doesn't see that well. A is going outside. B sees A grab her umbrella, then peer out the window, which is some distance away. A hesitates and then puts her umbrella down and starts heading out. We can imagine that, B, having watched all this, can almost *hear* A's internal deliberations, which apparently end with A saying to herself "It isn't raining." In such a case, it doesn't seem so farfetched for B to use (55).

(56)   B: # I$_F$ got dinner.

If B does do this, the hearer is forced to search for a possible antecedent for the prominence shift. If none is available, the utterance will be exceedingly strange, and the hearer may even ask why B said it like that. So the use of focus signals that γ should have a certain content, but it cannot just force it to have that content all by itself.

On the other end of the spectrum, focus can easily be marked when the right linguistic antecedent is directly present in the context. For example:

(57)   A: Jane got dinner.
         B: No, I$_F$ got dinner.

In (57), A's utterance provides the antecedent for B's focus shift, that is, γ gets its content from an overt linguistic utterance. (48a) demonstrates a parallel example for polarity focus.

The difficulty arises when we consider examples that are felicitous, but the antecedent does not seem to be present as a linguistic utterance in the immediately preceding context. For example, I have argued above that (1), (49c) and (51), are felicitous because an appropriate contrasting antecedent is somehow available in the context despite not being overtly uttered. Such examples are not without precedent for other kinds of focus, as demonstrated by (52). Furthermore, Rooth (1992) demonstrates that focus marking can be licensed by antecedents that come after the focus marked constituent, so-called *cataphoric focus*, such as the first instance of focus marking in:

(58)   An AMERICAN farmer was talking to a CANADIAN farmer...   (Rooth, 1992, 80)

Moreover, focus can be shifted to the subject when there is no clear linguistic antecedent in sight:

(59)   A: How was the quiz?
         B: Well, I$_F$ passed.   (Rooth, 1992, 82)

B's utterance implicates that others may not have passed. Rooth argues that the focus presupposi-

tion is met because the alternatives used in the calculation of this implicature all have the form *x passed*. Apparently, they do not need to be stated overtly to provide the antecedent necessary for focus marking. If focus is marked on the predicate, the implicature changes:

(60)   A: How was the quiz?
        B: Well, I PASSED$_F$.   (Rooth, 1992, 82)

Now B's utterance implicates that B did not do better than passing, and the focus presupposition is met because γ gets its content from the alternatives used to calculate the implicature, for example *I aced it*.

At first glance, (59) and (60) make focus marking that depends on salient but non-overt antecedents look wildly unconstrained. It looks like focus marking determines the implicature conveyed, and only then does implicature calculation provide the antecedents needed to satisfy the focus presupposition. But we already saw with (55) and (56) that focus cannot force its antecedents to be available without the help of the context. To get clear on these examples, it helps if we think of them first from the speaker's perspective, then from the hearer's. B intends to convey a scalar implicature. The calculation of this implicature depends on alternatives. Those alternatives then serve as antecedent for focus, which is reflected in the focus marking in B's utterance. This explains the different focus marking in (59) and (60). Then, the hearer A hears B's focus marked utterance. The location of focus signals the shape of a salient focus antecedent. The context and the focus marking allow the abductive inference that the antecedents would be available in the form of scalar alternatives if B intended to convey a certain implicature. A then infers the implicature. So scalar implicature calculation provides salient, non-overt antecedents for focus. Focus then signals the speaker's intended implicature to the hearer.

Finally, if we think of focus as a kind of anaphor, there is other precedent for anaphora that find their antecedents in non-linguistic context rather than in preceding utterances. For example the pronoun *it* (Heim, 1982):

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(61)   A cat walks into A and B's apartment, and meows and looks at them.
         A: It's hungry.

Similar examples exist for givenness deaccenting:

(62)   Seeing someone's new pack of cigarettes:
         A: I thought you QUIT smoking.   (Büring, 2016, 18)

(63)   A dog wanders into the room.
         A: I thought you HATED dogs.   (Büring, 2016, 100)

In the preceding two examples, nonlinguistic context seems to provide the antecedent for deaccenting. The following example from live radio arguably contains not just givenness deaccenting, but also contrastive focus on *your*:

(64)   A: Speaking of looks, the "Late Night With David Letterman," you were with him for so
         long. It's been [...] off the air now for about three years. How long is YOUR beard?
                                                                 (Sagal, 2017, @1:56)

In (64), A is speaking to David Letterman's former band leader. The joke depends on the mere mention of David Letterman making his post-retirement beard salient as an antecedent.

     One difference between (61)-(64) and polarity focus is that polarity focus requires a propositional antecedent, but these examples do not. We might question whether propositions can be made salient by nonlinguistic context. Note, however, that propositional anaphora may behave the same way. In recent work, Krifka (2013) and Roelofsen & Farkas (2015) have both argued that polar particles *yes* and *no* are propositional anaphora. Here are two examples of polar particles being used in a way that apparently picks up a propositional antecedent from nonlinguistic context:

(65)   A is offering bottles of water to people by holding it out to them. A offers one to B:
         a.   B: Yes, thank you.
         b.   B: No, thank you.

(66)   A is the only individual standing at a city bus stop that is used by three different buslines. A is waiting for bus 76. A sees bus 89 coming along, and the driver puts on the blinker and starts to slow down. A shakes his head "no" to the bus driver. The bus driver turns the blinker off and continues on his way.

The preceding examples suggest that propositional antecedents may be made available by nonlinguistic context.

It seems clear that salient antecedents for focus marking, givenness deaccenting, and pronouns are sometimes made available by other means than just overt, preceding linguistic utterances. Both linguistic utterances and non-linguistic context can make non-uttered meanings salient enough to act as antecedents for various of kinds of linguistic constructions. Therefore, it should be unsurprising that polarity focus sometimes depends on salient antecedents that are not directly uttered. I will return briefly to this issue while discussing an interesting asymmetry between focus marking and givenness deaccenting in polarity focus utterances in section 2.5.

2.3.3   Explaining the emphatic effect of polarity focus

Höhle (1992) and others since (Richter, 1993; Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Wilder, 2013; Gutzmann et al., submitted) have claimed that polarity focus utterances give rise to the intuition that the speaker emphasizes the truth of the proposition that it appears with. What is meant by "emphasis on truth" is somewhat vague. Moreover, other kinds of focus may seem emphatic in certain contexts, as I will discuss below. Nevertheless, even if "emphasis on truth" is vague, it does match the pre-theoretic intuition that assertions with PF contrast with their non-PF counterparts in that they are more emphatic.

Of interest here is the fact that this emphasis intuition is always present in PF utterances, which sets PF apart from other uses of focus. Some authors have taken this as evidence that PF is not a normal kind of focus, but instead contributes an operator whose semantics is responsible for this emphasis (Höhle, 1992; Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Gutzmann et al., submitted). Therefore, it is incumbent on a theory of PF as focus to explain why PF seems

to have this pragmatic effect. I will pursue an explanation now.

I noted above that I believe that Richter's (1993) informal insight into the emphasis effect of polarity focus is on the right track. His idea is that PF emphasizes the propositional content of an utterance by drawing explicit attention to the falsity of its negative alternative, *somehow*. The question is, how? Or more precisely, how is this done in a way that goes beyond the run-of-the-mill fact that when B asserts p, it therefore follows that B claims that $\neg p$ is false? In a nutshell, my answer will be that emphasis is produced because the information structure of polarity focus draws *explicit attention* to $\neg p$, which the propositional content of the assertion negates. The difference between PF and non-PF utterances is that only the former draws explicit attention to the falsity of the opposing alternative.

The issue is clearer with an example. We want to know what accounts for the following intuitive asymmetry.

(67)   A: Are you happy?
   a.   B: I AM happy.
        ⇝ B emphasizes the truth of the proposition *that B is happy*
   b.   B: I'm happy.
        ⇝̸ B emphasizes the truth of the proposition *that B is happy*

I have argued above that I do not think polarity focus has its own special semantics, but is instead reducible to a more general theory of focus semantics. Therefore, the inference in (67a) cannot be hardcoded into "the meaning of polarity focus". Instead, it has to be derived via the pragmatics. In order to explain the asymmetry between (67a) and (67b), there must be some extra input to the pragmatics in (67a) but not (67b) that leads to the inference. Since the only difference between these two utterances is PF, PF must somehow be responsible.

I argued in the previous section that polarity focus on p contributes the requirement that $\neg p$ is salient. As Klassen & Wagner (2017) say, choosing to signal that you take your utterance to contrast with a particular focus alternative has pragmatic effects. My claim is that the pragmatic effect of using focus to signal that your assertion of p contrasts with $\neg p$ is the inference present

in (67a), emphasis on p. In (67a), p is asserted, which entails that $\neg p$ is false. The information structure of PF draws explicit attention to the alternative $\neg p$. The combined effect is that explicit attention is drawn to the contrast between the truth of the asserted p and the falsity of the alternative $\neg p$, which results in the intuition that the PF utterance emphasizes the truth of the proposition. This can be contrasted with (67b), in which the assertion of p entails the falsity of $\neg p$, but focus is not used to draw explicit attention to this fact. Thus, no emphasis is derived.

This is similar in spirit to Wilder's (2013) derivation of the emphasis inference.[25] According to Wilder, (67a) results in the emphatic inference because the PF utterance answers the required antecedent question $?p$ with p, thereby eliminating its negative alternative $\neg p$. The problem with this account is that the use of PF does not provide any input to the pragmatic derivation that is not present in the non-PF answer in (67b): (67b) also answers the salient question $?p$ with p, thereby eliminating its negative alternative $\neg p$. In order to predict the asymmetry between (67a) and (67b), polarity focus has to add something that is not otherwise present. For Wilder, PF adds explicit attention to $?p$, however $?p$ is already attended to explicitly in the context given that A asked it. In my account, what information structure adds is explicit attention to $\neg p$.

The account I have offered predicts that the pragmatic effect of emphasis is not restricted to polarity focus. All that is required is that one utterance entails the falsity of a contrasting alternative, and focus draws explicit attention to the contrast between the assertion and the false alternative. For example:

(68)   A and B are arguing about whether Dinah or Moira likes Ivy more.
        A: Moira likes Ivy more.
        B: DINAH likes Ivy more.
        ⇝ B emphasizes the truth of the proposition *that Dinah likes Ivy more*

The context is such that B's utterance entails the falsity of the alternative highlighted by the focus structure of the utterance. The pragmatic effect is that B emphasizes the truth of her proposition in

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[25] I am following Wilder's intuitive description of his analysis, not the ultimate implementation in terms of Schwarzschild 1999, which lacks any reference to a polar question antecedent.

opposition to the sole, salient alternative. This effect is not intuitively different from the emphasis effect of PF, as we would expect since all of the same ingredients are present for the derivation:

(69)   A: Dinah doesn't like Ivy.
         B: Dinah DOES like Ivy.
         ⤳ B emphasizes the truth of the proposition *that Dinah likes Ivy*

Notice also that the effect does not necessarily depend on assertion. Consider again Wilder's demonstration of PF on a proposition that is presupposed.

(16)   A: If only Sue hadn't left her husband.
         B: I was surprised that she DID leave her husband.   (Wilder, 2013, 153)

B is clearly contrasting that Sue left her husband against what they had considered more likely, that she would not leave her husband. This has the pragmatic effect of emphasizing the proposition, derived in the same way just outlined above: A and B presuppose the proposition *that Sue left her husband*, this presupposition entails the falsity of the proposition *that Sue did not leave her husband*, and the information structure of B's utterance draws attention to the falsity of this alternative relative to the truth of the presupposed alternative.

The key takeaway from this subsection is that focus-marking conveys information structure, and information structure has pragmatic effects. The pragmatic effect of asserting p while drawing explicit attention to the opposing $\neg p$ via information structure is to emphasize the truth of p. Emphasis on truth *just is* asserting a proposition that (contextually) entails the falsity of a focus alternative that information structure draws explicit attention to. There may be other arguments in favor of a theory that analyzes polarity focus as unique, requiring a special operator, but the goal of explaining emphasis on truth is not one of them.

2.4   Non-focus accounts

As mentioned above, several researchers have argued that polarity focus contributes a special VERUM operator to the logical form (Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Repp, 2013; Gutzmann et al., submitted). Now that I have argued that polarity focus can be accounted for using standard focus semantics, I want to briefly consider the predictions of operator accounts of verum/polarity focus, and compare them to the predictions of the account proposed above. In section 2.4.1, I consider the theory in Romero & Han 2004. In section 2.4.2, I take up the theory in Gutzmann & Castroviejo Miró 2011 and its subsequent development in Gutzmann et al. submitted.

2.4.1   Romero & Han 2004

Romero & Han's (2004, R&H) account is based in part on the empirical observation that polar questions with polarity focus and high negation questions both convey epistemic bias. Epistemic bias can be characterized as a speaker belief that the answer with opposite polarity from the question is true. Here are two examples demonstrating the similarity:

(70)   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)

B asks a high negation question in (70), which for the moment we'll define as a polar question with preposed negation (see chapter 3 for a more detailed discussion). B is epistemically biased: She conveys that she expects the positive answer to be true.

Compare this to the polarity focus question in (71):

(71)   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

B seems to be epistemically biased in (71) as well, this time toward the negative answer. The epistemic bias that we are observing in these two questions is the subject of chapter 3. What matters here is that a large part of Romero & Han's (2004) goal in developing a VERUM operator is to explain both high negation questions and verum/polarity focus questions with one theory. This includes explaining both the presence of epistemic bias in these questions, but also explaining the distribution or licensing requirements of both high negation and polarity focus.

However, if we compare high negation and polarity focus carefully, what we find is that these two phenomena behave differently in a few ways, and this different behavior makes a unified account seem untenable. I will summarize their account and then demonstrate these challenges.

Romero & Han's (2004, 627) semantics for their VERUM operator is in (72).

(72) $[\![\text{VERUM}]\!] = \lambda p_{s,t}.\lambda w_s.\forall w' \in Epi(w)[\forall w'' \in Conv(w')[p \in CG_{w''}]]$
          $= \text{FOR-SURE-CG}$

(72) has the semantics of an epistemic modal with a conversational twist. $Epi(w)$ represents the epistemic modal base, a set of worlds compatible with what is known in w. $Conv(w')$ represents a set of worlds compatible with the conversational goals in w'. $CG_{w''}$ represents the common ground in w'', the set of propositions mutually believed by the interlocutors in w''. According to (72), VERUM takes a proposition p as complement, and says that in all worlds w' compatible with what is known in w, the worlds w'' compatible with the conversational goals in w' are such that p is in the common ground (CG) in those w'' worlds. To make discussion of the meaning of VERUM easier, R&H abbreviate it as FOR-SURE-CG. To simplify presentation, I have left out R&H's specification of a contextually determined individual x that determines whose information and conversational goals Epi and $Conv$ represent. In assertions, they represent the speaker's, while in questions they represent the hearer's.

This semantics is designed, in part, to explain Höhle's (1992) observation that verum/polarity focus emphasizes the truth of the proposition it appears with. R&H demonstrate this with the following example:

(73)   A: Peter claims Kimiko went to the Himalayas.
        B: She DID go to the Himalayas.   (Romero & Han, 2004, 630-631)

The idea is that an assertion of VERUM(p) such as B's goes beyond a regular assertion of p by making explicit reference to the speaker's epistemic state and conversational goals, thus insisting on the truth of p.

In order to explain the restricted distribution of verum/polarity focus, R&H argue that by making reference to conversational goals, utterances with VERUM are meta-conversational moves, which makes them subject to the following constraint:

(74)   Principle of Economy: Do not use a meta-conversational move unless necessary (to resolve epistemic conflict or to ensure Gricean Quality).
                                                          (Romero & Han, 2004, 629)

Due to the constraint in (74), VERUM can only be used when p conflicts with an interlocutor's epistemic state (R&H seem to take "epistemic conflict" to mean something like "contradictory beliefs between interlocutors"), or when the speaker's evidence for p is not strong enough to meet the requirements of the Gricean Quality maxim. The first half of this constraint on meta-conversational moves is what blocks VERUM from being used out of the blue, but allows it in, say, a direct disagreement:

(75)   Out of the blue
        B: # Jane DID steal the computer.

(76)   A: Jane didn't steal the computer.
        B: Jane DID steal the computer.

The conversation in (76) is in a state of epistemic conflict over p, so by (74) VERUM is licensed, and by (72), B is saying that p is in the common ground in all worlds compatible with B's conversational goals, given her epistemic state (FOR-SURE-CG p). The epistemic conflict half of (74) also explains certain restrictions on the use of high negation:

(77)   B has no idea whether Jane is going to A's for dinner, and B and Jane get along just fine.
        A: Want to come to dinner?
        B: # Isn't Jane coming?

(70)   A: Ok, now that Stephan has come, we are all here. Let's go!
        B: Isn't JANE coming?   (Romero & Han, 2004, 610)

In (77), there is no epistemic conflict over whether Jane is coming (and there is no other reason to use high negation here), so high negation is infelicitous.[26] However, A's utterance in (70) implies that Jane is not coming, which conflicts with B's belief that she is coming, thus meeting the requirement on (74), and licensing the use of the high negation question, which introduces a VERUM operator.

The second half of the constraint in (74) is designed to explain the felicity of high negation questions in suggestion contexts. For example:

(78)   A: Who stole the computer.
        B: Didn't JANE steal it?

B's question conveys that she believes that Jane stole the computer. However this belief is not in epistemic conflict with any other belief. Instead it just seems to be used to suggest an answer to the QUD, A's question. This is why such contexts are called suggestion contexts. (74) is meant to account for such examples. The idea is that B didn't assert *Jane stole it* because her evidence was not good enough to respect Gricean Quality. So in order to ensure Gricean Quality is not violated, the meta-conversational operator VERUM can be used in the form of the high negation question. Thus the second half of the economy constraint in (74) only applies to the use of VERUM in questions. The use of VERUM in a question ensures Quality by allowing the speaker to keep from asserting something they don't have evidence for.

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[26]The opposite context from the one in (77) would make B's use of high negation felicitous. I.e. if B has heard that Jane will be there, and B and Jane don't get along. Such a case might be explained by R&H's account as follows: suppose it is common ground between A and B that B and Jane don't get along. Then given other background assumptions about social behavior, A's invitation would imply that A thinks Jane won't be there, creating epistemic conflict between A and B. Thanks to E. Allyn Smith (p.c.) for discussion on this point.

R&H's primary goal in proposing their VERUM operator and the economy constraint in (74) is to explain the use and meaning of high negation questions, while also linking high negation to verum/polarity focus. Along the way, they seek to explain other effects of verum focus such as emphasis. They say that by "verum focus", they mean utterances with polarity focus in which the intuitive effect is to emphasize the truth of a proposition. It is clear that R&H take polarity focus and verum focus to come apart. In particular, they do not assume that all instances of polarity focus introduce the VERUM operator. They do not say whether they expect any context in which VERUM is licensed to be one in which polarity focus is licensed. So they do not discuss the precise relationship between their economy constraint in (74) and polarity focus, and they do not say whether (74) supplies sufficient or necessary conditions on the use of polarity focus. In the following, I turn my attention to answering the question of whether the account of VERUM in Romero & Han 2004 accounts for polarity focus. The conclusion will be that it does not.

First, to see that it does not supply a sufficient condition, reconsider suggestion contexts. While VERUM is predicted to be felicitous in (78), note that polarity focus is not:

(79)   A: Who stole the computer.
   a.   B: # DIDN'T Jane steal it?
   b.   B: # DID Jane steal it?

Neither (79a) nor (79b) are felicitous in this suggestion context. Though R&H's theory predicts that the context is sufficient to license VERUM, it is not sufficient to license verum/polarity focus. The obvious reason is that verum/polarity focus, like other kinds of focus shifting, requires a certain kind of antecedent in order to be licensed.

Here is another example of a suggestion context that licenses high negation but not polarity focus:

(80)   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.
   a.   B: Hasn't Frege not reviewed for us? He'd be a good one.

b. B: # HAS Frege reviewed for us? He'd be a good one.

R&H use this example to demonstrate the felicitous use of a high negation question like (80a) in a suggestion context. This question expresses bias toward the negative answer, and meets the constraint in (74) by ensuring quality. However, note that the polarity focus question in (80b) conveys the same bias but is intuitively infelicitous. The reason cannot be that VERUM is not licensed here due to the constraint in (74). Again, the obvious reason is that the prominence shift is not licensed because the proper antecedent is missing.

So far we have demonstrated that (74) is not sufficient to explain the distribution of polarity focus using only suggestion contexts. However there are epistemic conflict contexts that license high negation but not PF as well:

(81)   A: Ok, now that Stephan has come, we are all here. Let's go!

     a.   B: Isn't JANE coming too?   (Romero & Han, 2004, 610)

     b.   B: # ISN'T Jane coming too?

(81a) is felicitous, and R&H's theory explains this by claiming that VERUM is licensed by epistemic conflict between B's belief that Jane is coming, and A's contextually implied belief that she is not. However, the same question with a polarity focus prominence shift in (81b) is not felicitous. Clearly, the proper antecedent is lacking to license the prominence shift.

Here is another example demonstrating the same point:

(82)   A: (Did you hear?) Jane stole the computer.

     a.   B: That isn't TRUE!

     b.   B: # That ISN'T true.

There is clearly epistemic conflict between A and B in (82), so VERUM should be licensed by (74). However, it isn't, the obvious reason being that the proper antecedent is not present to license the prominence shift.

As mentioned above, R&H do not say whether they expect any context that licenses VERUM to also license polarity focus. The preceding examples demonstrate that they don't. The economy constraint in (74) that is meant to regulate the use of VERUM does not provide a sufficient condition for the use of polarity focus. That is, when the constraint is met, PF may still not be felicitous.

A possible solution to this issue might be to say that PF has extra licensing requirements in addition to those imposed by the presence of the meta-conversational operator VERUM. In particular, it imposes the same kind of felicity requirements that other prominence shifts do, for example the presuppositions imposed by Rooth's (1992) ∼ operator. In other words, verum/polarity focus would be a combination of R&H's VERUM operator with more standard focus prominence shifting. This would obviously close the gap I just demonstrated in using R&H's economy principle to predict the distribution of PF.

However it turns out that Romero & Han's (2004) economy principle in (74) also does not impose a necessary condition on the use of PF. That is, there are felicitous examples of PF that do not seem to meet the restrictions laid out in (74). Here are two examples we have already considered above:

(16)   A: If only Sue hadn't left her husband.
        B: I was surprised that she DID leave her husband.   (Wilder, 2013, 153)

(23)   A: Yesterday, Jolene didn't pitch the tent. What happened today?
        B: Jolene DID pitch the tent.

In neither of these examples is there any epistemic conflict between A and B. One might argue that in (16), B is in epistemic conflict with her own prior expectations, but no such claim could be made about (23). Moreover, as I pointed out above, ensuring Quality only applies to cases in which verum/polarity focus appears in questions, so it is irrelevant here. Thus, the constraint in (74) does not provide a necessary condition on the use of verum/polarity focus.

As I mentioned above, R&H do not take all instances of prominence shifting to the auxiliary to be verum/polarity focus. So one might claim that the reason that (16) and (23) do not seem to

be subject to (74) is that they do not include the VERUM operator. One problem with this view is that R&H's VERUM operator is meant to explain why prominence shifts to the auxiliary have the effect of emphasizing the truth of the proposition. I argued above that examples such as (16) and (23) display this emphatic effect, and I offered a pragmatic derivation of emphasis that explains its presence here, as well as in other cases. If it is claimed that (16) and (23) do not feature the VERUM operator, then R&H's account of the VERUM operator is unable to explain why these examples exhibit the hallmarks of verum/polarity focus.

Taking these possible repairs of the theory in Romero & Han 2004 together—that extra licensing requirements are imposed by the theory of focus prominence, and that VERUM is not always present when auxiliary prominence is—a larger challenge comes into focus: We now struggle to see what value the theory of the VERUM operator adds to an account of verum/polarity focus. It neither provides necessary nor sufficient conditions for the use of PF. It cannot fully explain the emphatic effect of PF. The theory needs to be supplemented by a theory of focus applied to polarity. Given that I developed an account above that provides complete explanations for the phenomena associated with PF without any appeal to a special VERUM operator, I believe that the VERUM operator is not needed for the theory of PF. A theory purely in terms of focus semantics and general pragmatic principles is more parsimonious.

There is the remaining issue of epistemic bias in polar questions such as (70) and (71). R&H's VERUM operator provides a unified account, arguing that they are underlyingly the same phenomenon. However, I have already pointed out an important asymmetry in their licensing requirements above: polarity focus questions require linguistic antecedents in a way that high negation questions do not. In chapter 3, I will further demonstrate that we should not seek a unified analysis of bias in these two types of questions. To preview the argument, the main reason is that bias in PF questions seems to be context dependent, and ultimately derivable from independently motivated pragmatic principles, whereas bias in high negation questions appears to be necessary and triggered by the preposing of negation.

Thus, it is my claim that the theory of polarity focus should be entirely independent of R&H's

VERUM operator. This claim is consistent with the view that the VERUM operator plays an instrumental role in the analysis of high negation questions. Perhaps the only general criticism of the VERUM operator that can be extracted from the discussion above is that its conversational-epistemic semantics seems to be designed to handle the truth-emphasizing effects of PF. Given that I have argued that polarity focus should not be accounted for via VERUM, one could then plausibly ask whether the operator should keep the same semantic shape, or whether the phenomenon of high negation might be better served by an operator with a different semantics (if high negation requires an operator at all). In chapter 3, I return to the issue of high negation, and argue in favor of a different account of that phenomenon, based on Krifka 2017.

2.4.2 Gutzmann & Castroviejo Miró 2011; Gutzmann et al. submitted

Gutzmann & Castroviejo Miró (2011, G&C) propose a VERUM operator with a use-conditional semantics. Gutzmann et al. (submitted, GHM) build on that semantics, and also offer a sustained argument that verum/polarity focus is an operator and not focus. I will start by considering the positive proposals in these two papers (section 2.4.2.1), and then I will consider the arguments against treating verum/polarity focus as focus (section 2.4.2.2).

2.4.2.1 The VERUM operators of G&C and GHM

Gutzmann & Castroviejo Miró (2011) analyze verum focus as a use-conditional operator that takes a proposition p as input and conveys that the speaker wants to "downdate", or answer, the question $?p$ so that it is no longer the QUD. Officially:

(83) $[\![\text{VERUM}(\phi)]\!] \approx$ The speaker wants to downdate $?p$ from QUD.
                                              (Gutzmann & Castroviejo Miró, 2011, 160)

This is meant to explain the fact that verum/polarity focus cannot be used out of the blue since the question $?p$ already needs to be the QUD in order to use VERUM. As for emphasizing truth, Gutzmann & Castroviejo Miró (2011, 162) say that asserting p while also using a special operator

to signal the desire to downdate $?p$ results in a "double assertion" that has the effect of emphasizing that p is true.

Starting with the analysis of emphasis, it's not clear that assertions of p without VERUM are any less explicit about attempting to downdate a salient question $?p$. That is, by asserting p in response to a salient QUD $?p$, the speaker signals that they want to downdate $?p$, regardless of whether or not they use the VERUM operator in (83). Recall the discussion in section 2.3.3: Pragmatic derivations of emphasis require some extra input from verum/polarity focus that would not be present otherwise. Just like Wilder's (2013) derivation of emphasis, G&C's does not clearly explain what PF adds above and beyond a non-PF utterance.

As for the proposed explanation for the discourse restrictions of verum/polarity focus, the account is indistinguishable from accounts such as Wilder 2013 or Samko 2016a that claim that the focus antecedent for PF is a polar question $?p$. It explains why PF cannot be used out of the blue, but it does not explain why PF is optional in response to overt polar questions.

Gutzmann et al. (submitted) recognize that the account in Gutzmann & Castroviejo Miró 2011 is more or less indistinguishable from a focus account that takes $?p$ as antecedent. They attempt to improve upon it by altering the semantics slightly.

(84) $[\![\text{VERUM}(\phi)]\!] = 1$, if the speaker wants to prevent that the QUD is downdated with $\neg p$.
                                                          (Gutzmann et al., submitted, 42)

GHM's goal with (84) is to strengthen the restriction that VERUM places on the context. They take (84) to require that an interlocutor has previously sought to downdate $?p$ with $\neg p$, or has at least implied this possibility.

I see two issues with this proposal. First, there is nothing about wanting to prevent a $\neg p$ answer to $?p$ that requires someone else to have uttered or implied $\neg p$. For example, if A asks $?p$ and B answers p, it follows from B's utterance that B wants to prevent $?p$ from being downdated with $\neg p$. Thus the condition in (84) is met. GHM seem to claim that one can only want to prevent a $\neg p$ downdate if that possibility were already suggested. However this is an assumption that does not

follow. They need some sort of bridging principle to explain why this should be so.

Second, GHM's goal is to strengthen G&C's semantics for VERUM in (83) so that VERUM(ϕ) is predicted to be acceptable in fewer contexts than predicted by (83), and therefore acceptable in fewer contexts than predicted by a focus account of verum/polarity focus. However the semantics in (83) and (84) predict meanings for assertions of VERUM(ϕ) that are actually *mutually entailing*. Suppose the speaker asserts VERUM(ϕ) and we assume the semantics in (83). According to standard assumptions for assertion and QUD, and G&C's semantics in (83), the speaker wants to downdate $?p$ with p, which entails that the speaker wants to prevent that $?p$ is downdated with $\neg p$. Thus an assertion of VERUM(ϕ) with the semantics in (83) entails an assertion of VERUM(ϕ) with the semantics in (84). Suppose the speaker asserts VERUM(ϕ) and we assume the semantics in (84). Then by (84), the speaker wants to prevent that $?p$ is downdated with $\neg p$, and by standard assumptions about assertion and QUD, the speaker wants to downdate $?p$ with p. Thus an assertion of VERUM(ϕ) with the semantics in (84) entails an assertion of VERUM(ϕ) with the semantics in (83). Therefore, assertions of VERUM(ϕ) with the semantics in (83) and the semantics in (84) are mutually entailing. So (84) cannot add any extra restriction on the use of VERUM that is not already present in (83), and therefore the account in (84) is not more restrictive than a focus account that takes the polar question $?p$ to be the antecedent for a verum/polarity focus utterance.

Despite these criticisms, it is worth pointing out the similarity between the intuitive idea behind GHM's proposal and the one I have adopted in section 2.3. To attempt to account for the distribution and intuitions about verum/polarity focus utterances, GHM's semantics takes a proposition p and says that $\neg p$ is not to be used. This bears a clear resemblance to my own analysis of PF: It requires a salient $\neg p$ antecedent in order to be felicitous, which explains its distribution, and then the combination of this with asserting p, which entails the falsity of that salient $\neg p$ alternative, produces the emphatic effect of PF. So intuitively, our proposals are on the same path, and share something with the spirit of Richter 1993. The challenge for capturing this insight is that an assertion of p already entails the falsity of $\neg p$—and that the speaker wants to prevent downdating with $\neg p$—without any help from special focus marking or an operator. So the challenge is to

explain what extra work focus (or the VERUM operator) does in explaining both the distribution and emphasis effect of PF. GHM's account does not tell us why wanting to prevent $\neg p$ downdate requires $\neg p$ to be salient, nor why it leads to emphasis. The focus account in terms of F-marking on the polarity head does tell us these things. First, focus introduces a presupposition requiring a $\neg p$ antecedent to be salient. Second, emphasis follows from the combination of this requirement and making an assertion that entails that the salient antecedent is false.

(84) could be altered to make it achieve everything the focus account does. But in so doing, one would eventually need to recreate the focus presupposition, a requirement that $\neg p$ is salient. And once one does this, one wonders why the VERUM operator is needed. That is, why recreate a more general effect that is clearly needed for independent reasons by positing a special silent operator that serves only this one purpose? The focus account seems more parsimonious.

However, GHM do make some arguments in favor of using a VERUM operator. Theoretical parsimony is not by itself a strong argument, especially when faced with empirical evidence to the contrary. So let's turn to their arguments now.

2.4.2.2   GHM's arguments against a focus account of PF

Gutzmann et al. (submitted) make several arguments against treating verum/polarity focus as a kind of focus. One argument is that PF does not exactly have the distribution that would seem to be predicted by a focus account. In particular, it appears to be optional in response to polar questions as discussed above. Moreover, they claim that a focus account cannot explain the pragmatic effect of emphasis conveyed by PF. However, as we have already seen, these issues have been dealt with above in section 2.3.

Moreover, as discussed above in section 2.3, GHM think that PF is not merely licensed by the presence of a focus antecedent, but requires some previous controversy or conflict over how to settle a QUD $?p$. I have claimed that this is not an accurate characterization of the facts. Instead examples like (1) are perfectly felicitous:

(1)   A: Did you buy yogurt?
        B: I DID buy yogurt.

Consider GHM's examples of PF in a polar question:

(85)   a.   A: Hey Blair, I have to ask you something:
              # ARE morphemes a part of syntax?
        b.   A: Since morphemes are part of syntax, ...
              B: Wait. ARE morphemes part of syntax?   (Gutzmann et al., submitted, 17)

(85a) demonstrates that polar questions with PF are not felicitous out of the blue. GHM argue that

what is required is that the question of whether morphemes are part of syntax was salient before

the PF question *and* that there is some controversy or conflict over how to resolve that question, as

in (85b). But just as no conflict is required in felicitous PF responses to polar questions such as in

(1), no conflict is required to use PF in a question, as demonstrated by (86):

(86)   B is a very bad undergraduate student who is trying to figure out what will be on the syntax
        quiz next class from their professor, A. B hasn't been doing any of the assigned work, and
        A is pretty fed up with B's attempts to find out what will be on the quiz.
        B: I guess I'd better study some phonology too, huh?
        A: If you think phonology is part of syntax, then you'd better study it, yes.
        B: IS phonology part of syntax?

B has no idea whether phonology is part of syntax and so can't have information that conflicts

with A's information. The PF prominence shift is licensed by the antecedent in the protasis of A's

conditional.

GHM's central argument against a focus account, the one for which they provide the most

empirical evidence, is a crosslinguistic one. The sorts of contexts that elicit verum/polarity focus

in English and German elicit non-focus, overt operators in several other unrelated languages. GHM

take this as evidence that all languages employ a VERUM operator. They claim that in English and

German, VERUM is realized by a pitch accent on the auxiliary that just accidentally happens to

look like focus prominence shifting.

However, just because a context elicits different grammatical constructions in different languages, do we therefore need to argue that those constructions are actually caused by a single underlying mechanism, in this case the VERUM operator? Consider the case of evidentiality in Cuzco Quechua and St'át'imcets. Both languages exhibit evidential morphemes that encode information about where the evidence in support of a proposition p came from, for example inference or secondhand reports. Thus, if given a context in which the speaker believes that it is raining but only because a friend told them so, not because they have seen it themselves, then speakers in each of these languages will use the reportative evidential when conveying p, e.g. "(reportative evidential) it is raining." Despite the very similar function of these morphemes, it has been argued that the Quechua evidentials are speech act operators (e.g. Faller, 2002, a.o.), while the St'át'imcets evidentials are epistemic modals (e.g. Matthewson et al., 2007, a.o.). Meanwhile, Gitksan, another evidential language, has some evidentials that are speech act operators while others are modals (Peterson, 2010). Moreover, if given a similar context, an English speaker might say "I heard that it's raining." Despite the similar function of these crosslinguistic constructions, it is not necessary to postulate a single analysis for all evidential morphemes in all languages.

Similarly, there is no pressing need for a unified analysis of all of the disparate grammatical phenomena that appear across the world's languages in GHM's "VERUM" contexts. To make the point, we need look no further than English. Goodhue et al. (2016) demonstrate experimentally that contexts in which one interlocutor directly disagrees with another reliably elicit both verum/polarity focus and the contradiction contour (Liberman & Sag, 1974). Despite this overlap in function, no one has ever proposed a unified analysis of these disparate English phenomena, nor should they.

For another example, consider the relationship between verum/polarity focus and the adverb *really*. Romero & Han (2004) argue that both of these contribute their VERUM operator. However, the two phenomena exhibit the following asymmetries:

(1)   A: Did you buy yogurt?

a. B: I DID buy yogurt.
b. B: # I really DID buy yogurt/I really bought yogurt.

(87)   B wants to know whether Jill will be at a meeting that is for members only. 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. B: # Is she really a member?

While answering a polar question as in (1) seems to allow for the use of PF, *really* is strange in this context. If we keep in mind that in the context in (87), B has no opinion about whether or not Jill is a member, then the use of PF in (87a) is perfectly felicitous, while the use of *really* in (87b) is quite strange. The latter seems to necessarily convey that B has some previous reason to doubt that Jill is a member, which clashes with the context.

Moreover, Gutzmann et al. (submitted, 17) themselves note that *really* behaves differently than PF. Consider again the context in (85a), which didn't license PF. Interestingly, *really* appears to be felicitous here:

(88)   A: Hey Blair, I have to ask you something:
Are morphemes really a part of syntax?   (Gutzmann et al., submitted, 17, fn. 7)

Whereas PF in (85a) was infelicitous because the proper focus antecedent was not present in the context, (88) does not impose such a requirement. Nevertheless, we do draw certain inferences here. In particular, we infer that A is skeptical that morphemes are a part of syntax (negative bias), and we accommodate that A has heard someone make this claim (otherwise, why would A bring it up?). Despite this accommodation, polarity focus is not licensed in this context.

What these asymmetries reveal is that, despite the superficial similarity in function between PF and *really* in English—a similarity that is strong enough for Romero & Han (2004) to have argued that the two have identical semantic interpretations—the two are nevertheless distinct grammatical phenomena that come apart when examined closely enough. In other words, similarity of

function is not enough reason by itself to suppose identity of grammatical phenomena. While verum/polarity focus exhibits the hallmarks of focus marking, *really* does not. GHM demonstrate that the "VERUM" operators that they identify in other languages do not behave like focus in those languages. This suggests that those operators are indeed something distinct, perhaps more akin to the adverb *really* than to polarity focus. But it does not prove that polarity focus in English and German should therefore be analyzed as contributing a special operator VERUM. Given that we have well developed and independently motivated theories of focus semantics (e.g. Rooth, 1992, a.o.), and polarity focus exhibits the behaviors of focus marking, we ought to use that focus semantics instead of grouping PF with other crosslinguistic grammatical phenomena due to similarity of function.

2.5   Deaccenting negation

Now that I have proposed an account of polarity focus, and argued that it explains the crucial empirical facts better than alternative accounts, we need to return to a particular type of example that is still unaccounted for. The problem is that there are certain deaccenting patterns that are not explained by a classic Roothian theory of focus such as the one I have developed for polarity focus above. Explaining it will require allowing givenness deaccenting to have its own requirements, separate from focus marking.

   We have already seen examples of this in (12) and (13), but I will use different examples to demonstrate the facts here. First, consider polarity focus agreements with a previous assertion of $\neg p$. As discussed in section 2.3.2, the PF utterances in (89a)-(89c) require p to be salient. p then serves as antecedent to the PF utterance of $\neg p$.

(89)   A: Dinah does not like Ivy.

    a.   B: Dinah DOESN'T like Ivy.
    b.   B: Dinah does NOT like Ivy.
    c.   B: Dinah DOES not like Ivy.

Interestingly, when negation is not contracted, focus prominence can fall on *not* or on the auxiliary *does*. Both (89b) and (89c) are felicitous.

Now consider a canonical example of polarity focus, namely direct disagreements as in (90). The PF utterance of $\neg p$ in (90a) is felicitous and my explanation is that A utters the required, contrasting polarity alternative, p. Thus the focus presupposition is met. (90b) is felicitous for the same reason.

(90)   A: Dinah likes Ivy.
      a.   B: Dinah DOESN'T like Ivy.
      b.   B: Dinah does NOT like Ivy.
      c.   B: # Dinah DOES not like Ivy.
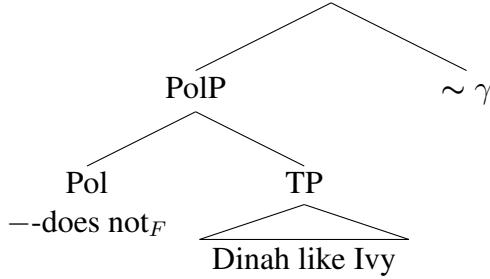
However, unlike in (89), when prominence falls on the auxiliary *does* as in (90c), the utterance is intuitively infelicitous. What is to explain this asymmetry? Ultimately, I will argue that the infelicity of (90c) is caused entirely by infelicitous givenness deaccenting. But first, let's try to account for it using just the theory of focus as applied to polarity focus that I have developed so far to see why it doesn't work. Then I will revise some assumptions and show that the revision doesn't work, either.

Rooth's (1992) theory makes predictions based on three inputs: (i) the ordinary semantic value of the focus-bearing utterance, (ii) the focus semantic value of the same utterance, and (iii) the focus antecedent that gives γ its content. If we assume that all three of (90a)-(90c) have the same syntactic structure with F-marking in the same place, then of course we can't predict the asymmetry. That is, suppose that regardless of whether the pitch accent lands on *doesn't*, *does*, or *not*, it is there due to an F-marker on the polarity head $-$. Then, the ordinary semantic value of the PF utterance is $\neg p$, its focus semantic value is $\{p, \neg p\}$, and the required antecedent is p. This antecedent is made available by A's utterance, thus all three should be felicitous, but only (90a) and (90b) are.
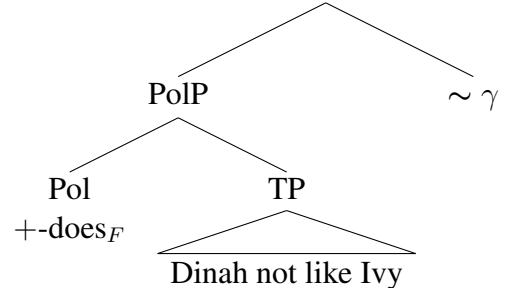
Let's try revising our syntactic assumptions. We'll keep our previous assumptions for the (a) and (b) sentences, namely the F-marked polarity head is $-$, which contributes propositional

negation at logical form. But for the (c) sentences, let's suppose that the F-marked polarity head is $+$, and that the negation *not* is a lower, constituent negation that modifies the VP/vP directly.

(91)   Tree for the (a)/(b) sentences: (92)   Tree for the (c) sentences:

```
        /\                                              /\
      PolP    ~ γ                                    PolP    ~ γ
      /\                                              /\
    Pol    TP                                       Pol    TP
  −-does not_F  /\                                +-does_F   /\
           Dinah like Ivy                              Dinah not like Ivy
```

The result is a syntactic distinction without a semantic difference. First, note there is no interpretational difference between the ordinary semantic values of the (a)/(b) sentences and the (c) sentences: Each of them convey $\neg p$. That is, they all convey contradictory negation, regardless of the syntactic position of *not*. This claim is obvious for the (a)/(b) sentences. For the (c) sentences in (92), negation is interpreted lower in the structure, modifying the VP. Assuming the VP denotes the set of individuals who like Ivy or $\lambda x_e.\ x$ *likes Ivy*, constituent negation takes this property as input and returns its complement, the set of individuals who do not have the property of liking Ivy. Once the negated property composes with the subject argument *Dinah*, the result will be the same proposition as is produced by applying propositional negation in the (a)/(b) sentences, namely $\neg p$.

Second, while the focus semantic value will be calculated differently for these two structures, they will nevertheless produce the same results because the only two alternatives are $+$ and $-$. For the (a)/(b) sentences in (91), the focus semantic value is calculated by allowing the alternative polarity heads $+$ and $-$ to each receive a proposition p as input, producing the propositions p and $\neg p$ respectively as the resulting focus alternative set. As for the (c) sentences in (92), I have just shown that the TP denotes $\neg p$. By the time the calculation of the focus semantic value reaches the PolP node, the alternatives $+$ and $-$ each receive the proposition $\neg p$ as input, producing the propositions $\neg p$ and $\neg\neg p\ (= p)$ respectively as the resulting focus alternative set.

Therefore in both (91) and (92), the ordinary semantic value will be $\neg p$, and the focus semantic value will be $\{p, \neg p\}$. Thus, all sentences are predicted by the focus presupposition to require a p

antecedent, and the asymmetry cannot be explained. So this change to our syntactic assumptions has no effect.

Here is the nature of the problem with trying to use focus marking to explain the asymmetry between (89) and (90). In both (89) and (90), the context provides the same antecedent to the (a)/(b) examples as it does to the (c) examples, namely p. For the theory I have proposed to predict the asymmetry, we need either the ordinary semantic values or the focus semantic values of (90a)/(90b) to be different from that of (90c). But if we find some way of making these values different, then it would also make either the ordinary or focus semantic value of (89c) distinct from those of (89a)/(89b). This would be undesirable since there is no asymmetry in (89). Thus, having the same semantic values for the (a)/(b) sentences as for the (c) sentences gets us into trouble in (90), while having different semantic values for the (a)/(b) sentences from the (c) sentences gets us into trouble in (89).

The contrast between the data in (89) and (90) calls out for an analysis in terms of givenness. (90c) seems to be infelicitous while the rest are not because *not* is deaccented despite not being given. The use of polarity focus in particular (that is F-marking on the polarity head) doesn't seem to have anything to do with it. After all, (90a) and (90b) are both felicitous, so polarity focus itself is felicitous in the context. Therefore, I believe these polarity focus examples provide an argument in favor of having a theory of givenness deaccenting that is distinct from the theory of focus. Various authors have argued for separate accounts of focus and givenness (Stevens, 2014; Tancredi, 2014; Rooth, 2015; Büring, 2016).
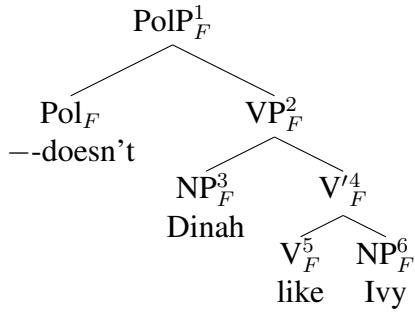
What is needed here is that the (c) examples above feature some kind of givenness (G) marking on the deaccented *not*. In (89), *not* is given by A's preceding utterance, and so whatever the restriction on G-marking is precisely, it is met. In (90), *not* is not given by A's preceding utterance, and so G-marking's requirements are not met. Let's consider a precise way of cashing this out using Rooth's (2015) proposal for representing anaphoric deaccenting, or givenness, within the theory of focus he develops in earlier work.

Consider again the dialogue in (69).

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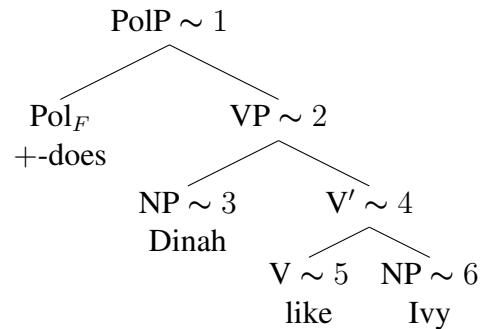
(69) A: Dinah doesn't like Ivy.
      B: Dinah DOES like Ivy.

Rooth (2015) proposes that every node is marked either with F or with $\sim \gamma$.[27] Thus the new structure for A's utterance is in (93), while that for B's is in (94). Superscripted numbers in (93) are used as indices for the semantic content that the constituents provide to the variables following each instance of $\sim$ in (94).[28]

(93)   A's utterance in (69):

$$\text{PolP}^1_F$$

- Pol_F — -doesn't
- VP^2_F
  - NP^3_F Dinah
  - V'^4_F
    - V^5_F like
    - NP^6_F Ivy

(94)   B's utterance in (69):

$$\text{PolP} \sim 1$$

- Pol_F +-does
- $\text{VP} \sim 2$
  - $\text{NP} \sim 3$ Dinah
  - $\text{V}' \sim 4$
    - $\text{V} \sim 5$ like
    - $\text{NP} \sim 6$ Ivy

In order for the system to predict the anaphoricity of deaccenting, an addition needs to be made to the presuppositions of $\sim$ in (34). (95a-i) and (95a-ii) are the same as before, while (95b) is new:

(95)   An adaptation of Rooth's (2015) presupposition for $\sim$:
  a.   If there is an F-marker in the scope of $\sim$:
    (i) $\phi \sim \Gamma$ presupposes that a contextually given Γ is a subset of the focus semantic value of ϕ ($\Gamma \subseteq \llbracket \phi \rrbracket^f$), and that Γ contains both the ordinary semantic value of ϕ and an element distinct from it.
    (ii) $\phi \sim \gamma$ presupposes that a contextually given γ is a member of the focus semantic value of ϕ ($\gamma \in \llbracket \phi \rrbracket^f$), and that γ is distinct from the ordinary semantic value of ϕ.
  b.   If there is no F-marker in the scope of $\sim$, $\phi \sim \gamma$ presupposes that $\gamma = \llbracket \phi \rrbracket^o$.

---

[27]Rooth (2015) simplifies the syntactic representation by allowing nodes to be marked with $\sim \gamma$ rather than adjoining them as sisters to syntactic constituents. However this simplification comes at the cost of the complication of the recursive rules used to derive focus semantic values. He makes further changes to the system allowing for the representation of utterances in which focus scopes over new. Since these issues are not relevant here, I will continue to allow $\sim \gamma$ to adjoin to clauses syntactically. However, for readability, I will mark nodes with $\sim \gamma$ as an abbreviation for an adjoined $\sim \gamma$.

[28]I have left out tense phrases (TP) to simplify presentation.

Note that every node in (93) is F-marked. The idea here is that F-marking outside the scope of $\sim$ indicates that a constituent is new, and thus it does not require an antecedent. Looking to (94), F-marking in the scope of $\sim$ works as before. $\sim$ requires an antecedent that is a member of the focus semantic value of ϕ, distinct from ϕ's ordinary semantic value. In this case A's PolP serves as antecedent in PolP ~ 1. What is new is that by (95b), nodes marked with $\sim$ that do not dominate an F-marker require an antecedent that is identical to their ordinary semantic value. Each node of A's sentence finds such an antecedent. Thus all of the deaccenting and also the prominence shifting in A's utterance is felicitous.
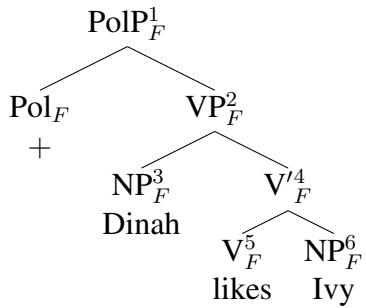
Now we are in a position to explore how this system can explain the asymmetries seen above in (89) and (90), simplified in (96) and (97):

(96)   A: Dinah likes Ivy.
        B: # Dinah DOES not like Ivy.
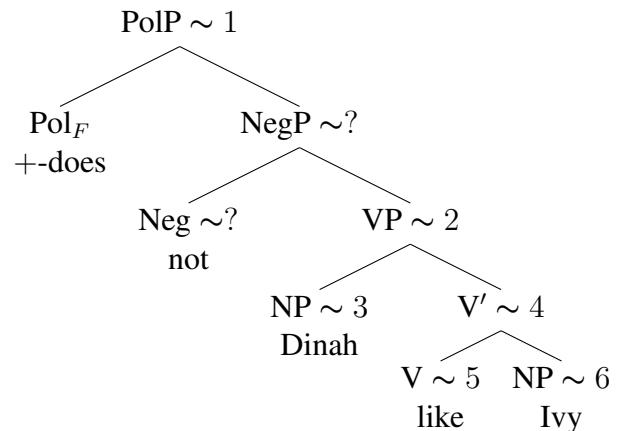
(97)   A: Dinah does not like Ivy.
        B: Dinah DOES not like Ivy.

A's and B's utterances in (96) are now represented as in (98) and (99).[29]

(98)   A's utterance in (96):

$$\text{PolP}^1_F$$

Pol$_F$ + ; VP^2_F

NP^3_F Dinah ; V$'^4_F$

V^5_F likes ; NP^6_F Ivy

(99)   B's utterance in (96):

PolP ~ 1

Pol$_F$ +-does ; NegP $\sim$?

Neg $\sim$? not ; VP ~ 2

NP ~ 3 Dinah ; V$'$ ~ 4

V ~ 5 like ; NP ~ 6 Ivy
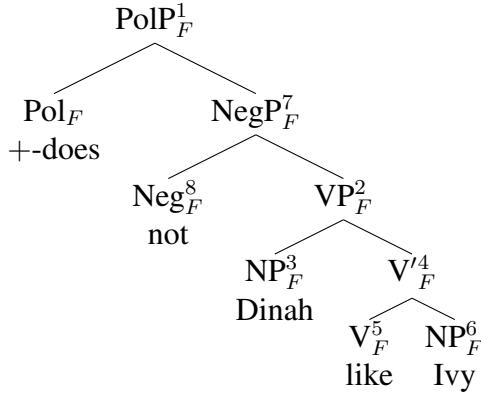
The infelicity of (96)B is now predicted. As discussed above, the negation *not* is now below the

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[29]I remind the reader of the assumption stated in footnote 16, that I am assuming that at LF certain constituents reconstruct to lower positions for interpretation. Representations that more accurately represent the pronunciation of these sentences would be ones where the subject raises to spec-PolP.
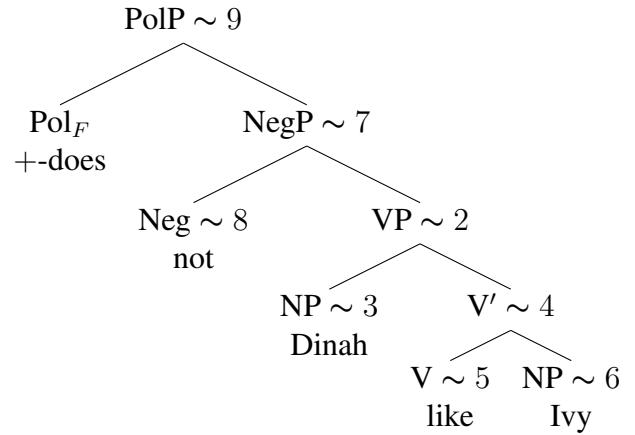
polarity head. It is represented here as propositional, contradictory negation, though it could have been embedded under the subject as constituent, contrary negation as outlined above and produced the same result. In the structure in (99), neither the node Neg, nor the node NegP find an antecedent in (98), therefore the givenness presupposition in (95b) is not met, and the utterance is correctly predicted to be infelicitous.

Let's contrast this with the felicitous use of the same polarity focus utterance in (97).

(100)   A's utterance in (97):

$$\text{PolP}^1_F$$

Pol$_F$ +-does

NegP^7_F

Neg^8_F not

VP^2_F

NP^3_F Dinah

V$'^4_F$

V^5_F like

NP^6_F Ivy

(101)   B's utterance in (97):

$$\text{PolP} \sim 9$$

Pol$_F$ +-does

NegP ~ 7

Neg ~ 8 not

VP ~ 2

NP ~ 3 Dinah

V$'$ ~ 4

V ~ 5 like

NP ~ 6 Ivy

Thanks to the presence of negation in A's assertion, the nodes Neg and NegP in (101) find the appropriate antecedents 8 and 7.

An interesting consequence of combining Rooth 2015 with my account of polarity focus above is that we now need to assume that there can be completely different antecedents for focus and givenness. In this particular example, since B asserts $\neg p$ with polarity focus, the antecedent required to satisfy ~ 9 has to have content p. The content 1 of A's PolP in (100) cannot provide the content for 9 because it does not contrast with the ordinary semantic value of B's PolP, as required by the individual case presupposition in (95a-ii). The antecedent for 9 could come from one of two places. First, it could come from the propositional content embedded under negation in A's utterance, namely 2. Second, I argued above in section 2.3.2.2 that in dialogues in which A and B both assert p, a $\neg p$ antecedent has to be provided contextually. Thus it's also possible here that a contextually salient antecedent provides the content 9 to satisfy ~ 9. This contrasts with the antecedents for givenness deaccenting, which are all provided by the constituents of A's sentence

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in (100).

To further see the asymmetry between antecedents for focus and givenness, note that a single context can make $\neg p$ salient enough to serve as antecedent for polarity focus, even though *not* is not salient enough to deaccent negation:

(102)   A: Does Dinah like Ivy?

    a.   B: She DOES like Ivy   F-antecedent = $\neg p$
    b.   B: She does NOT like Ivy   F-antecedent = p
    c.   B: # She DOES not like Ivy   F-antecedent = p, G-antecedent = *not*

Crucially, A's question makes $\neg p$ salient to license (102a). Despite this, *not* is not available as a salient antecedent for givenness deaccenting in (102c). The reason may be that B has to choose whether to take p or $\neg p$ to be the salient antecedent, and once the choice is made, the other is no longer available. Thus the $\neg$ from the $\neg p$ antecedent cannot license deaccenting in (102c).

However, givenness deaccenting can exploit overt constituents regardless of which salient F-antecedent is chosen. For example:

(103)   A: Does Dinah not like Ivy?

    a.   B: She DOES like Ivy   F-antecedent = $\neg p$
    b.   B: She does NOT like Ivy   F-antecedent = p
    c.   B: She DOES not like Ivy   F-antecedent = p, G-antecedent = *not*

(103c) is now felicitous. B chooses the p antecedent for polarity focus, but the G-antecedent required to deaccent *not* is still made available by the overt syntax of A's negative polar question.

The idea that focus and givenness can have completely separate antecedents should not be surprising. After all, the idea here is for focus and givenness to have separate statuses in the grammar. For example, the focus presupposition of B's utterance in (96) or (102c) is met. A's utterance provides the proper antecedent. It is only due to improper givenness deaccenting that (96)B and (102c) are infelicitous. Meanwhile for (97)B and (103c), with the presupposition of each $\sim$ satisfied, B's utterance is correctly predicted to be felicitous.

I believe there is something intuitively right about this approach. It predicts that the cause of the asymmetry between (96) and (97) is due only to givenness deaccenting, not focus marking. This seems desirable since it fits the observation, discussed above, that the cause of the infelicity intuitions has everything to do with the inappropriateness of deaccenting of *not*, not inappropriateness of using polarity focus in the context. After all, polarity focus is intuitively felicitous in (90a) and (90b). If this analysis is on the right track, then we can conclude that polarity focus acts as a case study that provides an argument in favor of the separation of focus marking and givenness deaccenting in the grammar. A theory designed to explain focus marking only such as that in Rooth 1992 cannot account for all facts about givenness deaccenting, as we have just seen. Likewise, a theory designed to explain givenness deaccenting such as that in Schwarzschild 1999 cannot explain all facts about focus marking, as we saw in section 2.2.2. Both focus and givenness are required to explain all of the facts about polarity focus.

On the other hand, it is worth pointing out a possible alternative analysis that relies on ideas from Krifka 2013, presented in chapter 4. Manfred Krifka (p.c.) points out that the theory of polar particle responses in Krifka 2013 claims that negative sentences introduce two propositional discourse referents, one anchored to the NegP with the content $\neg p$, the other anchored to the embedded TP with the content p. Importing this claim to deal with the data from this section, it could be argued that *Dinah does NOT like Ivy* requires p as its antecedent, while *Dinah DOES not like Ivy* requires $\neg p$ as its antecedent. This would explain the asymmetries we saw in (89) and (90) above, repeated here:

(89)   A: Dinah does not like Ivy.   (90)   A: Dinah likes Ivy.

    a.   B: Dinah does NOT like Ivy.   a.   B: Dinah does NOT like Ivy.

    b.   B: Dinah DOES not like Ivy.   b.   B: # Dinah DOES not like Ivy.

This idea is attractive in that it relates polarity focus to research in a related area, namely polar particle responses. The problem for this view is that I argued previously that the optionality of polarity focus in response to positive polar questions is that such questions make both p and $\neg p$ antecedents available. But crucially for the theory in Krifka 2013, positive questions only make

the p antecedent available for polar particles (see chapter 4). Therefore, I will stand by the analysis in terms of focus and givenness that I outlined above.

2.6 Conclusion

Treating polarity focus as focus on the polarity head offers a parsimonious account of PF data, drawing on a semantic toolkit that is well motivated by other empirical phenomena. The account explains three fundamental empirical facts about polarity focus. First, it explains why polarity focus cannot be used out of the blue, but instead requires a discourse antecedent, namely it imposes a focus presupposition. Second, it explains the optionality of polarity focus in some cases, namely polarity focus is optional when there is both an antecedent for PF and another antecedent. Third, it explains why polarity focus intuitively expresses speaker emphasis on the truth of the proposition. This is a result of information structure and the fact that a polarity focus utterance always entails the negation of its contrasting alternative.

Along the way, I demonstrated insights and shortcomings of previous focus accounts of polarity focus, and I compared the focus account to operator accounts of verum/polarity focus, arguing that focus accounts provide a simpler option and that operator accounts make incorrect predictions. Finally, we considered puzzling facts about deaccenting negation, which I argued are caused by givenness deaccenting rather than polarity focus itself.

I noted above that Romero & Han (2004) observe another interesting empirical fact about polarity focus that we have not taken up here, namely that polar questions with polarity focus usually convey epistemic bias: that the speaker believes that the answer with opposite polarity from the question is true. I turn to this issue now in chapter 3.

Preface to Chapter 3

In chapter 2, I argued that prominence shifting to the auxiliary in English is polarity focus, by which I mean F-marking on the polarity head. As a kind of focus, polarity focus is to be explained by the more general theory of focus, and any special meaning effects that polarity focus exhibits is to be explained via pragmatics rather than adding anything special to the semantics of polarity focus.

One special meaning effect of polarity focus is that it emphasizes the truth of the proposition it appears with. Instead of explaining this with a special operator at LF as a verum focus approach would, I explained it just by appealing to the kinds of focus alternatives made salient by any polarity focus utterance. Since there are only ever two polarity alternatives, p and $\neg p$, each alternative contradicts the other, every polarity focus utterance draws attention to its alternative, which it then entails is false. By drawing attention to the opposite alternative and entailing that it is false, polarity focus utterances add extra emphasis to the proposition asserted. By comparison, non-polarity focus utterance entails the falsity of its polarity alternative, but it does not draw explicit attention to that alternative, and is thus less emphatic.

One of the main pragmatic effects of polarity focus was left unexplained in chapter 2. Namely, polarity focus polar questions give rise to epistemic bias: the inference that the speaker believes that the answer with opposite polarity from the question is true. One approach to explaining this fact has been to claim that polarity focus is not a normal kind of focus, but instead contributes a verum operator that can explain both the emphasis on truth in assertions with polarity focus, and epistemic bias in polarity focus questions (Romero & Han, 2004). Moreover, this verum operator

is used to explain epistemic bias in high negation questions as well, which on the face of it appears to be identical to the kind of bias observed in polarity focus questions.

However, given my claim in chapter 2 that polarity focus is better explained by the general theory of focus than the verum focus approach, a crucial remaining task is to explain the appearance of epistemic bias in polarity focus questions without appealing to a special semantics that would not ordinarily be present in the question above and beyond what the usual theory of focus contributes. I turn to this task in chapter 3, completing the task of explaining all of the meaning effects of polarity focus without going beyond the resources made available by the theory of focus along with other standard syntactic, semantic, and pragmatic assumptions.

Once the bias of polarity focus questions is explained in this way, there is a remaining question about epistemic bias in high negation questions. High negation questions give rise to an epistemic bias that seems to be very similar to that of polarity focus questions despite that high negation questions do not rely on F-marking and prominence shifting for their meaning. If bias in polarity focus questions receive their own unique explanation, how do we explain the very similar bias in high negation questions? I also tackle this question in chapter 3.

First, I demonstrate a key asymmetry between bias in the two kinds of questions: Epistemic bias in polarity focus questions is context sensitive while epistemic bias in high negation questions is not. Rather high negation questions seem to require the speaker to be epistemically biased. Once this fact is observed, it is clear that it is wholly appropriate to have separate theories of bias in these two question types. I then explore other properties of high negation questions to help us get a handle on how to explain the bias they convey.

Chapter 3

Epistemic bias in polar questions

3.1 Introduction

The polar questions in (1) all, in some sense, ask the same question. The speaker wants to know whether or not Moira is here, and the possible responses *She's here* and *She isn't here* each provide a complete answer to each question. Classic theories of question semantics (Hamblin, 1973; Groenendijk & Stokhof, 1984) are able to account for this common meaning by modeling each question using a single semantic object. For Hamblin (1973), that is a set containing the propositions representing the positive and negative answers as in (2). For Groenendijk & Stokhof (1984), that is an equivalence relation that produces a partition on possible worlds (which in the case of polar questions produces the same set of two propositions in (2)).

(1) a. Is Moira here?   c. Isn't Moira here?
     b. Is Moira not here?   d. IS Moira here?

(2) {Moira is here, Moira is not here}, i.e. $\{p, \neg p\}$

What is puzzling from the perspective of these classic theories is that, despite the commonalities of meaning among the questions in (1), they nevertheless display meaning differences in other ways, as has been claimed in previous work. For example, (1b) seems to require contextual evidence in

favor of $\neg p$ (e.g. Büring & Gunlogson, 2000); (1c) conveys that the speaker has a previous belief or expectation that p is true (e.g. Ladd, 1981); (1d) seems to convey the opposite bias, an expectation that $\neg p$ is true (e.g. Romero & Han, 2004); (1a) lacks these properties. On the face of it, the classic theories do not capture these differences.

How can these differences in meaning be accounted for? Is it possible to maintain a classic theory of polar question semantics that unifies all of these questions by explaining the variation entirely via pragmatics? Or does each kind of question give rise to different shades of meaning as a result of a complex potpourri of compositional semantics, pragmatics, syntax and prosody?[1]

In this paper, I will focus on one large piece of this puzzle, so-called *epistemic bias*, which is when a questioner conveys that they already believe that one of the answers to the question is true. Both *high negation questions* (HNQs) as in (1c) and *polarity focus questions* (PFQs) as in (1d) display epistemic bias. Despite the similarity of the bias they convey, I will argue that epistemic bias in PFQs and HNQs spring from different sources. Bias in PFQs is derived from general pragmatic principles in combination with the sorts of conversational contexts that PFQs usually appear in. On the other hand, I will argue that HNQs have a unique syntax and semantics, and I will explain epistemic bias as non-at-issue content that arises as a direct consequence of their structure. Thus, while the special meaning effects of PFQs can be explained entirely via pragmatics while maintaining a classic semantics for polar questions, an explanation of HNQ bias requires a syntax and semantics that goes beyond classic theories. Asymmetries between PFQs and HNQs will be demonstrated in section 3.3, and the account of bias in PFQs is developed in section 3.4.

Crucial to the claim that HNQs have a special syntax and semantics is a collection of new empirical data in section 3.5 that demonstrates that the clitic *n't* attached to the preposed auxiliary in HNQs does not contribute a propositional negation to the semantics. Ladd (1981) claims that

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[1]I could have included other ways of asking about p here. For example, a speaker could say *Moira's here?*, or *Is Moira here or isn't she?*, or *Is Moira here or not?*, or *Is Moira here or no?*. These ways of asking about p have yet other distinct syntactic, semantic, and pragmatic effects that have been explored in recent work (e.g., Gunlogson, 2003; Nilsenovà, 2006; Biezma & Rawlins, 2012; Roelofsen & Farkas, 2015; Westera, 2017). Moreover, there are tag questions like *Moira's here, isn't she?* (e.g. Ladd, 1981; Malamud & Stephenson, 2015; Farkas & Roelofsen, 2017). I will leave these various question forms aside here, though I will suggest briefly at the end that the analysis I develop for HNQs may provide insight into tag questions.

HNQs have a reading in which the negation is somehow "outside" of the proposition, however, he also argues that questions with preposed negation are ambiguous between this reading and one with propositional negation. This ambiguity is supposedly demonstrated by the use of polarity items such as *either* and *too*, however the data has been disputed in the recent literature (e.g. Sailor, 2013; AnderBois, 2016), and it has been suggested that there is variation between speakers of American English and British English, with only the latter having access to the ambiguity. While more research is needed to determine whether such variation exists, I believe that part of the problem is that testing polarity with *either* produces murky results for reasons that are not yet understood, but that may be due in part to an incomplete understanding of the semantics and licensing of *either* itself. Therefore, I proceed by avoiding *either*. Section 3.5 demonstrates a suite of tests that clearly demonstrate that HNQs lack propositional negation in American English, and that could be used to test for variation in English more widely. For speakers who have intuitions that they believe corroborate Ladd's ambiguity, the tests in section 3.5 should clearly determine the extent of this ambiguity, and whether there is a dialect of English that truly allows for preposed negation in polar questions to be interpreted as propositional negation.

Given that section 3.5 demonstrates the lack of propositional negation in HNQs, we may then ask what kind of structure makes this prediction. In section 3.6, I will briefly review Krifka's (2015; 2017) theory of denegation of speech acts as applied to HNQs, which produces the desired result. In section 3.7, I will show how a syntax and semantics for HNQs such as Krifka's allows for an explanation of the epistemic bias that HNQs convey. Finally, in section section 3.8, I will conclude, and point out several open questions for future work.

Before turning to the empirical asymmetries between PFQs and HNQs in section 3.3, I will describe some key differences between HNQs and *low negation questions* (LNQs), such as (1b). At first glance, one might think that all negative polar questions in English are biased and in the same way. Therefore, it is important to get clear on some of the most basic empirical facts about negative polar questions first. I turn to this now.

3.2 Contextual evidence, HNQs, and LNQs

HNQs and LNQs have overlapping distributions. Both kinds of questions are usually felicitous in contexts in which the speaker is epistemically biased for the positive answer p, and there is contextual evidence in favor of $\neg p$. Goodhue & Wagner (2018, chapter 4 of this thesis) define contextual evidence as follows, building on Büring & Gunlogson (2000):

(3)   *Contextual Evidence*:
        Evidence for p is a change in the context that increases the likelihood that p is true.

Büring & Gunlogson (2000) claim that different generalizations hold between contextual evidence and the use of LNQs on the one hand, and HNQs on the other hand. In particular:

(4)   *Evidential condition on LNQs*:
        LNQs require contextual evidence in favor of $\neg p$.

(5)   *Evidential condition on HNQs*:
        HNQs are incompatible with contextual evidence for the positive answer p.

In this section, I will demonstrate the empirical facts distinguishing LNQs and HNQs. These generalizations will be shown to be correct, though I will claim that, while the generalization for evidence and LNQs in (4) is most likely a useful step along the way to proposing a theory of LNQs, the generalization for evidence and HNQs in (5) is not obviously relevant to forming a theory.

First some terminology: a *high negation question* is a polar question with a negative morpheme that does **not** contribute a propositional negation to the interpretation. Instead, the negation is interpreted "high", a notion to be made more precise below. In American English, I believe that all polar questions in which the negative morpheme *n't* is preposed with the auxiliary are HNQs. That is, the negative morpheme does not contribute a propositional negation to the semantics. This is not an uncontroversial claim since many researchers accept Ladd's (1981) claim that questions with preposed negation are ambiguous between "outer negation" and "inner negation" readings,

with the latter perhaps including a propositional negation (e.g., Romero & Han, 2004; Sudo, 2013). As mentioned in the introduction, I will return to this issue in section 3.5. Since I don't take HNQs to have propositional negation, when I refer to the *propositional content of a HNQ*, I mean the proposition p denoted by the non-negated prejacent of the question. For example, if the HNQ were *Isn't it raining?*, then the propositional content p would be *that it is raining*.[2]

A *low negation question* is a polar question with a negative morpheme that **does** contribute a propositional negation to the interpretation. Questions in which *not* is not preposed but remains below the subject are usually interpreted as LNQs, that is, they contribute a propositional negation to the semantics. However, it has been argued that such sentences are also ambiguous, able to be interpreted as HNQs despite the syntactically low negation, as noted in e.g. Romero & Han 2004; AnderBois 2016. Romero & Han call these uses of non-preposed *not* with a HNQ interpretation "archaic", and AnderBois dubs them "Gladiator questions" after their use in the film "Gladiator" when the protagonist says, *Are you not entertained?*. They also appear relatively frequently in J.R.R. Tolkien's "The Lord of the Rings".[3] For example:

(6)   Boromir, at Rauros:
        The Ring! Is it not a strange fate that we should suffer so much fear and doubt for so small a thing?

If (6) were truly a LNQ, then it should respect the evidential condition on asking LNQs in (4), namely there has to be contextual evidence for the negative answer. However there is no such evidence in the context; instead, the question is interpretationally indistinguishable from the HNQ *Isn't it a strange fate...?*. I assume that such questions are relatively rare in contemporary spoken American English, and I will leave them aside here with the assumption that, if they are indeed indistinguishable from HNQs with preposed negation, then what I say below about HNQs holds for them as well. Nevertheless, I believe more work is needed on Gladiator questions. In partic-

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[2]Note that HNQs can contain a propositional negation as well, e.g. for *Isn't it not raining?*, the propositional content of the HNQ would be $\neg p$, *that it is not raining*.

[3]I haven't done a formal corpus analysis of the book, but a cursory search of the text of the first two books (of six) suggests there are as many Gladiator questions as HNQs with preposed negation.

ular, are they actually archaic, or are they merely extremely formal? Moreover, can they be used in suggestion contexts like other HNQs? If not, does that mean that they cannot be treated as HNQs? These questions are left to future work. The result of leaving Gladiator questions aside is that, for the rest of the paper, the term "HNQ" will always refer to a syntactically high negative morpheme *and* a lack of propositional negation at interpretation, while "LNQ" will always refer to a syntactically low negative morpheme *and* a propositional negation at interpretation.

Example type: contextual evidence for $\neg p$**, epistemic bias for** p Here are two contexts that license both HNQs and LNQs:

(7)   A has just gotten home, and is expecting Moira to be there. But she looks all around the house and can't find her. She does find B in the last room though, and says to B:
    a.   Is Moira not here?
    b.   Isn't Moira here?

(8)   A has been in a windowless, basement computer lab for the last eight hours. She is thinking about going to find some food, and checks the weather, which says it is 70 degrees and sunny. Then B walks in wearing a windbreaker. She wipes her shoes on the floor, looks at A and says "Brrr." A says:
    a.   Is it not nice out?
    b.   Isn't it nice out?

In each of these contexts, A has reason to believe the positive answer is true, *that Moira is here* and *that it is nice out*. Moreover, in each of them A is confronted with some contextual evidence that the negative answer is true, Moira is nowhere to be found in (7), and B is acting like she's cold and her shoes may even be wet in (8). This combination of contextual factors seems to license both LNQs and HNQs.

One might think that this conflict between prior belief and contextual evidence is necessary for asking all such negative questions. Otherwise, why would the speaker even ask the question? For example, if the speaker already believes that Moira isn't home and the evidence suggests she isn't too, why would the speaker ask whether she is(n't) home?

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However, there are contexts with evidence for $\neg p$ but no epistemic bias for p (in fact, no bias either way). Such contexts license LNQs and not HNQs. And there are contexts with epistemic bias for p but no contextual evidence for $\neg p$. Such contexts license HNQs but not LNQs. These sorts of contexts demonstrate that while HNQs and LNQs have overlapping distributions, they nevertheless have distinct felicity conditions requiring separate analyses.

Example type: contextual evidence for $\neg p$, no epistemic bias First, consider a context that licenses LNQs but not HNQs:

(9)   A has been in a windowless, basement computer lab for the last eight hours. Given her background knowledge, it is equally likely that it could be nice out or that it could be raining. 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 this context, A has no previous belief or expectation that the positive answer will be true. She has no expectations either way. But she is confronted with some contextual evidence in favor of the negative answer. In such a context, the LNQ in (9a) is felicitous, while the HNQ counterpart in (9b) is not. Romero & Han (2004) and Reese (2007) give similar examples demonstrating this asymmetry, and further identify contexts that would license LNQs but not HNQs, namely contexts in which the questioner is primarily interested in the negative answer, or wants the negative answer to obtain. For example:

(10)   Scenario: A hates both Pat and Jane. The prospect of an excursion without them pleases A. A does not have any previous belief about whether either of them is coming or not. B says to A, "Pat is not coming." A replies:
   a.   Great! Is Jane not coming (either)? That would be the best!!!
   b.   #Great! Isn't Jane coming (either)? That would be the best!!!
                                                                    (Romero & Han, 2004, 613)

In (10), A has no prior beliefs about the answers, and moreover there is no contextual evidence

for the proposition *that Jane is not coming*. However, A does want the negative answer to be true. This context licenses the LNQ in (10a), but not the HNQ in (10b).

Example type: no contextual evidence for $\neg p$, epistemic bias for p Now consider contexts that license HNQs, but not LNQs:

(11)   A asks B what she is up to tonight, and B says, "I'm going to the War on Drugs concert." A replies: Oh yeah, I heard about that show....
      a.   Isn't Sun Kil Moon opening?
      b. #Is Sun Kil Moon not opening?

(12)   A and B have just walked outside together. A says:
      a.   Isn't it nice out?
      b. #Is it not nice out?

In neither (11) nor (12) is there any contextual evidence in favor of the negative answer. However, in each case, A seems to have private reasons to believe that the positive answer is true. In such contexts, HNQs like (11a) and (12a) are felicitous, while LNQs like (11b) and (12b) are not. These examples show that LNQs require contextual evidence for $\neg p$, while HNQs do not, as stated in Büring & Gunlogson's (2000) generalizations (4) and (5). This result is in direct opposition to Northrup's (2014) generalization for HNQs, which says that they require both a prior belief in p and contextual evidence for $\neg p$. Such a view would require one to claim that in (11) and (12), the HNQs are felicitous because contextual evidence for $\neg p$ is accommodated. For example, B's failure to mention that Sun Kil Moon is opening is taken by A as contextual evidence for $\neg p$. However, if this is so, then why is the LNQ in (11b) clearly infelicitous? If evidence for $\neg p$ can be accommodated to license a HNQ, then it should be possible to do so for a LNQ as well. Since this isn't what we find, I take such examples to provide strong evidence against Northrup's generalization that HNQs require contextual evidence for $\neg p$.

Given these facts, it is clear that LNQs and HNQs have different distributions. LNQs and HNQs are both acceptable when there is both contextual evidence in favor of the negative answer,

and a previous epistemic bias in favor of the positive answer. But upon closer inspection, it seems that LNQs primarily require contextual evidence for $\neg p$ (or at least an interest in $\neg p$ as in (10)), and do not require epistemic bias, while HNQs require positive epistemic bias, but not necessarily contextual evidence for $\neg p$. These differing distributions imply that distinct theoretical accounts of LNQs and HNQs are required.

Here again are Büring & Gunlogson's (2000) generalizations for LNQs and HNQs:

(4)   *Evidence condition on LNQs*:
        LNQs require contextual evidence in favor of $\neg p$

(5)   *Evidential condition on HNQs*:
        HNQs are incompatible with contextual evidence for the positive answer p.

Trinh (2014) and Roelofsen & Farkas (2015) offer two recent accounts of the LNQ generalization in (4). Since my focus in this paper is only on explaining epistemic bias, I will not pursue the evidential condition on LNQs further here, though it will return briefly in chapter 4 in the discussion on the contradiction contour.

Besides Büring & Gunlogson (2000), Sudo (2013) also claims that the generalization between HNQs and contextual evidence in (5) holds. Another way of stating (5) is that HNQs are only compatible with evidentially neutral contexts and contexts in which there is evidence for $\neg p$. We have already seen that HNQs are acceptable in each of these contexts, but we haven't seen that they are unacceptable in contexts with evidence for p. Let's turn to such examples now.

Example type: contextual evidence for p, epistemic bias for p

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

(13) is clearly infelicitous, however it seems unlikely that this fact should be explained by a strict

connection between HNQs and contextual evidence. Rather, the infelicity seems to result from a much more general fact about the usefulness of certain linguistic behaviors, that is, there is no need for A to ask this question. A already has a belief in p and the evidence supports it, so why ask about it? This view is supported by the observation that it would be equally infelicitous for A to ask *Is Jane left handed?*. Thus, while (13) fits the generalization in (5), I think it is explained on more general grounds. It does not require us to develop a theory specifically aimed at explaining (5).

Here is another context that is meant to support (5), inspired by Sudo (2013, 280):

Example type: contextual evidence for p, epistemic bias for $\neg p$ Here, p is the proposition *that Jane is left handed*, $\neg p$ is the proposition *that Jane is right handed*.

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

In (14), the evidence and the belief conflict, which provides motivation for A's question, but we can see that the propositional content of the HNQ is still restricted: (14a) with propositional content aligned with the contextual evidence is infelicitous, while (14b) with propositional content aligned with the epistemic bias is felicitous. So this is another context that seems to support the generalization in (5): a HNQ with propositional content p is incompatible with a context that provides evidence for p, e.g. (14a). However, we have already seen above in (9b) and (10b) that HNQs are infelicitous in contexts in which the speaker is not epistemically biased for the propositional content of the question, i.e. the positive answer. The cause of (14a)'s infelicity is the mismatch between the bias and the propositional content of the HNQ, while in (14b) there is no such mismatch and the question is felicitous. The infelicity of (14a) is not caused by the polarity of the propositional content of the HNQ running afoul of the contextual evidence condition in (5).

More generally, I believe that while Büring & Gunlogson's (2000) and Sudo's (2013) evidential

condition on HNQs in (5) is accurately stated, there is no need for a theory that explains (5) directly. Rather, the fact that the generalization holds is accidental, with heterogeneous explanations such as those offered for the two previous examples. This stands in stark contrast to the evidential condition on LNQs in (4), which I believe is the primary empirical fact about LNQs that distinguishes them from other polar questions, and therefore requires a more direct explanation, one that seems likely to follow somehow from the markedness of negation (Horn, 1989).

My claim—that the evidential condition on LNQs in (4) merits a direct explanation while that on HNQs in (5) does not—helps to dissolve the puzzle that Büring & Gunlogson (2000) end their paper with. They conclude by stating a unified formal system that successfully predicts the differences between the evidential generalizations holding on LNQs and HNQs (it accounts for the relationship between evidence and positive polar questions as well). However they stop short of endorsing their own account for several reasons: the representations for the three question types seem arbitrary, they are non-compositional, and they counterintuitively require propositional negation for HNQs, whereas negation applies to an abstract function for LNQs, which runs counter to the polarity item facts that they present. If I am right, the goal of seeking such a unified account of evidential conditions for LNQs and HNQs is misguided. While LNQs do require contextual evidence in favor of $\neg p$, a fact that should be explained by any theory of LNQs, the heterogeneous generalization that HNQs either require evidence for $\neg p$ or an evidentially neutral context, while technically accurate, merits no single explanation. Instead, HNQs require epistemic bias for p (a fact that Büring & Gunlogson note but leave to future work), and this in combination with general facts about the utility of asking questions in context explains the heterogeneous generalization in (5). So I take the need for an explanation of (5) to be dissolved.

The question as to why HNQs must convey bias toward the propositional content of the question (rather than bias toward the negation of the propositional content or no bias at all) still remains, and answering it is one of the goals of this paper. In pursuit of this goal, I turn now to exploring asymmetries between epistemic bias as it appears in HNQs and PFQs.

3.3 Two empirical asymmetries between polarity focus and high negation

Romero & Han (2004) observe that both high negation questions (HNQs) and questions with prominence shifted to the auxiliary or polarity focus questions (PFQs) convey that the speaker has an epistemic bias: The speaker has a previous belief or expectation that the answer with opposite polarity from that of the question is true.[4] For example:

(15)   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)

(16)   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

In both (15) and (16), B conveys an epistemic bias in asking her question. Given the strikingly similar pragmatic effect of these two questions, one might think that a unified analysis is called for, and this is the avenue pursued by Romero & Han, although the primary focus of their work is HNQs like (15). In particular, Romero & Han propose a silent VERUM operator that is introduced to the LF by either high negation or polarity focus. This operator plays a crucial role in the derivation of epistemic bias, and its use is subject to discourse constraints discussed in chapter 2 that are meant to explain the restricted distributions of both kinds of questions. However, in seeking a unified analysis between HNQs and PFQs, the ability to explain two empirical asymmetries between them is lost.

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[4]Romero & Han note that questions with *really* also give rise to an epistemic bias. I argued in chapter 2 that *really* is a distinct phenomenon, and will leave it aside here.

Asymmetry 1: Polarity focus is focus; high negation is not

The first asymmetry was already discussed in chapter 2 and I will review it briefly now. PFQs, like all instances of polarity focus and all instances of focus more generally, require a certain antecedent in order to be licensed. However HNQs place no such requirement on the previous context. For example, contrast (15) with (17):

(17)   A: Ok, now that Stephan has come, we are all here. Let's go!
         B: # ISN'T Jane coming?

While the HNQ in (15) is perfectly felicitous, the HNQ with polarity focus in (17) is not. If constraints on the use of VERUM are meant to explain all of the distributional restrictions on these questions, then their distributions shouldn't come apart in this way.

Another example demonstrating the different licensing restrictions on HNQs and PFQs is given in (18).

(18)   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.
    a.   B: Hasn't Frege not reviewed for us? He'd be a good one.
                                                                    (Romero & Han, 2004, 619)
    b.   B: # HAS Frege reviewed for us? He'd be a good one.

With both (18a) and (18b), B conveys that she is biased for ¬p, *that Frege has not reviewed for them*. Any account of HNQs will have to make the licensing requirements loose enough that examples like (18a) are predicted to be felicitous. These are so-called "suggestion contexts", where the bias of the HNQ is used to suggest an answer to an (implicit) question, in this case "Who hasn't reviewed for us?". But if those same licensing requirements are then meant to explain the distribution of polarity focus, they will incorrectly predict (18b) to be felicitous. Clearly, since polarity focus is a kind of focus, it cannot be used in "suggestion contexts" since the proper antecedent is missing.

As discussed in chapter 2, one possibility is that PFQs like (16), (17), and (18b) have extra restrictions imposed by prominence shifting that HNQs like (15) and (18a) do not. However I argued that such an explanation would be redundant if polarity focus could be explained entirely in terms of focus semantics and general pragmatic principles. I then sought to explain all of the crucial facts surrounding polarity focus in chapter 2, except for the epistemic bias in PFQs like (16). Below I will argue that the bias in HNQs and in PFQs have distinct sources, and this eliminates the need for a unified account of their distributions.

Asymmetry 2: Bias is context sensitive in polarity focus, but not high negation

The second empirical asymmetry between HNQs and PFQs is that the former always convey an epistemic bias, while the epistemic bias conveyed by the latter is context dependent. We already saw an example in which a PFQ displays an epistemic bias in (16). (19a) demonstrates a PFQ that is felicitous but does not convey epistemic bias.

(19)   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?
              $\not\leadsto$ B believes she isn't a member
      b.   B: # ISN'T she a member?
              $\leadsto$ B believes she is a member

Of course, if we removed the initial context and just observed the dialogue between B and A, then B's PFQ in (19a) *could* convey an epistemic bias. However, keeping in mind that B has no prior beliefs or opinions about whether Jill is a member, B's PFQ in (19a) is clearly not incompatible with her epistemic neutrality. Compare this to (19b). Keeping in mind the initial context that establishes B's epistemic neutrality, this HNQ is infelicitous in the context because it incorrectly conveys that B has an epistemic bias. If we were to remove the initial context and just observe the dialogue between B and A, then B's HNQ in (19b) would be perfectly felicitous, and would

necessarily convey that B has a positive epistemic bias.

(20) is another example demonstrating the felicitous but unbiased use of a PFQ, heard on NPR:

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

In the context in (20), it is clear that the journalist does not convey any bias via their PFQ. Compare this to the use of the HNQ *Didn't they all make it out of the barn in time?*, which clearly conveys a positive bias.

It is a, perhaps *the*, central fact about HNQs in English that they *always* convey a bias for the answer with the same propositional content of the question. Meanwhile, I claim that it is an equally crucial fact about PFQs that they do not always convey an epistemic bias, but that that bias instead seems to be conditioned by the particular context in which they appear. We will consider more data in the following section to demonstrate this latter claim.

An approach sympathetic to the VERUM operator account might be to claim that while HNQs necessarily have a VERUM operator at LF, PFQs do not necessarily have one. In fact, Romero & Han (2004) claim that polarity focus does not always trigger the presence of VERUM. Their claim is that in some contexts, prominence on the auxiliary merely indicates contrast, while in other contexts it conveys verum focus. However, one would like to have a principled explanation for why this is. This is likely to be difficult given (19). (19) shows us that we can simply force the bias of the PFQ in (19a) to go away by assuming the speaker is unbiased without changing any other features of the context. But the HNQ in (19b) does not allow for this flexibility. Try to force B to be unbiased, and the HNQ just sounds odd. It's not clear how the VERUM approach could explain this asymmetry between PFQs and HNQs.

Given these facts, I believe that we should pursue a theory of epistemic bias in PFQs that predicts its context dependence, and we should pursue a theory of epistemic bias in HNQs that

predicts its context *independence*. In the next section, I develop a context sensitive account of epistemic bias in PFQs.

3.4 Deriving bias in polarity focus questions

Since epistemic bias appears in some polarity focus questions but not others, the presence of the epistemic bias inference should not be explained as a reflex of polarity focus. Instead, I will argue that the bias inference results in some polarity focus questions because of the sorts of conversational contexts they happen to appear in. Given general pragmatic principles that have been proposed for other applications, these contexts lead to a bias inference. It is just a coincidence that many such contexts also license polarity focus.

Consider the following epistemically biased PFQ:

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

Let p be the proposition *that Dinah likes Ivy*. Using "$\Box$" to represent "B believes that", we can abbreviate the goal of our bias derivation as $\Box\neg p$. Let's examine the various pragmatic principles in play to see how they might lead to this bias inference. First, A asserts p. Given Grice's (1989, 27) maxim of quality, "Try to make your contribution one that is true," including the first submaxim, "Do not say what you believe to be false," A conveys that she believes p. According to Stalnaker's (1978) theories 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. She might say "Yes," or "That's true," or "I agree," or she might say nothing at all. The context set c would be updated with p by reducing the worlds it contains to just those in which p holds. But this is not

what happens in (21). Instead, B asks $?p$ (*Does Dinah like Ivy?*). Crucially, there are constraints on asking questions. In particular, both Roberts (1996/2012, 14) and Büring (2003, 541) propose versions of a principle that I will call *interrogativity* that is similar in spirit to Stalnaker's (1978) informativity principle:[5]

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

If p were mutually believed, then the common ground would have been updated with p, c would entail p, and $?p$ would be infelicitous by (22). Thus, by asking $?p$, B signals that c does not entail p, that p is not mutually believed. Since A believes p and has asserted it to B with the intention of making p common ground, the reason that c does not entail p is that B does not believe it, $\neg\Box p$.

I want to briefly consider and reject an alternative way of getting to $\neg\Box p$ that is much simpler than the one I have just sketched above. It starts with a different constraint on asking questions than (22): Ask $?p$ only if you are ignorant about the answer. Ignorance can be written as $\neg\Box p \wedge \neg\Box\neg p$. Therefore, from such a constraint, $\neg\Box p$ follows anytime a speaker asks $?p$. The problem with this simpler derivation of $\neg\Box p$ is that sometimes speakers ask $?p$ even if they think they know the answer, which clearly conflicts with the ignorance requirement. One example of this is exam questions, that is, a teacher asking a student a question. The teacher knows full well the answer, but is testing the student's knowledge. However, the amount of weight that we should put on exam questions in establishing this point is open to debate. One might argue that exam questions are not true information seeking questions, and perhaps the constraint we are interested in only applies to information-seeking questions. However, there is another kind of example in which a speaker asks a question even if they think they know the answer, namely epistemically biased questions like

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[5]Stalnaker's (1978) informativity principle constrains when a proposition can be asserted relative to the context set:

(i)   *Informativity principle*:
        A proposition asserted is always true in some but not all of the possible worlds in the context set. (Stalnaker, 1978, 88)

those I am trying to explain here. For example, a question like in (21) in which the speaker is biased for the negative answer, $\Box\neg p$. If we begin with a pragmatic constraint that requires the questioner to be ignorant, $\neg\Box p \wedge \neg\Box\neg p$, then it will be impossible to derive $\Box\neg p$. These two statements are contradictory, so requiring questioners to be ignorant is a non-starter for biased questions.

So far then, we have derived $\neg\Box p$ using the interrogativity principle in (22) and other commonly accepted Gricean and Stalnakerian notions from pragmatics. However, the epistemic bias inference in (21) is something stronger, namely $\Box\neg p$. In order to bridge the gap from the first statement to the second, I will make a move familiar from the quantity implicature literature that derives strong or secondary implicatures from weak or primary implicatures (Sauerland 2005b; Fox 2007; Geurts 2010; also used in explanations of neg-raising in Bartsch 1973; Horn 1989). The inference $\neg\Box p$ is strengthened to $\Box\neg p$ only when the context supports the assumption that the speaker is *opinionated* about p, which is to say that she either believes p or $\neg p$, i.e. $\Box p \vee \Box\neg p$. Combining $\neg\Box p$ and $\Box p \vee \Box\neg p$, we can conclude $\Box\neg p$.[6]

Let's put this all together by reconsidering our example in (21):

(21)   A: Dinah likes Ivy.
        B: DOES Dinah like Ivy?

We have already explained how this dialogue gives rise to the inference that $\neg\Box p$. Now suppose that B is as close of friends with Dinah and Ivy as A. Therefore, B can be expected to have an opinion about p, $\Box p \vee \Box\neg p$. Therefore, putting the first inference together with B's contextually-provided opinionatedness, we infer the epistemic bias inference $\Box\neg p$.

Now suppose instead that A knows Dinah and Ivy quite a bit better than B, and they both know this. In such a context, it is plausible to imagine B using the PFQ without conveying the bias inference, but instead conveying something weaker, like surprise. This is because we do not take B to be opinionated, and so only derive $\neg\Box p$. The two different readings could be brought out by possible continuations. In the first context, B could follow her PFQ with, "I don't think she does."

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

In the second context she could follow the PFQ with, "I didn't know that."

Here is another example demonstrating the weaker, surprise inference:

(23)   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 believes that Jill isn't a member.

In (23), A asserts p, but B is not opinionated about p, so strong epistemic bias is not derived.

Consider again (19), in which the PFQ conveys no bias, repeated here:

(19)   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 believes she isn't a member

This context is lacking two crucial conditions for the bias derivation laid out above. The first is

that no one expresses a belief in the prejacent of the question p. The second is that B lacks an

opinion about p. As a result, the bias derivation cannot get off the ground, and we do not infer that

B is epistemically biased. A similar example is observed in the pilot episode of the TV show "The

Newsroom" at about the 47 minute mark. The characters are journalists discussing the Deepwater

Horizon oil spill before the news has been made public.

(24)   A: It's a week before the oil reaches Louisiana's shores. Three days if the wind shifts.
        B: IS the wind gonna shift?
        ↛ B believes the wind isn't going to shift

Like the dialogue in (19), one can imagine contexts for the dialogue in (24) in which B is epistemi-

cally biased against the possibility that the wind could shift. However, in the context given, B is not

biased either way, she is merely interested in the answer to her question given its relevance in the

context. However, this lack of bias would not be possible if the ingredients for the bias derivation were present.

(25)   A: The wind is gonna shift.
         B: IS the wind gonna shift?
         ⤳ B believes the wind isn't going to shift

In (25), A asserts p, and so B's PFQ necessarily conveys bias.

The derivation I have outlined here is of course not a sufficient condition for licensing a biased PFQ.

(26)   A: Ivy is not coming to the party.
         a.   B: # IS Ivy coming to the party?
         b.   B: IS Ivy not coming to the party?
               ⤳ B believes that Ivy is coming to the party.

A has asserted $\neg p$. Given (22), by asking $?p$ in (26a), B conveys that she doesn't believe $\neg p$. This combined with an opinionatedness assumption should lead to a positive p bias. However, this is irrelevant since (26a) is infelicitous for an independent reason, namely it runs afoul of the positive question counterpart of the evidential condition on LNQs in (4) discussed above: positive polar questions are incompatible with contextual evidence for $\neg p$ (Büring & Gunlogson, 2000; Trinh, 2014; Sudo, 2013; Roelofsen & Farkas, 2015). A has asserted $\neg p$, which provides contextual evidence for $\neg p$, so if B wants to ask a polar question about p, she has to phrase it negatively, as in (26b), which is perfectly felicitous, and leads to the predicted epistemic bias.

As we can see, the account of epistemic bias in PFQs offered here predicts various kinds of context sensitivity. PFQs only lead to bias in some contexts and not others. All of these contexts license polarity focus however, because the proper antecedent for focus marking is provided by the context. We can see that it is coincidental that one kind of context that licenses polarity focus in polar questions is a context in which an interlocutor has asserted p and the speaker is opinionated about p. But this just happens to be a context that also leads to the derivation of epistemic bias via

standardly assumed pragmatic principles.

Another prediction of this approach 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.

(27)   A context where Jane is not present:
        A: Everyone's here, let's go!
        B: Wait. Is JANE coming?
        ⤳ B believes that Jane is coming.

In (27), A's assertion along with Jane's absence implies that A believes that Jane is not coming, or $\neg p$. If c entailed $\neg p$, then 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 $\neg\square\neg p$. Finally, if we combine this inference with an opinionatedness assumption, we derive the bias implicature, $\square p$. The first thing to note is that despite this epistemic bias, B's polar question in (27) could not have borne polarity focus, since the proper antecedent for a prominence shift is absent. So epistemic bias can arise even in the absence of polarity focus as predicted.

Second, the polarity of the bias in this case is actually identical to the polarity of the polar question. This is not so in any of the previous cases we have looked at. So we learn from this example that opposing polarity between the overt question and the implied bias is not required. The polarity of the bias inference is conditioned by the context, in this case, the implication that Jane is not coming arising from A's utterance. Note that B could have asked a low negation question instead, "Is JANE not coming?", and this would have had exactly the same bias inference.[7]

We can demonstrate the independence of bias and polarity focus without getting into these issues of polarity and the evidential condition. For example:

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[7]This variation in possible polarities suggests that at least in rare cases the evidential conditions on polar questions may be violated. In this case, A's utterance can be taken to provide contextual evidence that Jane is not coming, thus the evidential conditions should require B not to use the positive PQ, but instead use the LNQ. Perhaps the reason is that the inference to $\neg p$ arising from A's utterance is relatively implicit, perhaps implicit enough to allow the evidential condition to be obviated. However, a complete explanation of this fact requires a complete theory of the evidential condition on polar questions, and I am not offering such a theory here. So this issue has to be left to future work.

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

B can take A's utterance to imply that Jane is coming. If so, the bias can again be derived along the

lines I have outlined above, assuming that B is opinionated. Again, PF would be infelicitous here,

but the bias can be derived independently, as predicted.

An alternative analysis that claims that epistemic bias always requires a silent operator like

VERUM would need to explain why that operator is in effect in some contexts but not others, and

also why it can appear in questions that lack both polarity focus and high negation, like (27) and

(28). In defense of the VERUM approach, one could claim that while VERUM in questions gives rise

to bias, bias can also be derived from broader pragmatic principles as I describe above. However, if

broader principles can be used to derive bias in all PFQs and non-PFQs, then it is valid to ask what

work a theory relying on VERUM does that is not already done by more widely accepted pragmatic

mechanisms.

With this account of epistemic bias in PFQs in hand, we now have a partial answer to the ques-

tion I posed at the beginning of this chapter about the varying kinds of polar questions in (1): Can

we explain the interpretational differences between these various polar questions via pragmatics,

while leaving in place a classic polar question semantics that explains the commonalities in their

meaning? Or do we need to consider explaining the meaning effects of each question type via

wholly separate theories that depend on particularities of their syntax, semantics, and prosody?

The epistemic bias of PFQs does not depend directly on unique aspects of their prosody or syntax.

Epistemic bias in these questions is derived entirely via independent pragmatic principles. Seman-

tically and syntactically (F-marker notwithstanding), PFQs are no different from non-prominence

shifted polar questions. We are able to keep a classic semantics for polar questions in place.

In section 3.5, I will argue that we need to give the opposite answer for HNQs, namely that

they have a syntax and semantics all their own that is linked to the epistemic bias they convey.

3.5 HNQs do not contribute propositional negation

In the introduction, I claimed that HNQs in American English do not exhibit the ambiguity that is claimed to exist by Ladd (1981). In particular, it is my view that polar questions with preposed negation do not have an "inner" negation reading in which the negative morpheme *n't* contributes a propositional negation. As pointed out by AnderBois (2016), the claim that preposed negation questions are ambiguous between outer and inner negation readings is almost always supported using examples with and without the NPI *either*. For example, Sudo (2013) demonstrates the asymmetry between the inner and outer reading using *either*, and claims that the inner reading requires contextual evidence for ¬p while the outer reading does not. However, Rullmann (2003) argues that *either* itself may have a licensing condition that requires some evidence that *either*'s complement clause is false. He then demonstrates that *either* can appear in positive polar questions, but there is always a negative implication. For example:

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

Given this fact, we may then wonder whether HNQs with *either* are really bringing out an ambiguity in HNQs. Perhaps we are instead observing an effect of *either*. This is especially worrying given that the semantics of *either* is still not well understood. Rullmann himself points out several challenges for his own licensing condition for *either*. Ahn (2015) offers a new account of the licensing of *either*, but does not completely settle the matter, in particular leaving open the question of why *either* behaves like a strong NPI, which will be crucial to understanding how *either* affects the interpretation of HNQs. Moreover, many speakers of American English find HNQs with *either* to be either infelicitous or at least severely degraded, a fact demonstrated experimentally by Sailor (2013).

In order to get a handle on whether or not HNQs contribute a propositional negation, a set of diagnostics that goes beyond *either* is needed. First, I will consider constructions that contribute projecting content such as presuppositions and conventional implicatures. Since this content projects

out of questions, if the propositional content of the question contains a propositional negation, then the projected content should also contain a propositional negation. Second, I'll consider expressions that are sensitive to aspect. Since the aspect of a verb is affected by negation, whether or not these expressions are felicitous in a negative question will be affected by whether or not the question contains a propositional negation. Third, I'll consider the behavior of responses to HNQs, which is quite different from the behavior of responses to LNQs. Fourth, I will review Ladd's (1981) use of *either* and *too* in preparation for the final section on the behavior of the n-word *tampoco*, which is the Spanish counterpart to *either*. N-words need to stand in a close relationship to negation, so if a question can license *tampoco*, it must have a propositional negation. Interestingly, we will see that Spanish questions that have been claimed to be HNQs can license *tampoco*, but when they do, they are no longer epistemically biased.

3.5.1 Projecting content

The word *again* triggers the presupposition that the proposition denoted by its complement has happened before (see e.g., Stechow, 1996; Pedersen, 2015). For example, consider the presuppositions of the two following sentences.[8]

(30)   a.   Danielle came to class again.
           presupposes: Danielle has come to class before
      b.   Danielle didn't come to class again.
           presupposes: Danielle has not come to class at least once before

The presuppositional content contains negation if *again*'s complement contains negation.

     Again also triggers presuppositions in questions.

(31)   a.   Did Danielle come to class again?
           presupposes: Danielle has come to class before

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[8](30b) has another reading in which the presupposition is that Danielle came to class before. This reading is made more salient by stressing *again*, or by adding *ever* before *again*. We can safely ignore it here.

b.   Did Danielle not come to class again?
       presupposes: Danielle did not come to class at least once before.

Again, the presupposition is different depending on whether the sentence contains a negation or not. Now consider *again* in a HNQ:

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

Interestingly, the HNQ in (32) does not presuppose the negative proposition that (31b) presupposes. Instead it patterns with (31a), presupposing *that Danielle has come to class before*.

The same pattern is seen with the presupposition trigger *also*. I will assume that the focus sensitive operator *also* always associates with the subject in the following examples, so they are best read with prominence on the subject.[9]

(33)   a.   Danielle came to class, also.
              presupposes: Someone else came to class.
        b.   Danielle didn't come to class, also.
              presupposes: Someone else didn't come to class.

Positive polar questions and LNQs display the same behavior as their declarative counterparts in (33).

(34)   a.   Did Danielle come to class, also?
              presupposes: Someone else came to class.
        b.   Did Danielle not come to class, also?
              presupposes: Someone else didn't come to class.

Compare this to *also* in HNQs:

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[9]While I find (33b) acceptable, some speakers may find it infelicitous or at least degraded. Rullmann (2003, 387ff.) argues that additive particles in similar examples are felicitous for some speakers, and presents some naturally occurring examples. The idea is that *also* (or *too*) scopes over negation, producing the presupposition in (33b), and to the extent that some speakers find it infelicitous, it is because there is a preference for low attachment. Crucial for our purposes here is whether (34b) is judged felicitous. Again, I find this acceptable.

(35)   Didn't Danielle come to class, also?
         presupposes: Someone else came to class.

Again, we see that the HNQ patterns with the positive polar question in (34a), rather than the LNQ

in (34b).

   These effects can be demonstrated in context:

(36)   B knows that A's student Danielle did not do the first assignment this semester, and that
         A is worried about her. B also knows that 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?

(37)   A: Angelo didn't come to class this morning.

         a.   B: # Did Danielle come to class, also?
         b.   B: Did Danielle not come to class, also?
         c.   B: # Didn't Danielle come to class, also?

What these examples show is that the presuppositional operators *again* and *also* can scope over a

propositional negation in LNQs but not in HNQs. It may be that the negative morpheme in HNQs

contributes propositional negation, but the negation is too high for these operators to scope over.

Another possibility is that HNQs do not contain propositional negation at all, and thus there is no

negation for the operator to scope over. I will pursue the latter explanation below.

   As-parentheticals, discussed at length by Potts (2002), provide another test involving non-at-

issue content projecting out of questions, this time conventional implicatures. The content of the

claim in the *as*-parenthetical in (38) could either include or exclude negation.

(38)   Ames did not steal the documents, as the senators claimed.
         a.   ⤳ the senators claimed that Ames did not steal the documents
         b.   ⤳ the senators claimed that Ames stole the documents   (Potts, 2002, 625)

Potts shows that the complement of the *as*-parenthetical projects through various presupposition

holes as would be expected for a conventional implicature, for example, it projects out of questions:

(39)   Is it said that, as Joan claims, you are an excellent theremin player?   (Potts, 2002, 652)

As above, we can check to see what content projects out of LNQs vs. HNQs:

(40)   Did Benedict not win, as we predicted?
         a.   ⤳ we predicted that B did not/would not win
         b.   ⤳ we predicted that B did/would win

(41)   Didn't Benedict win, as we predicted?
         a.   ⤴̸ we predicted that B did not/would not win
         b.   ⤳ we predicted that B did/would win

Again, we find that the projected content can contain negation in a LNQ, but not a HNQ. It is clear that the *as*-parenthetical does not have access to propositional negation in the HNQ. And if high negation does not contribute propositional negation to begin with, we understand why.

3.5.2   Negation sensitivity

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

(42)   *Durative*:
         The girls stayed up until midnight.

(43)   *Punctual*:
         # The girls discovered the hole in the wall until midnight.

However, if a punctual clause is negated, then the *until* adverbial can combine with it:

(44)   The girls didn't discover the hole in the wall until midnight.

Now consider the behavior of polar questions relative to *until* modifiers.

(45) a. #Did they discover the hole in the wall until midnight?
      b.   Did they not discover the hole in the wall until midnight?
      c. #Didn't they discover the hole in the wall until midnight?

While (45b) is perfectly felicitous, (45a) is not. (45c) clearly patterns with (45a).

It has been debated whether the behavior of *until* has to do with negation changing a punctual aspect to a durative one, or if it is due to *until* being ambiguous between a durative version and a strong NPI version (Karttunen, 1974; Mittwoch, 1977; de Swart, 1996; Giannakidou, 2002; Gajewski, 2011). Given that we are trying to avoid *either* in part because it is a strong NPI and it is unclear exactly how it is licensed, it is helpful to see that *for*-adverbials provide a similar test for the negativity of polar questions, despite that they are not thought of as NPIs. Like *until*, *for*-adverbials are acceptable with durative but not punctual clauses.

(46) *Durative*:
      a.   Jane slept for ten hours.
      b.   Mary ran for two hours.

(47) *Punctual*:
      a. #Jim arrived for an hour.
      b. #The ball landed for two minutes.

While the sentences in (47) are clearly infelicitous, their negations are completely acceptable:

(48) a.   Jim didn't arrive for an hour.
      b.   The ball didn't land for two minutes.

Again, we can consider the behavior of polar questions with *for*-adverbials.

(49) a. #Did the ball land for two minutes?
      b.   Did the ball not land for two minutes?

c. #Didn't the ball land for two minutes?

We find the same pattern as before. The HNQ in (49c) patterns with the positive polar question, not the LNQ. It appears as if there is no propositional negation in HNQs that can license the *until*- and *for*-phrases examined above. This fact follows as a matter of course if high negation does not contribute propositional negation to begin with.
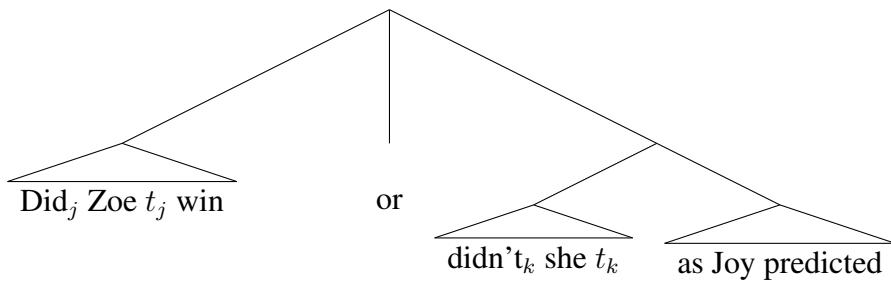
3.5.3 Inversion is not enough

The empirical facts examined so far might be summarized as follows: The relevant operators— *again*, *also*, *as*-parentheticals, *until*- and *for*-adverbials—cannot scope above negation in HNQs. Ultimately, I will claim that this is because high negation does not modify the prejacent of the question, and is instead above a speech act operator, putting it well out of reach of the relevant operators. However, it is worth asking if these scope observations are simply due to the fact that the negative morpheme *n't* inverts with the auxiliary. That is, perhaps the landing site of an inverted auxiliary is too high for *again* and the other operators to reach, and no speech act operator is needed to explain the HNQ facts. To test this idea, we can look at other examples of inversion of *aux-n't* to see whether they behave like HNQs. Here is an example with an *as*-parenthetical:

(50)   Did Zoe win or didn't she, as Joy predicted?
         implicates: Joy predicted that Zoe didn't win

Unlike in HNQs, the *as*-parenthetical scopes over negation in (50), suggesting a structure like (51):

(51)

Did_j Zoe t_j win   or didn't_k she t_k as Joy predicted

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Here is an example with *until*:
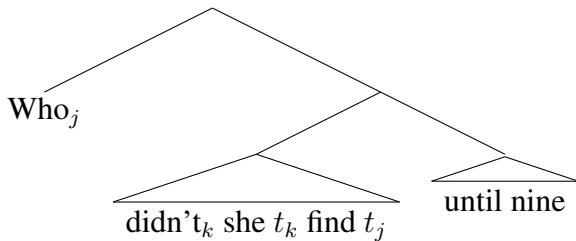
(52)   *A game of hide & seek*
       A: Liv found most of them quickly, but she didn't find some of them until nine.
       B: Who didn't she find until nine?

Unlike in HNQs, the *until*-phrase scopes over negation in (52), suggesting a structure like (53):

(53)

Who$_j$

didn't$_k$ she t_k find t_j until nine

I take these results to demonstrate that we are safe in assuming that the HNQ data considered so far are not simply due to the inversion of *aux-n't* in HNQs. Something different seems to be going on in HNQs than in other sentences in which *aux-n't* is inverted.

3.5.4   Responses to negative sentences

As has been explored in recent work (Kramer & Rawlins, 2009; Krifka, 2013; Roelofsen & Farkas, 2015; Holmberg, 2016, as well as chapter 4 of this thesis), negative polar questions have a noteworthy effect on English polar particle responses. While *yes*/*no* responses to positive polar questions as in (54) convey unambiguous, clear answers, they are interchangeable in response to LNQs, as in (55).

(54)   A: Is Jane here?
       a.   B: Yes
            (i)   *can mean*:   She is here
            (ii)   *cannot mean*: She is not here
       b.   B: No
            (i)   *cannot mean*: She is here
            (ii)   *can mean*:   She is not here

(55)   A: Is Jane not here?

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

Accounts of these facts in the work cited above differ in interesting ways that are explored in detail in chapter 4, along with the effect of intonation on the interpretation of such responses. However, while the accounts may differ, all researchers agree that a crucial component of the explanation for the contrast between (54) and (55) is that the sentence that B responds to in (55) is negative, i.e. it contains propositional negation, while that in (54) is not.

Krifka (2017) points out that responses to HNQs pattern with (54) rather than (55):

(56)   A: Isn't Jane here?

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

Again, the HNQ patterns with the positive polar question rather than the LNQ. Whatever the negative morpheme in the HNQ is doing, it clearly is not contributing the propositional negation necessary to condition the interchangeable behavior of *yes* and *no* seen in (55).

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

(57)   A: Is Jane here?

    a.   B: It's possible.
        (i)   *can mean*:   It's possible Jane is here
        (ii)   *cannot mean*: It's possible Jane is not here

The null complement clause has to have the content p, not $\neg p$.[10] Compare this to (58):

(58)   A: Is Jane not here?

      a.   B: It's possible.
          (i)   *cannot mean*: It's possible Jane is here
          (ii)   *can 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 the positive polar question, not the LNQ.

(59)   A: Isn't Jane here?

      a.   B: It's possible.
          (i)   *can mean*:   It's possible Jane is here
          (ii)   *cannot mean*: It's possible Jane is not here

The null complement clause has to have the content p, not $\neg p$, again suggesting that the negative morpheme in HNQs does not contribute a propositional negation.

3.5.5   Ladd's ambiguity and *either*

Ladd (1981) claims that high negation questions are ambiguous between outer negation and inner negation. Questions with outer negation are roughly the kind we have been examining here: They convey a positive epistemic bias, and Ladd describes the negation as being somehow "outside" of the proposition. In questions with inner negation, Ladd claims that the negation is regular propositional negation, which suggests they might be identical to low negation questions. However, later authors who have accepted Ladd's ambiguity (e.g. Romero & Han, 2004; Reese, 2007; Sudo, 2013), have argued that the inner negation reading is not identical to LNQs. Romero & Han (2004) claim that both outer and inner negation readings of HNQs convey a previous bias toward

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[10]While it is intuitively clear that B means to convey (57a-i) and not (57a-ii), assuming that B has made the strongest statement that she can, then her utterance entails that it is also possible that Jane is not here. That is, if B asserts $\lozenge p$ and is respecting Gricean quantity, then $\neg \square p$ holds, which entails $\lozenge \neg p$. Nevertheless, it is intuitively clear that there are non-trivial differences between asserting *It's possible that p* and *It's possible that $\neg p$*, and (57a) clearly conveys the former.

p. What distinguishes them is that outer negation HNQs double check *p* and license PPIs, while inner negation HNQs double check ¬*p* and license NPIs. Thus given the proper contexts, Romero & Han's claim is that both (60a) and (60b) are felicitous, and that intuitively both convey a bias toward *p*, but (60a) double checks *p*, while (60b) double checks ¬*p*.

(60)   a.   Isn't Jane coming too?
            b. %Isn't Jane coming either?

However, I have added the "%" sign to (60b) because several authors have disputed that it is felicitous, some of them experimentally (e.g. Sailor, 2013; Northrup, 2014; AnderBois, 2016). AnderBois (2016) notes that, with the exception of the two original examples in Ladd 1981, examples demonstrating the inner negation reading invariably come with an NPI, usually *either*, which makes it unclear whether the double-checking ¬*p* reading, if it exists at all, is due to an ambiguity in the position of negation, or to the NPI itself.

    Let's consider the two examples lacking polarity items that Ladd uses to demonstrate the ambiguity.

(61)   "Outside negation"
        Kathleen and Jeff have just come from Chicago on the Greyhound bus to visit Bob in Ithaca.
        Bob: You guys must be starving. You want to go get something to eat?
        Kathleen: Yeah, isn't there a vegetarian restaurant around here—Moosewood, or something like that?
        Bob: Gee, you've heard of Moosewood all the way out in Chicago, huh? OK, let's go there.   (Ladd, 1981, 164)

In (61), the HNQ bias is used to answer a QUD.

(62)   "Inside negation"
        Bob is visiting Kathleen and Jeff in Chicago while attending CLS.
        Bob: I'd like to take you guys out to dinner while I'm here—we'd have time to go somewhere around here before the evening session tonight, don't you think?
        Kathleen: I guess, but there's not really any place to go in Hyde Park.

Bob: Oh, really, isn't there a vegetarian restaurant around here?
Kathleen: No, about all we can get is hamburgers and souvlaki.   (Ladd, 1981, 164)

In (62), the HNQ conveys a bias toward p in the face of contextual evidence for $\neg p$. Does this pair of examples demonstrate a genuine ambiguity? Anderbois argues they do not, and claims that the evidence in favor of $\neg p$ in (62) means that Bob is epistemically biased for $\neg p$, but that Bob also expresses a bouletic bias toward p, given the goals of the conversation.

However, I don't think we need to posit a contrast between epistemic and bouletic bias to explain (62). Instead, we simply claim that Bob has a previous epistemic bias toward p, and is confronted with evidence for $\neg p$. Even Romero & Han 2004, who take Ladd's ambiguity seriously, do not argue that HNQs in such contexts have inner negation. Consider again the following example:

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

Just like (62), the speaker in (15) has a prior belief in p, and is confronted with contextual evidence for $\neg p$. But by Romero & Han's lights, (15) has to be an example of outer negation since it contains a PPI. So the one example pair from the literature that does not rely on polarity items, (61) and (62), does not establish the purported ambiguity. Instead, we learn from (61) and (62) that HNQs can appear in a wider distribution than Ladd initially thought: HNQs are compatible with contextual evidence for $\neg p$, but do not require it.

The only minimal pairs we are left with that demonstrate Ladd's ambiguity contain polarity items, like (60a) and (60b). To the extent that there is an intuitive contrast in their meaning (assuming a speaker finds them both felicitous), we have to wonder whether that contrast might be due entirely to the polarity items themselves.

To make matters worse, Sailor (2013) has conducted experiments demonstrating that participants disprefer HNQs with NPIs like (60b). Interestingly, Sailor demonstrates a continuum in intuitions, with HNQs with *either* receiving a mean acceptability rating of 3.31 on a seven point

scale, while HNQs with *until* phrases like that in (45c) received a mean rating of 1.67. Sailor also

suggests there may be dialectal variation with British English speakers accepting *either* in HNQs,

though more empirical work is needed to establish this.

If *either* is in fact degraded or unacceptable in HNQs, then the data continue the trend we have

established so far, with HNQs patterning with positive polar questions, not LNQs:

(63)   a.   Is Jane coming too?
          b. ??Is Jane coming either?

(64)   a.   Is Jane not coming too?
          b.   Is Jane not coming either?

(60)   a.   Isn't Jane coming too?
          b. ??Isn't Jane coming either?

Consider a context that has been claimed to render (60b) felicitous in the literature:

(65)   Pat and Jane are two phonologists who are supposed to be speaking in our workshop on optimality and acquisition.
        A: Pat is not coming. So we don't have any phonologists in the program.

        (60b) B: Isn't Jane coming either?   (Romero & Han, 2004, 610–611)
        (64b) B: Is Jane not coming either?

While judgments may vary for (60b), note that an LNQ like (64b) is clearly felicitous. This contrast

can be explained by my claim that LNQs have propositional negation while HNQs do not. Suppose

either is an additive, focus sensitive operator that presupposes that there is a focus alternative to its

propositional complement such that the alternative is false. Supposing that *either*'s complement

in (65) is the proposition *that Jane is coming*, this presupposition is met because the proposition

that Pat is coming is false. *Either* also has a licensing requirement. As discussed above, Rullmann

(2003, 361–362) makes the following proposal, but notes that it does not explain all of the data:

"[α *either*] must be contained in a constituent which implies (i.e. entails or implicates) that $[\![\alpha]\!]^o$ is

false." Even if this licensing requirement won't work, something like it may have to be correct. At

the very least, *either* is some kind of strong NPI that is in some sense licensed by a nearby negation. Therefore, appearing under negation will clearly license *either*. Thus, we understand the felicity of (64b): The presupposition is met, and because the question contains a propositional negation that embeds *either* and its complement, the licensing requirement is met. On the other hand, (60b) is infelicitous or at least degraded because while the presupposition is met, the licensing requirement is not. The high negation is not able to license *either*. In fact, the bias inference implies that the complement is true, which seems to oppose *either*'s licensing requirement, whatever its precise nature turns out to be.

3.5.6   Spanish *tampoco*

To try to get a better handle on the licensing of additive particles, I turn now to Spanish, where the cognate of *either* is *tampoco*, an n-word (Herburger, 2001). It is useful to consider Spanish here because *tampoco* is clearly felicitous in structures that have been claimed to be HNQs in Spanish, as we will see in a moment. Thus it will help us get around the disputed intuitions in English.

Romero & Han (2004) claim that high negation in polar questions in Spanish trigger positive bias, like English. High negation is indicated via a postverbal subject as in (66).

(66)   ¿No bebe   Juan?
         not   drinks Juan
         "Doesn't Juan drink?"

         ⤳ S believes that Juan drinks   (Romero & Han, 2004, 614)

A preverbal subject as in (67) does not convey an epistemic bias:

(67)   ¿Juan no   bebe?
         Juan   not drinks
         "Does Juan not drink?"

         no epistemic bias   (Romero & Han, 2004, 614)

Romero & Han note that the negation in (66) is probably not as high as high negation in English

HNQs. What matters, they claim, is the relative position of negation.

Now the claim of researchers who believe that Ladd's ambiguity exists is that regardless of whether the reading is inner or outer, the HNQ necessarily conveys a positive bias, but only inner readings license NPIs. The explanation for this in Romero & Han 2004 is that the effects of high negation are due to a VERUM operator at LF, and this operator can engage in scope relations with negation, which in turn affects the licensing of NPIs and PPIs:

(68)   Outer negation
       a. $\neg$ VERUM $[_p \ldots$ PPI $\ldots]$
       b. *$\neg$ VERUM $[_p \ldots$ NPI $\ldots]$

The structure in (68a) licenses the PPI because the PPI is protected from negation by the intervening VERUM operator. By the same token, the NPI in (68b) is not licensed, because VERUM blocks $\neg$ from standing in the correct relationship with the NPI to license it. When VERUM takes wide scope, the licensing pattern for polarity items is reversed.

(69)   Inner negation
       a. *VERUM $\neg$ $[_p \ldots$ PPI $\ldots]$
       b.   VERUM $\neg$ $[_p \ldots$ NPI $\ldots]$

Crucially, the structure in (69b) is claimed to license NPIs, despite still conveying a positive bias toward p. The problem that we run into in trying to evaluate this analysis in English is that the data for the NPI *either* in HNQs is disputed, as we have just discussed.

Luckily, *tampoco* is perfectly felicitous in negative questions with postverbal subjects like (70), which have been claimed to be HNQs. Zeijlstra (2004, 266–269) argues that in order for an n-word like *tampoco* to be licensed, there must be a negation in the same syntactic domain. Romero & Han's theory is compatible with this claim, since it predicts structures like (69b). Nevertheless, I will translate (70) with an English LNQ for reasons that will become clear shortly.

(70) No viene Ana tampoco?
      Not comes Ana either?
      "Is Ana not coming either?"

While (70) is perfectly felicitous, the question with *tampoco* no longer necessarily conveys a positive bias. To see this, consider the following context (adapted from Romero & Han 2004, 613). The postverbal subject question in (71a) is infelicitous in the context because the question conveys a positive bias, and the context is incompatible with the speaker having a positive bias:

(71) S hates Ana. The prospect of an excursion without her pleases S, but she doesn't have any prior beliefs about whether Ana is coming. Moreover, she does not have any previous belief about whether Maria is coming, and doesn't care either way. A says, "Maria is not coming." S replies: "Okay..."
      a. #No viene Ana? That'd be great!
          Not comes Ana? That'd be great!
          "Isn't Ana coming? That'd be great!"
          ⤳ S believes that Ana is coming
      b. No viene Ana tampoco? That'd be great!
          Not comes Ana either?   That'd be great!
          "Is Ana not coming either? That'd be great!"
          ⇝̸ S believes that Ana is coming

While (71a) is infelicitous because the bias does not match the context, the same question with *tampoco* in (71b) intuitively does not convey positive epistemic bias, and is therefore felicitous in this context. Notice also that the English HNQ *Isn't Ana coming?*—with or without *either*—would be infelicitous here because it conveys a positive bias that is incompatible with the context. On the other hand, the LNQ *Is Ana not coming (either)?* would be felicitous.

The question now is, why would that be? If HNQs are ambiguous between inner and outer readings as Romero & Han claim, then the inner negation reading should license an n-word like *tampoco* while still conveying a positive epistemic bias, which should make it infelicitous in the context.

I explain this as follows: Postverbal subject negative questions in Spanish are indeed HNQs, which is why they give rise to an epistemic bias that renders (71a) infelicitous. However, the

negative morpheme in a HNQ cannot license n-words like *tampoco*. Interestingly, instead of this causing (71b) to be infelicitous, it seems that the presence of the n-word forces the postverbal subject negative question to be interpreted with a propositional negation. That is, postverbal subject negative questions are capable of being interpreted with low negation if it is required to license an n-word. But once this happens, the epistemic bias is lost, which allows (71b) to be felicitously used in the context. In other words, on the assumption that n-words require a local negation for licensing, (71) provides evidence that high negation cannot license n-words like *tampoco*, which in turn provides yet more evidence that whatever high negation contributes, it is not a propositional negation in the prejacent of the question. This fact is easily explained by the hypothesis that high negation is not interpreted as a propositional negation at all. Once we have a proposed structure and interpretation for HNQs in section 3.6, I will return to this data to provide a fuller explanation.

3.5.7 Interim conclusion

The various data points in this section demonstrate that HNQs pattern with positive polar questions to the exclusion of LNQs in many capacities. I believe that what this boils down to is that LNQs contain a propositional negation within the prejacent of the question, while HNQs—like positive polar questions—contain no propositional negation, contrary to what some authors have previously claimed (e.g. Ladd, 1981; Büring & Gunlogson, 2000; Romero & Han, 2004; Trinh, 2014). The idea then is that Ladd (1981, 165) is on the right track when he claims that some HNQs have "outer negation" that is "somehow outside the proposition". However, the evidence above suggests this is the only reading that they have. In the next section, I turn to a recent theory of HNQs that provides a framework for thinking about what it means for negation to be outside of a proposition.

3.6 Krifka's (2017) theory of HNQs

Apart from asking about p (a property shared with other kinds of polar questions), we have now established that high negation questions do two things: they convey that the speaker has a prior

belief in p (the positive bias inference), and they pattern with positive polar questions rather than with low negation questions in various tests for negativity. So now we need to find something that does these two things. Explaining the positive bias inference will require a derivation. We could claim that the construction *Auxn't p?* comes hardwired with this implication, but this doesn't explain why that should be so. Moreover, Romero & Han (2004) have argued that counterparts of HNQs exist in many other languages, some unrelated, all conveying a positive bias inference (see also Sudo, 2013, for a discussion of bias in Japanese negative questions). If this is correct, then it seems that the relationship between high negation questions and positive bias requires a systematic explanation.

To formulate a bias derivation, we need to have some independent evidence about the structure of HNQs, as a starting point from which to derive the bias. Romero & Han find independent evidence by identifying a correlation between bias in HNQs and bias in PFQs, which allows them to connect high negation to the notion of verum focus (Höhle, 1992). By making the assumption that high negation introduces verum focus, Romero & Han expand the empirical base, and identify a starting point from which to develop a semantics that covers all of the empirical facts. A drawback to this approach, already acknowledged in Romero & Han 2004, is that it does not explain why the HNQ structure should have such a biasing effect, since we have to assume without further explanation that high negation introduces a VERUM operator.

More importantly, once we look closely at how verum focus works, as we have done above and in chapter 2, it becomes clear that it is just polarity focus, that is, F-marking of polarity heads, and so does not merit a special operator. Moreover, comparison of bias in PFQs and bias in HNQs reveals important asymmetries. As I have argued above, this is because bias in PFQs is to be derived just from the sorts of conversational contexts they appear in and general pragmatic principles. The presence of polarity focus is coincidental to the bias in PFQs. HNQs on the other hand *always* convey bias. So I believe seeking to expand the empirical base with verum focus leads us astray.
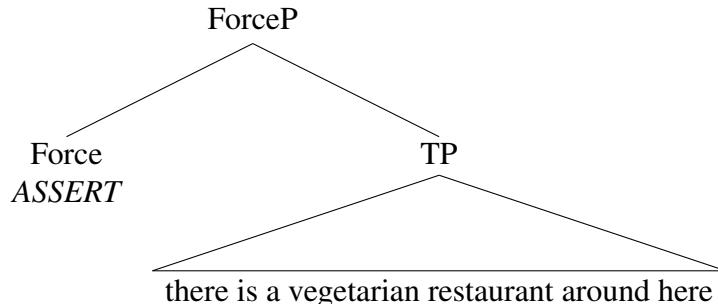
Instead, I will use the evidence established in the last section as a signpost to determining the

structure of HNQs: They pattern with positive polar questions, not LNQs in tests for negativity. Given the systematic, crosslinguistic relationship between high negation questions and epistemic bias, let's begin by figuring out what kind of syntactic structure contains a negative morpheme, but nevertheless produces a semantics that explains the non-negative behavior of HNQs. With such a structure in hand, we can try to figure out why it would systematically give rise to epistemic bias.

In recent work, Krifka (2017) provides such a structure (see also Krifka, 2015, which revises aspects of Krifka 2017, the latter having been written first). What is useful for our purposes here is that Krifka develops a framework which provides an interpretation for negation scoping over a speech act operator. This interpretation helps us understand why the HNQs above pattern with positive questions rather than with LNQs. Below I will argue that it also gives us a framework for understanding why high negation is systematically associated with epistemic bias.

Krifka treats HNQs as requests for an interlocutor to denegate an assertion. This means that the interlocutor is asked if they would *refrain* from committing to an assertion of p. A special negation operator that can scope over a speech act operator is what is responsible for producing this lack of commitment to an assertion. By designing syntactic speech act operators and a special speech act negation, Krifka puts flesh on the bones of Ladd's (1981) claim that the negation of HNQs is actually outside of the proposition. To see how this works consider a simple structure with a speech act operator:

(72)   S$_1$: There is a vegetarian restaurant around here.

The idea is that the TP produces a proposition as standardly assumed. The head of ForceP is a speech act operator, in this case *ASSERT*. Speech act operators are functions from commitment

states to commitment states. A commitment state c is a set of public commitments made by inter-locutors. For example, if speaker$_1$ asserts p, they are committed to p, written $S_1{:}p$. Thus, c is a set of commitments $S_n{:}p'$. A speech act A can be thought of as unioning the commitments in c with the new commitments expressed by A, i.e.

(73) $\lambda c.[c + A]$
         where "$c + A$" is the union of c with the commitments expressed by A

In order to model HNQs as denegations, the system needs to be able to refer to future developments of commitment states, which are called commitment spaces. A commitment space C is a set of commitment states that has a root commitment state that is the intersection of all of the commitment states in C, written $\sqrt{C}$. $\sqrt{C}$ represents the current commitment state in the discourse. The other commitment states in C are possible continuations of $\sqrt{C}$:

(74) C is a commitment space iff

         a. C is a set of commitment states
         b. $\exists c \in C[\forall c' \in C[c \neq \emptyset \wedge c \subseteq c']]$

Update with a speech act like assertion can be generalized to commitment spaces:

(75) $C + A = \{c \in C \mid \sqrt{C} + A \subseteq c\}$

So update with a speech act A removes all commitment states c' from C in which the commitments expressed by A do not hold.

   C can also be updated via denegation of a speech act A. Denegation is written $\sim$. The idea here is that a denegation removes all commitment states c' from C in which the commitments of A would hold.

(76) $C + \sim A = C - \{c \mid \exists c'[c' + A] \subseteq c\}$

The example Krifka gives of a denegation is a speaker refraining from a promise to come.

(77)   I don't promise to come.

As a result of such a speech act, the root commitment space $\sqrt{C}$ remains unchanged, but every possible future commitment state in C in which the speaker promises to come is removed. Note that this is not the same as promising not to come. No promise is made either way.[11]

Whereas assertions normally commit the speaker to the proposition embedded within them, certain kinds of biased questions are modeled as the speaker committing the addressee to an assertion of a proposition. This is done using a *REQUEST* operator that takes speech acts as input, and restricts continuations to those where the addressee performs the speech act. For example, a rising declarative like *There is a vegetarian restaurant around here?* has the following structure:

(78)   [ForceP *REQUEST* [ForceP *ASSERT* [TP there is a vegetarian restaurant around here]]]

(78) restricts continuations to those where the addressee asserts that it is raining.

With these tools in hand, we can consider the model of HNQs in Krifka 2017.[12] Consider the following dialogue.

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[11]The notion of speech act denegation comes from Searle 1969. It's worth noting asymmetries between Searle's example (77) and HNQs. In particular, the negation here seems to be propositional. If it were really speech act denegation in Krifka's sense, then negation scoping over *promise* should be enough to trigger the denegation interpretation above. However this is not what we find using the tests from section 3.5. For example:

(i)   Did Jane not promise to come again?
        can presuppose Jane didn't promise to come before
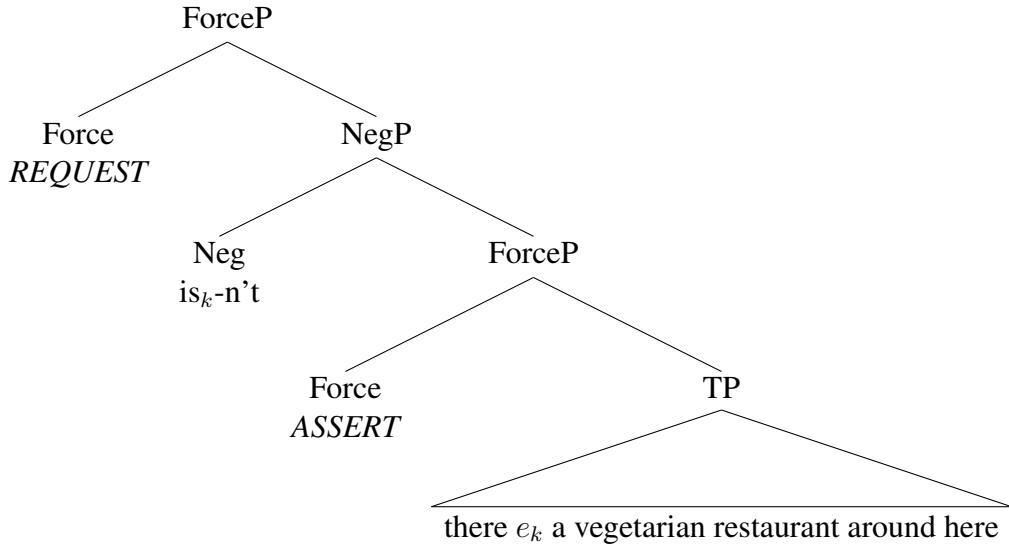
Though (i) is a LNQ, the negation scopes over *promise* and so should be denegation, not propositional negation. But *again* has no problem scoping over *not*. The other tests from section 3.5 reveal similar results. Since I will argue that Krifka's framework for denegation explains the facts from section 3.5, I take it that Searle's example of denegation needs to be modeled differently. Which of these truly deserves the label "denegation" isn't of concern. What matters is that high negation needs to be in a structural position that explains the facts from section 3.5, and Krifka's theory provides that.

[12]Krifka also defines the notion of commitment space developments. These are ordered tuples of commitment spaces that keep a record of prior commitment spaces leading up to the present moment. The purpose of these is to model an interlocutor's rejection of a prior development made by a fellow interlocutor, since this requires the ability to back up to a previous commitment space. Though we discussed answers to HNQs briefly above, the precise modeling of them is not crucial for our purposes, so I leave commitment space developments aside.

(79) S_1 and S_2 have just met up on a street corner. They're planning to get a meal together.
        S_2: So, where do you want to eat?
        S_1: Isn't there a vegetarian restaurant around here?

The HNQ in (79) is proposed to have the following structure:

(80)

```
                        ForceP
             _____
            /                        \
        Force                       NegP
       REQUEST              _____
                          /                \
                        Neg              ForceP
                      is_k-n't      _____
                                   /                \
                                Force               TP
                               ASSERT          _____
                                              /            \
                                there e_k a vegetarian restaurant around here
```

In (80), negation takes scope above the *ASSERT* operator, indicating denegation of a speech act rather than propositional negation. Thus, the speaker is requesting their interlocutor to perform the speech act of denegation on the prejacent of the HNQ *there is a vegetarian restaurant around here*, which we'll call p. In other words, the addressee S_2 is asked to refrain from committing to p:

(81)   ⟦Isn't there a vegetarian restaurant around here?⟧ ≈ S_1 requests S_2 to refrain from asserting *that there is a vegetarian restaurant around here* ($\neg \Box p$)

This is consistent with two kinds of states of affairs:

1. Ignorance: Commitment states in which the addressee remains agnostic about p ($\neg \Box p \wedge \neg \Box \neg p$)

2. Commitment states in which the addressee commits to $\neg p$ ($\Box \neg p$)

This is modeled as removing from the initial commitment space C all commitment states c in which S_2 commits to p:

(82) $C + REQUEST_{S1,S2}(\sim ASSERT(p))$
      $= C + \sim ASSERT_{S2,S1}(p)$
      $= C - \{c \mid \exists c'[c' + S_2 : p] \subseteq c\}$

One attractive feature of this account is that it gives a negation-like role to high negation in that it is represented by an operator $\sim$ that produces complementation. Thus it gives us a way of understanding why the phenomenon under consideration, HNQs, contains a negative morpheme at all rather than some other particle that is morphologically unrelated to negation.
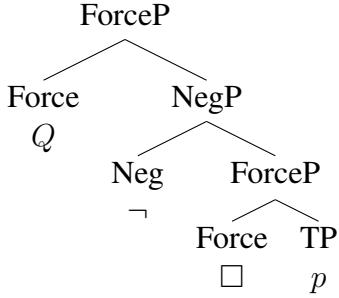
It is reasonable to ask at this point whether this model of HNQs accurately reflects our intuitions about them. S_1 clearly conveys that she believes there is a vegetarian restaurant around, and that she wants to eat there. So far, none of this is reflected in (82). However S_1 did not directly assert, *There's a vegetarian restaurant around here, let's eat there.* Instead she chose to ask a question, and is clearly looking for a response from S_2. She wants to know if her addressee agrees with her belief in p, expressed via the epistemic bias. Though we don't yet have an account of why the HNQ gives rise to epistemic bias, the meaning in (82) is a perfectly good way for S_1 to achieve her goal of determining agreement over p. By requesting S_2 to refrain from committing to p, S_1 ensures that she will find out whether her interlocutor agrees with her belief in p or not. If S_2 accepts the challenge to refrain from committing to p, either because she thinks the answer to $?p$ is unknown, or because she believes $\neg p$, then S_1 and S_2 are in disagreement, and they can go about trying to resolve it. If S_2 rejects S_1's request, then she believes and commits to p, and they know they are in agreement. So the meaning in (82) presents a perfectly good strategy for a speaker to determine whether an interlocutor agrees with a belief that the speaker already holds. What remains to be explained is why the meaning for HNQs in (82) is associated with epistemic bias in the first place, an issue I return to in section 3.7.

3.6.1   An alternative view of the *ASSERT* operator

Before moving on, I would like to briefly mention that an alternative but similar approach would be to analyze *ASSERT* as a doxastic or epistemic operator $\square$ in the syntax, as has been suggested in

previous work (e.g. Kratzer & Shimoyama, 2002; Chierchia, 2006; Alonso-Ovalle & Menéndez-Benito, 2010; Meyer, 2013).

(83)   Isn't there a vegetarian restaurant around here?

```
                  ForceP
                 /     \
            Force       NegP
             Q         /    \
                    Neg      ForceP
                     ¬       /    \
                        Force      TP
                          □         p
```

Using a semantics for Q that takes a proposition such as $\neg\Box p$ as input and returns a standard denotation for polar questions (Hamblin, 1973; Groenendijk & Stokhof, 1984)[13], we get the set $\{\neg\Box p, \neg\neg\Box p\}$, which is equivalent to $\{\Box p, \neg\Box p\}$. This denotation would partition the possibility space in the same way as Krifka's denotation for HNQs does, between commitment to p ($\Box p$) and lack of commitment to p ($\neg\Box p$). The latter is compatible with the two kinds of states of affairs outlined above. Thus, this account would provide roughly the same interpretational effect.

3.6.2 Explaining the data in section 3.5

Krifka's (2017) analysis of HNQs enables an explanation for the asymmetrical evidence seen in section 3.5. Crucially, the HNQ does not contain a propositional negation. Instead, it contributes a denegation $\sim$ above the lower speech act operator. We expect HNQs with *again*, *also*, and *as*-parentheticals not to project negative non-at-issue content because they cannot scope above denegation. We expect *until-* and *for*-adverbials, and strong NPIs like *either* not to be licensed for the same reason. And we expect polar particles like *yes* and *no* not to be interchangeable, since this behavior depends on the presence of a propositional negation.

Still, there may be some lingering questions about polar particle responses to HNQs. On the

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[13]I am thinking here of the Q-morpheme semantics used by Romero & Han (2004, 616):

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

one hand, the lack of propositional negation explains the lack of interchangeability of *yes* and *no*. On the other hand, responses to HNQs do not seem to either confirm that the speaker refrains from committing to p, or reject that challenge and commit to p. But formally, these are the options that Krifka's commitment space semantics for HNQs presents to an addressee. Moreover, a *yes* response to a HNQ intuitively agrees with the questioner's bias, but must be formally modeled in Krifka's framework as a rejection of the request to refrain from committing to p.

However, as counterintuitive as this result may seem, one thing we have learned from recent research into polar particle responses is that they do not correspond directly to the alternatives present in the semantics of polar questions. After all, positive polar questions and low negation questions present the same two possible answers, and yet polar particle responses behave very differently in response to each of them. Under Krifka's (2013) account of polar particles, an account that I revise and adopt in chapter 4, *yes* and *no* are propositional anaphora, sensitive to the discourse referents made available by preceding linguistic utterances. This in combination with Krifka's account of HNQs perfectly explains *yes*/*no* responses to HNQs: the structure for HNQs in (80) only makes one propositional discourse referent available corresponding to p. *Yes* picks this up and asserts it while *no* picks it up and negates it. The purpose of the semantics of questions is not to present the addressee with linguistic objects corresponding to possible answers. It is to signal the questioner's conversational goals, and the kind of information she is interested in. The questioner who asks a HNQ signals they are interested in determining agreement over p, a belief they hold. While the question semantics betrays the speaker's intentions to her addressee, it does not shape the meaning of the *yes*/*no* response. The linguistic structure of the question does that.

Now that we have a structure for HNQs, let's apply it to negative polar questions in Spanish to give a fuller explanation of the *tampoco* data. First reconsider the preverbal subject negative question from (67) above:

(67)   a.   ¿Juan no bebe?
           b. $[_{ForceP}$ *REQUEST* $[_{ForceP}$ *ASSERT* $[_{NegP}$ Juan$_i$ no($\neg$) $[_{TP}$ e_i bebe$]]]]$

(67) is unambiguously interpreted as containing low, propositional negation because *no* is frozen below the subject, and the subject cannot be above the lower speech act operator *ASSERT*.

Now consider the postverbal subject negative question from (66):

(66) a. ¿No bebe Juan?
   b. $[_{ForceP}$ *REQUEST* $[_{NegP}$ no($\sim$) $[_{ForceP}$ *ASSERT* $[_{TP}$ bebe Juan]]]]

There is pressure to interpret (66) as containing high negation because it is in competition with (67), which unambiguously contains low negation. However, the postverbal subject negative question *may* be interpreted as containing low, propositional negation, if something else necessitates that interpretation, such as the presence of an n-word like *tampoco*.

(84) a. ¿No bebe Juan tampoco?
   b. *$[_{ForceP}$ *REQUEST* $[_{NegP}$ no($\sim$) $[_{ForceP}$ *ASSERT* $[$ $[_{TP}$ bebe Juan] tampoco$_{uNEG}$]]]]
   c. $[_{ForceP}$ *REQUEST* $[_{ForceP}$ *ASSERT* $[_{NegP}$ no($\neg$)$_{iNEG}$ $[$ $[_{TP}$ bebe Juan] tampoco$_{uNEG}$]]]]

(84b) is an unacceptable structure because there is an unchecked uNEG feature (Zeijlstra, 2004). However, there is no overt material forcing *no* to be interpreted above the lower speech act operator. Given this and the felicity of (84a), it appears that Spanish postverbal subject negative questions allow for *no* to be interpreted as propositional negation as in (84c), as would be required by *tampoco*. On the assumption that the high position for negation is responsible for the presence of epistemic bias, once *no* is interpreted low, bias disappears, which explains the felicity of the postverbal subject negative question in (71b) in the unbiased context in (71).

What remains to be explained is why the syntax and semantics for HNQs proposed in Krifka 2017 triggers positive epistemic bias in HNQs.

3.7   Deriving bias in HNQs

As discussed in section 3.2, high negation questions seem to necessarily convey epistemic bias. They are clearly infelicitous in contexts in which the speaker is unbiased with respect to the propositional content of the question. Given this fact, it seems that epistemic bias is a necessary condition for using a HNQ, and any complete theory of HNQs should explain this fact.

One criticism of Krifka's (2017) theory outlined in the previous section is that it is not clear why the proposed structure for HNQs should give rise to their most striking feature, epistemic bias. Silk (2016, 50) writes, "Why would asking the addressee to exclude asserting p express a[n] [...] expectation that p? Perhaps Krifka's account could be developed to address this, but additional resources will be needed." In this section I will develop an explanation based on Krifka's (2017) structure for HNQs. In a nutshell, I claim that a question with the structure of Krifka's HNQ will be useful only if the speaker were epistemically biased for p. I will show this by showing that if we assume the speaker uses a HNQ but is unbiased, an alternative question would clearly be more useful than the HNQ. So we can conclude that the HNQ requires bias. But before I can develop this idea, we need to first dig a little deeper into what an epistemic bias is.

3.7.1   What is epistemic bias?

In order to judge a proposed derivation of epistemic bias in high negation questions, we ought to first have a clear idea of what the bias is. Epistemic bias is usually described as the speaker having a previous belief that the proposition denoted by the prejacent of the question is true. So for the question *Isn't it nice out?*, the bias is that the speaker previously believed that the proposition *that it is nice out* is true. But does the bias really rise to the level of *belief*? Is it possible that bias toward p means something weaker than belief, for example that the speaker is fairly certain that p? After all, the data we have seen so far and that is familiar from Romero & Han 2004 and Sudo 2013, merely shows that HNQs are incompatible with a complete lack of bias. I will argue now that HNQs do in fact require the speaker to believe p.

To get there, first notice that HNQs are used as genuine questions and are therefore subject to certain pragmatic constraints that will be made explicit in a moment:

(85)   A checked the weather forecast when she woke up, and it said the sun would come out and it would be a nice day. B wakes up a bit later, and immediately looks out the window and sees bad weather. A knows B has not heard any weather forecasts. B says, "It's gross out." A says to B:

    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?

In the context of (85), A's assertion in (85a) is perfectly felicitous, and A clearly conveys that she believes the propositional content of her assertion. On the other hand, (85b) is fairly odd in this context if we keep in mind that A is talking to B. A would only ask B this HNQ if A thinks B had seen the forecast. But given the context, A has no reason to think this. Another way to render (85b) felicitous is if A is talking to herself. But that is not the case in the context in (85).

Now consider (86):

(86)   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 says to B:

    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?

Notice that nothing about A's information relative to p has changed from (85) to (86). Yet the HNQ in (85b) is infelicitous while that in (86b) is clearly felicitous. The key difference is that B's information has changed and A knows it. B now knows as much as A does about p. In both contexts, A is confronted with contextual evidence that challenges the information contained in the weather forecast. But only in the second context can A double check this information with B.

Notice that conflict between the contextual evidence and the prior belief doesn't seem to be required.

(87)   A heard that the rock band the War on Drugs are playing a concert tonight and that Sun
        Kil Moon are the opening act.
        B: What's going on tonight?
        A: The War on Drugs are playing a concert...

        a.   Sun Kil Moon is opening.
        b.   #Isn't Sun Kil Moon opening?

(88)   A heard that the rock band the War on Drugs are playing a concert tonight and that Sun
        Kil Moon are the opening act.
        B: Did you hear that the War on Drugs are playing a concert?

        a.   A: Yeah. Sun Kil Moon is opening.
        b.   A: Yeah. Isn't Sun Kil Moon opening?

Again, there is no difference in A's information relative to p in the contexts in (87) and (88). In

both cases, the assertion is felicitous, and A clearly believes p. The key difference again has to do

with A's perception of B's information: In (87), B seems to be ignorant about p, *that Sun Kil Moon*

is opening. In (88), B seems to be likely to know as much about p as A, and the HNQ is felicitous.

In this context, A is not faced with any contextual evidence against p. One might claim that B's

failure to mention p is taken as evidence against p, however this would be fairly weak evidence

against p, and one doesn't get the feeling from A's utterance in (88b) that A is acting as if B has

implied that p is false. Rather, A seems to be using the HNQ to introduce p, a relevant additional

proposition, without asserting it. Moreover, as pointed out in section 3.2, if evidence against p

can be accommodated in such a context, then the LNQ *Is Sun Kil Moon not opening?* should be

felicitous, contrary to fact.

We learn two important things from these examples. First, HNQs are acceptable in contexts

in which the information underlying the epistemic bias is strong enough to license an assertion

of p. That is, the belief supporting HNQ epistemic bias **can be as strong as** the kind of belief

that licenses assertion. Moreover, the evidence supporting epistemic bias **can be as strong as** the

evidence that supports an assertion.

Second, HNQs can't be asked if the speaker thinks the addressee isn't likely to know the answer.

This is a more general constraint on the use of questions. Hudson (1975, 12) proposes a sincerity

condition along these lines, which I will refer to as the *epistemic peer condition*, and formulate as follows:

(89)   *Epistemic peer condition*:
         Ask a question $?p$ only if you take your addressee to be at least as informed about p as you are.

Obviously, (89) is not met in (85) or (87) above, but it is met in (86) and (88). I believe this is the crucial difference affecting the felicity of the HNQs across these minimal pairs. HNQs are genuine questions, and as such are subject to the epistemic peer condition in (89).

Of course, (89) applies in other sorts of contexts to other sorts of questions. The most obvious kind of context in which (89) is met is one in which the speaker A is ignorant about p and her interlocutor B is mutually believed to be an authority about p. If A wants to know about p, she could ask $?p$, and (89) would be met.

(89) seems to depend on rational behavior. There is no good reason to ask someone a question if you think they don't know at least as much as you do about the content of the question. However, (89) can be exploited for social purposes. Suppose we are in a context in which the speaker A believes p. I do not take (89) to require A to believe that their addressee B believes p. Rather, asking $?p$ merely conveys, via (89), that A takes B to be in a position to be as informed about p as A is. A may do this knowing full well that B has committed publicly to $\neg p$, or has expressed ignorance of p. Cases like these were discussed for polarity focus questions in section 3.4. In such contexts, B asserts p, therefore they claim publicly to believe in and have evidence for p. A, who believes $\neg p$, then chooses to ask $?p$. This is a diplomatic way to convey conflict, and it is diplomatic in part because the use of the question allows A to signal, via (89), that B is an epistemic peer with respect to p, even if A and B disagree about p. An assertion of $\neg p$ on the other hand does away with this diplomacy, making the conflict explicit.

This kind of diplomacy comes into play even in contexts in which there is no direct conflict:

(90)   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 bit of a 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?
         ⤳ A believes Jane is working the grill.
         B: Oh right, Jane is doing it.

In (90), there is no direct conflict over p between A and B. However A seems to know more about
p than B, so why use the HNQ? 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 touchiness about being forgetful. This
provides a more gentle way to introduce p than assertion, allowing B to save some face. The reason
for this is that using the HNQ conveys that A takes B to be an epistemic peer thanks to (89). In
other words, A behaves as if (89) is met, even though in actuality, it may not be. The underlying
reason for A to behave this way in this case is that it shows deference to her superior, keeping her
on the boss's good side.

To recap, I have made two claims so far in this section. One is that HNQs, being questions,
are subject to constraints holding of questions more generally, namely (89). The second is that
the epistemic bias toward p conveyed by a HNQ can be supported by the same kind of belief and
evidence that supports an assertion of p. Therefore, explaining why a speaker chooses to ask a
biased question rather than assert a proposition does not boil down to how strong their information
for p is.

HNQs are infelicitous if the speaker is unbiased, and they are **compatible with** the kind of
belief in p that licenses assertion. Given these two facts, it is clear that HNQs require the speaker
to be at least partially biased for p, and intuitively it seems fair to say that HNQs require the speaker
to be fairly certain that p, that is, that the speaker believes that p is probably true. However, I believe
that the correct generalization about HNQ bias goes a little further: HNQs **require** the speaker to
believe p. Unfortunately, this claim is difficult to prove. We can start by trying to concoct contexts
in which the speaker is fairly but not completely certain that p, and see if the HNQ is felicitous.

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(91)   A is in a windowless basement computer lab. She reads the weather online, which says, "There's a 75% chance that it's raining." B comes in and says, "Want to go outside and play frisbee?"

    a.   A: ?? Isn't it raining?
    b.   A: Is it not raining?

In (91), A knows that it is probably raining, but doesn't know for sure. B's utterance implicates that it may not be raining (otherwise, why suggest frisbee outside?). A's HNQ in (91a) is out of place in this context. A seems to have assumed that it is raining, despite that her evidence is not strong enough for that assumption. In other words, the epistemic bias that the HNQ conveys seems to require stronger evidence than A has. The low negation question in (91b) on the other hand is fine. It reveals that A thought it possible, even probable, that it was raining (otherwise, why ask about rain?), but it does not necessarily convey that A held the belief that it was raining.

Here is another example:

(92)   A doesn't know much about hockey. B, a huge fan of the local hockey team (the Habs), tells A, "The Habs are almost certainly going to win tonight." Later, after game time, A sees B. B says, "The Habs make me so mad!"

    a.   A: ? Didn't they win?
    b.   A: Did they not win?

Again, A is fairly certain that the propositional content of the HNQ, p, is true. Nevertheless, (92a) is at least slightly odd. The HNQ would be more appropriate in a context in which A heard, after the game was over, that the Habs had won. A more appropriate HNQ in this context would be "Weren't they supposed to win?", which conveys the bias *that they were supposed to win (according to B)*, a bias that A clearly has. If (92a) is acceptable at all, then it may be because we are willing to believe that A is a bit rash in her beliefs. She has taken on p as a belief on the basis of B's claim. (92b) is more appropriate, and clearly does not necessarily convey that A believed p.

Part of the difficulty here is that we don't have access to how agents form beliefs on the basis of some kind of evidence. A less careful individual may come to believe p on the basis of relatively weak evidence. Then the epistemic bias of a HNQ may seem to be supported by weak evidence

when in fact it is still supported by belief, albeit a rash one.

Moreover, the standards for assertion are context dependent. If B tells A that she was at the movies last night, then A might later assert that B was at the movies last night. But if a police detective starts questioning A about B's whereabouts the night before, A might be a little more careful in how she reports what B told her. However, the existence of such examples do not threaten the sincerity conditions of assertion. I.e. an assertion of p does not commit the speaker to something weaker than p. It's just that the standard of assertion is context sensitive thus allowing weaker evidence to satisfy the certainty required for assertion in some contexts than others.

All of this said, I suspect that the correct generalization is that HNQs require the speaker to have evidence for a belief in p that would be strong enough to license an assertion of p in a minimally altered context. That is, for any context C_1 that licenses the use of a HNQ with bias p, I believe there is a related context C_2 that licenses the assertion of p, and the speaker's belief in and evidence for p does not differ in C_1 and C_2. The differences in acceptability of the HNQ and the assertion between C_1 and C_2 will be due entirely to ancillary pragmatic factors such as the epistemic peer condition in (89), as well as constraints on using assertions. So I define epistemic bias as follows:

(93)   The speaker is epistemically biased for p iff they believe p

Thinking of epistemic bias as this kind of belief in p simplifies the following discussion a bit because the relationship between epistemic states and propositions is familiar territory. Moreover, in the following section I want to characterize the function of HNQs as clarifying agreement or disagreement about a proposition p, and this is easier to do if we just think of A as believing p. However, I believe a similar account to the one I am about to give could still be formulated if we relaxed the nature of epistemic bias from full belief to high probability.[14]

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[14] At this point, we have covered enough ground to consider a question that arises about an example from chapter 2.

(i)   A: Want to come to dinner?
        B: # Isn't Jane coming?

The observation was that Romero & Han (2004) can account for (i) via their claim that HNQs are metaconversational

Many researchers have characterized epistemic bias as being a *previous* belief on the part of the speaker. Empirically, the characterization of the bias or belief as previous seems to me to be apt in some contexts, but not others. In the following, I won't mention the previousness of the belief again. As far as I can see, nothing I have to say hinges on whether we take the speaker to continue to believe p, or whether we take them to have believed it up until a time very recent to the asking of the HNQ, at which point they may have suspended their belief. What is required is that they believed p at t', which is a time just prior to t, the utterance time.

What is left now is to explain why HNQs require bias. Part of my goal is to have the negative morpheme *n't* play an active role that bears some resemblance to the notion of negation despite not contributing a propositional negation. Why? The theoretical motivation is that if we just stipulate the connection between "high" negation and bias as an accident, then there isn't much of interest to say. We could claim the *n't* is expletive, and the construction *Aux-n't subject predicate?* is just hardwired in the lexicon with an epistemic bias requirement. I think we can and should have a more explanatory account than this.

The second reason we should have an account of bias that depends on *n't* playing a negation-like role is empirical. Romero & Han (2004) claim that HNQs exist in multiple unrelated languages, and moreover that epistemic bias is always associated with what seems like a high position for negation. If this is right, then it seems like epistemic bias depends in part on a structurally high

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moves that require epistemic conflict over p. There is no conflict here, so the question is infelicitous. On the other hand, if we imagine a richer context in which B has heard that Jane will be there, and B and Jane don't get along, then B's HNQ is felicitous. Such a case might be explained by Romero & Han's account as follows: suppose it is common ground between A and B that B and Jane don't get along. Then given other background assumptions about social behavior, A's invitation would imply that A thinks Jane won't be there, creating epistemic conflict between A and B.

Given that my own account of HNQs does not predict epistemic conflict over p to be required, it is worth asking how I account for the effects of context on such an example. First off, it matters whether or not B is biased for p, since I claim this is a crucial feature of HNQs. If B is not biased, then I predict the HNQ to be infelicitous. If B wants to know whether Jane is coming (for any reason), she would just use the positive polar question. If B is biased, then the HNQ might be used, especially if B doesn't want Jane to be at the dinner. The reason that B needs to have this negative motivation isn't because HNQs require epistemic conflict. It has to do with the relevance of asking the question. If B already believes Jane will be there (as is required by the HNQ) and she wants Jane to be there, then it's not clear why she would need to ask about Jane's presence in order to answer A's original invitation. (She may optionally do this if she wants to bring up Jane's planned presence for some other reason, perhaps just out of excitement. This use of the HNQ would be felicitous according to my own intuition.) But if B doesn't want Jane to be there and she believes Jane will be there, now it is worth bringing it up because it poses a conundrum. So epistemic conflict may be required (or at least likely) in this case, but the reason for it is dissolved into the relevance of asking the question. Thanks to E. Allyn Smith (p.c.) for discussion on this point.

negation, and we would like to an explanation for this fact.

3.7.2 Deriving bias

The objective is to explain or derive the following requirement from the semantics for HNQs and general pragmatic principles:

(94)   *Necessary condition on using high negation questions*:
         A HNQ with propositional content p is felicitous only if the speaker is epistemically biased for p

In order to explain (94), we need to think about the underlying purpose of asking questions. Questions are used to serve a speaker's goals. Depending on those goals, different questions will be more or less useful. My approach will be to show that given the speaker's goals, the HNQ structure will be useful only if the speaker is epistemically biased for p. If the speaker didn't have a p-bias, then another question would be better or preferable. By linking the felicity of a question to its usefulness, I will claim that (94) holds.

I will start by stating the assumption that the felicity of a question depends on its usefulness relative to other questions.

(95)   *Question utility*:
         A question Q is felicitous only if Q is at least as useful as other questions.

This assumption seems reasonable enough on its face. If the speaker wants to know whether it is raining, they do not ask their interlocutor "Have you eaten breakfast?". Such a question would be infelicitous given the speaker's goals, and I would argue this is because of (95). Of course, there are many contexts in which more than one question would be felicitous because the questions are equally useful, which (95) allows for.

Clearly, a lot depends on what it means for a Q to be "at least as useful as other questions". Ultimately, I would like to have a precise way of measuring the utility of questions so that whether

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Q is at least as useful as other questions can be calculated for any given context. This notion of question utility might depend on Gricean quantity as applied to questions. More useful questions are "stronger":

(96)   Q is at least as useful as other questions $\Leftrightarrow$ there is no (relevant alternative) Q' s.t. $Q' \subset Q$

(96) would depend on a suitable notion of strength "$\subset$" for questions. Because of the complexities of the kinds of contexts relevant to high negation questions, it is not yet clear how to obtain a suitable definition for $\subset$, so I leave this line of inquiry to future work.[15]

Instead, I will suggest that what it means for a Q to be "at least as useful as other questions" is context dependent, in particular, it depends on the speaker's goals in a given context. We will need to consider two kinds of contexts, one in which the speaker is trying to **gain information** about p, the other in which the speaker is trying to **determine agreement** with an interlocutor about p. To see why we need to consider these two kinds of contexts, we must first consider the overall structure of the explanation that I will offer for epistemic bias in HNQs.

We already started with the assumption in (95):

(95)   *Question utility*:
        A question Q is felicitous only if Q is at least as useful as other questions.

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[15]The work of Krifka (1995) and van Rooy (2003) may be relevant here, enabling a definition of question strength in terms of information theoretic entropy.

Here is another approach: assuming that questions partition states of affairs into cells c, question utility might be defined as follows, where "$\geq$" stands for "at least as useful as" and Epi_S stands for "the set of worlds representing the speaker's epistemic state":

(i) $Q1 \geq Q2 \Leftrightarrow \forall c \in Q1[\neg \exists c' \in Q2 \ [Epi_S \cap c' \subset Epi_S \cap c]]$

(i) says that $Q1$ is at least as useful as $Q2$ if and only if for each cell c of $Q1$, there is no cell c' in $Q2$ such that the speaker's epistemic state updated with c' is strictly stronger than when updated with c. Of course, it is easy to imagine some $Q2$ that is more useful than $Q1$ on this definition; the questions that are compared will have to somehow be restricted to a valid set of alternatives, as is familiar from work on quantity implicatures.

The challenge for both of these approaches is that they are defined in terms of informative strength, but as we will see, HNQs are less about increasing information relative to a proposition p, and more about determining agreement with an interlocutor over p.

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Next I will need to show that the following statement holds, where "HNQ-p" means "a high negation question with propositional content p":

(97)   *Lemma*:
        HNQ-p is at least as useful as other questions only if S is epistemically biased for p.

Finally, we simply recall that the goal is to derive (94):

(94)   *Necessary condition on using high negation questions*:
        HNQ-p is felicitous only if S is epistemically biased for p.

By the transitivity of *if. . . then* statements, (94) follows from (95) and (97). All that remains is to show that (97) holds, that HNQs are only useful when the speaker is epistemically biased. To do this, I will restate (97) as its contrapositive:

(98)   *Contrapositive of Lemma*:
        If S is not epistemically biased for p, then some other Q is more useful than HNQ-p.

As discussed above, I take epistemic bias for p to be that S is committed to or believes p, which I will abbreviate as $\Box p$. To show that (98) holds, we just show that the assumption $\neg\Box p$ leads to some other question being more useful than HNQ-p.

$\neg\Box p$ is consistent with two states of affairs:

1. S is ignorant about p: $\neg\Box p \wedge \neg\Box\neg p$

2. S is certain that $\neg p$: $\Box\neg p$

Thus, we need to show that in each of these state of affairs, some other question is more useful than HNQ-p.

1. S is ignorant about p, $\neg\Box p \wedge \neg\Box\neg p$ Supposing a context in which S is ignorant about p (and interested in whether p holds), S's goal is to learn whether p or $\neg p$. I claim that in this kind of

context, the speaker pursues the following strategy:

(99)   *Gain info strategy*:
        Q_1 is more useful than $Q_2 \Leftrightarrow$ the cells of the partition representing Q_1 produce epistemic states that are more informed relative to p than the cells of Q_2 do.

Consider the positive polar question, *Did Jane eat?*, which I take to denote the set of its two answers, $\{p, \neg p\}$. Given S's ignorance about p, either of these cells would clearly strengthen S's epistemic state.

Compare this to the HNQ, *Didn't Jane eat?*. According to Krifka (2017), this question is used to request the addressee to refrain from committing to p. As suggested in section 3.6.1, an alternative way of thinking about this question is that it denotes the set $\{\Box p, \neg\Box p\}$, where $\Box$ is relativized to the addressee. Either of these denotations allow the addressee to refrain from committing to p (choose $\neg\Box p$), which as we just saw is consistent with two kinds of states of affairs, one of which is ignorance. Clearly, this cell of the partition would not increase S's information relative to p, since S is already ignorant about p. By (99), the positive polar question is more useful than the HNQ when S is ignorant about p.

2. S is certain that $\neg p$, $\Box\neg p$ Suppose S believes $\neg p$, and they also take their addressee to be an epistemic peer with respect to $\neg p$, which is to say that the speaker behaves as if the addressee is at least as informed as they are about $\neg p$. Moreover, S has some reason to find out if the addressee agrees with them. We have already seen the kinds of reasons for this in various contexts presented in this paper. One is that there is some contextual evidence that conflicts with $\neg p$. Another is that an interlocutor's linguistic behavior conflicts with $\neg p$. Yet another is that $\neg p$ is now relevant and the speaker wants to introduce $\neg p$ while signaling that the addressee is a peer. The speaker's goal then is to find out whether or not the addressee's beliefs agree with the speaker's. In this kind of context, the speaker pursues the following strategy:

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(100)   *Determine agreement strategy*:
        Q_1 is more useful than Q_2 $\Leftrightarrow$ the cells of the partition representing Q_1 make it easier to
        determine whether A agrees with S about a proposition than the cells of Q_2 do.

Consider our two possible denotations for HNQ-$\neg p$:

(101)   Krifka 2017:
        ⟦Didn't Jane not eat?⟧ $\approx$ Requests A to refrain from committing to $\neg p$ ($\neg\square\neg p$)

(102)   From section 3.6.1:
        ⟦Didn't Jane not eat?⟧ $= \{\square\neg p, \neg\square\neg p\}$

Both of these denotations provide the addressee A with two options: If A refrains from committing

to $\neg p$ (chooses $\neg\square\neg p$), then S knows that they disagree. If A does not refrain (chooses $\square\neg p$), then

S knows that they agree. Either way, S learns whether they agree.

    Compare this to our two possible denotations for HNQ-p:

(103)   Krifka 2017:
        ⟦Didn't Jane eat?⟧ $\approx$ Requests A to refrain from committing to p ($\neg\square p$)

(104)   From section 3.6.1:
        ⟦Didn't Jane eat?⟧ $= \{\square p, \neg\square p\}$

If A refrains from committing to p (chooses $\neg\square p$), then S doesn't know whether they agree yet,

because A may be refraining due to ignorance. If A is ignorant about p, while S is committed to $\neg p$,

then they do not agree. That is, ignorance entails $\neg\square\neg p$, which clearly contradicts S's commitment

to $\neg p$, $\square\neg p$. By (100), HNQ-$\neg p$ is more useful than HNQ-p when S is certain that $\neg p$.

    To summarize, the goal was to show that (98) holds:

(98)   *Contrapositive of Lemma*:
        If S is not epistemically biased for p ($\neg\square p$), then some other Q is more useful than HNQ-p.

$\neg\square p$ was consistent with two states of affairs:

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1. S is ignorant about p: $\neg\Box p \wedge \neg\Box\neg p$

2. S is certain that $\neg p$: $\Box\neg p$

I have just shown that in both 1 and 2, some other question is more useful than HNQ-p. Therefore, (98) holds, and so its contrapositive, the original lemma in (97) holds. By combining this with our initial assumption about question utility in (95), the epistemic bias of high negation questions in (94) is derived.

(95)   *Question utility*:
A question Q is felicitous only if Q is at least as useful as other questions.

(97)   *Lemma*:
HNQ-p is at least as useful as other questions only if S is epistemically biased for p.

(94)   *Necessary condition on using high negation questions*:
HNQ-p is felicitous only if S is epistemically biased for p.

In other words, the HNQ with propositional content p only manages to be useful to a speaker S in contexts in which S is epistemically biased for p. If S is not biased for p, other questions are more useful. This fact depends crucially on the semantic denotation of the HNQ, which in turn depends crucially on the high position of negation, namely above a syntactically represented speech act operator. This high position for negation produces a partition that divides the possibility space between those where the addressee refrains from committing to p, and those where she commits to p. What is novel here is the argument that this question semantics is only useful if the speaker is epistemically biased. Since the semantics flows from the syntax, the arguments presented here collectively provide us with an explanation for the link between high negation and epistemic bias.

3.8 Conclusion

There are several ways to ask about a proposition p, including positive polar questions, low negation questions, high negation questions, and polarity focus questions. The initial question was, how we can account for the differences in meaning among these questions? In particular, we would like to know whether we can maintain a classic theory of polar question semantics, explaining the differences only via pragmatics, or whether the different shades of meaning are a result of a complex potpourri of compositional semantics, pragmatics, syntax and prosody.

I have focused on a *prima facie* similarity between PFQs and HNQs, that they both convey epistemic bias, and I have argued that, despite this similarity, the bias of each question type merits a unique explanation. PFQs have the same structure as regular polar questions with the exception of F-marking on the polarity head. But this F-marking does not play a crucial role in the derivation of the bias associated with PFQs. Instead, PFQ bias is derived from the sorts of conversational contexts they appear in, in combination with general pragmatic principles. I identified several ways in which the bias is context sensitive, as we should expect given the derivation I proposed.

On the other hand, I have argued that HNQs must have a special structure all their own. One reason is that they *necessarily* convey epistemic bias, and in multiple unrelated languages (Romero & Han, 2004), which suggests that the bias is tied to a special syntactic structure specific to high negation questions. Another reason is that they do not behave like low negation questions with respect to various diagnostics. I have argued that Krifka (2015, 2017) provides a structure for HNQs that explains the results of these tests, and moreover, I have offered a new explanation as to why that structure would be tied to epistemic bias that depends crucially on the structural height of high negation.

3.8.1 Future directions

There are still several open questions. One is about the disputed intuitions for English HNQs containing *either* and Ladd's ambiguity. What exactly are the empirical facts? If such questions are

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degraded without being outright infelicitous, how can the theory capture that? If there is dialectal variation, what is it? Moreover, Frana & Rawlins (2015) claim that, while there may be variation in English, the ambiguity is clearly present in Italian. So the issue may need to be dealt with in other languages regardless of the English facts. On the other hand, more work may be needed to see if Italian, or any other language claimed to exhibit the ambiguity, behaves like Spanish in that the presence of either an NPI or an n-word eliminates epistemic bias, calling into question whether the sentence still features high negation.

One promising avenue for future research is to extend the work here to tag questions.

(105)   You like coffee, don't you?

The idea is that utterances like (105) contain two speech acts. The clause *You like coffee* is an assertion of p. The tag *don't you?* is a HNQ, with the same structure and interpretation as argued for above, leading to the same epistemic bias for p. Thus, the initial clause is essentially an overt statement of the epistemic bias.

Now consider the following data:

(106)   a.   You don't like coffee, do you?
         b.   You like coffee, do you?
         c.   #You don't like coffee, don't you?

Positive tag questions as in (106a) and (106b) are acceptable with both positive and negative preceding clauses. However (106c) demonstrates that negative tags are not compatible with preceding negative clauses. On the assumption that negative tags are HNQs, while positive tags are positive polar questions, we can explain this asymmetry as follows: positive polar questions are compatible with any kind of speaker bias, while HNQs always come with bias for the propositional content of the question. Since the propositional content of the HNQ tag in (106c) is p, the bias of the tag contradicts the preceding assertion of $\neg p$. (106c) is infelicitous because the speaker contradicts themselves. These remarks are only a first step, however, since the ideas need to be explored more

fully and compared to other recent approaches to tag questions (e.g. Malamud & Stephenson, 2015; Farkas & Roelofsen, 2017).

There are open questions about the framework that Krifka's account of HNQs is couched in. One is which operators can scope over speech act operators, and which cannot? How are such scope interactions restricted? Another is that Krifka (2015) argues that neutral polar questions ("bipolar questions") have the same structure and representation as *or not* questions. For example:

(107)   a.   Do you like to play golf?
            b.   Do you like to play golf or not?

However, Biezma & Rawlins (2012, 400) (by way of Bolinger 1978) point out that such questions have different distributions, an asymmetry that is not explained by the unified analysis.

Before concluding, I would like to discuss two remaining puzzles at slightly greater length: embedded HNQs, and HNQs in the first disjunct of disjunctive polar questions.

3.8.1.1 Embedded HNQs

It has been argued, especially by Sailor (2013) that HNQs can be embedded. For example:

(108)   This is why I wonder if we haven't been contacted by aliens already.
        ≈ Haven't we been contacted by aliens already?   (Sailor, 2013, 11)

Moreover, I note that embedded negative polar questions can have what feel like low and high negation readings, given the right contexts:

(109)   Hans is two years old and hates vegetables, it's really a struggle to get him to eat them.
        a.   "*Low negation reading*": Hans's mother is in the living room with some friends talking. Hans's father is in the kitchen, feeding Hans. The mother and her friends hear a noise like a dish falling to the floor.
            Mother: I wonder if Hans wouldn't eat his vegetables (again).
        b.   "*High negation reading*": Hans's mother and father are talking about how to get Hans to eat his vegetables. Pretty much the only thing Hans will eat is peanut butter and jelly sandwiches. Hans's mother says,

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Mother: Maybe we could put them in a peanut butter and jelly sandwich. I wonder if Hans wouldn't eat his vegetables (then).

Intuitively, while Hans's mother seems to strongly suspect $\neg p$ in (109a), she seems to have a positive expectation for p in (109b). The latter feels like a high negation question. Likewise, we can imagine the sentence in (110) being used in a context where the speaker is leaning toward the positive answer, and in a context where the speaker is leaning toward the negative answer.

(110)   I wonder if Jane doesn't live in Montreal.

If HNQs can be embedded, this would seem to be a challenge to the theory of HNQs developed in Krifka 2017 and adopted above. It seems unlikely that speech act operators should be embeddable under matrix predicates like *I wonder if*.

However, in section 3.7.1, I argued that epistemic bias is quite strong, approaching the level of belief required to license assertion. However, notice that, while in the above examples it is easy to imagine the speaker leaning toward a positive answer, this expectation is intuitively weaker than the strong bias found in unembedded HNQs. For example:

(111)   Doesn't Jane live in Montreal?

gives rise to a much stronger bias inference than (110). Since the strength of the bias in unembedded HNQs seems to be a necessary component of HNQs, this asymmetry calls into doubt the claim that the above examples of embedded negative questions are HNQs. Nevertheless, I think this only scratches the surface on the future work needed on embedded negative polar questions.

3.8.1.2   Disjunctions of polar questions

One of the few cases in which *n't* is fronted with an auxiliary in English but does not come with the bias that high negation questions are known for is in alternative questions like in (112). Alternative questions are pronounced with a regular polar interrogative rising intonation on the first disjunct,

and a falling intonation on the second disjunct.

(112)   Do you like coffee or don't you?

The question in (112) appears to be completely unbiased, or can at least be used in an unbiased way. The *don't you* portion does not convey a strong positive bias, unlike normal HNQs. Instead, the question seems to provide two overt alternatives and ask the addressee to pick one (cf. Biezma & Rawlins, 2012; Roelofsen & Farkas, 2015). The *don't you* in the second disjunct provides the $\neg p$ alternative to the prejacent p of the question in the first disjunct. The question *Do you like coffee or not?* has a very similar if not identical interpretation to (112).

Importantly, the questions in either disjunct must clearly present contrasting alternatives to one another:

(113)   a. #Do you like coffee or do you?
         b. #Do you not like coffee or don't you?

At first glance, an attempt to use a high negation question as the first disjunct of an alternative question results in infelicity, much like (113b):

(114)   #Don't you like coffee or don't you?

This is surprising because, given the positive bias of the HNQ *Don't you like coffee?*, the alternative question in (114) seems like it should present two contrasting alternatives, which should render it acceptable, more like (112) than (113b).

Interestingly though, there may be something about the repetition of the form *Don't you P or don't you* in (114) that is responsible for its unacceptability, rather than a lack of two clear semantic alternatives. Consider the example in (115a) found online, in which there is no repetition of form, even though the semantic content of the two disjuncts is roughly p and $\neg p$. Such a sentence renders a HNQ acceptable as the first disjunct of an alternative question:

(115)   Along similar lines, I also understand the frustration of people who see innocent peo-
         ple dying, and whose every idea is swatted down—even if quite convincingly—by their
         opponents.

         a.   Can't you people support anything? Or is it all just no, no, no, at every turn?

                                                                                    (Benson, 2017)

         b.   #Can't you people support anything or can't you?

While (115a) is written as two distinct questions, note that it is read with a rising intonation on the

first question, and a fall on the second, just like alternative questions are. Attempting to read it with

a rise on both questions sounds odd or at least dispreferred. So I take (115a) to be an alternative

question. But in this case, a HNQ felicitously serves as the first disjunct, and it presents the

positive alternative p, in contrast to the negative alternative $\neg p$ offered in the second disjunct. The

infelicity of the alteration of (115a) in (115b) shows that there is something about the repetition

of the form *AUXn't PRO P or AUXn't PRO?* in disjunctive questions with a HNQ as the first

disjunct that renders them unacceptable, rather than an inability of a HNQ to provide the positive

alternative as the first disjunct in a disjunctive question. (115a) avoids this repetition by using

different lexical content in each disjunct to convey semantically contrastive alternatives. I am not

sure why the repetition causes infelicity, or why different lexical content avoids it, but we don't

need an explanation here since all that matters for our purposes is the empirical fact.

    To see how a HNQ alternative question like (115a) compares to LNQ alternative questions, we

need to construct parallel examples to (115a) in which the LNQ is felicitous, and in which the LNQ

is infelicitous. This will allow us to see if HNQ alternative questions and LNQ alternative questions

pattern together or not. However, while it is possible to manipulate (115a) for this purpose, the

task is unnecessarily complicated by the presence of the modal and NPI, so consider the following

constructed examples instead:

(116)   a.   Did Jane play golf, or did she skip it today?
         b.   #Did Jane not play golf, or did she skip it today?
         c.   Didn't Jane play golf, or did she skip it today?

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Unlike (114), (116c) patterns with the alternative question in which the first disjunct is positive in (116a), while a LNQ in the first disjunct in (116b) is infelicitous.

Compare this to alternative questions with a second disjunct that renders the LNQ in the first disjunct as in (117a) acceptable. Again, the HNQ in (117c) patterns with the positive question in (117b) rather than the LNQ in (117a).[16]

(117)   a.   Did Jane not play golf, or did she stick around and hit a few?
            b. #Did Jane play golf, or did she stick around and hit a few?
            c. #Didn't Jane play golf, or did she stick around and hit a few?

As far as I know, this is the first evidence that HNQs can serve as the first disjunct in an alternative question, and when they do, they pattern with positive questions, not LNQs, examples like (114) notwithstanding, which I think are infelicitous for phonological reasons having to do with the repetition of preposed negation and the following predicate. This can all be seen as further evidence to add to that found in section 3.5, demonstrating asymmetries between HNQs and LNQs.

However, it is not clear how to square these facts with the framework developed in Krifka 2015, 2017. Krifka's theory provides for a more complete Boolean speech act algebra, including both conjunction and disjunction for speech acts, which essentially amounts to intersection and union of commitment spaces respectively. Moreover, Krifka (2015) uses speech act disjunction (union) to analyze alternative questions. Essentially, alternative questions are disjunctions of two speech acts, the two possible commitment space continuations offered to the addressee by the two alternatives in the question. Thus we could in principle imagine denegation taking scope under or over disjunction. It is quite clear that denegation in (115a) and (116c) is taking scope under disjunction. For example, if it were given wide scope in (115a), then the denegation of the disjunctive question would be asking the interlocutor to refrain from asserting that they can support something *and* to refrain from asserting that they can't support anything, which is to say that the whole alternative question provides them only with the continuation in which they commit neither

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[16]For these examples to work properly, we of course need to interpret *stick around and hit a few* as a colloquial way of saying *play golf*, that is ⟦play golf⟧ = ⟦stick around and hit a few⟧. It would be possible to read "sticking around and hitting a few" as contrasting semantically with "playing golf", and then (117b) and (117c) would be felicitous.

way. But this clearly isn't what the question in (115a) is doing. Moreover, in section 3.7 above, I argued that the bias of HNQs corresponds to the continuations *not* offered to the addressee, that is the proposition that the addressee is being asked to refrain from asserting. But this would mean that the whole alternative question in (115a) expresses bias toward the disjunction, that the addressees can support something or not. But clearly this isn't what is expressed. Instead, the speaker seems to express a bias that is local to the HNQ in the first disjunct, that the addressees should be able to support something.

Therefore, the denegation must be taking scope under the disjunction. In order to see what Krifka's account predicts, let's just briefly consider how normal alternative questions are supposed to work in his theory. For a question like (112), *Do you like coffee or don't you?*, the speaker provides the addressee with two possible continuations, one which contains only commitment states in which the addressee commits to liking coffee, and one which contains only commitment states in which the addressee commits to not liking coffee. This is modeled as a request by the speaker that the addressee either asserts that they like coffee or asserts that they don't, which is in turn treated as the union of the two commitment spaces. This model is meant to represent an unbiased choice between two alternatives. While Krifka (2015) doesn't go into much detail on the nature of the alternatives, Biezma & Rawlins (2012) argue that the alternatives need to be exhaustive and mutually exclusive. I believe this is correct and helps explain why the alternative questions in (113) are so odd.

Turning now to (115a), we can crank through the predictions. The HNQ requests the addressee to refrain from asserting that they can support something, which is to say, it presents them with the continuations in which they either commit to not supporting anything, or don't commit either way. The second disjunct requests the addressee to assert that they can't support anything, i.e. the addressee is presented with continuations in which they commit to not supporting anything. But this latter commitment space is a proper subset of the commitment space made available by the HNQ in the first disjunct. So the two alternatives are not truly alternatives in this model: They are not mutually exclusive.

This does not just run afoul of Biezma & Rawlins's restriction on the relationship between the alternatives in alternative questions, it also clearly does not match our intuitions about (115a). Intuitively, the question is contrasting two exhaustive, mutually exclusive alternatives: Either that the addressees can support something or that they can't. The first alternative is identical to the speaker bias we expect from the HNQ, that the speaker has a prior expectation that they could support something. So it seems that the alternative question here does not get its alternatives directly from the commitment space continuations predicted from Krifka's compositional semantics. Instead, we need to say that the HNQ in the first disjunct is processed all the way to the bias, and the bias serves as the first alternative and contrasts with the continuation offered by the second alternative. This does not fit neatly with the theory of alternative questions on the table in Krifka 2015, but it does seem to be what is happening descriptively speaking. I leave it to future work to develop a theory that explains it.

Preface to Chapter 4

In chapter 3, I explored differences in interpretation between low negation questions (LNQs) and high negation questions (HNQs). In particular, LNQs require contextual evidence in favor of the negative answer, while HNQs do not. Moreover, LNQs contain a propositional negation as revealed by several tests demonstrated in chapter 3, while HNQs do not contain a propositional negation. One piece of evidence is that polar particles in response to HNQs behave like they do in response to positive polar questions, while polar particles in response to LNQs are interchangeable.

The interchangeability of English *yes* and *no* in response to LNQs has garnered much attention in recent literature. Researchers have sought to explain this effect, in particular why does the presence of propositional negation in a polar question have such a profound effect on responses to them. Moreover, researchers have wondered whether the intonation polar particle responses could affect their acceptability and interpretation, however there hasn't been any empirical investigation into this issue.

In chapter 4, coauthored with Michael Wagner, we critically review theories of polar particles, and introduce some new evidence that leads to a synthesis of existing accounts. Then we report on several experiments that expand the empirical landscape for polar particle research. Moreover, they explore for the first time the intonations that people produce in polar particle responses, and how those intonations affect the interpretations of polar particles.

Polarity focus, discussed in chapter 2, makes a reappearance in our experimental results here, though we refer to it as "verum focus" since that is how it has been labeled in the polar particle literature. We find that participants produce polarity focus in both positive and negative responses

to LNQs. This is unsurprising given that polarity focus on either response can be licensed by a context in which an LNQ is used. As discussed in chapter 3, the LNQ signals the presence of contextual evidence for $\neg p$, but is also compatible with a previous expectation that p. Either way, polarity focus can be used to emphasize the truth of a response against its alternative, regardless of which response it is, as we will see.

Chapter 4

Intonation, *yes* and *no*

4.1 Introduction

Whether a speaker chooses to say *yes* or *no* in response to a polar question (PQ) depends on the intended answer. Consider (1). If B means to say that Jane is coming, she uses *yes*, not *no*.[1] If she means to answer that Jane isn't coming, she uses *no*, not *yes*.

(1)   A: Is Jane coming?
      a.   B: Yes, she is.
      b.   B: #No, she is.
      c.   B: #Yes, she isn't.
      d.   B: No, she isn't.

However, in response to negative PQs, B is free to choose *yes* or *no* to convey either answer.[2]

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[1]Note that (1b) is not always impossible in response to positive PQs. We will return to this below in footnote 35.

[2]High negation questions in which the negation is fronted with the auxiliary, e.g. *Isn't Jane coming?*, do not have this effect, and pattern with (1) (at least in American English). *Yes* can only mean that she is, while *no* can only mean that she is not (Romero, 2006; Kramer & Rawlins, 2009). We will not discuss high negation questions in detail in this paper, and when we say "negative questions" below, we will be referring to PQs with low negation (negation following the subject as in (2)). There is a further difficulty here, which is that low negation questions can sometimes be interpreted as if the negation were syntactically high (Romero & Han, 2004; Reese, 2007). We will ignore such readings. Moreover, an examination of our experimental results by item shows that participants did not interpret any of the low negation questions in our experiments as high negation.

(2)   A: Is Jane not coming?

    a.   B: Yes, she is.
    b.   B: No, she is.
    c.   B: Yes, she isn't.
    d.   B: No, she isn't.

We will discuss nuances in the intuitions below, but it is clear that (1b) and (1c) contrast with (2b) and (2c) in that the latter are much more acceptable. We will call this behavior of English polar particles in negative contexts *interchangeability*.[3] *Yes/no* responses to negative (falling) declaratives are interchangeable as well, but in this paper we focus on responses to negative PQs and negative rising declaratives. Negative questions are only felicitous in the presence of contextual evidence for the negative answer (see Büring & Gunlogson 2000 a.o., as well as recent accounts of this effect by Trinh 2014 and Roelofsen & Farkas 2015). For example, A can only ask *Is Jane not coming* if there is some contextual evidence that suggests that she might not be.[4,5] We will call (2a) and (2b) *positive* answers because *she is* has positive polarity. Positive answers to negative PQs *contradict* or *disagree with* the contextual evidence and affirm the positive proposition. Analogously, we will call answers like (2c) and (2d) *negative* answers, since they have negative polarity. Negative answers to negative PQs *agree with* the contextual evidence that licenses the negative question, and they affirm the negative proposition.

Earlier experiments on interchangeability have demonstrated that the phenomenon is robust, but also that speakers prefer certain responses over others. Brasoveanu et al. (2013) looked at particle preferences in agreements with both positive and negative declaratives. The results show that while only *yes* can be used to agree with a positive declarative sentence, both *yes* and *no* can

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[3]Researchers have referred to the phenomenon with other names that we want to avoid for various reasons: "Ambiguity" because not all theorists agree that such responses are ambiguous, "multifunctionality" because it already implies a certain interpretation of the facts, and "negative neutralization" because it only applies to the responses in (2c) and (2d), not the full range of answers in (2).

[4]Although asker interest or desires can also have an effect, see e.g. Romero & Han (2004); Sudo (2013). We will leave these issues aside.

[5]This is sometimes characterized as a "bias" toward a negative answer, but we note that the speaker asking the question does not have to be biased at all, as long as relevant evidence for the negative answer is salient. This contrasts with the positive epistemic bias observed in high negation questions, which necessarily involve that the speaker is biased toward p.

be used to agree with a negative sentence, with participants preferring *no* over *yes*.[6] For example, (2d) would be preferred to (2c). Our results, first reported in Goodhue et al. (2013) and Goodhue & Wagner (2015), match these findings.

Kramer & Rawlins (2012, reported in Roelofsen & Farkas (2015)) ran an experiment testing *bare particle responses*, that is, uses of *yes* and *no* that were not followed by an overt clause. Participants were asked to rate the felicity of the bare particle responses, and they were also asked whether, given the context, the responses were *true*, *false*, or they were *unsure*. Besides demonstrating interchangeability, the results show the following for responses to negative PQs: Participants preferred bare particles in contexts in which the negative answer was true, and bare particles were more likely to be judged true in a context in which the negative answer was true. Thus, bare particles are preferred as negative rather than positive responses (e.g. (2c) and (2d) are preferred over (2a) and (2b) when the particles are bare).

Theorists such as Kramer & Rawlins (2009); Holmberg (2013, 2016); Krifka (2013); Roelofsen & Farkas (2015) have attempted to explain interchangeability in general, as well as the more nuanced *preference patterns* just discussed. Moreover, Roelofsen & Farkas (2015) and Holmberg (2016) have offered accounts meant to explain the diversity found in the polar particle systems of the world's languages.

Interestingly, almost all prior work notes that factors such as intonation and whether the particle is followed by an overt clause or not could play a role in the felicity of the responses. However, there has been little agreement on the nature of the intonational effect. Which intonations do naïve speakers actually produce in *yes/no* responses? How do those intonations affect interpretation and preference patterns? We tried to answer these questions by running several production studies eliciting *yes/no* responses to polar questions and rising declaratives, in order to see which intonational tunes speakers choose to convey certain intentions. Furthermore, we ran a perception experiment to see how intonation affects the interpretation of bare particle responses. Taken together, these pro-

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[6]This result was only found when the subject was a referential NP. Participants preferred *yes* for responses to sentences with downward- and non-monotone quantificational subject NPs such as *at most n* or *exactly n*, and showed no preference either way for upward-monotone quantifiers such as *some n*.

duction and perception experiments expand our understanding of how intonation interacts with the use of polar particles in particular, but also of how intonation affects interpretation more generally.

Our experimental results contribute to the empirical landscape beyond the intonational findings. We also collected participants' felicity ratings. Our results partly replicate earlier findings, but also go beyond them. For example we compared responses to polar questions with those to rising declaratives, and we compared *yes* with *yeah* responses. Neither comparison had been tested experimentally before.[7] Finally we ran a follow-up reading experiment in English, modeled on work by Meijer et al. (2015) on German that tested whether preference patterns are sensitive to the polarity of sentences in the context that precede the sentence that *yes* and *no* respond to.

In order to appreciate how intonation affects the interpretation of polar particles and how our results interact with the literature, we need to understand the issues involved in the analysis of polar particles. We therefore begin by summarizing some contemporary theories of polar particles in section 4.2. While doing this, we make some new observations that suggest a synthesis of the different theories may be needed. Then in section 4.3, we discuss relevant background on the contradiction contour (Liberman & Sag, 1974), which, as we will see, plays a major role in responses to polar questions.

Having introduced the relevant background, we then turn in section 4.4 to experiments in which participants produce polar particle responses to polar questions and rising declaratives in scripted dialogues. In section 4.5, we describe a perception experiment in which participants interpret bare polar particles varied by intonation. In section 4.6, we discuss the reading experiment modeled on the work of Meijer et al. (2015).

4.2   Accounts of interchangeability

What does interchangeability in negative contexts tell us about the nature of polar particles like *yes* and *no*? Kramer & Rawlins (2009); Holmberg (2013, 2016); Krifka (2013); Roelofsen & Farkas

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[7]Roelofsen & Farkas (2015) note the intuition that *yeah* might differ from *yes* in subtle ways.

(2015) offer various answers to this question. In the following, we distill their theories down to their core explanations. Each account has its merits, and we will discuss some new evidence that suggests that certain aspects of each are needed.

4.2.1 Krifka (2013)

Krifka (2013) explains interchangeability by arguing that negative sentences introduce multiple antecedents for *yes* and *no* to pick up. Consider the likely interpretation of the propositional anaphor *that* in the following two examples:

(3)   A: You didn't win the jackpot.
    a.   B: I expected that.
    b.   B: I didn't expect that.

That can either take the proposition that B won the jackpot or its negation as its antecedent, and which interpretation is more likely depends on the plausibility of the different readings given our world knowledge (winning a jackpot is unlikely and therefore should be unexpected). In Krifka's analysis, *yes* and *no* are propositional anaphora which, just like *that* or *so*, require linguistic antecedents. Polar particles are different from regular propositional anaphora, however, in that they do not just refer to a proposition, they also either assert it (in the case of *yes*) or assert its negation (in the case of *no*). Krifka therefore treats *yes* and *no* as standing in semantically for entire speech acts, and assumes that they have a corresponding syntactic phrasal category which Krifka calls ActP. This analysis aims to explain their syntactic distribution. For example, it can account for why it is not possible to say *Yes surprised me*.

The antecedents for polar particles are contextually salient linguistic expressions that denote propositions, which Krifka (2013) calls propositional discourse referents. A positive PQ as in (4) makes available a discourse referent d anchored to the TP, which denotes the proposition *Jane is coming*:

(4)   Is Jane coming?
         simplified LF: [$_{\text{TP}}$ Jane is coming]
                    ↪ d

        a.   Yes = ASSERT(d)   [meaning: Jane is coming]
        b.   No = ASSERT(¬d)   [meaning: Jane is not coming]

The particle *yes* can pick up this discourse referent d as in (4a) and assert *Jane is coming*. It cannot assert $\neg d$ as there is no antecedent denoting that proposition. Similarly, *no* can only negate d producing $\neg d$ as in (4b) because d is the only antecedent available. To produce d, *no* would need to be able to negate an antecedent that is equivalent to $\neg d$, but there is no such antecedent available in the context in (4). Krifka's account hence correctly predicts the non-interchangeability of *yes* and *no* in the context of a positive polar question (1).

The key idea accounting for interchangeability in negative contexts in Krifka's analysis is that these structures make two antecedents available, similar to (3). The first antecedent is the embedded antecedent d anchored to the TP, which denotes the positive proposition *Jane is coming*. The second antecedent is d' anchored to the NegP, which denotes the negated proposition *Jane is not coming*:

(5)   Is Jane not coming?
         simplified LF: [$_{\text{NegP}}$ not [$_{\text{TP}}$ Jane is coming]]
                   ↪ d'   ↪ d

        a.   (i)   Yes = ASSERT(d)   [meaning: Jane is coming]
            (ii)   No = ASSERT(¬d)   [meaning: Jane is not coming]
        b.   (i)   Yes = ASSERT(d')   [meaning: Jane is not coming]
            (ii)   No = ASSERT(¬d')   [meaning: Jane is coming]

In (5a), *yes* asserts d, and *no* asserts its negation. In (5b), *yes* asserts d' (which is equivalent to $\neg d$), and *no* asserts its negation.

Under this analysis, bare polar particles are in principle expected to show the same interchangeability in negative contexts, since they should also be able to pick up one of the two antecedents. However, Krifka makes additional assumptions about pragmatic factors which affect which uses

of polar particles in general and bare particles in particular should be more or less preferable given a certain discourse. We will return to these finer grained claims when discussing the experimental results.

4.2.2 Kramer & Rawlins (2009)

Under Krifka's analysis, *yes* and *no* are not syntactically related to the sentences that follow them. They form separate speech acts, and the relation to a following sentence would be guided by the same principles that guide sequences of speech acts in discourse more generally. Prior analyses have often assumed a much more direct syntactic relation between the particle and the following sentence, however, in which *yes* and *no* are part of the structure of the following sentence. For example, Kramer & Rawlins (2009; referred to as K&R), building on Laka (1990), propose that *yes* and *no* are adverbs in the specifier of the functional polarity head in the left periphery.[8] According to K&R's account, the use of *no* is constrained in that it can only occur if the following, optionally elided, sentence contains negation. This is achieved formally by assuming that *no* has an uninterpretable negative feature (uNEG) that must enter into a negative concord chain with an interpretable negative feature (iNEG). *Yes* does not contribute any features, and thus is not constrained by the polarity of the following sentence. This explains why both are compatible with negative responses to negative questions.

(6)   A: Is Jane not$_{[i\text{NEG}]}$ coming?
   a.   B: [$_{\text{PolP}}$ No$_{[u\text{NEG}]}$ [$_{\text{TP}}$ she is not$_{[i\text{NEG}]}$ coming]]
   b.   B: [$_{\text{PolP}}$ Yes [$_{\text{TP}}$ she is not$_{[i\text{NEG}]}$ coming]]

While for Krifka the use of polar particles without a following sentence is unexceptional, under this analysis such cases are analyzed as fragment answers, where the TP-complement of the polar projection has been elided. As in all fragment answers, ellipsis requires an appropriate antecedent. K&R assume with Merchant (2001) that elided structure and the antecedent have to mutually entail

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[8]Laka (1990) and Kramer & Rawlins (2009) refer to this head as Σ, while Holmberg (2016) and Roelofsen & Farkas (2015) call it Pol. We adopt the latter terminology.

each other. In the context of a negative question, the antecedent for ellipsis is simply the TP of the question:

(7)   A: Is Jane not$_{[i\text{NEG}]}$ coming?
   a.   B: [$_{\text{PolP}}$ No$_{[u\text{NEG}]}$ [$_{\text{TP}}$ ~~she is not$_{[i\text{NEG}]}$ coming~~]]
   b.   B: [$_{\text{PolP}}$ Yes [$_{\text{TP}}$ ~~she is not$_{[i\text{NEG}]}$ coming~~]]

Yes and *no* are both predicted to be acceptable in (6) and (7). *No* is in a negative concord relationship with iNEG in the elided constituent. *Yes*, on the other hand, does not place any syntactic requirements on the follow-up sentence, and hence is also acceptable here. The source of the interchangeability of *yes* and *no* in negative answers to negative questions is therefore that both particles are compatible with cooccurring with a clause that contains negation.

One issue with this account is that it only deals with one half of the interchangeability phenomenon, negative answers. As K&R note themselves, it is not obvious under their analysis why *no* can appear with a positive clause in response to a negative PQ, e.g. *No, she IS coming*. Since *no* contains a uNEG feature, it must enter into a negative concord chain with an iNEG feature, but there is none present in such a response. To explain this use of *no*, K&R claim that there is a second lexical entry for *no* that encodes, in combination with an obligatory intonational peak on the auxiliary, a reverse feature uREV, similar to reverse particles such as French *si* and German *doch*. Ellipsis is argued to be impossible in reversing *no* responses due to the obligatory intonational peak on the auxiliary. While K&R do not discuss positive *yes* responses to negative questions, for example *Yes, she IS*, we believe that their account predicts that ellipsis should be impossible, since there is no appropriate antecedent.

What about polar particles in response to a positive question? The analysis of the use of *yes* in positive responses is straightforward. The elided structure is simply identical to the antecedent *Jane is coming* provided by the question, see (8a). The reason *no* cannot be used in a positive response is also clear: There is no syntactic negative feature that it could enter into a concord chain with, and *no* is therefore not licensed, see (8b).

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But how do *no* responses convey negative answers to positive questions? It would seem that the positive question cannot provide the required antecedent for the elided negative sentence. K&R argue that in such cases, an *i*NEG feature appears in the polarity head, higher up in the structure than the ellipsis site, see (8c).

(8)   A: Is Jane coming?

     a.   B: [$_{\text{PolP}}$ Yes [$_{\text{TP}}$ ~~she is coming~~]]
     b.   B: *[$_{\text{PolP}}$ No$_{[u\text{NEG}]}$ [$_{\text{TP}}$ ~~she is coming~~]]
     c.   B: [$_{\text{PolP}}$ No$_{[u\text{NEG}]}$ [$_{\text{Pol}}$ [*i*NEG]] [$_{\text{TP}}$ ~~she is not$_{[u\text{NEG}]}$ coming~~]]

This account of the use of *no* works technically, but it seems a bit ad hoc in that it runs counter to the idea that ellipsis is licensed by mutual entailment. Both Krifka (2013) and Roelofsen & Farkas (2015) note an additional problem: Since *yes* does not impose any syntactic requirement on the structure it occurs in, there is actually nothing in this account to stop *yes* from appearing in negative responses to positive PQs. Thus contrary to fact, the response in (9) is predicted to be entirely acceptable.

(9)   A: Is Jane coming?
       B: [$_{\text{PolP}}$ Yes [$_{\text{TP}}$ she is not$_{[i\text{NEG}]}$ coming]]

We turn now to an account in the same vein as Kramer & Rawlins (2009) that addresses some of these issues.

4.2.3   Holmberg (2013, 2016)

Holmberg (2013, 2016), like Kramer & Rawlins, treats *yes* and *no* as specifiers of a functional projection, and analyzes bare particles as fragment answers in which everything but the polar particle remains unpronounced.

For Holmberg, *yes* and *no* are operators that assign positive and negative values respectively to the polarity head of their complement. The polarity head contains a polarity variable that can have

one of three values: Positive [+], negative [−], and open [±]. Positive polar questions have open polarity, according to this analysis. Consider (10), where the PolPs in the answers are elided.

(10)   A: Is–[±] Jane coming?

    a.   B: [$_{\text{FocP}}$ Yes [$_{\text{PolP}}$ [+] [$_{\text{TP}}$ ~~she is coming~~]]]

    b.   B: [$_{\text{FocP}}$ No [$_{\text{PolP}}$ [−] [$_{\text{TP}}$ ~~she is not coming~~]]]

The polarity variables of the answers in these cases are different from that of the question, an apparent problem since the identity condition on ellipsis seems to be violated. Holmberg argues, however, that elided pronoun variables can have different interpretations than their antecedents, and he suggests that polarity variables behave in the same way. For example, *Jane took her car, and Amanda did, too* has an interpretation where Amanda took her own car. The idea then is that *yes* and *no* bind an elided polarity variable and assign it [+] or [−] respectively. The feature value [−] would be spelled out as *not* if the following sentence were not elided.

While Krifka finds the source of interchangeability in the possibility of either picking up the entire proposition in the context or just the one embedded under negation, Holmberg finds its source in a structural ambiguity in the negated context sentence. According to his analysis, negation in English attaches at two different heights. High negation attaches between TP and vP, and low negation is adjoined to vP/VP. When A asks the question "Is Jane not coming?", B is free to interpret the question as having high or low negation. If it is low as in (11a), then the polarity head is open and *yes* and *no* are both free to bind it. *Yes* will produce a negative response (11a-i), while *no* produces a double negative, which reduces to a positive response (11a-ii). If negation is high, as in (11b), then the polarity head is negative and *yes* requires an unelided clause to change it to positive (11b-i), while *no* forms a negative concord chain with it (11b-ii).[9]

(11)   *Structures for* "Is Jane not coming?":

    a.   A: Is–[±] Jane [$_{\text{vP}}$ not coming]?   low negation PQ

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[9]This analysis requires Holmberg to claim that there are two separate entries for *no* in English, one with an interpretable [−] feature enabling it to bind the open polarity variable, as in (11a-ii), and one with an uninterpretable [−] feature enabling it to enter into a negative concord chain in (11b-ii).

(i) B: [FocP Yes [PolP [+] [TP she is [VP ~~not coming~~]]]]

(ii) B: [FocP No [PolP [−] [TP she is not [VP ~~not coming~~]]]]

b. A: Is Jane not–[−] coming?   high negation PQ

(i) B: [FocP Yes [PolP [+] [TP she is [VP ~~coming~~]]]]

(ii) B: [FocP No [PolP [−] [TP ~~she is not coming~~]]]

The structural ambiguity of the two attachment heights of negation in the polar question is what makes *yes* and *no* interchangeable in negative contexts in this account. The two polar questions (11a) and (11b) are string identical and interpretively indistinguishable.[10] Similar to the analysis in K&R, a bare *yes* cannot convey a positive answer, but must be followed by an overt clause as in (11b-i). Holmberg (2013) notes that in some contexts, bare *yes* seems to be able to convey a positive response to a negative question. He suggests that intonation may play a crucial role in making such responses felicitous though he does not discuss what the intonation may be or how it interacts with his account to make the response felicitous.

4.2.4 Roelofsen & Farkas (2015)

Unlike Krifka (2013), Roelofsen & Farkas (2015; referred to as R&F) do not find the source of interchangeability in the presence of two potential antecedents, nor do they find it in a structural ambiguity in the context as Holmberg (2016) does. Rather, building on Farkas & Bruce (2010), which was in turn inspired by Pope (1972), R&F attribute the interchangeability of *yes* and *no* to their ability to encode two different types of features. On this view, polarity particles in English do "double duty": They can either signal the polarity of the answer being given or they can signal whether the present response agrees or disagrees with a prior utterance. According to R&F, *absolute* polarity features are responsible for the former function, while *relative* polarity features perform the latter.

Roelofsen & Farkas (2015) assume a polarity projection in the left periphery whose head takes a clausal argument, which is elided in the case of bare particle utterances, similar to Kramer &

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[10]Thus, as Holmberg points out, high negation in Holmberg (2016) bears no relation to "high negation" in Romero & Han (2004), which involves even higher attachment under this analysis. Holmberg actually refers to the high negation discussed in the text as "middle negation".

Rawlins (2009) and Holmberg (2016). There are two types of features that are realized on the polarity head. The *absolute* features [+] and [−] presuppose that the complement of the polarity head has positive or negative polarity respectively.[11] The *relative* features [AGREE] and [REVERSE] each introduce presuppositions relative to a unique most salient antecedent in the discourse: [AGREE] presupposes that the complement has the same polarity and identical propositional content to the antecedent, while [REVERSE] presupposes that the complement has opposite polarity and complementary propositional content to the antecedent. *Yes* is capable of realizing [+] or [AGREE], while *no* is capable of realizing [−] or [REVERSE]. Only one of the features it realizes needs to be present to license the polar particle.

This system is demonstrated in (12) and (13). Since positive responses to positive sentences only meet the presuppositions of the [+] and [AGREE] features, and only *yes* can realize those features, only *yes* is acceptable in (12a). *Mutatis mutandis*, only *no* is acceptable in (12b). Responses with the features [AGREE, −] or [REVERSE, +] would be infelicitous since in each case one of the features would trigger a presupposition failure.

(12)   A: Petra passed the test.

    a.   B: Yes / #No, she did.   [AGREE, +]
    b.   B: #Yes / No, she didn't.   [REVERSE, −]

In response to negative sentences, the situation is different. The two valid responses in (13a) and (13b) contain features that can be realized by either *yes* or *no*. Thus either particle can be used in either response. This is how R&F explain interchangeability.

(13)   A: Petra didn't pass the test.

    a.   B: Yes / No, she didn't.   [AGREE, −]
    b.   B: Yes / No, she DID.   [REVERSE, +]

In (13a), *yes* is licensed by the presence of [AGREE], and *no* is licensed because [−] is present.

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[11]A sentence has negative polarity if the highest-scoping sentential operator is negation. Otherwise it is positive (Roelofsen & Farkas, 2015, 379).

Likewise, in (13b) *yes* is licensed because of the presence of [+] and *no* is licensed because of the presence of [REVERSE]. Responses with the feature combinations [AGREE, +] and [REVERSE, −] are not felicitous, since one of their presuppositions would not be fulfilled.

Similar to Krifka's analysis, R&F's account is in principle compatible with bare particles conveying either response, but just like Krifka, they make additional assumptions that predict bare particle interpretations to be more constrained, and we return to these when we discuss the experimental results.

4.2.5   Summary and synthesis

Now that we have reviewed several theories of polar particles, let's recap how they differ: First, they differ in the structural analysis of polar particles themselves. Some treat them as separate speech acts, syntactically unrelated to the following clause (Krifka, 2013, the pure sentential anaphor view), others treat them as part of the syntactic structure of the following clause, which may possibly be elided (Kramer & Rawlins, 2009; Holmberg, 2013, 2016; Roelofsen & Farkas, 2015, the single structure view). Second, they differ in their accounts of interchangeability. They attribute interchangeability to the presence of multiple potential antecedents (Krifka, 2013), to a structural ambiguity in the context sentence (Holmberg, 2016), or to the ability of *yes* and *no* to realize absolute or relative polarity features (Roelofsen & Farkas 2015, building on Farkas & Bruce (2010) and Pope (1972)).

Are there any arguments that can distinguish between these accounts on these two points? In the following we will make several novel observations that bear on these issues. But before discussing these observations, we note that the various accounts we discussed also differ in other ways. First, they make more fine grained claims about the possible readings of bare particles, and about which of the four possible combinations of polar particles and responses in the interchangeability paradigm in (2) are more or less felicitous. As mentioned before, we postpone discussion of these more fine-grained issues until section 4.4, in which we discuss results from our production experiments that bear on these predictions. Second, these accounts differ in their crosslinguistic

empirical reach. The proponents of each of these accounts discuss ways that they can be extended to explain the behavior of polarity particles crosslinguistically. However, Roelofsen & Farkas (2015) and Holmberg (2016) are more ambitious than Krifka (2013) in this regard in that they each make proposals for how their accounts might make universal predictions for polar particle responses. Krifka's account would need to be extended in nontrivial ways in order to make such universal predictions. Given space limitations and the fact that our experiments below focus only on English, we will not engage in an in depth discussion of these issues.

4.2.5.1 An argument for the single structure view

One difference between Krifka's theory of polar particles and all of the others is that it assumes that polar particles do not stand in a direct syntactic relationship with the following sentence, but are instead analyzed as separate speech acts (Krifka, 2013, 7-8). While any analysis must allow for uses of *yes* and *no* as separate speech acts, we present two arguments in favor of a single structure analysis of polar particles from the intonation of polar particles and their following clauses in English.

The first argument is a simple observation: Polar particles and following sentences can easily be pronounced with a single intonational tune (observed already in Pope, 1972, 147, ex. (73R2), and also demonstrated in our experiments below). This seems to be impossible with sequences of two separate speech acts. Consider (14). In (14b), B clearly makes two separate speech acts.[12]

(14)   A: Jane likes steak, right?
         a.   B: No, she doesn't.
         b.   B: She doesn't, she's vegetarian.

(14a) can be pronounced using a single intonational contour without difficulty. In the recordings (see footnote 12), it is produced with a single contradiction contour over the whole utterance. However, (14b) cannot be pronounced this way. The recordings include three pronunciations of

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[12]Recordings of numbered examples in which intonation is crucial, starting with example (14), can be found at `http://semanticsarchive.net/Archive/GU4M2ZhN/`.

(14b). (i) is a single contradiction contour over the whole utterance. (ii) is a single falling contour over the whole utterance. (iii) is a falling contour on *she doesn't*, followed by a separate falling contour on *she's vegetarian*. We believe there is a clear contrast between the first two, which are infelicitous, and the third, which is felicitous.[13] If we are correct that two separate speech acts cannot be pronounced with a single intonational tune, then the fact that (14a) can be pronounced with a single contour suggests that polar particles and following clauses can exist in a single speech act. This would run contrary to the predictions of Krifka's account.

A second, related argument is due to Michael Rochemont (p.c.), who pointed out to us that it is possible to shift prominence to a polar particle and deaccent a following sentence as in (15):

(15)   A: Does Jane like coffee?
     a.   B: YES, she likes coffee.
     b.   B: NO, she doesn't like coffee.

We observe that, compared to (15), attempts to shift prominence between separate sentences in (16a) and (17a) are much less natural. We know the prominence shift is the culprit because (16b) and (17b), in which the second clauses each have their own prominence, are felicitous:

(16)   A: Does Jane like coffee?
     a.   B: #She DOES, she likes coffee.
     b.   B: She DOES, she LIKES coffee.

(17)   A: Who likes coffee?
     a.   B: #JANE, she likes coffee.
     b.   B: JANE, SHE likes coffee.

If prominence shifts can indeed only occur intrasententially, this suggests that contrary to Krifka's analysis, *yes* and *no* are at least sometimes part of a larger syntactic structure with the following

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[13]One might object that the (i) pronunciation is infelicitous because the contradiction contour is not licensed on *she's vegetarian* in the dialogue in (14). But even if we imagine the (i) pronunciation of (14b) in response to the utterance *Jane likes steak, she isn't vegetarian*, it still sounds infelicitous, suggesting that the problem is in trying to use a single contour on both sentences.

sentence. We note further that they pattern with propositional adverbs in this regard:

(18)   A: Does she like coffee?
    a.   B: Of COURSE, she likes coffee.
    b.   B: SURE, she likes coffee.

The meaning of the prominence shifted utterances in (15) as well as those in (18) seems to have focus on the polarity of the proposition (similar to "verum focus", see Höhle, 1992), which is compatible with Holmberg's and R&F's proposed connection between polar particles and the polarity head. These observations, taken together with crosslinguistic facts discussed by Kramer & Rawlins (2009), Roelofsen & Farkas (2015) and Holmberg (2016), arguably speak in favor of analyzing the syntax of polar particles similarly to propositional adverbs, high in the left periphery, and analyzing uses of bare *yes* and *no* as involving ellipsis.

Note that this conclusion only impacts Krifka's syntactic assumptions, not his account of interchangeability. One can imagine the minimal modifications required to make Krifka's account compatible with the preceding facts. The result is a hybrid between Krifka's and R&F's theories that retains Krifka's explanation for interchangeability. First, suppose that *yes* and *no* attach high in the left periphery, as proposed in K&R's, Holmberg's and R&F's analyses. Krifka's semantics for *yes* and *no* are roughly identity and negation. Translating these into a form that operates on syntactic complements produces operators that are indistinguishable from R&F's relative polarity features: *Yes* requires its complement to have identical propositional content and polarity to a salient antecedent (R&F's [AGREE] feature), while *no* requires its complement to have the opposite propositional content and polarity from a salient antecedent (R&F's [REVERSE] feature). Despite this, the revised theory does not capture interchangeability in the manner of R&F's account, which depends on having both relative and absolute features. Instead, it makes all of the same predictions as Krifka's theory (apart from the prominence shifting facts above) because it captures interchangeability via the same basic insight proposed in Krifka (2013): Negative sentences introduce two discourse referents, one corresponding to the NegP and one corresponding

to the TP. Therefore, there are still three accounts of interchangeability on the table: Multiple discourse referents (the modified Krifka, 2013), structural ambiguity of negation (Holmberg, 2016), and multiple kinds of polarity features (Roelofsen & Farkas, 2015).[14]

4.2.5.2 An argument for the multiple antecedents view of interchangeability

Krifka hypothesizes that *yes* and *no* are sensitive to multiple propositional discourse referents arising from negative sentences. If *yes* and *no* can pick up multiple antecedents from other kinds of sentences, this would provide independent evidence in favor of the multiple antecedent view. Krifka (2013, 5) already demonstrates the existence of multiple antecedents with the propositional anaphor *that*, similar to our example (3). (19) provides more direct evidence for the analysis from uses of *yes* and *no* responses themselves.

(19)   A finds B and C arguing about whether John is home, and decides to add her two cents.
        A: I know Mary believes John is home.

    a.   C: No, he isn't.
    b.   C: No, she doesn't.
    c.   C: No, you don't.

The three responses each make reference to a different antecedent. Under Krifka's assumption that

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[14]Note, however, an additional twist. Prominence shifts seem to interact with interchangeability:

(i)   Is Jane not coming?

    a.   YES she's coming
    b. ??YES she isn't coming
    c.   NO she isn't coming
    d. ??NO she's coming

Based on the intuitions of a few informants as well as our own, (ib) and (id) seem to be degraded relative to the other responses. This might suggest that in responses like (ia) and (ic), the polar particles can be within the same structure as the following sentence, while in responses like (ib) and (id), they cannot. Huddleston & Pullum (2002, 848) claim that the responses *Yes it isn't* and *No it is* are ungrammatical as single clauses. It may be that while on the face of it English polar particles seem to be interchangeable, uses of *yes* with a following negated sentence and of *no* with a following non-negated sentence are in fact necessarily separate utterances. This might be taken as an argument in favor of an account like Roelofsen & Farkas's (2015), which allows *yes* and *no* to realize either absolute or relative polarity features, if we were to make the additional assumption that relative features are more pragmatic in nature, while only absolute features are true polarity features that take part in a syntactic structure with a following clause. Clearly more work is needed, both to fully establish the empirical facts, and to flesh out an explanation.

propositional discourse referents are introduced by any syntactic constituent in the preceding utterance that conveys a propositional meaning, these interpretations are straightforwardly accounted for.

In R&F's terms, each of the responses in (19) has the feature bundle [REVERSE, −]. R&F's account could explain the range of responses in (19), but in order for the presupposition of the [REVERSE] feature to be met in each response, it has to be assumed that each embedded propositional constituent introduces an antecedent. Thus under R&F's account, we are forced by (19) to make the same crucial assumption undergirding Krifka's account, namely that polar particles can refer to more than one propositional discourse referent made available by a preceding utterance.

Given that both of the accounts must allow for the existence of multiple antecedents arising from other embedding environments, and given that *that* is sensitive to both positive and negative discourse referents arising from negative sentences, analyzing *yes* and *no* as picking up propositions embedded under negation à la Krifka seems appealing. It explains the phenomenon of interchangeability without positing any other extra factors such as multiple kinds of polarity features, or sensitivity to the structural height of negation.

In response to (19), a *Glossa* reviewer observes that there are other embedding environments in which the embedded antecedents are often not readily available (we have adapted the examples slightly):

(20)   Jane hopes that Peter wrote a thank you note.
        a.   No, she doesn't. / Yes, she does.
        b. ??No, he didn't. / ??Yes, he did.

We think that the cause of these intuitions is pragmatic. In particular, the availability of an antecedent may be constrained by whether the resulting assertion is relevant to the question under discussion (QUD, Roberts, 1996/2012). Discourse referents attached to matrix propositions are usually relevant to the QUD, thus are usually available. In (19), the QUD is whether John is home, so the most deeply embedded clause is available as an antecedent. Moreover the issue is disputed,

so Mary's beliefs on the topic may be relevant, and since this is the case, what A knows about Mary's beliefs on the topic is also relevant, making each of these larger constituents available as antecedents in (19).

Suppose we alter (20) by switching the matrix subject to the first person pronoun *I*. The resulting *I hope that Peter wrote a thank you note* may be taken as an indirect question about whether Peter wrote a thank you note. Thus we would predict the responses in (20b) to be more felicitous, and we believe this matches intuitions.[15, 16]

If we return now to considering embedding via negation, it should not be surprising if we don't see strong asymmetries with respect to whether the embedded antecedent is available or not. If the truth of a proposition is relevant to the QUD, then we would also expect its negation to be relevant, thus discourse referents arising from both propositions should be available to polar particles.

We conclude that there is some independent evidence for a multiple antecedents account of interchangeability such as Krifka (2013). In combination with the evidence in favor of treating polar particles as part of a larger syntactic structure with following clauses (as advocated for by Kramer

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[15]These observations connect to Simons (2007), which reports the following judgements:

(i) A: Who was Louise with last night?

  a. B: Henry thinks/believes/suggested/hinted that she was with Bill.
  b. B: I think/believe/imagine/suppose that she was with Bill.
  c. B: (?)Henry hopes/I hope that she was with Bill.

Simons claims that embedded clauses can answer questions in some cases, with the matrix clause serving as an evidential. On (ic), she writes, "The oddity [...] is presumably due to the fact that Henry's hopes [...] do not provide very good evidence as to what is the case, and so are not evidence on which answers to a factual question should be based" (Simons, 2007, 1037). We think that there is a contrast between the third and first person subject in (ic) with the latter being more acceptable. This contrast may be related to the contrast in whether the polar particle can pick up the embedded clause in (20): First person subjects with *hope* may make embedded clauses more directly relevant to the QUD (or "main point" in Simons's terms), thus making them more available as antecedents.

[16]The *Glossa* reviewer also introduced the example in (i):

(i) If Jane is at home, Peter will be too.

  a. ??Yes, she is. / ??No, she isn't.
  b. ??Yes, he is. / ??No, he isn't.

Similar to our comments about (20), we think that when the conditional in (i) is embedded into a larger discourse with a QUD about either Jane or Peter's whereabouts, the relevant responses may improve, however the intuitions here are subtler than those for (20), and may require further exploration.
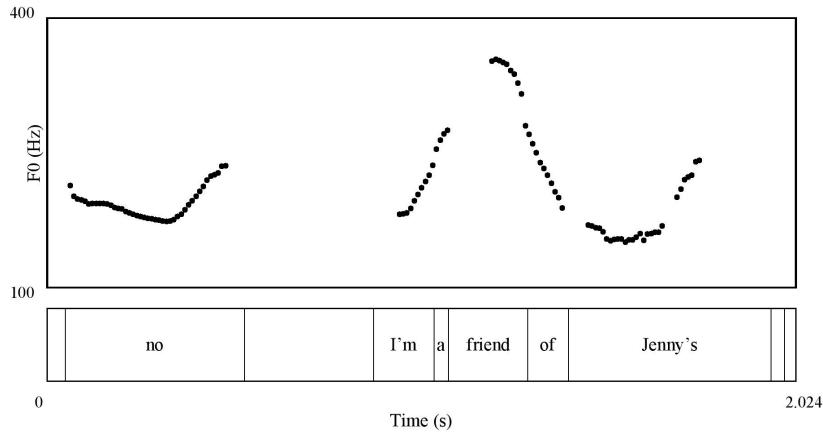
& Rawlins, 2009; Roelofsen & Farkas, 2015; Holmberg, 2016), this suggests that the correct theory may be a combination of ingredients from the described accounts. But as mentioned above, there is still non-trivial work to be done to extend a multiple antecedents analysis of interchangeability so that it could capture the full range of crosslinguistic facts, a task that remains beyond the scope of this paper. Further comparisons of the theories discussed above, in particular their accounts of preference patterns, will be taken up when we discuss our experimental results.

4.3 The contradiction contour

What we know so far about interchangeability in responses to polar questions in English is mostly based on impressionistic judgments and two rating studies in which participants evaluate written dialogues (Kramer & Rawlins, 2012; Brasoveanu et al., 2013). The reliance on written stimuli is potentially problematic, however. All prior research we have discussed so far invariably notes that certain intonational tunes may correlate with certain types of responses. Roelofsen & Farkas (2015) claim that positive responses to negative sentences have to bear verum focus prominence on the auxiliary of the following clause, for example *No, she IS*. Krifka (2013) claims such positive responses require a "rejecting accent", though he does not describe what it should sound like. Cooper & Ginzburg (2011) observe a "rise fall" tune on the polar particle *no* in disagreeing responses. The observations about the role of intonation so far have remained impressionistic, and there has not been any empirical work to test which intonational patterns English speakers actually produce.

Our own intuition was that one particular rising tune, the contradiction contour (CC) described in Liberman & Sag (1974), would play a role. The contradiction contour, as its name suggests, has been associated with evoking a sense of contradiction with the prior discourse. We are not alone in the intuition that it is crucial in understanding responses with polar particles. Pope (1972, 145-147) identifies a rising-falling-rising tune that can be imposed on the utterance *no, it isn't* in response to a positive assertion (ex. (67R2)) or the utterance *yes, he is* in response to a negative assertion

Figure 4.1: A visual representation of B's utterance in (21)

(ex. (73R2)). If this is correct, and the contradiction contour can appear on particles themselves, then it might disambiguate bare particle responses to negative questions. In the following, we will describe the form and meaning of the contour in question.[17]

4.3.1 The form of the contradiction contour

The example in (21) exhibits a common use of the CC.[18] The image in Figure 4.1 is a pitch track of a particpant's performance of B's utterance made using Praat (Boersma & Weenink, 2017).

(21)　　A: You're not a friend of Jenny's.
　　　　B: No (CC). I'm a friend of Jenny's (CC).

According to Ladd (1980, 150), the CC begins with a rise-fall, followed by a low-rise pitch accent on the nuclear or main stress of the sentence. The initial high-fall is likely to be preceded by a rise if the utterance involves multiple syllables preceding the syllable carrying the final accent,

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[17]In experimental work on Catalan and Russian, González-Fuente et al. (2015) find that Catalan speakers frequently use a rise fall rise intonation they call "contradiction tune". This tune seems to be similar in form to English contradiction contour (Liberman & Sag, 1974), a fact meriting further exploration. Interestingly, González-Fuente et al.'s (2015) intonational results for Russian differ from those for Catalan (and English, based on our results), both in terms of distribution and form.

[18]"(CC)" following an utterance indicates that the utterance bears a CC tune. There are two CCs in (21). Again, recordings of all examples where intonation is crucial can be found at http://semanticsarchive.net/Archive/GU4M2ZhN/.

such as in our example (21). On a monosyllable like *no*, the tune starts high and falls to the low pitch accent before the final rise.[19]

Pierrehumbert & Hirschberg (1990) transcribe the nuclear tune of the CC in ToBI as L* L-H%, while Constant (2012) transcribes it as L*(+H) L-H%. These transcriptions do not capture the fact that the CC necessarily has an initial rise or at least starts high before reaching the final low pitch accent. This pre-nuclear part of the CC is reflected in Ladd's (1996) transcription L*+H L* L-H% and Bartels's (1999) H+!H* L* L-H%. Hedberg et al. (2003) conduct a corpus study that lends support to Ladd's and Bartels's transcriptions, and they further observe that the CC may have one or more L* pitch accents before reaching the obligatory final L*L-H% nuclear tune (Hedberg et al., 2003, 2).[20]

A problem we see with these transcriptions is that it is not clear that the initial rise or high tone is a pitch accent, that is, it does not need to align with a stressed syllable. For instance, in the monosyllabic *no* in (21), the tune reliably starts high despite that there can only be one pitch accent, and it is a low one. Moreover, in longer utterances, the initial rise-fall (or high-fall) does not necessarily align with a stressed syllable, contrary to what we would expect if it were the result of a pitch accent (cf. Ladd, 1980, 150). Thus, we believe a more accurate transcription might be %H L* L-H%, with the possibility of iterated L* pitch accents after the initial %H in cases where multiple words are accented.

4.3.2 Keeping the contradiction contour separate from the phonetically similar rise-fall-rise contour

Pope (1972, 139-147) observes the use of a rising-falling-rising intonation in responses contradicting a previous statement, which she characterizes as a "B-accent", drawing on Jackendoff (1972)

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[19]In Iberian Spanish, Torreira & Grice (2017) demonstrate experimentally that tunes may have one form when produced with a single prosodic word, but another, longer form when produced with two or more prosodic words. We think something similar may be happening with English CC, although more phonological work is needed.

[20]We are discussing here what Hedberg et al. (2003) refer to as "Classic Contradiction Contour", which they contrast with two variations of the CC. One of them, the "Contrastive Contradiction Contour", may be related to the rise-fall-rise contour, discussed in section 4.3.2.

who discusses B-accents in the context of contrastive topics. Utterances with a final B-accent were later analyzed as involving the so-called rise-fall-rise contour (RFR, Ward & Hirschberg, 1985), which is usually transcribed as L*+H L-H%.

We believe that the tune Pope observes is not the RFR/B-accent, but the CC. Arguably, the two contours have often been confounded. In fact, Liberman & Sag (1974) analyze certain examples that are now widely agreed to exhibit the RFR as involving the CC. In response to Liberman & Sag, Ladd (1980, 148-152) gives compelling arguments for distinguishing the two, but identifies a particular set of circumstances in which they are practically indistinguishable, thus providing an explanation for the common confusion. We illustrate Ladd's insights with the following examples:[21]

(22)   A: Jane doesn't like movies.

      a.   B: Jane likes movies (CC).
            %H (L*) L* L-H%
      b.   B: JANE likes movies (RFR).
            L*+H   L-H%

The example in (22a) has the CC with the nuclear stress falling on the object. (22b) has the RFR with subject focus, hence the nuclear accent falls on the subject. Ladd's insight is that these two types of utterances sound very similar to each other, despite the difference in tune and prominence location. Varying the choice of tune and prominence such that we have CC + broad focus and RFR + subject focus produces two intuitively indistinguishable contours.

Ladd (1980) also helps us convince ourselves that, despite appearances, the intonational tunes in (22) are really different. If we replace the subject *Jane* with a polysyllabic name with stress at least three syllables in, like *Alvarado*, then the phonetic form of the two contours are clearly distinct:[22]

(23)   A: Alvarado doesn't like movies.

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[21]Capitals indicate that focus is shifted to the subject.

[22]Ladd (1980) uses Liberman & Sag's (1974) *Elephantiasis isn't incurable* to illustrate this point.

a.　B: Alvarado likes movies (CC).
　　　%H (L*)　　　L* L-H%
b.　B: ALVARADO likes movies (RFR).
　　　　L*+H　　　　L-H%

Whereas the contour in (23a) rises and falls utterance initially, in (23b) the contour does not start

rising until the third syllable *ra*. This is because RFR locates its initial rise on the stressed syllable

of the focussed constituent, whereas the CC's rise fall always occurs utterance initially.

　　When we try to use these two utterances in a context that motivates the use of the RFR but not

the CC, we can see that they are also clearly semantically distinct:

(24)　　A: Who do we know who likes movies?
　　　　a.　B: #Alvarado likes movies (CC).
　　　　b.　B:　ALVARADO likes movies (RFR).

The meaning of the CC as described by Liberman & Sag (1974) requires some element of con-

tradiction, which is not motivated in the context in (24), hence (24a) is infelicitous, whereas the

requirement is clearly met in (23), so (23a) is felicitous. The RFR, on the other hand, signals

that the utterance is incomplete or that some further implication is intended.[23] This contribution is

compatible with the contexts in both (23) and (24), but has a very different effect on meaning from

the CC: When the CC is used in (23a), B simply conveys that she disagrees with A's statement;

when the RFR is used in (23b), B conveys that while Alvarado does like movies, there is someone

else who does not (or at least remains noncommittal about others). There is no such implication in

(23a). This incomplete/implication meaning of RFR is also compatible with (24), where it implies

that there may be others who like movies as well, and B isn't sure whether she has completely

answered A's question.

　　Thus it is clear that the CC and the RFR are distinct contours with distinct semantic contribu-

tions. While the RFR necessarily involves some sort of implication about focus alternatives, the

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[23]For research on the meaning of the RFR, see Ward & Hirschberg (e.g. 1985); Constant (e.g. 2012); Wagner (e.g. 2012a); Westera (e.g. 2017) See also Goodhue et al. (2016) for an experiment demonstrating that contextual manipulations can systematically affect whether participants produce the CC or the RFR.

CC necessarily involves a sense of contradiction. Ladd teaches us that when we are in doubt about which contour is in question, we should try to construct the example so that the first stress does not appear until at least three syllables in.

We turn now to the task of producing a more precise characterization of the sense in which the contradiction contour contradicts.

4.3.3   The meaning of the contradiction contour

About the meaning of the contradiction contour, Liberman & Sag (1974, 421) write, "This contour is appropriate (although of course optional) just when the speaker is using the utterance that bears it to **contradict**—he may contradict what has just been said by another, he may contradict some assumption or implication of what has been said or done by another, or he may contradict himself" [boldface ours, replaces underlining in the original text]. Defining the notion of "contradict" in this quote is not trivial, as is anticipated by the authors, who allow for contradictions of implications of both verbal and non-verbal actions. If we were to define a contradiction as two contradictory sentences in the logical sense, then we would not predict the use of the contradiction contour in responses to PQs, as in for example (25).[24]

(25)   It's been a busy day at work. You have ten clients to meet with before your boss gives a presentation at 4 pm that everyone is expected to attend. You are intent on going to the presentation because you have an important question to raise. In your haste to meet with all ten of your clients, you completely lose track of time. Your coworker Thomas knocks at your door. You look at the clock which reads 4:07 pm and you realize you are late for the presentation. Thomas asks:
Thomas: Are you not coming to the presentation?
You: No (CC). I'm coming to the presentation (CC).

The apparent antecedent of the CC is not a prior assertion, but the information provided by the context and the question, which at best imply evidence in favor of the negative response (for discussions of the notion evidence in negative questions, an issue we will take up below, see Büring &

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[24](25) is an example of one of our experimental stimuli for our production experiments, to be discussed in section 4.4.

Gunlogson, 2000; Trinh, 2014; Roelofsen & Farkas, 2015; Krifka, 2017). Clearly, a weaker notion of contradiction is needed.

One possible analysis is that an utterance of p(CC) requires a propositional discourse referent anchored to $\neg p$, and thus involves a propositional anaphor similar to polar particles under Krifka's (2013) or Roelofsen & Farkas's (2015) analyses. But such an analysis would miss an important difference between polar particles and the CC. Consider (26), in which A asks a positive PQ.

(26)   It's been a busy day at work. You have ten clients to meet with before your boss gives a presentation at 4 pm that everyone is expected to attend. In your haste to meet with all ten of your clients, you completely lose track of time. Your coworker Thomas knocks at your door. You look at the clock which reads 4:07 pm and you realize you are late for the presentation. Thomas asks:
A: Are you coming to the presentation?

   a.   B: I'm coming to the presentation (CC).
   b.   B: Yes, I am
   c.   B: No, I'm not
   d.   B: #Yes, I'm not
   e.   B: #No, I am

The judgments in (26b) through (26e) are exactly as expected given existing theories of polar particles: Since A asks a positive PQ, *yes* and *no* can only be used as in (26b) and (26c). (26d) and (26e) are unavailable. Note however, that using the CC on a positive response as in (26a) is perfectly acceptable here. An analysis that treats the CC as similar to polar particles creates the following puzzle: Why is the CC licensed on a positive response here when interchangeability is not licensed?

To explain how the CC is licensed, we will adapt ideas about *contextual evidence* introduced by Büring & Gunlogson (2000) for constraints on polar questions. We propose that the CC requires contextually salient evidence against the asserted proposition. We define evidence as follows:

(27)   *Contextual Evidence*: Evidence for p is a change in the context that increases the likelihood that p is true.

As Büring & Gunlogson note, contextual evidence needs to be publicly available. We further note that contextual evidence can come from any kind of perceptual experience or from interlocutors' actions, including speech acts. Moreover, contextual evidence does not necessarily affect the speaker's commitments or expectations about p (Büring & Gunlogson, 2000, 8). For example, the contextual evidence for p in (28) and (29) does not seem to affect B's commitment to $\neg p$:

(28)   B is an experienced animal tracker who knows that mountain lions no longer live in these parts. Then B sees some mountain lion scat, and says to herself:
B: There aren't any mountain lions around here (CC).

(29)   A: There are mountain lions around here.
B: There aren't any mountain lions around here (CC).

Using p as a label for the proposition *that there are mountain lions around here*, we take (28) and (29) to both be contexts in which there is contextual evidence for p by our definition in (27). In (28) evidence for p is in the form of B's perception of scat (combined with B's expertise), and in (29) the evidence for p is in the form of A's assertion of p. In both cases B asserts $\neg p$ despite the evidence for p. This presumably means that B's commitments or expectations have not been altered with respect to p by the new evidence. So, while evidence for p is some publicly available feature of the context that would ordinarily increase the likelihood that p is true, it needn't necessarily cause B to change her own beliefs about p.

Before demonstrating the role that this notion of evidence plays in the meaning of the CC, we note that it is independently needed for other linguistic phenomena. For example, it can be motivated based on broad principles of question answering. Consider Roberts's (1996/2012, 21) formulation of Gricean relevance (Grice, 1989):

(30)   A conversational move is relevant to the question under discussion (QUD) iff it either introduces a partial answer to the QUD, or raises another question as part of a strategy to answer the QUD.

Suppose that questions denote sets of alternative propositions (Hamblin, 1973). For Roberts, a partial answer is a proposition the contextually entails that one of the Hamblin alternatives is true or false. There may be reason to recast relevance in terms of our notion of contextual evidence in (27) by adjusting (30) with the italicized part in (31).

(31)   A conversational move is relevant to the QUD iff it either *provides evidence for or against one or more of the propositions denoted by the QUD*, or raises another question as part of a strategy to answer the QUD.

(31), but not (30), is broad enough to be compatible even with very indirect responses to questions, such as in (32):

(32)   A: Who will come to the reading group meeting today?
        B: Jane's mother is in town.
           ⤳ Jane is unlikely to come to the meeting.

B's response does not contextually entail that Jane is not coming, thus it does not provide a partial answer to the QUD according to (30). It is nevertheless an intuitively valid response. When combined with world knowledge about visiting mothers, it provides evidence for the proposition *that Jane will not come to the meeting* by our definition of evidence in (27), that is it increases the likelihood that the proposition is true. Since this proposition is the negation of a partial answer to A's question, B's response counts as providing evidence against an answer, and (31) is met.

The need for a notion of contextual evidence such as (27) is further motivated by its use in Büring & Gunlogson (2000); Sudo (2013); Trinh (2014), among others, to state generalizations about the felicity of negative questions:

(33)   Low negation PQs: Require contextual evidence for $\neg p$.[25]

Furthermore, the notion of evidence is arguably crucial in characterizing the licensing condition

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[25]As mentioned in the introduction, *evidence* and *bias* should not be confounded.

on rising declaratives (see Gunlogson, 2001; Nilsenovà, 2006; Trinh, 2014; Goodhue & Wagner, 2015; Farkas & Roelofsen, 2017, for recent analyses of rising declaratives along these lines):

(34)   Rising Declaratives: Require contextual evidence for p.

For example, in (28) in which B sees mountain lion scat, B could use *There are mountain lions around here?* to convey her incredulousness. In fact, a question rise on a declarative is by far the contour speakers prefer to use to convey incredulity in North American English (Goodhue et al., 2016). This suggests that an analysis of rising declaratives in terms of speaker bias in favor of the proposition would be too strong (though see Westera 2017 for a defense of a speaker bias analysis). Rather, rising declaratives seem to require contextual evidence for p, and are compatible with speaker bias in either direction.

With the notion of contextual evidence in (27) in place, we return to the task of characterizing the meaning of the contradiction contour. Following Truckenbrodt (2012), we assume intonational contours compose with proposition denoting constituents and act as partial identity functions, placing felicity requirements on the utterance.

(35)   The contradiction contour takes a proposition p as input and presupposes that there is contextual evidence for the complement of p, i.e. evidence for $\neg p$. If the presupposition is met, the contradiction contour returns p.

The resulting assertion will have the same propositional content as p. It is the tension between presupposing contextual evidence for $\neg p$ and being true iff p is true that creates the signal of disagreement that the CC is known for.[26, 27]

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[26]A possible challenge to treating the CC as a presuppositional operator is that, assuming the principle of maximize presupposition (Heim, 1991), we might expect the CC to appear obligatorily in all contexts in which it is licensed. However, as Liberman & Sag (1974) already note, the CC is used optionally. It may be that the CC includes some additional expressive meaning that a speaker may or may not consider appropriate in a given context. However, we think it is likely that a speaker is always free to choose one tune or another given some context and sentence to be uttered. Thus, if we wish to maintain an analysis of tunes as imposing felicity conditions on utterances as a general program, we may need a more general explanation for this optionality.

[27]Portes & Reyle (2014) provide a QUD account of French implication contour, which the authors claim primarily encodes a contradiction. Therefore, one might wonder whether such an account could also be applied to the CC. Note

Returning to our comparison between the CC and polar particles, we can see that they are similar in that they are both dependent on previous context, but they differ in that polar particles require a discourse referent denoting a certain proposition, while the CC merely requires contextual evidence for a certain proposition. This explains the asymmetry in (26).

Our analysis of the CC is similar to that of Liberman & Sag's (1974) in that we tie its meaning to the notion of contradiction, but it is more precise and is therefore able to address an objection that Pierrehumbert & Hirschberg (1990, 293) raise via the following example:

(36)   A: My chances? The election isn't over till the last ballot has been counted.
        B: #But CBS has just declared you the next president (CC).

In (36), B is in some sense trying to contradict A's claim that the election is not over, thus Pierrehumbert & Hirschberg note that Liberman & Sag's analysis incorrectly predicts B's utterance to be felicitous. Under our analysis, the infelicity is expected, since what A asserts does not present evidence against the truth of the proposition B asserts (that CBS made an announcement). Similarly, in (37) it is odd to use the CC, but if the order of the two statements is reversed as in (38), using the CC in the response is possible:

(37)   A: There are mountain lions around here.
        B: #Alvarado said there are no mountain lions around here (CC).

(38)   B: Alvarado said there are no mountain lions around here.
        A: There are mountain lions around here (CC).

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however that there are empirical differences in the distributions of the two contours. E.g. Portes & Reyle's example (3), in which French implication contour is acceptable, would be unacceptable with the CC in English, but acceptable with a contrastive accent on *curtains*:

(i)   A: There aren't any shutters here.

        a.   B: #Yeah (CC). There are curtains (CC).
        b.   B: Yeah (Contrastive). There are CURtains (Contrastive).

Therefore, French implication contour may be more similar to English contrastive accents than to the CC.

A's claim in (37) that there are mountain lions does not provide evidence against B's claim that Alvarado made a claim about the lack of mountain lions. However, B's claim in (38) that Alvarado made a claim about there being no mountain lions does provide evidence against A's claim that there are. A more vague description of the CC's meaning as in Liberman & Sag (1974) does not predict this contrast. But our analysis of the CC in (35) combined with our characterization of contextual evidence in (27) has more empirical bite. The CC only looks for contextual evidence against the matrix proposition it combines with. It cannot see more deeply embedded propositions.[28] Thus in (37), it combines with p, the proposition *that Alvarado said $\neg q$*, and there is no evidence against p in the context, so the CC utterance is infelicitous. But in (38), the CC combines with q, *that there are mountain lions around here*, and B's utterance provides evidence against q since B asserts p, which embeds $\neg q$ under the verb *said* (see Simons 2007 for an argument that utterances of the form *X said p* introduce evidence for p). So while the CC cannot see embedded propositions in its complement, utterances in the preceding discourse can provide contextual evidence for propositions embedded within them, at least in some cases.[29]

There are other observations in the prior literature that pose a challenge to our analysis, however. Pierrehumbert & Hirschberg (1990) argue that the contour we describe can also be used in completely non-contradictory speech acts such as in greetings (e.g., *Good morning (CC)!*). We also note here the similarity of the contour we analyze as the CC and O'Connor & Arnold's (1973) "low bounce" intonation, which they demonstrate can be used to ask a question, among other things. If what we call the contradiction contour can really also be used in these different types of speech acts, then our characterization of its meaning may not be general enough to cover all its uses. We leave it to future work to determine if these other cases are indeed instances of the contradiction

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[28]Nor can the CC itself be embedded, as noted in Ladd (1980). If it could, we would expect there to be a pronunciation and reading of (37)B that is felicitous. This suggests that the CC might actually be an operator over speech acts, similar to Wagner's (2012a) proposal for the RFR contour. Another possibility is that the CC contributes a conventional implicature, as in the analysis of expressive meaning in Potts (2005). These issues are left to future work.

[29]Meanwhile, the meaning that Pierrehumbert & Hirschberg (1990, 293) propose for the CC—roughly "the addressee should already be aware that p"—cannot be accurate. Suppose Betty tells Ann that tomorrow she wants waffles for breakfast. In the morning, Ann says, "What do you want for breakfast today?" Since Ann should be aware that Betty wants waffles and the question implies she is not aware, Pierrehumbert & Hirschberg predict the CC to be felicitous on "I want waffles," but it clearly isn't. However, it is clearly felicitous on "You know what I want." Since Ann's question provides evidence against the latter sentence but not the former, our account predicts the asymmetry.

contour, or whether they may be another distinct contour.

4.4 Production Experiments

There are three groups of empirical questions that we aim to address with the experimental work below:

1. **Intonation**: Does a special intonation appear on positive *yes*/*no* responses to negative PQs, as claimed in previous studies? If so, how does it affect the interpretation of bare particles?

2. **Preference patterns**: When responding to a negative sentence, which particles do speakers prefer to use when giving a response with negative polarity? With positive polarity? How are bare polar particle responses to negative sentences interpreted?

3. **Context sensitivity**: If the negative sentence that the polar particle responds to is itself responding to a negative sentence, are preference patterns affected, and in particular is *yes* now more acceptably interpreted as a negative response, e.g. "she didn't"?

As already discussed in the introduction, previous experimental work has already provided partial answers to the questions in 2. Brasoveanu et al. (2013) found that *no* was preferred over *yes* when giving a negative agreeing response to a negative declarative with a referential NP subject, e.g. "No, she didn't." However their study does not consider positive responses to negative sentences, which are included in our experiments. Moreover, Kramer & Rawlins (2012) found that bare polar particles are more likely interpreted as agreements with negative questions, e.g. "she didn't." Our results will suggest that it is crucial to control for intonation when exploring these questions.

Question 3 has been addressed for German in Meijer et al. (2015), where it was found that preference patterns are not context sensitive. We will report on a similar experiment in section 4.6.

Finally, our experiments provide empirical evidence answering question 1 for the first time.

In total we will report on five experiments. 1 – A production experiment that gathers intonations and naturalness ratings for the polar particles *yes* and *no* in response to both positive and negative polar questions (PQs) in which inversion has taken place and the auxiliary is fronted (section 4.4). 2 – A production experiment testing *yeah* and *no* in response to negative rising declaratives, that is, sentences with declarative word order that have the rising intonation typically associated with PQs. 3 – A follow up to experiment 2 that tests naturalness ratings for bare particles (section 4.4). 4 – A perception experiment that tests participants' interpretations of bare *yes/no* responses to negative PQs, controlling for intonation (section 4.5). 5 – A rating experiment modeled after the experiments in Meijer et al. (2015) that tests whether the polarity of a preceding context sentence affects preference patterns (section 4.6).[30]

4.4.1 Methods

The methods of our three production experiments (Experminents 1, 2 and 3) are very similar. We will describe the methods for 1 in detail first, then we will note how it differs from experiments 2 and 3.

In each trial, the participant silently read a context story, followed by two lines of dialogue. See (25) above and (39) below for samples of our stimuli. Participants were asked to produce the second line of dialogue as naturally as possible. When ready, they would press any button to hear a recording of the first line of dialogue through headphones, and then they would be recorded producing the second line. The recording of the first line always featured rising, polar question intonation.

Experiment 1 has three factors: QUESTION, whether the questioner asked a positive or a negative question; PARTICLE, whether the participant used the polar particle *yes* or *no*; and ANSWER, whether the participant gave a positive answer (*yes/no, I am coming*) or a negative answer (*yes/no, I'm not coming*).

Each level of the factor ANSWER requires a different context story. The context in (25) sets

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[30]These experiments received ethics approval from the McGill Research Ethics Board under file number 401-0409.

up a positive answer (e.g. *yes/no, I'm coming to the presentation*). The context in (39) sets up a negative answer:

(39)   It's been a busy day at work. You have ten clients to meet with before your boss gives a presentation at 4 pm that everyone is expected to attend. You've been to hundreds of your boss's presentations, and you think they are boring and keep you from doing important work. You plan to meet with your clients, and if you can't finish meeting with all ten by 4 pm, then you'll just have to miss the presentation since clients come first. Your coworker Thomas knocks at your door at 4:07 pm. He asks:
Thomas: Are you not coming to the presentation?
You: No ___ I'm not coming to the presentation

Regardless of whether the context sets up a negative or positive answer, all contexts were designed to make contextual evidence for the negative response salient. E.g. in both (25) and (39), there is contextual evidence suggesting that the participant's character is not coming to the presentation, namely they are in their office working even though it has already started. When a negative polar question is used, it reinforces the contextual evidence, at least if the analysis of negative polar questions in (33) is correct.[31] There are eight context pairs total (eight items). Responses are always complete sentences, but we will refer to them as "Am" and "Am Not" in plots and tables for brevity. We instructed participants to pause at "___" to maximize unique intonations on polar particles themselves. This made annotations of intonations easier, and also enabled us to use participants' polar particle productions in the perception experiment to be discussed in section 4.5. Participants were not made aware that the experiment was about intonation.

After recording each trial, we asked for the participant's naturalness judgments: "Please indicate how natural this response seems on a scale of 1 to 5 (1=least natural, and 5=most natural)." We intended for participants to rate the naturalness of the response they were asked to give, not the naturalness of their own production of the response. Evidence that they conformed to our in-

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[31]Note that our experimental trials sometimes featured positive PQs in contexts like (25) and (39) in which there was contextual evidence for $\neg p$. A NELS reviewer writes "...that in recent work [Trinh (2014)] has argued that positive polar questions are incongruent with contextual evidence towards $\neg p$." While Trinh's examples seem to support this claim, we believe that positive PQs are nevertheless acceptable in our experimental contexts. Further work on the relationship between the licensing conditions of positive PQs and contextual evidence is needed.

tentions is found in the fact that the intonations they produced had no effect on their naturalness ratings.[32]

The three factors were crossed, $2 \times 2 \times 2$, making eight conditions. Each participant saw each condition for each item in eight randomly ordered blocks of trials with one condition from each item.[33] We ran 30 native speakers of North American English (mostly McGill undergraduates), but had to exclude 7 due to technical issues, making for 1,472 observations total.

To facilitate analysis, we split the results between the levels of the factor QUESTION. I.e., we analyzed the results of responses to negative questions and positive questions separately, each as a 2×2 design with the two factors PARTICLE and ANSWER.

Experiment 2 tested responses to negative rising declaratives, e.g. *You're not coming to the presentation?*, instead of polar questions as in experiment 1. Moreover, instead of using *yes*, *yeah* was used. Otherwise, the design was the same, crossing the two two-level factors, PARTICLE and ANSWER, 2×2. There were six items and four conditions.[34] There were 22 participants, therefore 528 observations total.
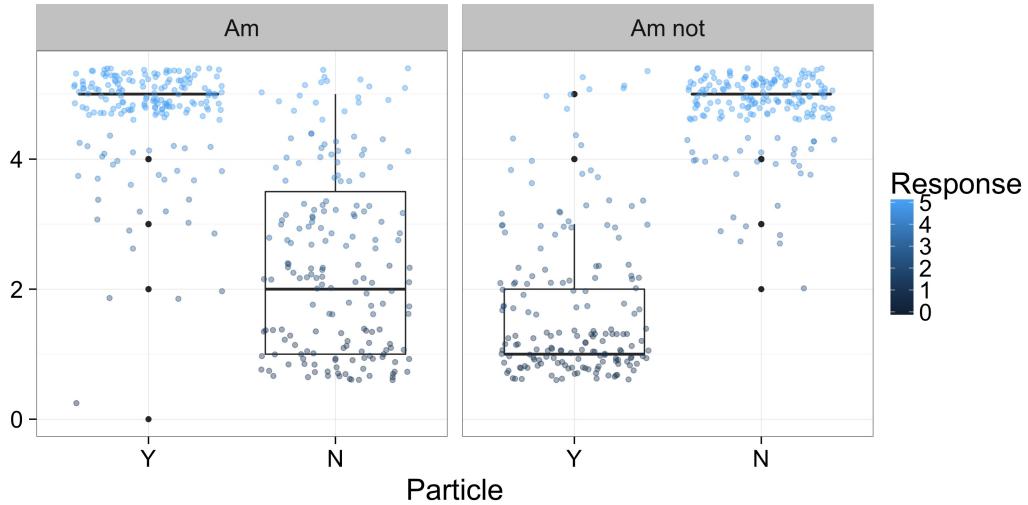
Finally, experiment 3 is a follow up experiment to experiment 2 with the exact same design, except that participants were only asked to produce the particles *yeah* and *no* themselves, with stage directions indicating the meaning of the response. E.g. if the question was *You're not coming to the presentation?*, the response would have been indicated to the participant as follows: Yeah (You want to convey: I'm coming to the presentation). There were 33 participants.

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[32]Moreover, we ran a follow up experiment (not reported here) in which participants rated the responses without actually producing them themselves. The results were not affected by this variation, and were qualitatively identical to the results reported below.

[33]If need be, this enables a latin-square analysis by looking at only the first quarter of trials. The same holds for all other experiments to be described below.

[34]In fact, there were six conditions, four test-conditions with negative rising declaratives, and two additional conditions testing responses to positive PQs. In these two latter conditions in experiment 2, we did not fully cross the two factors, PARTICLE and ANSWER, because we took it as given that *yeah, I'm not* and *no, I am* are infelicitous in response to a positive PQ. We will only report on the subset of the data with negative rising declaratives, since experiment 1 captures responses to positive PQs more fully.

Figure 4.2: Naturalness ratings of responses to positive polar questions in experiment 1

4.4.2 Naturalness Results

Figure 4.2 displays a plot for the naturalness ratings of responses to positive PQs in experiment 1.

As expected, when indicating a positive response to a positive PQ, *yes* is rated as highly natural and *no* is rated as unnatural, and vice-versa in negative responses. *Yes* and *no* are therefore indeed not interchangeable in response to positive PQs.[35]

Figure 4.3 displays plots for experiments 1, 2 and 3: The experiment 1 plot (left) shows how participants rated responses to negative PQs, while the experiment 2 plot (middle) and the experiment 3 plot (right) show ratings for full sentence responses and bare particle responses respectively to negative rising declaratives.

We observe that *yes/yeah* and *no* are overall acceptable in both positive and negative responses. Experiment 3 exhibits certain nuances to be discussed shortly, but nevertheless has a qualitative pattern that is distinct from responses to positive PQs in Figure 4.2. Taken together, the results indicate a high degree of interchangeability of English polar particles when used in response to negative questions or rising declaratives.

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[35]However, we note that *No, I am*, while clearly degraded relative to *Yes, I am/No, I'm not*, is nevertheless rated as somewhat more natural than *Yes, I'm not*. We suspect that the difference exists because *no* is able to pick up on a questioner's negative bias, even when they are asking a positive PQ. Thus if a questioner asks $?p$, but in doing so in a certain context clearly implies that they suspect $\neg p$, the speaker can reply, *no, p*. Cf. Tian & Ginzburg (2017) who take a similar position.

Figure 4.3: Naturalness ratings of responses in three experiments. Experiment 1 (left), responses to negative polar questions. Experiment 2 (middle), responses to negative rising declaratives. Experiment 3 (right), bare particle responses to negative rising declaratives
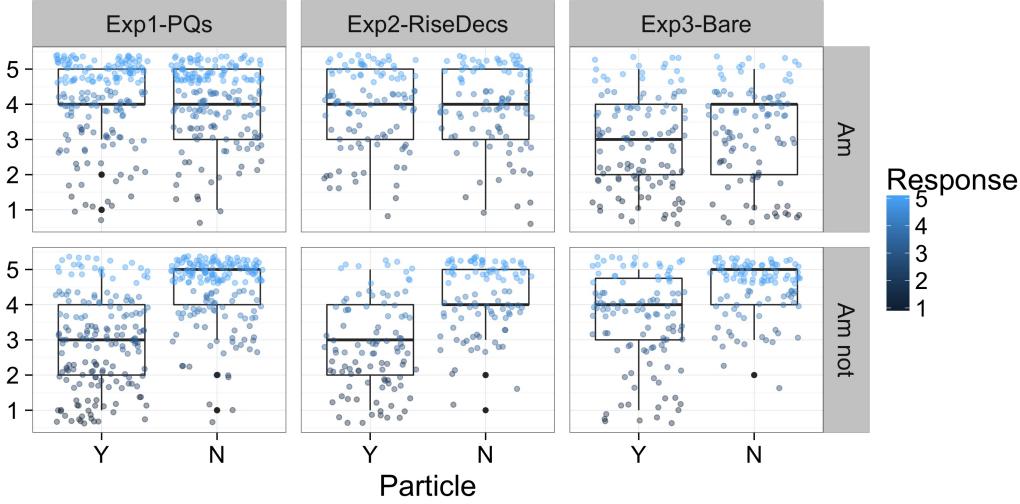

Table 4.1: Cumulative link mixed models for naturalness ratings in experiments 1, 2 and 3, as well as a model including data from all three experiments for comparison (the table lists model estimates and standard errors).

	Exp1-PQs	Exp2-RiseDecs	Exp3-Bare	All
ParticleY.vs.N	$-1.58\ (0.29)^{***}$	$-1.25\ (0.23)^{***}$	$-1.31\ (0.31)^{***}$	$-1.66\ (0.25)^{***}$
AnswerAm.vs.Am not	$0.75\ (0.35)^{*}$	$0.67\ (0.29)^{*}$	$-2.04\ (0.45)^{***}$	$0.73\ (0.32)^{*}$
ParticleY.vs.N:AnswerAm.vs.Am not	$3.23\ (1.11)^{**}$	$2.37\ (0.41)^{**}$	$2.06\ (0.78)^{**}$	$3.73\ (0.87)^{***}$
Exp1Exp2				$-0.58\ (0.28)^{*}$
Exp1Exp3				$-0.84\ (0.31)^{**}$
ParticleY.vs.N:ExpExp2				$0.24\ (0.34)$
ParticleY.vs.N:ExpExp3				$0.37\ (0.34)$
AnswerAm.vs.Am not:Exp1Exp2				$0.00\ (0.44)$
AnswerAm.vs.Am not:Exp1Exp3				$-2.74\ (0.46)^{***}$
ParticleY.vs.N:AnswerAm.vs.Am not:Exp1Exp2				$-1.22\ (1.06)$
ParticleY.vs.N:AnswerAm.vs.Am not:Exp1Exp3				$-1.94\ (1.11)$

$^{***}p < 0.001, ^{**}p < 0.01, ^{*}p < 0.05$

We fitted cumulative link mixed model regressions for each experiment (Christensen, 2010), with random intercepts and slopes for participant and item (see Table 4.1). We also ran a cumulative link mixed model regression with random intercepts and slopes for participant and item on all of the data combined, so that we could check for statistically significant differences between the different experiments.[36]

First we consider the models for experiments 1 and 2. The interaction between PARTICLE and ANSWER, which is the largest effect, is due to the fact that in positive answers, both *yes/yeah* and *no* are equally acceptable, while in negative answers, *yes/yeah* is rated as significantly less natural

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[36]We did not include the intonation that participants produced as a predictor since exploratory data analysis as well as a separate model showed there was no effect. Thus, the intonation participants produced had no effect on how natural they rated a response to be.

than *no*. Moreover, PARTICLE had an overall effect in that *no* responses are rated more natural than *yes/yeah* responses, and ANSWER had an overall effect in that positive responses are rated more natural than negative responses. These effects are driven by the fact that *no* is more acceptable than *yes/yeah* when the answer polarity is negative. *No* is not more acceptable than *yes/yeah* in general. Likewise, positive responses are not more acceptable than negative responses in general.

The pattern of the naturalness ratings for experiment 3 are somewhat different from those for experiments 1 and 2. *Yeah-am not* responses are still rated as significantly less natural than *no-am not* responses, however there is a clear main effect of ANSWER in that positive responses are significantly less natural than negative responses in general.

Considering now the model for all of the data, we note significant differences between the data from experiment 1 and 2, and between experiment 1 and 3: Overall, the polar particle responses are rated slightly less natural in response to polar questions than in response to rising declaratives. We had no expectations about this, and do not expect there to be a theoretical motive behind it.

As one would expect from Figure 4.3, there is a large effect of ANSWER polarity on the difference between experiments 1 and 3. Positive (*am*) responses were significantly less natural in experiment 3 than in experiment 1. There are no other significant differences between experiment 1 and the other two experiments.

4.4.2.1 Discussion of Naturalness Ratings

Recall question 2 from section 4.4, "**Preference patterns**: When responding to a negative sentence, which particles do speakers prefer to use when giving a response with negative polarity? With positive polarity? How are bare polar particle responses to negative sentences interpreted?" Our participants prefer to use *no* to convey a negative polarity response to a negative PQ or rising declarative. This result confirms earlier findings by Brasoveanu et al. (2013), but also expands on it since their study considered responses to declarative sentences while ours is on polar questions and rising declaratives. Moreover, our participants are equally happy using *yes* or *no* to convey a positive polarity response, which had not been tested before. However, participants disprefer us-

Table 4.2: Calculation of optimal forms in an OT tableau (adapted from Krifka 2013, 13)

	expression	reference	resulting meaning	*DISAGR	*NONSAL	favorite
a	*yes*	d′	"He did."	*		((☞▌))
b	*yes*	d	"He didn't."		*	(☞▌)
c	*no*	d′	"He didn't."			☞▌
d	*no*	d	"He did."	*	*	

ing bare particles to convey a positive response. This result confirms Kramer & Rawlins's (2012) felicity judgment findings, but again expands on it by considering responses to rising declaratives instead of PQs, and using *yeah* instead of *yes*. Moreover, we found a significant interaction effect, showing that negative *no* bare particles are more felicitous than negative *yeah* bare particles. This is a new result since although this trend was seen in Kramer & Rawlins's (2012) data, it was not significant there.

How do the theories of polar particles proposed by Krifka (2013), Roelofsen & Farkas (2015, R&F) and Holmberg (2016) compare in light of these results? The main result of the naturalness ratings is that *no* is more natural when agreeing with a negative question than *yes*. The theories of Krifka and R&F capture this result. To see this, we need to describe briefly how preference patterns are accounted for in these theories.

Krifka hypothesizes two pragmatic markedness principles to explain preference patterns.

(40)   a. *DISAGR: Penalizes disagreement with the other speaker.
        b. *NONSAL: Penalizes reference to less-salient discourse referents.

The relative salience of discourse referents is contextually determined. Krifka argues that in unmarked contexts the discourse referent anchored to the embedded TP is more salient than its negative counterpart because negative sentences are usually uttered in contexts in which the positive sentence is already salient. Krifka uses these principles in the optimality theory (OT) tableau in Table 4.2 to predict different preferences for *yes*/*no* responses to negative sentences.

Krifka's account of preference patterns accurately predicts the result from the naturalness ratings that *no* is more natural than *yes* in negative agreeing responses. For Krifka, this is because

no picks up the most salient discourse referent, the positive one, and negates it, while *yes* incurs a violation for picking up the less salient negative discourse referent.

The ranking in Table 4.2 erroneously predicts negative *yes* responses to be preferred to positive *yes* responses. However, Krifka notes that *DISAGR is only ranked higher than *NONSAL in responses to assertions, which indicate a high degree of commitment to the proposition on the part of original speaker, making disagreement costly. In response to questions, *NONSAL is ranked higher, which predicts negative *yes* responses to be less natural and is more in line with the results.

Under either ranking, there is a problem for Krifka's theory however. Positive *no* responses are predicted to be the least natural. This does not match our participants' judgments.

Roelofsen & Farkas (2015) argue that some feature combinations in their account are more marked than others. The more marked a feature is, the greater its need to be realized overtly. [REVERSE] is more marked than [AGREE] since complementation is more marked than identity. [−] (negative polarity) is assumed to be more marked than [+] (positive polarity) because crosslinguistically negativity always seems to be pragmatically marked (cf. Horn, 1989). Moreover, absolute polarity features are marked in the presence of [REVERSE] since [+] and [−] each necessarily contrast with the polarity of the antecedent when [REVERSE]'s presupposition is met. Finally, R&F argue that by virtue of both being unmarked, [AGREE] and [+] should be an unmarked combination of features, and [REVERSE] and [−], by virtue of both being marked, should be the second most "natural" combination of features.[37] From these markedness assumptions, R&F derive the following markedness scale from least to most marked for the four possible feature combinations.

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[37]Central to R&F's account of the preference patterns is the claim that the [AGREE, +] and [REVERSE, −] feature combinations each form what R&F call a "natural class", importing terminology from phonology. However, it is not clear to us why two marked features should be likely to co-occur. In fact, the combination of two marked features is assumed to be the least likely combination in phonology. The "worst-of-the-worst", in the terminology of Smolensky (2006), is least likely to occur crosslinguistically (e.g., voiced aspirates are rare). Indeed, if we were to abandon this assumption that [REVERSE] and [−] form a natural class, then following R&F's other markedness assumptions (namely that [−] is contrastive in the presence of [REVERSE]), [REVERSE, −] should be more marked than [AGREE, −]. This would lead to a different ranking with some distinct predictions:

(i)   Markedness scale: [AGREE, +] < [AGREE, −] < [REVERSE, −] < [REVERSE, +]

But perhaps there is another way to motivate the claim that the feature combination [REVERSE, −] is "natural."

(41)   Markedness scale: [AGREE, +] < [REVERSE, −] < [AGREE, −] < [REVERSE, +]

In [AGREE, −] responses, only one of the features is marked, [−]. Since only *no* realizes this feature, *no* is predicted to be more natural than *yes* for realizing agreements with preceding negative sentences. This prediction matches the results. Furthermore, R&F predict *yes* and *no* to be equally natural when indicating a positive response to a negative PQ ([REVERSE, +]), which is borne out by the results above.

Holmberg (2016) argues that speakers who disprefer negative *yes* responses do so because they interpret the preceding negative PQ as having a syntactically high negation between TP and vP. Those who interpret the PQ as having a low negation, adjunct to vP/VP, are predicted to find such negative *yes* responses to be completely natural. Therefore, this account predicts that such responses should be rated by individual participants either as completely natural or completely unnatural, but should not receive in between ratings, i.e. a bimodal distribution is predicted. However this is not what we found. The median rating of 3 in our results were not caused by participants being evenly split between ratings of 5 and ratings of 1. Instead, negative *yes* responses are consistently rated as somewhat degraded relative to all other response combinations by most of our participants. Thus Holmberg's account does not capture the results from the naturalness ratings.

We used *yeah* in experiment 2 because we had the intuition that it would be more acceptable in negative, agreeing responses. Roelofsen & Farkas (2015) report this same intuition in a footnote, and suggest more empirical work is needed. We were therefore surprised that negative agreeing responses were dispreferred with *yeah* in this experiment, just like *yes* was in experiment 1. It is an open question whether systematically varying *yes* and *yeah* in the same experiment might nevertheless produce preferences for the latter in the negative response level of the ANSWER condition.

As for the decreased naturalness of positive bare particle responses in experiment 3, both Krifka (2013) and Roelofsen & Farkas (2015) predict this result. Both argue that positive sentence polar particle responses to negative utterances require overt following sentences, and that such responses are less natural with bare particles. Holmberg (2016) predicts bare *yeah* to be less natural when

Table 4.3: Contour annotation counts and percentages on particles and following sentences for experiments 1, 2 and 3. Note that there are more observations of particle contours than following sentence contours because experiment 3 featured bare particles

Contour	n contours on particles	n contours on sentences
Declarative Fall	1863 (70%)	1456 (72%)
Contradiction Contour (CC)	450 (17%)	411 (20%)
Rise Fall	207 (8%)	99 (5%)
Other/Unclear	28 (1%)	57 (3%)
None	126 (5%)	n/a

conveying a positive response since it requires an unelided elliptical clause to change the polarity from negative to positive. However, the correspondingly low rating of bare *no* indicating a positive response is not predicted by Holmberg. Interestingly, the results of the perception experiment in section 4.5 below will conflict with these naturalness ratings by our speakers. That is, the way hearers interpret bare particles differs from the preferences exhibited by the speakers themselves.

4.4.3   Intonation results

The recorded responses in experiments 1, 2 and 3 were annotated for intonational contour by an RA and the first author. We annotated contours on polar particles and their following sentences separately. After listening to a subset of the data, we determined the vast majority of productions fell into one of three intonational categories: Declarative fall, contradiction contour (CC), and rise fall. Intonations were marked "unclear/other" if it did not fit any of these categories, and "problematic" in case of disfluencies, recording errors, etc. Polar particles were marked as "none" when the participant produced a single contour over the whole utterance.

The form and meaning of contradiction contours were discussed in section 4.3. Declarative falls have a high final pitch accent followed by a fall, H* L-L%. Rise fall intonation is an upstepped high pitch accent that can appear on either the particle or the following sentence.

Counts and percentages of intonations used in response to PQs and rising declaratives in experiments 1, 2 and 3 are summarized in Table 4.3.[38]

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[38]A category for polar question rises was included in the annotation, but was only used 4 times total. Question rise annotations are included in the "other/unclear" row of Table 4.3.

Table 4.4: Rise fall annotation counts for responses to negative sentences for experiments 1, 2 and 3. Percentages reflect percent of all responses to negative sentences in all three experiments

Particle and answer polarity	n rise falls on particles	n rise falls on sentences
Yes, I am	58 (3.7%)	13 (1.2%)
Yes, I'm not	24 (1.5%)	8 (0.7%)
No, I am	37 (2.4%)	16 (1.4%)
No, I'm not	16 (1%)	12 (1.1%)
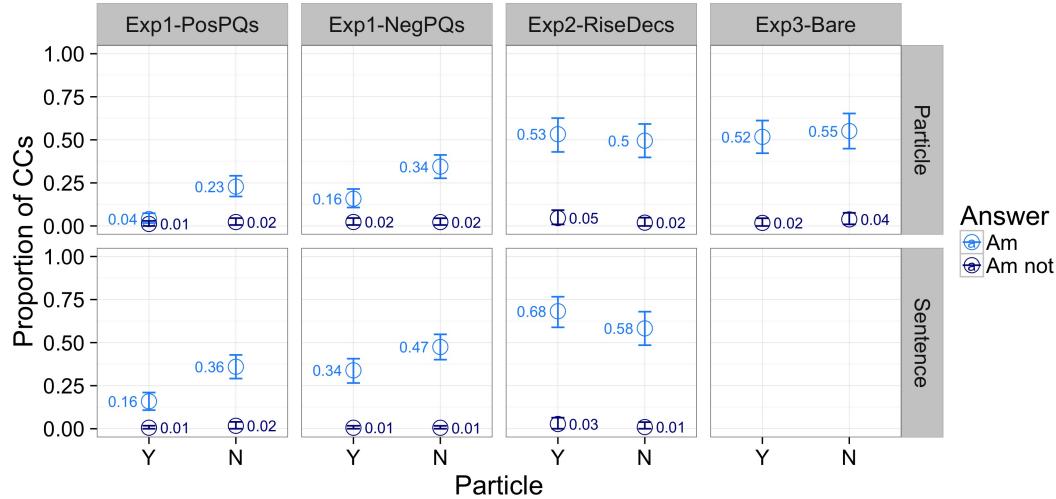
Considering Table 4.3, we can see that declarative falling intonation is by far the most frequent contour observed, followed by CC, and then rise fall. There were relatively few contours that fell into the other/unclear category, suggesting that the annotation scheme was well suited to the data.

Cooper & Ginzburg (2011) claim that when *no* is used to convey a positive response to a negative PQ, it will bear a distinct rise fall tune. We think that our rise fall category corresponds to what they have in mind, however it does not have the restricted distribution they have suggested. While it does appear more frequently in positive responses to negative sentences, it is well represented in negative responses as well, as demonstrated in Table 4.4. Moreover, it was produced relatively infrequently (see percentages). Thus it does not seem likely that the rise fall is the special intonation hypothesized by theorists to be reserved only for positive responses to negative sentences.

Before moving on, we note that we believe that the production of rise fall in our data set was correlated with verum focus prominence shifts, that is prominence shifts to the auxiliary, for example *Yes, I AM coming*. Roelofsen & Farkas (2015) argue that verum focus is obligatory in positive disagreeing responses, but we note that, like rise fall, it appeared in both positive and negative responses in our data. We believe this makes intuitive sense: Verum focus can emphasize the truth of an assertion regardless of whether it has the same or opposite polarity of the preceding sentence. E.g. when responding to the negative PQ *Are you not coming to the presentation?*, both verum focus and rise fall intonation can appear on either a positive response (*No, I AM coming*), or a negative response (*No, I'm NOT coming*).

The tune with the most interesting distribution in our results was the contradiction contour (CC): It was produced almost exclusively in positive responses to negative sentences. Figure 4.4 shows the proportion of CC that participants produced in response to various antecedents: Posi-

Figure 4.4: Proportion of CC produced on particles and on sentences in response to three different kinds of sentences. (From left to right) Responses to positive polar questions, responses to negative polar questions, responses to negative rising declaratives, and bare particle responses to negative rising declaratives

tive polar questions (left), negative polar questions (second from left), negative rising declaratives (second from right), and in bare particle responses to negative rising declaratives (right). The top panels show the proportion of CC produced by participants on the particles themselves, while the bottom panels show the proportion of CC on the following sentences. Positive sentence answers are in blue, negative in purple. For instance, the Exp1-PosPQs column (leftmost) shows that the CC was produced on the sentence in 36% of trials in which positive sentences followed the particle *no*, but only in 2% of trials in which negative sentences followed the particle *no*.

Descriptively, the CC appears quite frequently in positive responses (blue), but hardly ever in negative responses (purple), suggesting an effect of ANSWER polarity. In each case, the rate of CC is greater on following sentences than on the particles themselves. Rates of CC are greatest in response to rising declaratives (experiments 2 and 3), followed by responses to negative polar questions (experiment 1-Negative), and with the least amount produced in response to positive polar questions (experiment 1-Positive).

Furthermore, in responses to PQs only, the CC appears more frequently on *no* than *yes*, suggesting an effect of PARTICLE choice.

We fitted a mixed effects logistic regression for the combined data with random intercepts and slopes for participant and item (for discussion on the advantages of mixed effects regressions, see Baayen, 2008; Jaeger, 2008; Barr et al., 2013). The dependent variable was whether or not the CC was produced. The model tested whether it matters that the response was positive or negative (ANSWER), and that *yes* or *no* was used (PARTICLE). It also tested whether it matters that the context sentence was positive or negative (CONTEXTPOS.VS.NEG., the difference between the positive half of the experiment 1 and the rest of the data), whether the context consisted of a polar question or a rising declarative (CONTEXTPQ.VS.RISEDEC, the difference between the negative half of experiment 1 and experiments 2 and 3), and whether the particle was bare or not (CONTEXTFULL.VS.BARE, the difference between experiment 2 and experiment 3), as well as interactions between PARTICLE and these latter predictors (see Table 4.5).

The effects of ANSWER and POLARITY just mentioned are borne out by the model. We also found several other effects: More CC is produced in response to negative PQs and rising declaratives than in response to positive PQs (CONTEXTPOS.VS.NEG). More CC is produced in full sentence responses to rising declaratives than bare particle responses (CONTEXTFULL.VS.BARE). Finally, as one might expect from plot 4.4, whether *yes* or *no* was used had a fairly large effect on the difference in CC production between responses to positive and negative sentences (PARTICLEY.VS.N.:CONTEXTPOS.VS.NEG) and on the difference between PQs and rising declaratives (PARTICLEY.VS.N.:CONTEXTPQ.VS.RISEDEC).

4.4.3.1 Discussion of intonation results

Consider again question 1 from section 4.4, "**Intonation**: Does a special intonation appear on positive *yes*/*no* responses to negative PQs?" The answer is yes, the CC appears on positive *yes*/*no* responses to negative PQs. This result confirms the suspicions of researchers that a special intonation appears only in positive responses to negative sentences. It also establishes for the first time that it is the contradiction contour that is used in these circumstances. This is significant since, now that we know that this intonation plays a crucial role in these contexts, we can test experimentally

	Model 1
(Intercept)	$-2.26\ (0.33)^{***}$
AnswerAm.vs.AmNot	$4.59\ (0.46)^{***}$
ParticleY.vs.N	$-0.60\ (0.17)^{***}$
ContextPos.vs.Neg.	$-1.52\ (0.34)^{***}$
ContextPQ.vs.RiseDec	$-0.65\ (0.39)$
ContextFull.vs.Bare	$0.96\ (0.45)^{*}$
ParticleY.vs.N:ContextPos.vs.Neg.	$-1.40\ (0.35)^{***}$
ParticleY.vs.N:ContextPQ.vs.RiseDec	$-1.13\ (0.37)^{**}$
ParticleY.vs.N:ContextFull.vs.Bare	$0.73\ (0.49)$

$^{***}p < 0.001, {}^{**}p < 0.01, {}^{*}p < 0.05$

Table 4.5: Logistic mixed effects regression modeling whether the contradiction contour was used on the particle or the sentence (or both). The model includes which answer was intended (*I am* vs. *I am not*), which particle was used (*yes* vs. *no*), and which context it was used in.

whether it has a significant impact on the interpretation of bare polar particles (discussed in section 4.5).

That the CC appears in positive responses to negative PQs could be taken to show one of two things. Either the CC requires a linguistic antecedent with opposite polarity, or it merely requires contextual evidence for that proposition, as we claimed in section 4.3. We can determine which is the case by looking at responses to positive PQs in contexts that supply evidence for the negative answer before the question is asked (as all of our experimental contexts did). If the former view is correct, then the contextual evidence shouldn't matter and the CC should only appear on negative responses to positive PQs. If the latter is correct, then the polarity of the PQ shouldn't matter and the CC should appear on positive responses. As noted above, we found the latter to be true. The CC is not reserved just for contradicting a linguistic antecedent with opposite polarity, it is sensitive more generally to contextual evidence for a proposition that is opposite from the proposition that the speaker asserts. This fits with our analysis of the contradiction contour in section 4.3.3, and demonstrates the importance of a notion of contextual evidence like in (27) to certain linguistic phenomena.

As noted in footnote 26 at the end of section 4.3, one might expect the CC to appear in 100% of trials in which it is licensed, assuming it is a presuppositional operator and maximize presup-

position is in effect. But this is not what we found. Liberman & Sag (1974) were right when they claimed the CC is optional. Interestingly, not only is the CC optional, but its rate of use is sensitive to the kind of antecedent, with negative rising declaratives eliciting it more frequently than negative polar questions. We speculate that there may be a gradient correlation between the likelihood of producing the CC on p and the strength of the contextual evidence for $\neg p$: The stronger the evidence for $\neg p$ the more likely that an intonation reserved for disagreement, the CC, is produced. If this is right, then we would have to make the intuitively plausible assumption that negative rising declaratives convey stronger evidence for $\neg p$ than negative polar questions. This in turn would require a theory of negative question licensing that predicts that negative rising declaratives require more or stronger evidence for $\neg p$ than negative PQs. We leave these issues to future work.

The second interesting result is that the CC is produced more frequently in *no* responses than *yes* responses in experiment 1, but not in experiments 2 and 3. One possible explanation for this effect is that, given the non-interchangeable use of polar particles in response to positive PQs, *no* is *generally* more likely to be used in disagreements than *yes*. Therefore it is more likely to appear with the CC. This correlation affects speakers' choices even in cases where in principle the CC would be licensed on *yes*. One possible reason that this effect is missing in experiment 2 and 3 is that the latter used *yeah* whereas *yes* was used in experiment 1. For a reason that remains unknown, it may be the case that *yeah* more readily admits CC intonation than *yes*.

4.5   Perception Experiment

Given the finding from our production experiments that *yes* and *no* themselves can carry the CC, we wondered whether its presence affects a listener's interpretation. This corresponds to question 1 from section 4.4: Does the contradiction contour (CC) affect the interpretation of bare particles? Here is a sketch of how the CC might affect the interpretation of a bare particle: In response to "Are you not coming to the presentation?" a bare *yes/no* can either convey a positive disagreeing response (*I am*), or a negative agreeing response (*I'm not*). Therefore, it may be unclear to the

hearer which interpretation was intended. Intonation can provide a clue, however: If the particle bears the CC, the speaker conveys that the response disagrees with some contextually salient evidence. The negative question requires that there is contextually salient evidence in favor of the negative response (Büring & Gunlogson, 2000; Trinh, 2014; Roelofsen & Farkas, 2015; Krifka, 2017). If this is the evidence that the CC signals disagreement with, then the particle must indicate the positive response.

On the other hand, the choice not to use the CC in a context in which there is negative evidence might lead a listener to conclude that the speaker does not disagree with the evidence, leading to a negative interpretation. We conducted a perception experiment to test the effects of intonation on the interpretation of bare polar particles.

The perception experiment also provides answers to question 2: How are bare polar particle responses to negative sentences interpreted? While Roelofsen & Farkas (2015) predict bare particles to be ambiguous, they also say that they are more likely to be used to convey a negative response to negative PQs. Krifka (2013) predicts that bare *no* will unambiguously convey a negative response. Holmberg (2016) predicts that bare *yes* will unambiguously convey a negative response. The results of our experiment test these predictions.

4.5.1 Methods

Participants were presented with a context story on a computer screen. The experiment's contexts were similar to those in the production experiments, except that now they crucially leave open whether the character will give a positive or negative response:

(42)   **Context**: Taylor and Mark are coworkers. Their boss is giving a presentation at 4 pm that they are both supposed to attend. Mark is running a bit late, and on his way to the presentation at 4:05, he notices Taylor is on the phone and hasn't gone to the presentation yet either. The following dialogue ensues:
Mark [Heard through headphones]: Are you not coming to the presentation?
Taylor [Heard through headphones]: Yes

The question recordings came directly from the stimuli of production experiment 1. The bare particle answers were extracted from recordings of the participants in experiment 1. The perception experiment had three factors. PARTICLE: Whether the word uttered is *yes* or *no*. INTONATION: Whether the intonation used was the CC or a declarative fall (Dec). ORIGIN: Whether the sound file used was originally followed by a positive or negative sentence in the production experiment. Thus the response in (42) is PARTICLE = *yes*. Suppose the recording used has the CC, then INTONATION = CC. Finally, if the recording came from a trial in the production experiment in which *yes* was originally followed by a positive sentence, e.g. *I'm coming to the presentation*, then ORIGIN = positive.

On each trial, participants first silently read the context and the dialogue, then pressed a key to hear the dialogue. Afterwards, the participants were asked how they interpreted the response:

(43)   **Question**: Based on Taylor's response, which of the following is true:
        1. Taylor is coming to the presentation.
   2. Taylor is not coming to the presentation.
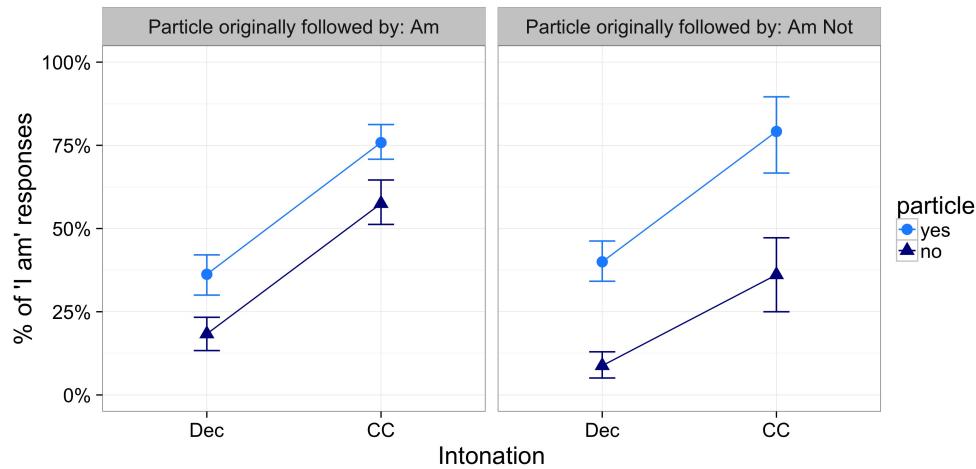
The participants were 25 North American English speakers, mostly undergraduate students. There were eight different dialogues (items), and the experiment was run so that each participant saw all conditions in all items, therefore 1,536 observations total.[39] The trials were randomized so that participants never saw the same condition twice in a row, and trials from the same item were organized into different blocks to maximize their distance.

4.5.2   Results

The results showing the percentage of positive interpretations chosen are visualized in Figure 4.5. Results for *yes* are in blue, *no* in purple. Particles that were originally followed by a positive sentence are in the left panel, those originally followed by a negative sentence are in the right panel. Within each panel, particles bearing declarative falling intonation are on the left, particles

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[39]One participant was removed for completing less than 50% of trials, and 10 observations were removed due to participants choosing neither possible answer.

Figure 4.5: Percent positive *I am* interpretations of bare particle responses by PARTICLE (*yes* vs. *no*, INTONATION (CC vs. Dec), and ORIGIN (whether the particle was originally part of a positive or negative response in the production study that it was culled from)

bearing the CC are on the right.

The CC made participants more likely to interpret the particle as conveying a positive answer. There were also more positive interpretations if the particle *yes* was used. For the particle *yes*, it didn't seem to matter whether it originated from a positive or negative response—the rate of interpreting it positively was roughly the same. However, for the particle *no*, it mattered whether it was originally followed by a positive or a negative sentence, with the latter making negative interpretations more likely. So besides obvious main effects of PARTICLE and INTONATION, it looks like there may be an interaction between PARTICLE and ORIGIN.

We fitted a logistic mixed effects regression, which included PARTICLE, INTONATION, ORIGIN, and all interactions, with random effects and slopes for participant and item (see Table 4.6).

The largest significant effect was for INTONATION. Particles bearing the CC were significantly more likely to be interpreted as a positive sentence, e.g. *I am coming to the presentation* (26% positive interpretation with Dec, 65% with CC). There was also an effect of the choice of PARTICLE. *Yes* responses were significantly more likely to be interpreted as conveying a positive sentence response, e.g. *I'm coming to the presentation* (30% for *no*, 53% for *yes*).

Whether an utterance was originally uttered in a negative agreeing response or a positive disagreeing response (our factor ORIGIN) did not significantly affect interpretation ($p > 0.32$), nor was

	Perception
(Intercept)	$-0.65\ (0.15)^{***}$
Particle	$-1.60\ (0.65)^{*}$
Origin	$0.34\ (0.29)$
Intonation	$2.47\ (0.32)^{***}$
Particle:Origin	$0.93\ (0.47)^{*}$
Particle:Intonation	$-0.09\ (0.84)$
Origin:Intonation	$-0.02\ (0.76)$
Particle:Origin:Intonation	$-0.31\ (1.10)$

$^{***}p < 0.001, ^{**}p < 0.01, ^{*}p < 0.05$

Table 4.6: Logistic mixed model looking at how the three factors PARTICLE, INTONATION and ORIGIN, and all possible interactions affect whether listeners interpret the bare particle to mean *I am* or *I am not*.

there an interaction between ORIGIN and INTONATION ($p>0.39$). This gives our intonational annotation some validation—there could have been some crucial prosodic cues revealing the intent of the speaker that is not captured by annotating whether they used the CC or not, or maybe what we annotated as CC could have been quite different depending on which type of utterance it occurred in. But there is no evidence for either of these conceivable problems with the way we annotated the data.

On the other hand, participants were more likely to interpret *no* responses as agreements with the negative question when the *no* sound file came from a negative agreement response in experiment 1 than when it came from a positive disagreement response (the interaction between ORIGIN and PARTICLE in Table 4.6). We make two observations about this effect: First, because there were relatively few CCs produced in confirming responses in the production experiments, the perception experiment could not be completely balanced. That is, there were only three *noes* followed by negative sentences that were produced with the CC in experiment 1, and only two *yeses*. To have had a completely balanced design, we would have needed eight of each. Therefore, the data for this experiment includes relatively few observations in which polar particles that were originally followed by a negative sentence bore the CC (the rightmost dots in figure 4.5—this is likely why the error bars are larger here than elsewhere in the plot). Since there are fewer negative-origin CCs, we might expect any effect of ORIGIN to be attributable to INTONATION. That is, fewer CCs result

in more negative interpretations, given the strong effect that the CC has on interpretation.

The second observation is that despite this lack of balance leading to possible interference by INTONATION, it must be noted that even the negative-origin *no* responses bearing Dec intonation were interpreted as a negative response more frequently than the positive-origin *no* responses with Dec intonation. Thus, it seems likely that this interaction effect between PARTICLE and ORIGIN is at least in part genuine: Negative-origin *noes* must sound more negative to our participants than their positive-origin counterparts. This means that there is likely an effect of prosody on these *no* responses not captured by the intonation annotation. We note that this effect is smaller than the main effects of INTONATION and PARTICLE.

4.5.3 Discussion

The questions we set out to answer were: How are bare polar particle responses to negative sentences interpreted? Does the contradiction contour (CC) affect the interpretation of bare particles? We found that in response to negative PQs, bare *yes* is interpreted as a positive response at about chance level (53% of trials), while bare *no* is interpreted as positive in 30% of trials. However, intonation has a big effect on bare particle interpretation, both in the case of *yes* and *no*. Particles bearing the CC are interpreted as positive in 65% of trials, while particles bearing a declarative contour are interpreted as positive in only 26% of trials.

None of the theories discussed above explicitly considers predictions for the interpretations of bare polar particles that have different intonations. The theory of Krifka (2013) predicts that in order to convey a positive response to negative PQs, *no* must be followed by an overt sentence. Holmberg (2016) makes the same prediction for *yes*. Roelofsen & Farkas (2015) predict negative interpretations of bare particles to be preferred, other things being equal. One might read this as meaning that a systematic manipulation of intonation could alter the expected interpretation. On the other hand, R&F claim that positive interpretations of polar particles will require an overt following clause with verum focus. Thus, our results are not directly anticipated in the previous literature. However theorists have suggested that intonation could have some effect, and that positive

responses to negative questions in particular would bear a special intonation, even if that intonation is predicted to appear on a following clause. Our results lend empirical support to this intuition, but expand on it by identifying for the first time that this unique intonation is the CC, that it can appear on bare particles themselves, and that it has a large effect on the interpretation of bare particles.

Given our proposed meaning for the CC, we could ask why positive interpretations are not at 100% when the CC is present. After all, in order for the CC to be licensed on a bare particle in response to a negative PQ, the intended response must be positive, right? Actually, not quite. Note that using the CC on a negative response to a negative question is possible in principle, if there is also positive contextual evidence (in addition to the negative evidence necessary to license the negative question). The contexts in our perception experiment may have been open enough to leave some room for listeners to posit that there may have been such evidence. Sometimes, even asking a negative PQ can suggest that the speaker considers there to be some evidence for *p* (in addition to evidence for *not p*). For example, the following question (adapted from examples by Trinh, 2014) both suggests contextual evidence that B is not left-handed (antecedent for CC in (44a)), and given the lower odds of being left-handed the formulation of the question suggests a prior belief of A that B is left-handed, which B can take as positive evidence (antecedent for CC in (44b)):

(44)   A always thought B was left-handed, but now sees B writing with her right hand.
        A: Are you not left-handed?
   a.   B: I'm left-handed (CC).
   b.   B: I'm not left-handed (CC).

The fact that negative PQs can license CC in both responses might explain why not all CC-bearing particles were interpreted as positive.

The main effect of PARTICLE is that *yes* responses were significantly more likely than *no* responses to be interpreted as conveying a positive sentence response. Viewed through the lens of Krifka's theory, this is expected since a pragmatic constraint is in effect, *NONSAL: Being anaphoric to a less salient discourse referent is dispreferred. Since the negative discourse referent is typically less salient, both *yes* and *no* prefer picking up the inner, positive discourse referent,

which results in a positive response interpretation for *yes* and a negative interpretation for *no*. R&F also predict *no* to be more frequently interpreted as a negative response, since it realizes the [−] feature of the [AGREE, −] response. However, they predict positive responses to the be the most marked, thereby requiring an overt following clause, so they predict that bare particles will more likely be interpreted as negative responses in general. This latter prediction does not fit with the effect we found here. Holmberg predicts bare *yes* should only be interpreted negatively, which is exactly the opposite of the main effect of PARTICLE in our experiment.

Suppose Krifka's theory is right, participants are driven by *NONSAL to interpret polar particles as picking up the inner antecedent. But now we have a question: If the positive antecedent is preferred, why is *yes* with declarative intonation only interpreted as positive in under 50% of observations? It should be interpreted positively much more of the time. This can be explained if there is a preference to use the CC whenever possible. Failing to use the CC in a context where there is negative evidence (such as in response to negative PQs) then licenses the inference that the speaker must agree with the negative evidence. The absence of the CC is a cue in favor of the outer, negative antecedent.[40]

There is an aspect of Kramer & Rawlins's (2012) results that diverge from ours. They found that when trying to convey a positive response (*I am*), bare *yes* is mostly judged false, while *no* is judged more ambivalently. In our experiment, *yes* was more likely than *no* to be interpreted as conveying a positive response. The discrepancy might be due to the fact that Kramer & Rawlins did not control for intonation. Our participants were more likely to produce the CC on *no* than on *yes* (production experiment 1), and bare particles carrying the CC are more likely to be interpreted as positive (perception experiment). It is plausible then that Kramer & Rawlin's participants imagined more *no* responses with the CC when silently reading the dialogues, leading to more positive interpretations, while *yes* was imagined with more Dec intonation. This would lead to more negative interpretations of *yes* than *no*, and therefore more judgments of falsity when the particle

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[40]It could be that this inference by the listeners is an artifact of our experiment, since utterances with and without the CC were juxtaposed across trials—in a more natural situation, this effect might be smaller, given the optionality of the CC.

was meant to convey a positive response in K&R's experiment. We note that the possibility of such issues is a good argument in favor of controlling for intonation when asking participants for judgments about bare particle responses.

Before moving on, we would like to note that the interpretation patterns found here differ in a substantive way from the naturalness ratings found in the production experiments. The latter were best predicted by the theory of Roelofsen & Farkas (2015), especially the fact that *yes* and *no* were rated equally natural when conveying a positive response. On the other hand, as just argued above, Krifka's (2013) theory best predicts the preference to interpret *yes* as a positive response more frequently than *no* in the perception experiment. This difference in results will be discussed in detail in section 4.7.

4.6   Context Sensitivity Experiment

Recall question 3 from section 4.4: "**Context Sensitivity**: If the negative sentence that the polar particle responds to is itself responding to a negative sentence, are preference patterns affected, and in particular is *yes* now more acceptably interpreted as a negative response?"

Meijer et al. (2015) attempt to answer this question for German, and they note that Krifka (2013) and Roelofsen & Farkas (2015, R&F) make different predictions with respect to these questions. As discussed above in section 4.4.2.1, Krifka argues that negative sentences are usually uttered in a context in which the positive discourse referent is already salient, thus making the positive TP discourse referent more salient to anaphora. However, the relative salience of discourse referents introduced by negative sentences can be flipped according to Krifka, in an all negative context like (45).

(45)   [From Krifka (2013), ex. (54)]
            A: Which of the mountains on this list did Reinhold Messner not climb?
            B: Well, let's see... He did not climb Mount Cotopaxi in Ecuador.
            C: Yes. / No.

According to Krifka, *yes* is most naturally interpreted as meaning "he didn't climb it," since *yes* picks up the more salient negative discourse referent. *No* is also predicted to be most naturally interpreted as meaning "he didn't climb it," since, even though this would require picking up the less salient positive discourse referent, *DISAGR is more highly ranked than *NONSAL when responding to an assertion (see the OT tableau in Table 4.2). Finally *yes* is predicted to be preferred over *no* when indicating a negative response, since *DISAGR plays no role when the response agrees, and *yes* picks up the more salient discourse referent. This all holds for German *ja* and *nein* as well, with the difference that *doch* is preferred for indicating a positive response to a negative sentence.

On the other hand, neither R&F nor Holmberg predict shifts in context to have any effect on preference patterns in polar particle responses.
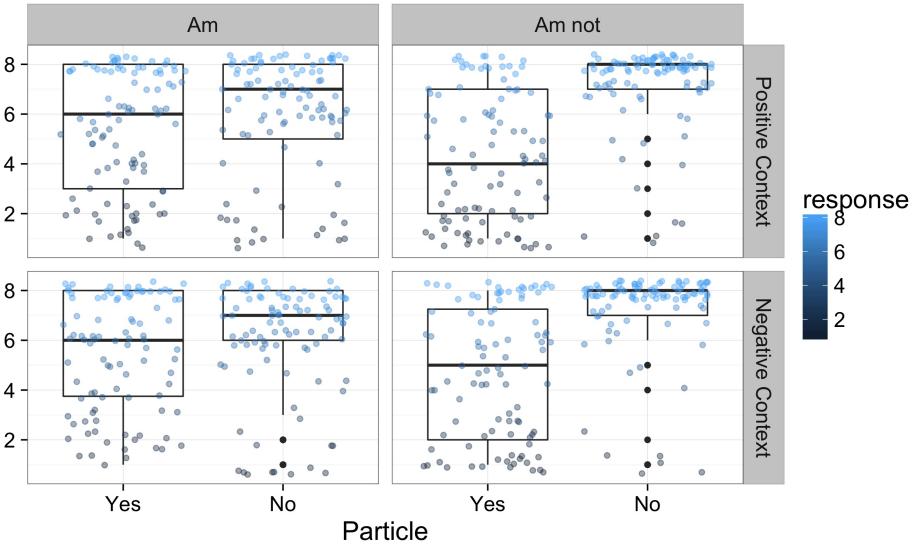
Meijer et al.'s (2015) results do not favor any theory. They found two groups of speakers when it came to preferences for negative, affirming responses. One group preferred *nein* for such responses while the other preferred *ja*. Their preferences held regardless of whether the context WH-question was positive or negative, counter to Krifka's predictions.

We wondered whether these results would be the same in English. The goal of this experiment was to see if putting our original contexts into Meijer et al.'s (2015) experimental design would affect the naturalness ratings of our stimuli, either in the way predicted by Krifka, or to be more like the results of Meijer et al. for German.

4.6.1 Methods

This experiment has three two-level factors, $2 \times 2 \times 2$. Two are identical to the first set of production experiments, the PARTICLE used (*yes* vs. *no*), and the polarity of the ANSWER (positive vs. negative). In all conditions, these responses are made to a negative declarative antecedent. The third factor was manipulating the polarity of the CONTEXT sentence preceding the antecedent. Participants were asked to rate the naturalness of the responses, and they were asked a follow up verification question. Here is an example stimulus.

Figure 4.6: Naturalness ratings by three factors: PARTICLE (*yes* vs. *no*), ANSWER (*I am* vs. *I am not*), and CONTEXT (whether the sentence preceding the sentence that *yes* and *no* respond to was positive or negative)

(46)   **Setup**: You and your coworker Harley are closing down the restaurant for the night. Harley is trying to determine ...
Positive context: ... which tasks have been done already.
Negative context: ... which tasks haven't been done yet.
Antecedent: You didn't take the trash out.
Positive, disagreeing response: Yes/No, I took the trash out.
Negative, agreeing response: Yes/No, I didn't take the trash out.

The participants were 12 North American English speakers (mostly McGill undergraduates), making for 768 observations total. The trials were pseudo-randomized so that participants never saw the same condition twice in a row, and trials from the same item were organized into different blocks to maximize their distance.

4.6.2   Results and Discussion

From Figure 4.6, it looks like there is an interaction between PARTICLE and ANSWER with *yes* being rated as less natural than *no* when giving a negative response, as we saw in the production experiments in section 4.4. The polarity of the CONTEXT preceding the antecedent appears to be unlikely to have any effect, except perhaps on *yes, I'm not* responses, which appear to be

Table 4.7: Cumulative link mixed effects model looking at three factors affecting whether readers found the responses natural given the context: Which particle was used, what the intended reading was, and whether the context preceding the antecedent was positive or negative

	Reading
ParticleYes.vs.No	$-1.51\ (0.43)^{***}$
AnswerAm.vs.AmNot	$-0.36\ (0.35)$
ContextNegative.vs.Positive	$-0.21\ (0.14)$
ParticleYes.vs.No:AnswerAm.vs.AmNot	$2.59\ (0.30)^{***}$
ParticleYes.vs.No:ContextNegative.vs.Positive	$0.06\ (0.28)$
AnswerAm.vs.AmNot:ContextNegative.vs.Positive	$0.37\ (0.28)$
ParticleYes.vs.No:AnswerAm.vs.AmNot:ContextNegative.vs.Positive	$-0.26\ (0.56)$

$^{***}p < 0.001, ^{**}p < 0.01, ^{*}p < 0.05$

rated slightly more natural in negative contexts (median 5 in negative contexts to median 4 in positive contexts). If this three-way interaction is significant, it would lend support to Krifka's hypothesis that preceding context polarity modulates naturalness ratings. The null hypothesis is that the preceding context has no effect.

We fitted a cumulative link mixed model regression with all three factors and all possible interactions, with random intercepts and slopes for participant and item (see Table 4.7). We found a significant main effect of PARTICLE, as well as a significant interaction between PARTICLE and ANSWER, as expected and like in the other production experiments. We did not find a significant three way interaction ($p>0.67$), nor were any other factors significant. A likelihood ratio test revealed no difference between this model and one with only PARTICLE, ANSWER and their interaction ($p>0.46$).

Therefore, we fail to reject the null hypothesis. *No, I'm not* responses are rated more natural than their *yes* counterparts regardless of context, which is predicted by Roelofsen & Farkas's (2015) and Holmberg's (2016) accounts. However, we note that, according to Meijer et al.'s (2015) results, context polarity had no effect on naturalness in German either, yet the result did not clearly fit with R&F's predictions. Therefore, when taking our results together with Meijer et al.'s, the results of both experiments demonstrate that controlling for the polarity of a preceding context sentence has no effect on preference patterns in either English or German, at least not in this experimental paradigm.

Thus, it seems that the answer to question 3, "If the negative sentence that the polar particle

responds to is itself responding to a negative sentence, are preference patterns affected, and in particular is *yes* now more acceptably interpreted as a negative response?" is no. Naturalness ratings of particle responses appear to be insensitive to systematic manipulation of the polarity of context sentences.

Nevertheless, we think there is some merit to the intuition that in a context like (45), *yes* more naturally indicates a negative, agreeing response, whether as a bare particle or with a following overt sentence. We point out that we only fail to reject the null hypothesis here, and that it is possible that the experiment is underpowered. In future work, we would like to see other experimental designs used to test whether context can affect preference patterns. If, after further testing, *yes*-negative responses remain dispreferred regardless of context, then it seems likely that a context-insensitive theory is on the right track.

4.7   Concluding discussion and future directions

In section 4.4, we posed three groups of research questions, reprinted below.

1. **Intonation**: Does a special intonation appear on positive *yes/no* responses to negative PQs? If so, can it affect the interpretation of bare particles?

2. **Preference patterns**: When responding to a negative sentence, which particles do speakers prefer to use when giving a response with negative polarity? With positive polarity? How are bare polar particle responses to negative sentences interpreted?

3. **Context sensitivity**: If the negative sentence that the polar particle responds to is itself responding to a negative sentence, are preference patterns affected, and in particular is *yes* now more acceptably interpreted as a negative response?

As discussed in the introduction, various researchers working on polar particle responses have shared the intuition that a special intonation may appear in positive responses to negative utterances, and affect the interpretation of polar particles. However there has been disagreement over

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the form that the intonation takes, and no quantitative data has been presented in support of any particular claim. The main finding of our work is that there is indeed a particular intonation that is produced in positive responses to negative utterances: A fall rise that we identify as the contradiction contour (Liberman & Sag, 1974). The CC is the only intonation we found that is systematically produced in positive responses that disagree with the negative bias of negative PQs, while not appearing in negative, agreeing responses.

The results of our perception experiment demonstrate that this intonation has a strong effect on how hearers interpret bare polar particle responses to negative utterances: Participants are much more likely to interpret a bare *yes* or *no* as indicating a positive response when it bears the CC than when it bears falling intonation. Building off of Liberman & Sag (1974), we have argued that the CC, when used on an assertion of p, conveys that there is contextual evidence for $\neg p$. This hypothesis accounts for why it is used almost exclusively on positive responses, given that our contexts made evidence in favor of the negated proposition salient. Prior to this experiment, it would have been hard to guess how sensitive to intonation naïve participants are. We believe the results suggest that intonation plays a prominent role in interpretation. Thus, when researchers probe intuitions about the interpretation of polar particles (whether from the armchair or the lab), the effects of intonation might need to be kept in mind.

Regarding question 2, one clear finding from the naturalness ratings, replicating a finding from Brasoveanu et al. (2013), is that *no* is more acceptable than *yes* when giving a negative, agreeing response to a negative sentence. Both Roelofsen & Farkas's (2015) and Krifka's (2013) theories account for this preference, as discussed above, while Holmberg's (2016) does not.

Besides this result, the production naturalness ratings and the perception results clearly bear on question 2 in other ways, however determining exactly how the results bear on previous theoretical claims about preference patterns is complex. The reason for this is that the literature on preference patterns does not distinguish between preferences regarding the *use* of polar particles and preferences regarding the *interpretation* of bare particle responses, but our results do. Our results provide data in the form of (i) naturalness ratings by the producers of polar particles with complete,

overt following sentences,[41] and (ii) forced choice interpretations of bare particle responses in a perception experiment. The two kinds of results do not perfectly align with one another, and could be argued to support the predictions of competing theories as follows.

First, the naturalness ratings from the production experiments reveal that participants find *no* followed by a positive sentence and *yes/yeah* followed by a positive sentence to be equally acceptable. This holds true both when the particles are followed by overt sentences in experiments 1 and 2, and when they were bare in experiment 3 (section 4.4.2). This result runs counter to Krifka's (2013) theory, which clearly predicts that positive *no* responses should be less natural than positive *yes* responses, regardless of previous context (see the OT tableau in Table 4.2). Roelofsen & Farkas (2015), on the other hand, predict this result.

On the other hand, the interpretation results from the perception experiment (section 4.5.2) reveal that participants are more likely to interpret bare *no* as conveying a negative response than bare *yes*, regardless of the intonation used on the bare particle. While the naturalness ratings contradicted the predictions of Krifka (2013), those predictions are confirmed by this result. Since positive *no* responses are predicted to be less natural, it makes sense that we would find that bare *no* responses are more likely to be interpreted as negative than bare *yes* responses (Table 4.2). Roelofsen & Farkas's (2015) theory predicts both bare *yes* and bare *no* to be more likely interpreted as negative. Thus it does not predict our finding. Finally, Holmberg's (2016) theory also has trouble explaining this result, since it makes the strong prediction that bare *yes* in English cannot be interpreted as a positive response to a negative utterance, but instead must be followed by an overt positive clause.

Therefore, the results for question 2 and how they bear on existing theories of polar particles are somewhat mixed. More testing using various experimental paradigms may be needed. For example, if we had allowed participants the freedom to give responses in their own words, along the lines of the completion task described in González-Fuente et al. (2015), then perhaps the production and perception results would have been more similar. However, a drawback to this approach

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[41]With the exception of experiment 3, which provided naturalness ratings of bare particle responses.

is that the experimenter cannot control whether the participant will even use a polar particle at all.

Regarding question 3, the experimental results from section 4.6 reveal that, so far, no experimental paradigm has successfully demonstrated that manipulating the polarity of preceding context sentences affects the result that negative *yes* responses are dispreferred. This result contradicts the predictions of Krifka (2013), and supports those of any theory that predicts preference patterns to be context insensitive, such as Roelofsen & Farkas (2015) and Holmberg (2016).

Our experiments have several limitations. For one, we only used contexts which convey negative contextual evidence. We did not vary evidence in order to keep the complexity of the experiments under control. As noted in footnote 31, there are theoretical questions about whether it is even felicitous to use a positive PQ in the presence of negative contextual evidence. We believe our experimental contexts do license the use of both positive and negative PQs, but this raises the question of why. Is it because theories that predict this to be impossible are wrong, or is it because our contexts were complex enough that they could be taken to have both positive and negative evidence? If it is the latter, then why was the CC only produced on positive responses, regardless of whether the PQ was positive or negative? If evidence can be manipulated between purely negative and purely positive in a production experiment, we predict it to have an effect on the distribution of the CC, with CC appearing on negative responses in the presence of positive evidence and on positive responses in the presence of negative evidence.

Another limitation is that the perception experiment only tested CC against falling intonation. We noted in section 4.4.3 that rise fall intonation was distributed relatively evenly across conditions in the production experiment. However it may nevertheless be interesting to run a perception experiment with rise fall intonation on the polar particles to see how it affects interpretation.

Moreover, there are clear next steps to be taken. In particular, which intonations are produced in response to other kinds of sentences such as falling declaratives, positive rising declaratives, high negation questions, and tag questions? In the introduction, we said we focussed only on responses to PQs and rising declaratives to simplify the number of experimental conditions and discussion, as well as to expand on the work of Brasoveanu et al. (2013), which focussed on

responses to falling declaratives. Therefore, it remains to be seen how using falling declaratives might affect intonation and naturalness ratings in our experimental paradigms. Likewise, positive rising declaratives would be interesting to test, as they are usually thought to require evidence for the positive response, as already mentioned above in (34). Thus we might expect the CC to appear in negative responses to these questions. However, given that rising declaratives can be used to express incredulity (Goodhue et al., 2016), it is possible that the very question itself, even if phrased as a positive rising declarative, suggests some doubt on the part of the speaker, i.e. an expectation that $\neg p$. Thus it may be possible that, depending on context manipulations, the CC could appear in positive responses as well as negative responses to such utterances.

To conclude, we have provided experimental evidence demonstrating that a particular intonation, the contradiction contour, is used primarily in positive, disagreeing polar particle responses to negative polar questions and rising declaratives, and that this tune has a large impact on the interpretation of bare particle responses to negative polar questions. This suggests that when formulating theories of the preferred interpretation of bare particles, the way that intonation impacts empirical data should be taken into account.

Chapter 5

Conclusion

5.1 General discussion

This thesis has been concerned with how non-standard polar questions are used, how they convey meaning, and how polar particles are used to respond to them. In order to approach this topic, I found I had to first lay some groundwork by developing an account of polarity focus (verum focus) in terms of the broader theory of focus semantics (chapter 2). With this accomplished, I then developed two distinct accounts for two different kinds of epistemically biased polar questions: polarity focus questions and high negation questions (chapter 3). I then examined the behavior of polar particle responses to polar questions, with a particular interest in how intonation affects the interpretation of such responses (chapter 4, published as Goodhue & Wagner 2018, coauthored with Michael Wagner).

At the outset, my primary goal was to investigate negative questions. In order to do this, I began in chapter 2, somewhat counterintuitively, by researching polarity focus instead. The reason for this is that many researchers have taken polarity/verum focus to be entwined with negative questions and epistemic bias (Romero & Han, 2004; Gutzmann & Castroviejo Miró, 2011; Repp, 2013; Frana & Rawlins, 2015; Romero, 2015; AnderBois, 2016; Samko, 2016a). Some authors have called for a very tight connection between verum/polarity focus and high negation (e.g. Romero & Han,

2004), while others have suggested the connection is less direct (e.g. AnderBois, 2016). Digging into polarity focus revealed a phenomenon that bears no connection at all to high negation, or so I argued in both chapter 2 and chapter 3. Instead, I argued that polarity focus should be explained by the more general theory of focus that has been used to explain other focus phenomena (e.g. Rooth, 1985, 1992; Kratzer, 1991; Schwarzschild, 1999; Büring, 2016). In particular, I argued that polarity focus utterances require a salient antecedent with contrasting polarity. I also argued that examples with polarity focus provide new evidence in favor of having two separate grammatical mechanisms, one that marks focus and another that marks givenness deaccenting.

High negation questions do not display a similar requirement for focus antecedents, a point demonstrated in both chapter 2 and chapter 3. Moreover, I found that the phenomenon that has traditionally been the motivation for a unified analysis of polarity focus and high negation, epistemic bias, displays asymmetries in polarity focus questions and high negation questions. In particular, I demonstrated in chapter 3 that the epistemic bias in polarity focus is context dependent, while the epistemic bias of high negation questions is context insensitive. Thus, the evidence uncovered in chapter 2 and chapter 3 lead me to claim that polarity focus and high negation are indeed distinct phenomena requiring separate theoretical accounts.

Having assimilated the theory of polarity focus to the more general theory of focus semantics in chapter 2, I then pursued an explanation for epistemic bias in polarity focus questions in chapter 3. What I observed is that many but not all of the contexts that license focus marking in polarity focus questions also trigger epistemic bias. In particular, if an interlocutor asserts p, and then the speaker asks $?p$, two things happen. First, polarity focus is licensed because the proper focus antecedent is found in the context. Second, the speaker's question sets off a chain of inferences that, in some contexts, leads to the inference that the speaker is epistemically biased toward $\neg p$. This inferencing depends on the interlocutor having asserted p, as well as on the assumption that the speaker is opinionated about p. Given these two ingredients, along with other well-motivated pragmatic principles governing conversation (Grice, 1989; Stalnaker, 1978; Roberts, 1996/2012; Büring, 2003), it can be inferred that the speaker is not inclined to accept p because they hold a

prior belief that $\neg p$. But if either of these ingredients are missing, the inference does not arise.

This theory predicts polarity focus to be entirely distinct from the epistemic bias arising from polarity focus questions: the bias derivation does not depend at all on polarity focus. Thus it is possible to have questions in which polarity focus is present but epistemic bias is not, and to have questions in which epistemic bias is present but polarity focus is not. I demonstrate such examples in chapter 3. Moreover, I argued that given the derivation that I propose, no VERUM operator is needed to explain epistemic bias in polarity focus questions.

At this point then, part of the goal of the thesis has been achieved, as I have explained the distribution of one particular kind of non-standard polar question, the polarity focus question, as well as how it comes to convey epistemic bias in some contexts but not others. The account does not require a special semantics for polarity focus questions, or a special operator, or a connection to other empirical phenomena. Polarity focus can be completely understood in terms of more general, independently motivated, and fairly well understood grammatical mechanisms and pragmatic principles: the theory of focus, questions semantics, Gricean implicature, the common ground and its relationship to asserting and questioning, and the epistemic step from scalar implicature calculation.

Moreover, the work I did in service of coming to this intermediate conclusion lays important groundwork for the next kind of non-standard polar question on the docket: the high negation question. Since some researchers have thought that high negation questions involve verum/polarity focus in one way or another, the work I did in chapter 2 and chapter 3 to distinguish the two phenomena is crucial. Given all of the empirical asymmetries, it seems clear that the two are distinct. Therefore, in developing an account of high negation questions, we can safely ignore polarity focus, and this is just what I do in chapter 3.

In search of further evidence for what high negation questions are, I tried to follow Lewis's (1970) influential and ever relevant advice: I first sought to get clear on what high negation questions do, empirically speaking, so that I could then try to find something that does that. The evidence I uncovered in chapter 3 suggests that there are two main things that high negation ques-

tions do, with perhaps a third thing worth mentioning. The first is that high negation questions always convey epistemic bias toward the propositional content of their prejacent. For example, the propositional content of the prejacent of the high negation question *Isn't it sunny?* is *that it is sunny*, and any speaker who uses this question conveys that they are epistemically biased toward this proposition. I further tried to determine exactly what epistemic bias is, and came to the conclusion that epistemic bias seems to be belief in p, the kind of belief that can license an assertion of p. The presence of epistemic bias in high negation questions appears to be nonnegotiable, that is, the bias cannot be canceled, but appears in every context in which they are used.

The second thing that high negation questions do is they behave as if they lack propositional negation. I developed several tests to demonstrate this in chapter 3. This is significant because there has been debate in the recent literature over whether or not high negation questions license strong NPIs such as *either*. The intuitions about this are somewhat mixed, with possible dialectal variation. Given this fact, it seems necessary to look to other tests of the negativity of high negation questions, and that is what I did here. One of the key tests here is the use of polar particles in response to high negation questions. This demonstrates an important asymmetry with low negation questions that is further explored in chapter 4. In sum, then, high negation does not seem to contribute propositional negation, at least not one that applies to the prejacent.

The third thing that high negation questions do is they behave like genuine questions. By this I mean, they can only be used in contexts where a question would be acceptable more generally. In particular, a high negation question is infelicitous in a context if the speaker does not have cause to take their interlocutor to know as much as they do about the content of the question. This general constraint impacts the usage of high negation questions just as it does any other type of question.

Now to follow through on Lewis's (1970) edict, what is left to do is to find some grammatical structure that does what high negation questions do: that conveys bias, that does not contribute propositional negation, and that asks a genuine question. Since the contribution of propositional negation seems to be closely tied to grammatical structure, this seems like the most promising place to start. Whatever one's theory of high negation in questions, it must at least make the right

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predictions for the tests of negativity that I deploy in chapter 3.

Surveying the literature, one finds quite a lot of recent attempts to explain high negation questions. One recent theory in particular in Krifka 2017 claims that high negation questions do not contain propositional negation. Instead they contain denegation, a kind of speech act connective that scopes over speech act operators in the syntax. Besides predicting that high negation is not propositional negation, the account also explains the use of high negation questions as questions, since they come with a REQUEST operator that asks an interlocutor to make a commitment. Another attractive feature of the account is that it gives a negation-like role to the negative morpheme *n't* in high negation questions in that denegation is a kind of complementation. It also explains in what sense denegation is "high", as it is above an ASSERT speech act operator. This is attractive since Romero & Han (2004) have claimed that high negation questions exist in multiple unrelated languages, and they always convey epistemic bias. If so, we would like a systematic explanation for why such constructions appear crosslinguistically. If all languages have speech act operators and denegation, then it stands to reason that several would develop question constructions in which denegation scopes over ASSERT.

Finally, I argue in chapter 3 that Krifka's (2017) account of high negation questions enables an explanation for the epistemic bias toward the propositional content of the question that high negation questions are known for. The denotation of Krifka's (2017) high negation question is odd at first glance: It produces a commitment space in which all possible continuations of the conversation are ones in which the addressee does not commit to p, the propositional content of the question. That means that in each possible commitment state produced by the question, the addressee either commits to $\neg p$ or does not commit to p or to $\neg p$. Why would anyone ask such a question of an interlocutor? You wouldn't ask it if you just wanted to find out whether p or $\neg p$, since if the addressee accepts the commitment space, you won't know whether it's because they believe $\neg p$ or they just aren't committed either way. I argue that the only reason for the speaker to divide the commitment space up this way is if the speaker already believes p, and now has some reason to check on that belief. By making the commitment space include commitment states in

which the addressee refrains from committing either way to p or to $\neg p$, the speaker maximizes her chances of learning some new information that conflicts with her own beliefs. Since this is the only reason to use a question with this denotation, we can be sure any time a high negation question is used, the speaker is epistemically biased.

At this point in the dissertation, I have addressed and solved a large piece of the puzzle about the meanings and uses of non-standard polar questions: I have found accounts of the syntax, semantics and pragmatics of those polar questions that give rise to epistemic bias. In unraveling epistemic bias, I showed that it is in fact two distinct phenomena, contextual epistemic bias of the sort found in polarity focus questions and high negation epistemic bias.

Having done this, I then turn to responses to non-standard polar questions in chapter 4. Polar particle responses provided a key test of the negativity of high negation questions as opposed to low negation questions in chapter 3. In chapter 4, I dug further into recent theories of such responses, arguing that they are parts of larger syntactic structures, in line with proposals by Kramer & Rawlins (2009); Holmberg (2013, 2016); Roelofsen & Farkas (2015). At the same time, I also argued that the interchangeability of polar particles in response to low negation questions is due to the availability of multiple antecedents, as proposed by Krifka (2013).

Interestingly, our experimental results from chapter 4 demonstrate some asymmetries in the way that speakers and hearers interpret polar particle responses. Speakers find *no* followed by a positive sentence and *yes* followed by a positive sentence to be equally acceptable. On the other hand, hearers are more likely to interpret bare *no* as conveying a negative response than bare *yes*. This result is interesting and is not explained under current theories, since they do not distinguish between the intuitions of speakers and hearers.

We also demonstrate experimentally for the first time that the intonation of a polar particle has a large effect on interpretation of the polar particle in interchangeable contexts. The main finding was that there is a particular intonation that is produced in positive responses to negative utterances, namely the contradiction contour (Liberman & Sag, 1974). This contour was the only intonation we found that is systematically produced in positive responses that disagree with the negative bias

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of negative PQs, while not appearing in negative, agreeing responses.

We also found instances of polarity/verum focus in our experiments, however these were distributed across both positive and negative responses to both positive and negative polar questions. This validates the analysis of polarity focus I developed in chapter 2, since I argued that polarity focus is possible in utterances that have either the same or opposite polarity from an overt utterance in the preceding context. While I argued that polarity focus requires a contrasting antecedent to be salient, that antecedent can be salient without being uttered.

5.2 Future work

I discussed avenues for future work in each chapter, and I would like to highlight a few now.

First, in chapter 2, I contrasted the apparent optionality of polarity focus in response to polar questions against the apparent obligatoriness of answer focus in response to WH-questions. I mentioned that some researchers have suggested that polarity focus responses to polar questions are exceptional. On the other hand, some informants have suggested to me that *non*-polarity focus responses to certain polar questions are exceptional. In the future, it would be worthwhile to run both production and perception experiments testing how frequently speakers use these kinds of focus in response to questions, and how felicitous listeners find them to be.

A possible variation on these experiments would be to test whether there is a gradient effect linked to the degree to which the speaker accentuates their focus prominence shift, as discussed in chapter 2. As I mentioned there, it may be that some of the dispute in the literature is caused by varying amounts of accentuation that researchers imagine when reading a sentence with all caps at the location of focus.

Another possible experiment suggested by this dissertation would be to test experimentally naïve speakers' reactions to the tests for negativity I introduced in chapter 3. These experiments should be run across two groups to start: American English speakers and British English speakers. If there is indeed cross-Atlantic dialectal variation on the use of high negation questions, as has

been suggested previously in the literature, it would be good to determine that empirically. It would indeed be very interesting if the tests I have developed show that high negation questions do not contain propositional negation for American English speakers, but they do contain negation for British English speakers. If that were the case, very different theories of these questions would be needed for the two dialects.

A third avenue for future research is the evidential condition on asking positive vs. low negation polar questions. I discussed the empirical facts in chapter 3, however I did not pursue a theoretical account. I believe these facts will likely be explained by appealing to the markedness of negation, however there are still open questions here to address.

Finally, there is the issue of embedded high negation questions. It is intuitively clear that embedded negative polar questions can be used in contexts where there seems to be an expectation of the positive answer. This looks like epistemic bias. However, as I pointed out in chapter 3, the bias may not be as strong as an unembedded high negation question, so this should be explored further. Other issues to explore here include placing positive polarity items into these negative questions to see if a high negation interpretation can be forced.

5.3 Conclusion

The three research papers in this thesis investigated polarity focus, epistemic bias, and intonation in polar particle responses. The results show that polarity focus is a kind of semantic focus, unrelated to the phenomenon of high negation in polar questions. Epistemic bias in polarity focus questions and high negation questions was shown to have distinct provenances, requiring distinct theoretical accounts. Intonation was shown to have a large effect on the interpretation of polar particles, with the contradiction contour playing the crucial role.

Bibliography

Ahn, Dorothy. 2015. The semantics of additive either. In *Proceedings of Sinn und Bedeutung*, 20–35. Göttingen, Germany.

Alonso-Ovalle, Luis & Paula Menéndez-Benito. 2010. Modal indefinites. *Natural Language Semantics* 18(1). 1–31. doi:10.1007/s11050-009-9048-4. `https://doi.org/10.1007/s11050-009-9048-4`.

AnderBois, Scott. 2016. Negation, alternatives, and negative polar questions in American English. To appear in an untitled collection.

Baayen, R Harald. 2008. *Analyzing linguistic data: A practical introduction to statistics using r*. Cambridge University Press.

Barr, Dale J, Roger Levy, Christoph Scheepers & Harry J Tily. 2013. Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of memory and language* 68(3). 255–278. doi:10.1016/j.jml.2012.11.001. `http://dx.doi.org/10.1016/j.jml.2012.11.001`.

Bartels, Christine. 1999. *The intonation of English statements and questions: A compositional interpretation* Outstanding dissertations in linguistics. New York, NY: Routledge.

Bartsch, Renate. 1973. "negative transportation" gibt es nicht ["Negative transportation" does not exist]. *Linguistische Berichte [Linguistic Message]* 27(7). 1–7.

Benson, Guy. 2017. As gun control advocates cry, "do something," what should conservatives consider? `https://townhall.com/tipsheet/guybenson/2017/10/04/are-there-any-new-gun-regulations-that-are-appropriate-in-the-wake-of-las`

Biezma, María & Kyle Rawlins. 2012. Responding to alternative and polar questions. *Linguistics and Philosophy* 35(5). 361–406. doi:10.1007/s10988-012-9123-z.

Boersma, Paul & David Weenink. 2017. Praat: Doing phonetics by computer [computer program]. Version 6.0.29. `http://www.praat.org/`.

Bolinger, Dwight. 1978. Yes—no questions are not alternative questions. In Henry Hiż (ed.), *Questions*, 87–105. Dordrecht: Springer Netherlands. doi:10.1007/978-94-009-9509-3_3. `https://doi.org/10.1007/978-94-009-9509-3_3`.

Brasoveanu, Adrian, Donka Farkas & Floris Roelofsen. 2013. N-words and sentential negation: Evidence from polarity particles and VP ellipsis. *Semantics and Pragmatics* 6(7). 1–33. doi: 10.3765/sp.6.7. `http://dx.doi.org/10.3765/sp.6.7`.

Büring, Daniel. 2003. On d-trees, beans, and b-accents. *Linguistics and philosophy* 26(5). 511–545.

Büring, Daniel. 2016. *Intonation and meaning*. Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780199226269.001.0001.

Büring, Daniel & Christine A. Gunlogson. 2000. Aren't positive and negative polar questions the same? Ms. UCLA/UCSC.

Chierchia, Gennaro. 2006. Broaden your views: Implicatures of domain widening and the "logicality" of language. *Linguistic Inquiry* 37(4). 535–590. doi:10.1162/ling.2006.37.4.535. `https://doi.org/10.1162/ling.2006.37.4.535`.

Christensen, Rune Haubo Bojesen. 2010. Ordinal—regression models for ordinal data. *R package version* 22.

Constant, Noah. 2012. English rise-fall-rise: a study in the semantics and pragmatics of intonation. *Linguistics and Philosophy* 35. 407–442. doi:10.1007/s10988-012-9121-1. `http://dx.doi.org/10.1007/s10988-012-9121-1`.

Cooper, Robin & Jonathan Ginzburg. 2011. Negation in dialogue. In R. Arstein, M. Core, D. DeVault, K. Georgila, E. Kaiser & A. Stent (eds.), *SemDial 2011 (Los Angelogue): Proceedings of the 15th Workshop on the Semantics and Pragmatics of Dialogue.*, .

Eckardt, Regine & Manuela Fränkel. 2012. Particles, *maximize presupposition* and discourse management. *Lingua* 122(15). 1801–1818. doi:https://doi.org/10.1016/j.lingua.2012.08.014.

Faller, Martina T. 2002. *Semantics and pragmatics of evidentials in Cuzco Quechua*. Palo Alto, CA: Stanford University dissertation.

Farkas, Donka & Kim Bruce. 2010. On reacting to assertions and polar questions. *Journal of Semantics* 27. 81–118. doi:10.1093/jos/ffp010. `http://dx.doi.org/10.1093/jos/ffp010`.

Farkas, Donka F. & Floris Roelofsen. 2017. Division of labor in the interpretation of declaratives and interrogatives. *Journal of Semantics* 34(2). 237–289. doi:10.1093/jos/ffw012.

Fox, Danny. 2007. Free choice and the theory of scalar implicatures. In *Presupposition and implicature in compositional semantics*, 71–120. Springer.

Frana, Ilaria & Kyle Rawlins. 2015. Italian 'mica' in assertions and questions. In *Proceedings of Sinn und Bedeutung 20*, .

Gajewski, Jon R. 2011. Licensing strong npis. *Natural Language Semantics* 19(2). 109–148. doi: 10.1007/s11050-010-9067-1. `https://doi.org/10.1007/s11050-010-9067-1`.

Geurts, Bart. 2010. *Quantity implicatures*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511975158.

Giannakidou, Anastasia. 2002. Until, aspect, and negation: A novel argument for two *until*s. *Semantics and Linguistic Theory* 12(0). 84–103. doi:10.3765/salt.v12i0.2872. `https://journals.linguisticsociety.org/proceedings/index.php/SALT/article/view/2872`.

González-Fuente, Santiago, Susagna Tubau, M. Teresa Espinal & Pilar Prieto. 2015. Is there a universal answering strategy for rejecting negative propositions? Typological evidence on the use of prosody and gesture. *Frontiers in Psychology* 6(899). 1–17.

Goodhue, Daniel. 2017. *Must* ϕ is felicitous only if ϕ is not known. *Semantics & Pragmatics* 10(14). 1–27. `https://doi.org/10.3765/sp.10.14`.

Goodhue, Daniel, Lyana Harrison, Y. T. Clémentine Su & Michael Wagner. 2016. Toward a bestiary of English intonational contours. In Brandon Prickett & Christopher Hammerly (eds.), *The Proceedings of the North East Linguistics Society (NELS)*, vol. 46, 311–320. `http://prosodylab.org/research/bestiary/`.

Goodhue, Daniel, James Pickett & Michael Wagner. 2013. English reverse prosody in yes-no responses. In Raquel Fernández & Amy Isard (eds.), *SemDial 2013 (DialDam): The Proceedings of the 17th Workshop on the Semantics and Pragmatics of Dialogue*, 73–81. `http://www.illc.uva.nl/semdial/dialdam/papers/GoodhueEtal_dialdam.pdf`.

Goodhue, Daniel & Michael Wagner. 2015. It's not just what you say, it's how you say it: Intonation, *yes* and *no*. In Deniz Ozyildiz & Thuy Bui (eds.), *The Proceedings of the North East Linguistics Society (NELS)*, vol. 45, 227–240. `http://ling.auf.net/lingbuzz/002866`.

Goodhue, Daniel & Michael Wagner. 2018. Intonation, *yes* and *no*. *Glossa* 3(1). 5. 1–45. `https://doi.org/10.5334/gjgl.210`.

Grice, Herbert Paul. 1989. *Studies in the way of words*. Cambridge, MA: Harvard University Press.

Grimshaw, Jane. 1979. Complement selection and the lexicon. *Linguistic Inquiry* 10(2). 279–326.

Groenendijk, Jeroen & Martin Stokhof. 1984. *Studies on the semantics of questions and the pragmatics of answers*: Universiteit van Amsterdam dissertation.

Gunlogson, C. 2003. *True to form: Rising and falling declaratives as questions in English*. Routledge.

Gunlogson, Christine. 2001. *True to form: Rising and falling declaratives and questions in english.*: UC Santa Cruz dissertation.

Gutzmann, Daniel & Elena Castroviejo Miró. 2011. The dimensions of verum. In Olivier Bonami & Patricia Cabredo Hofherr (eds.), *Empirical issues in syntax and semantics*, vol. 8, 143–165. Colloque de syntaxe et sémantique à Paris. `http://www.cssp.cnrs.fr/eiss8/`.

Gutzmann, Daniel, Katharina Hartmann & Lisa Matthewson. submitted. Verum focus is verum, not focus: Cross-linguistic evidence. Ms. University of Cologne/Goethe-Universität Frankfurt/University of British Columbia. `https://www.danielgutzmann.com/work/verum-focus-is-verum-not-focus`.

Hamblin, Charles L. 1973. Questions in Montague English. *Foundations of language* 10(1). 41–53.

Hedberg, Nancy, Juan Sosa & Lorna Fadden. 2003. The intonation of contradictions in american english. Paper presented at Pragmatics and Prosody, North West Conference on Linguistics, University of Southern Lancashire, Preston, England.

Heim, Irene. 1982. *The semantics of definite and indefinite noun phrases*: University of Massachusetts Amherst dissertation.

Heim, Irene. 1991. Artikel und definitheit [Article and definiteness]. In Arnim von Stechow & Dieter Wunderlich (eds.), *Semantik: Ein internationales handbuch der zeitgenossischen forschung [Semantics: An international handbook of contemporary research]*, 487–535. De Gruyter.

Herburger, Elena. 2001. The negative concord puzzle revisited. *Natural Language Semantics* 9(3). 289–333. doi:10.1023/A:1014205526722. `https://doi.org/10.1023/A:1014205526722`.

Höhle, Tilman N. 1992. Über verum-fokus im deutschen [About verum-focus in German]. In Joachim Jacobs (ed.), *Informationsstruktur und grammatik [Information structure and grammar]*, 112–141. Wiesbaden: VS Verlag für Sozialwissenschaften. doi:10.1007/978-3-663-12176-3_5.

Holmberg, Anders. 2013. The syntax of answers to polar questions in English and Swedish. *Lingua* 128. 31–50. doi:10.1016/j.lingua.2012.10.018. `http://dx.doi.org/10.1016/j.lingua.2012.10.018`.

Holmberg, Anders. 2016. *The syntax of yes and no*. Oxford University Press.

Horn, Laurence. 1989. *A natural history of negation*. Chicago: University of Chicago Press.

Huddleston, Rodney & Geoffrey K Pullum. 2002. *The Cambridge grammar of the English language*. Cambridge: Cambridge University Press.

Hudson, Richard A. 1975. The meaning of questions. *Language* 1–31.

Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.

Jaeger, T Florian. 2008. Categorical data analysis: Away from anovas (transformation or not) and towards logit mixed models. *Journal of memory and language* 59(4). 434–446. doi:10.1016/j.jml.2007.11.007. `http://dx.doi.org/10.1016/j.jml.2007.11.007`.

Karttunen, Lauri. 1974. Until. In *Proceedings of chicago linguistics society (cls)*, vol. 10, 283–297.

Katzir, Roni. 2007. Structurally-defined alternatives. *Linguistics and Philosophy* 30(6). 669–690. doi:10.1007/s10988-008-9029-y.

Kelly, Mary Louise. 2017. Thoroughbred horses killed in california wildfire. `https://www.npr.org/2017/12/08/569516045/thoroughbred-horses-killed-in-california-wildfire`.

Klassen, Jeffrey & Michael Wagner. 2017. Prosodic prominence shifts are anaphoric. *Journal of Memory and Language* 92. 305–326. doi:10.1016/j.jml.2016.06.012.

Kramer, Ruth & Kyle Rawlins. 2009. Polarity particles: An ellipsis account. In *The proceedings of nels*, vol. 39, .

Kramer, Ruth & Kyle Rawlins. 2012. An ellipsis approach to answer particles in positive and negative contexts. In *Presentation at a workshop on the syntax of answers to polar questions at newcastle university*, .

Kratzer, Angelika. 1991. The representation of focus. In Arnim von Stechow & Dieter Wunderlich (eds.), *Semantics: An international handbook of contemporary research*, 825–834. Berlin: de Gruyter.

Kratzer, Angelika & Junko Shimoyama. 2002. Indeterminate pronouns: The view from Japanese. In Y. Otsu (ed.), *Proceedings of the 3rd Tokyo conference on psycholinguistics*, 1–25. Tokyo: Hituzi Syobo.

Krifka, Manfred. 1991. A compositional semantics for multiple-focus constructions. In S. Moore & A. Wyner (eds.), *Proceedings of the First Semantics and Linguistis Theory conference (SALT 1)*, .

Krifka, Manfred. 1995. The semantics and pragmatics of polarity items. *Linguistic Analysis* 25. 209–257.

Krifka, Manfred. 2013. Response particles as propositional anaphors. In *The proceedings of salt*, vol. 23, 1–18. doi:10.3765/salt.v23i0.2676. `http://dx.doi.org/10.3765/salt.v23i0.2676`.

Krifka, Manfred. 2015. Bias in commitment space semantics: Declarative questions, negated questions, and question tags. In *The proceedings of salt*, vol. 25, 1–18.

Krifka, Manfred. 2017. Negated polarity questions as denegations of assertions. In Chungmin Lee, Ferenc Kiefer & Manfred Krifka (eds.), *Contrastiveness in information structure, alternatives and scalar implicatures*, 359–398. Springer International Publishing. doi:10.1007/978-3-319-10106-4_18.

Ladd, D. Robert. 1980. *The structure of intonational meaning*. Bloomington, IN: Indiana University Press.

Ladd, D Robert. 1981. A first look at the semantics and pragmatics of negative questions and tag questions. In *Papers from the seventeenth regional meeting of the chicago linguistics society* 17, 164–171. Chicago.

Ladd, Robert D. 1996. *Intonational phonology*. Cambridge: Cambridge University Press.

Laka, Miren Itziar. 1990. *Negation in syntax: On the nature of functional categories and projections*. Cambridge, MA: Massachusetts Institute of Technology dissertation.

Lewis, David. 1970. General semantics. *Synthese* 22(1/2). 18–67. doi:10.1007/BF00413598.

Liberman, Mark & Ivan Sag. 1974. Prosodic form and discourse function. In *Proceedings of chicago linguistics society (cls)*, vol. 10, 402–415.

Malamud, Sophia A & Tamina Stephenson. 2015. Three ways to avoid commitments: Declarative force modifiers in the conversational scoreboard. *Journal of Semantics* 32(2). 275–311.

Matthewson, Lisa, Henry Davis & Hotze Rullmann. 2007. Evidentials as epistemic modals: Evidence from St'át'imcets. *Linguistic Variation Yearbook* 7(1). 201–254. doi:10.1075/livy.7.07mat.

Meijer, Anna Marlijn, Berry Claus, Sophie Repp & Manfred Krifka. 2015. Particle responses to negated assertions: Preference patterns for German *ja* and *nein*. In Thomas Brochhagen, Floris Roelofsen & Nadine Theiler (eds.), *Proceedings of the 20th amsterdam colloquium*, 286–295. Amsterdam: ILLC / Dept. of Philosphy, University of Amsterdam.

Merchant, Jason. 2001. *The syntax of silence: Sluicing, islands, and the theory of ellipsis*. Oxford University Press.

Meyer, Marie-Christine. 2013. *Ignorance and grammar*. Cambridge, MA: Massachusetts Institute of Technology dissertation.

Mittwoch, Anita. 1977. Negative sentences with *until*. In *Proceedings of chicago linguistics society (cls)*, vol. 13, 410–417.

Nilsenovà, Marie. 2006. *Rises and falls: Studies in the semantics and pragmatics of intonation*. Amsterdam, The Netherlands: Institute for logic, language and computation dissertation.

Northrup, Oliver. 2014. *Grounds for Commitment*: UC Santa Cruz dissertation.

O'Connor, Joseph D. & Gordon F. Arnold. 1973. *Intonation of colloquial English*. London: Longmans 2nd edn.

Partee, Barbara. 1991. Topic, focus and quantification. In S. Moore & A. Wyner (eds.), *Proceedings of the First Semantics and Linguistis Theory conference (SALT 1)*, .

Pedersen, Walter A. 2015. A scalar analysis of again-ambiguities. *Journal of Semantics* 32(3). 373–424. doi:10.1093/jos/ffu003. `+http://dx.doi.org/10.1093/jos/ffu003`.

Percus, Orin. 2006. Antipresuppositions. In A. Ueyama (ed.), *Theoretical and empirical studies of reference and anaphora: Toward the establishment of generative grammar as an empirical science*, 52–73. Report of the Grant-in-Aid for Scientific Research (B), Project No. 15320052, Japan Society for the Promotion of Science.

Peterson, Tyler Roy Gösta. 2010. *Epistemic modality and evidentiality in Gitksan at the semantics-pragmatics interface*: University of British Columbia dissertation.

Pierrehumbert, Janet & Julia Hirschberg. 1990. The meaning of intonational contours in the interpretation of discourse. In Philip R. Cohen, Jerry L. Morgan & Martha E. Pollack (eds.), *Intentions in communication*, 271–311. Cambridge, MA: MIT Press.

Pope, Emily Norwood. 1972. *Questions and answers in English*. Cambridge, MA: Massachusetts Institute of Technology dissertation.

Portes, Cristel & Uwe Reyle. 2014. The meaning of French "implication" contour in conversation. In Nick Campbell, Dafydd Gibbon & Daniel Hirst (eds.), *7th International conference on Speech Prosody*, 413–417. Dublin, Ireland.

Potts, Christopher. 2002. The syntax and semantics of As-parentheticals. *Natural Language & Linguistic Theory* 20(3). 623–689. doi:10.1023/A:1015892718818.

Potts, Christopher. 2005. *The logic of conventional implicatures*. Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780199273829.001.0001.

Reese, Brian Jon. 2007. *Bias in questions*. ProQuest.

Repp, Sophie. 2013. Common ground management: Modal particles, illocutionary negation common ground management: Modal particles, illocutionary negation and VERUM. In Daniel Gutzmann & Hans-Martin Gärtner (eds.), *Beyond expressives: Explorations in use-conditional meaning*, 231–274. Leiden, Boston: Brill.

Richter, Frank. 1993. Settling the truth. Verum focus in German. Manuscript, University of Massachusetts, Amherst.

Roberts, Craige. 1996/2012. Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics and Pragmatics* 5(6). 1–69.

Roelofsen, Floris & Donka Farkas. 2015. Polarity particle responses as a window onto the interpretation of questions and assertions. *Language* 91(2). 359–414. doi:10.1353/lan.2015.0017. http://dx.doi.org/10.1353/lan.2015.0017.

Romero, Maribel. 2006. Biased *Yes/No* questions: The role of VERUM. *Sprache und Sprach und Datenverarbeitung* 30. 9–24.

Romero, Maribel. 2015. High negation in subjunctive conditionals and polar questions. In Eva Csipak & Hedde Zeijlstra (eds.), *Proceedings of Sinn und Bedeutung*, 499–516. Göttingen, Germany.

Romero, Maribel & Chung-Hye Han. 2004. On negative yes/no questions. *Linguistics and Philosophy* 27(5). 609–658. doi:10.1023/B:LING.0000033850.15705.94.

Rooth, Mats. 1985. *Association with focus*: University of Massachusetts Amherst dissertation.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1(1). 75–116. doi:10.1007/BF02342617.

Rooth, Mats. 2015. Representing focus scoping over new. In Deniz Ozyildiz & Thuy Bui (eds.), *The Proceedings of the North East Linguistics Society (NELS)*, vol. 45, .

van Rooy, Robert. 2003. Negative polarity items in questions: Strength as relevance. *Journal of Semantics* 20(3). 239–273. doi:10.1093/jos/20.3.239. `+http://dx.doi.org/10.1093/jos/20.3.239`.

Rouillard, Vincent & Bernhard Schwarz. 2017. Epistemic narrowing for maximize presupposition. In Andrew Lamont & Katerina A. Tetzloff (eds.), *Proceedings of the 47th annual meeting of the north east linguistic society*, vol. 47, 49–62.

Rullmann, Hotze. 2003. Additive particles and polarity. *Journal of semantics* 20(4). 329–401.

Sagal, Peter. 2017. Not my job: Band leader Paul Shaffer gets quizzed on sidekicks. `https://www.npr.org/2017/07/08/536000569/not-my-job-band-leader-paul-shaffer-gets-quizzed-on-sidekicks`.

Sailor, Craig. 2013. Questionable negation. Handout from the LSA Annual Meeting.

Samko, Bern. 2016a. *Syntax & information structure: The grammar of english inversions*: UC Santa Cruz dissertation.

Samko, Bern. 2016b. Verum focus in alterntive semantics. Handout from the 90th annual meeting of the LSA.

Sauerland, Uli. 2005a. Don't interpret focus! Why a presuppositional account of focus fails, and how a presuppositional account of givenness works. In E. Maier, C. Bary & J. Huitink (eds.), *Proceedings of Sinn und Bedeutung 9, university of nijmegen*, 370—384. Nijmegen: NCS. doi:10.1023/A:1008370902407.

Sauerland, Uli. 2005b. The epistemic step. In *Experimental Pragmatics*, .

Sauerland, Uli. 2008. Implicated presuppositions. In Anita Steube (ed.), *The Discourse Potential of Underspecified Structures* (Language, Context and Cognition 8), 581–600. Berlin: De Gruyter.

Schwarzschild, Roger. 1999. GIVENness, AvoidF and other constraints on the placement of accent. *Natural language semantics* 7(2). 141–177.

Searle, John. 1969. *Speech acts: An essay in the philosophy of language*. Cambridge: Cambridge University Press.

Silk, Alex. 2016. Expectation biases and context management with negative polar questions. Ms. University of Birmingham. `http://www-personal.umich.edu/~asilk/Alex_Silk/home_files/silk%20NPQs.pdf`.

Simons, Mandy. 2007. Observations on embedding verbs, evidentiality, and presupposition. *Lingua* 117(6). 1034–1056.

Smolensky, Paul. 2006. Optimality in phonology II: Harmonic completeness, local constraint conjunction, and feature domain markedness. In Geraldine Legendre Paul Smolensky & (eds.) (eds.), *The Harmonic Mind: From neural computation to optimality-theoretic grammar*, vol. 2, 27–160. MIT Press.

Stalnaker, Robert. 1978. Assertion. In *Context and content: Essays on intentionality in speech and thought*, 78–95. Oxford University Press.

Stechow, Arnim von. 1996. The different readings of *Wieder* 'Again': A structural account. *Journal of Semantics* 13(2). 87–138. doi:10.1093/jos/13.2.87.

Stevens, Jon Scott. 2014. Against a unified analysis of givenness and focus. In *Proceedings of the 31st west coast conference on formal linguistics*, 438–446.

Sudo, Yasutada. 2013. Biased polar questions in english and japanese. In Daniel Gutzmann & Hans-Martin Gärtner (eds.), *Beyond expressives: Explorations in use-conditional meaning*, 275–295. Leiden, Boston: Brill.

de Swart, Henriëtte. 1996. Meaning and use of not. . . until. *Journal of Semantics* 13(3). 221–263. doi:10.1093/jos/13.3.221. +http://dx.doi.org/10.1093/jos/13.3.221.

Tancredi, Christopher. 2014. Focus and givenness across the grammar. In *JSAI International symposium on artificial intelligence*, 200–222. Springer.

Tian, Ye & Jonathan Ginzburg. 2017. "No, I AM": What are you saying "no" to? In Robert Truswell (ed.), *Sinn und Bedeutung (SuB) 21*, 1–12.

Torreira, Francisco & Martine Grice. 2017. Melodic constructions in Spanish and their implications for intonational phonology. Ms. McGill University.

Trinh, Tue. 2014. How to ask the obvious: A presuppositional account of evidential bias in english yes/no questions. In Luka Crnič & Uli Sauerland (eds.), *The art and craft of semantics: A festschrift for Irene Heim*, vol. 2, MITWPL 71.

Truckenbrodt, Hubert. 2012. Semantics of intonation. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning*, vol. 3, 2039–2969. Berlin: de Gruyter. doi:10.1515/9783110253382.2039.

Wagner, Michael. 2005. *Prosody and recursion*: MIT dissertation.

Wagner, Michael. 2006. Givenness and locality. In *Semantics and Linguistic Theory (SALT)*, vol. 16, 295–312.

Wagner, Michael. 2012a. Contrastive topics decomposed. *Semantics and Pragmatics* 5(8). 1–54. doi:10.3765/sp.5.8. http://dx.doi.org/10.3765/sp.5.8.

Wagner, Michael. 2012b. Focus and givenness: a unified approach. In Ivona Kučerová & Ad Neeleman (eds.), *Contrasts and positions in information structure*, 102–147. Cambridge University Press. doi:10.1017/CBO9780511740084.007.

Ward, Gregory & Julia Hirschberg. 1985. Implicating uncertainty: The pragmatics of fall-rise intonation. *Language* 61(3). 747–776. doi:10.2307/414489. `http://dx.doi.org/10.2307/414489`.

Westera, Matthijs. 2017. *Exhaustivity and intonation: A unified theory*. Amsterdam: Institute for Logic, Language and Computation, University of Amsterdam dissertation.

Wilder, Chris. 2013. English 'emphatic *do*'. *Lingua* 128. 142–171. doi:10.1016/j.lingua.2012.10.005. SI: Polarity emphasis: distribution and locus of licensing.

Zeijlstra, Hedde. 2004. *Sentential negation and negative concord*. Utrecht, The Netherlands: LOT Publications.