Informative Presupposition & Accommodation

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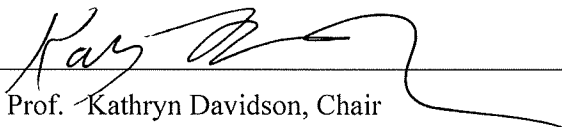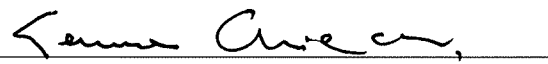
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The undersigned, appointed by the

Department of Linguistics

have examined a dissertation entitled

"Informative Presupposition & Accommodation"

presented by Ethan Gotlieb Wilcox

candidate for the degree of Doctor of Philosophy and hereby
certify that it is worthy of acceptance.

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Date: May 5, 2022

Informative Presupposition & Accommodation

Thesis advisors: Kathryn Davidson & Roger Levy   Ethan Gotlieb Wilcox

Informative Presupposition & Accommodation

Abstract

Presuppositions are the parts of meanings of utterances which are backgrounded and strongly committed to by the speaker. They are carried by a diverse range of lexical items called presupposition triggers, which include determiners, particles, open class verbs, and syntactic constructions. For example, the sentence "Lee read *War and Peace* again" asserts that Lee read *War and Peace* and presupposes that she has done so previously via the trigger *again*. Most triggers occur in contexts where their presuppositions are supported (i.e. already entailed) by a local context; however some can also occur in contexts that lack local support, in which case their presuppositions are informative. Informative use of presupposition is typically modeled via an accommodation mechanism (Lewis, 1979) that pre-updates a context prior to utterance interpretation to go along with the presuppositions of a sentence. Understanding when triggers can communicate novel information using accommodation—which I refer to as the "Novelty Problem" for presupposition triggers—is the main goal of this dissertation.

The dissertation is arranged into five chapters. Chapter 1 provides a background on presupposition and accommodation, and introduces the notion of Contextual Felicity Constraints, or CFCs (Tonhauser et al., 2013). If a trigger is infelicitous in cases where its presuppositions are not entailed, it is said to be subject to a strong CFC. Chapter 2 measures the CFCs for thirteen English presupposition triggers in two online comprehension studies, making it the largest cross-trigger comparison of CFCs

reported in the literature to-date. A ranking of triggers is proposed, from weak-CFC triggers to strong-CFC triggers. Chapter 3 presents a theoretical solution to the novelty problem, which views CFCs as the result of an information-structural discourse clash. The proposal, which I refer to as the Maximalty/Accommodation Clash (or MAC), treats CFCs as arising not from accommodation failure, but from downstream semantic contradictions that result from successful accommodation. Chapter 4 develops this proposal within alternative pragmatic frameworks. Finally, Chapter 5 presents two studies that test the MAC experimentally. Taken together, the results lend support for the perspective that presupposition triggers impose constraints on the context in which they are uttered and that their contextual felicity is modulated by local information structure—the two key ingredients of the MAC approach

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This thesis is dedicated to:

My brother, Oren
My parents, Jane and Dean
And their parents, Frank, Margaret, Kelly and Phyllis

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Introduction

Meanings are messages embedded into a formal system that are precise, potentially unrelated from the context in which they were created, and potentially infinitely complex. Understanding what makes a meaning and how to model the formal system in which they are embedded is the study of semantics. Understanding how meanings work in a particular context, and how to model the relationship between meaning and context is the study of pragmatics. The two are inextricably bound together and this dissertation is good evidence of that—it is about semantics, pragmatics, and how they are related.

Starting in the early 20th century, semanticists began to ask whether meanings were homogeneous, or whether they could be broken down into multiple, distinguishable subcategories. That is, they began looking for an ontology of meanings. The first major step in this program was scholarly consensus that meanings could be divided into at least two categories: Assertions and presuppositions. Assertions were taken to be the primary contributions of a sentence; the main point that it conveyed. Presuppositions, on the other hand, were secondary, backgrounded components of a sentence, the assumptions that must be met in order for the utterance to be coherent. Presuppositions are introduced by individual lexical items called presupposition *triggers*. Presupposition triggers are a heterogeneous class of items, which include verbs, particles, determiners and even full syntactic constructions. To give a brief example, the utterance "Lee read *War and Peace* again" is taken to assert that Lee read *War and Peace*, and to presuppose that she had done so previously via the presupposition trigger *again*. Since this initial conceptual distinction of presupposition vs. assertion, more types of meaning have been added to our ontology, however interest in presuppositions has endured. Understanding the empirical nature of presuppositions, as well as creating theories for why these meanings behave the way they do, has become one central goal in semantics and pragmatics, and is the larger project of which this dissertation forms a part.

As the study of presupposition grew, a perspective crystallized that viewed presuppositions as signifying something about the relationship between a sentence and the context in which it was uttered. Debates ensued about the nature of this relationship: Were presuppositions assumptions made by a speaker (Stalnaker, 1973)? Requirements imposed on the context by a sentence (Heim, 1983)? Or anaphors, akin to pronouns, that needed to be bound by previous material (Van der Sandt, 1992; Kripke, 2009)? Although these perspectives differ, all of them viewed presupposed meaning, at its basic level, as backwards looking or discourse-old. Presuppositions were treated as conveying information that has already been established before the presupposition trigger itself is uttered. There is, however, a basic problem with this perspective. Sometimes presuppositions can be used to convey

novel information. Take, for example the following pair of sentences "Lee is having a bad day. She is upset that someone took her copy of *War and Peace*." Looking at the second sentence, it is generally assumed that *upset that* presupposes the truth of its complement and that *her* presupposes that its referent owns its complement. In this case, the utterance introduces two presuppositions, both that Lee owns a copy of *War and Peace* and that someone took it, neither of which is supported by the local context. The problem of how to incorporate novel, or informative use of presuppositions into a broader theory of meaning is what I will refer to the Novelty Problem for presuppositions, and the motivating puzzle of this dissertation.

The main response to the novelty problem is to assume that presuppositions can be flexibly accommodated (Lewis, 1979; Von Fintel, 2008). That is, if someone utters a sentence with a presupposition which is not supported, interlocutors will flexibly adjust their representation of the context to support the requirements imposed by the presupposition. While accommodation is an elegant solution, merely positing the existence of an accommodation mechanism does not resolve the issue because, problematically, there are presuppositions that resist accommodation. For example consider the following sentence pair: "Lee is having a bad day. She lost her copy of *War and Peace*, too." In this context, the second sentence sounds distinctively odd. This is because *too* resists having its presupposition (that Lee lost something other than *War and Peace*) used to communicate novel information. Connecting back with the theory of accommodation, we can state that the presuppositions of *too* resist accommodation. Likewise, adopting the terminology that I will use for the rest of this dissertation, we can say that *too* is subject to a Contextual Felicity Constraint, or CFC for short (Tonhauser et al., 2013). In order to gain traction on the novelty problem, concretely, this dissertation will introduce ways that CFCs can be measured using experimental methods and propose theories for why some presupposition triggers, like *too*, are subject to CFCs, while others, like *upset that* are not.

Contextual Felicity Constraints have been hypothesized to arise for a number of reasons, including social aspects of a discourse such as the amount of trust between speakers and listeners, information

theoretic components of the proposed material, as well as formal semantic and pragmatic factors. This dissertation focuses solely on the third of these causes. In order to demonstrate that formal semantic properties can influence contextual felicity, I conduct a series of experiments showing that there is substantial trigger-by-trigger variation in terms of contextual felicity, and that semantically like triggers cluster together. For example, additive particles (*too*, *again*, *back*) are all associated with stronger CFCs, and exclusive operators (*only*, it-clefts) with weaker CFCs. Theoretically, I endorse a view of CFC effects that roots them in an information-structural discourse clash. During utterance interpretation, comprehenders are sensitive to two pragmatic pressures: The first is to be accommodating and to accept an utterance's presuppositions without fuss. The second is to interpret an utterance in a maximally informative manner by strengthening it to convey information beyond its literal meaning. Sometimes, due to the way that certain triggers package the relationship between their presupposed and asserted content, these two pressures are in competition with each other, producing a discourse clash. Comprehenders are sensitive to this discourse clash, and it is responsible for CFC effects. I call this approach the Maximality/Accommodation Clash (MAC) approach to contextual felicity.

While building on Lewis's original proposal for accommodation, the perspective I endorse is compatible with a somewhat different interpretation for its function in discourse. While accommodation has traditionally been viewed as a last-resort mechanism, saving an utterance at the last minute from uninterpretability, the MAC perspective treats accommodation as a routine component of communication. Rather than rooting CFC effects in the failure of accommodation, this view proposes that CFCs arise from the downstream consequences of *successful* accommodation. Taking a broader perspective, the proposed view of accommodation raises questions about why presupposition should exist across the world's languages. If presuppositions will generally be accommodated, then why would a producer frame their message with a combination of presuppositions and assertions, rather than just assertions? Although this is not the main point of the dissertation, my perspective on accommodation is compatible with a treatment of presupposition as being useful for maintenance of attention during

discourse. They give producers the opportunity to frame some material as backgrounded while being confident that it will be accepted by their interlocutors.

The dissertation is organized into five chapters: Chapter 1 provides a background on presuppositions, accommodation, and contextual felicity. Although it is opinionated, the goal here is merely to introduce the mainstream approaches to presupposition, rather than to adjudicate between them. Chapters 2 and 5 are experimental: Chapter 2 evaluates the contextual felicity of thirteen English presupposition triggers in a broad range of contexts, while Chapter 5 introduces targeted experiments that test particular aspects of two triggers and is designed to help draw out differences between different theoretical predictions. Chapter 3 and 4 are theoretical. Chapter 3 introduces a novel theory for Contextual Felicity Constraints from within a particular paradigm, and Chapter 4 extends this work in different paradigms. Each of the chapters is outlined in greater detail below:

Chapter 1 provides a background on presupposition, setting up the Novelty Problem for presuppositions and introducing previous attempts to solve it. I argue that presuppositions are a natural class of meanings, which are backgrounded (in the sense that they cannot be easily targeted by negation), strongly-committed to (in the sense that the cannot be canceled) and not necessarily speaker-oriented. Next, I introduce major theoretical approaches to presupposition, focusing on the satisfaction approaches, which view presuppositions as imposing constraints on the context in which they are uttered, and anaphoric approaches, which view presuppositions as elements akin to pronouns that must be bound by preceding linguistic material. Previous solutions to the Novelty Problem are introduced, including the hypothesis that contextual felicity is governed by the information content of their presupposition (Van der Sandt, 1992), the presence of non-triggering alternative utterances (Blutner, 2000), and the focus-sensitivity of trigger itself (Göbel, 2020). I outline the predictions that each hypothesis makes for thirteen presupposition triggers.

Chapter 2 introduces an experimental framework for assessing Contextual Felicity Constraints and tests the strength of CFCs for thirteen presupposition triggers in English. Experiment 1 tests

CFCs imposed by triggers in matrix clauses of sentences, finding that all triggers are subject to some Contextual Felicity Constraint except for possessive pronouns and factive predicates. Looking at effect sizes of CFCs, I find good correlations between the experimental paradigm presented here and corpus-based production data, providing ecological validity for the approach. Experiment 2 tests CFCs for presupposition triggers in embedded contexts, such as under the scope of negation, producing similar results to Experiment 1. A ranking of triggers is proposed, with additives triggers imposing the strongest CFCs, followed by exclusives, open-class verbal predicates, and finally possessive pronouns and factive predicates. The experimental results are compared to theories from the previous section. I conclude that while some approaches are consistent with the data, none successfully predicts the full range of trigger-by-trigger variation, nor why some triggers should not be subject to any Contextual Felicity Constraint.

Chapter 3 presents a theory for novelty effects from within the perspective of presuppositions that treats them as constraints on the context in which they are uttered. It is hypothesized that during conversation comprehenders are subject to two competing pragmatic pressures: The first is to be accommodating and, in the words of Von Fintel (2008) to adjust their context to meet the presuppositional requirements imposed by a sentence "quietly and without fuss." The second pressure is to interpret utterances, especially responses to questions, in a maximally informative manner. Sometimes, because of the way that a trigger packages the relationship between its asserted and presupposed content these two pressures are pitted against each other. When this happens a discourse clash is produced, and it is this discourse clash that gives rise to the observed contextual felicity effects. I refer to this hypothesis as the Maximality/Accommodation Clash, or MAC, approach to contextual felicity. The MAC approach builds on recent advances in the literature on presupposition by connecting presuppositional phenomena to information-structural considerations, such as exhaustivity and focus sensitivity. It is novel insofar as it proposes that contextual felicity is not due to the success or failure of an accommodation mechanism. Rather, the MAC is consistent with a perspective that views presuppositions as

generally being accommodated, and CFC effects arising from downstream contradictions that are the result of successful accommodation.

Chapter 4 continues the theoretical discussion, proposing ways in which the MAC could be articulated from a Neo-Gricean and Iterated Rationality Modeling perspective. For the latter, I develop a model of presupposition interpretation using the Rational Speech Act modeling framework, which views utterance interpretation as recursive reasoning between various communicative speaker/listener layers. The model proposes that, in addition to reasoning about meaning and message choice, comprehenders reason about the communicative intent of of the presupposition trigger: Is it meant purely presuppositionally, or to convey novel information? I demonstrate that a very basic model derives the prediction that *too* should never be used informatively, as it is an imprecise (i.e. not informative) way of communicating information relative to nearby alternative utterances.

Chapter 5 tests the presuppositions as anaphors approach and the MAC in two experiments. Experiment 1 assesses the analogy between presuppositions and anaphora by asking whether one additive presupposition trigger (*too*), like pronouns, can enter into cataphoric dependencies, where the pronoun precedes its co-referential R-expression. The second experiment directly assesses the MAC by investigating whether local information structural considerations can influence the relative acceptability of the presupposition trigger *again*. Taken together, the results lend support for the perspective that presupposition triggers impose constraints on the context in which they are uttered and that their contextual felicity is modulated by local information structure—the two key ingredients of the MAC approach advocated in Chapter 3. However, at the same time, they suggest that the approach may not be able to explain all the observed variance and that anaphoricity may still be a crucial ingredient in explaining the full distribution of CFC effects.

Before moving on to Chapter 1, I want to pause and briefly motivate the study of presupposition and accommodation. Why should anyone would be interested in such arcane subjects? Although presuppositions have traditionally been analyzed a sort of second form of meaning, they are, in fact,

extremely common in both spoken and written text. Furthermore, corpus studies suggest that presuppositions require accommodation about one third the time they are used (Spenader, 2002). So understanding how and when accommodation takes place is central for understanding the basic mechanics of linguistic communication. Second, presupposition and accommodation can be used by people to frame messages in ways that may benefit them, or their objectives. To illustrate this with a brief example, let's consider some language from our recent political discourse, president Barack Obama's 2009 inaugural address. Near the start of the speech Obama states: "[W]e have always understood that when times change, so must we; that fidelity to our founding principles requires new responses to new challenges; that preserving our individual freedoms ultimately requires collective action." Here, *understand that* is a presupposition trigger. Sentences such as "I understand that times have changed" are typically analyzed to presuppose that times have changed and to assert that the speaker is aware of this information. In this case, Obama uses this construction *not* to convey a conception of America that he wants to be backgrounded or that he assumes, already, to be broadly shared and uncontroversial. Rather, he uses this construction to articulate the main visions of his presidency and he does so by using language which implicitly assumes that these are universally shared beliefs. I don't pick this quote to suggest that Obama is alone in his use of presuppositions. Examples like this are easy to find in political discourse. In a campaign speech in 2016, for example, Hillary Clinton contended, "We have to stop the endless flow of secret, unaccountable money that is distorting our elections, corrupting our political process, and drowning out the voices of our people." Here Clinton's sentence communicates her vision of dark money in politics not by claiming that it exists, but by presupposing it and claiming that it must be stopped.

The experiments and theories discussed in this dissertation can explain why these powerful figures choose to frame messages in the way that they do. Both *upset that* and *stop* are triggers that impose weak or almost no Contextual Felicity Constraints. Thus, they can be used to introduce information

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presuppositionally without calling attention to what they are doing.[1] The point I wish to draw out with these examples is that, beyond its linguistic interest, the study of presupposition and accommodation has implications for understanding the society that we live in, and how ideas and messages are exchanged within it.

Finally, all the experimental materials, analysis scripts and code for generating figures is available at the following link: `https://osf.io/83n2q/`.

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[1] We could compare this use messaging to other political language that is less subtle in its presupposition use. Take, for example, Trump's slogan "Make America great again," which frames its message in a combination of assertions (we should make America great) and presuppositions (America used to be great but no longer is). By using a trigger associated, as we shall see, with CFCs that are strong, but not so strong that they make the sentence totally unacceptable, this sentence calls attention to itself and sets itself apart from other political speech.

1

A Background on Presuppositions

1.1 Introduction

Presuppositions are the parts of meanings of utterances that are seemingly non-novel and backgrounded, and survive various entailment-canceling operations. They are introduced by individual lexical items called presupposition *triggers*, for example in the sentence "Alex spilled coffee again" the trigger *again* introduces the presupposition that Alex has spilled coffee previously. This chapter provides a intro-

duction to presuppositions, focusing on aspects that will be central to the main issue of this thesis: When can presuppositions be used to introduce novel information? Section 1.2 introduces the basics of presuppositions, focusing on their characteristic behaviors. Section 1.3 dives into various theoretical approaches that have been proposed to explain presuppositional phenomena. I propose that theories can be divided into three basic groups: Semantic theories assume presuppositions are parts of meaning that have a special status at the moment they are introduced into the derivation. Pragmatic theories assume that presuppositions have no special meaning status, but wind up being presupposed as the result of a productive triggering algorithm. Finally, hybrid theories assume that presuppositions are a mixed category, incorporating both semantic an pragmatic approaches. Turning to the central issue of this dissertation, Section 1.4 discusses theories that have been proposed to explain Novelty Effects, introducing four proposals for when presuppositions can be used to introduce novel information.

1.2 Presuppositions and their Properties

1.2.1 Presuppositions: A Natural Class of Meaning?

Presuppositions have played a central role in formal semantics since its origins in the late 19th and early 20th century. The first presupposition to be identified was the definite determiner, and early debates focused around whether sentences that contained a non-referring definite determiner (famously, "The king of France") were false (Russell, 1905) or lacking a truth value all-together (Strawson, 1950; Frege, 1892). As this latter view gained traction, further lexical items were discovered which, it was argued, could cause a sentence to lack truth values under special circumstances. These items were dubbed *presupposition triggers*. Over the years the number of presupposition triggers swelled: In addition to the original definite determiner, presupposition triggers included semantic operators such as *only* and *even*; additive particles (*too*, *again*, *back* and *still*); verbs (*stop* and *win*); factive predicates like *know* and

regret; possessive pronouns; as well as syntactic constructions including questions and clefts.

The heterogeneous nature of this group has lead to a question: Are presuppositions a natural class of meanings, or are they a historical artifact (Karttunen, 2016)? By way of introducing presuppositional phenomena, and establishing them as a natural basis for inquiry, this section will argue that presuppositions are, indeed, a natural class of meanings. Using the definition of the term from phonology, I will introduce a set of distinctive behaviors that are associated with presuppositions and presuppositions alone. Instead of using articulatory or acoustic properties to delineate classes, semantic diagnostics are used to differentiate presuppositions from three other categories of meaning: regular asserted content (i.e. the information conveyed by matrix clauses of sentences), conversational implicatures such as scalar implicatures (Horn, 1972); and conventional implicatures (Potts et al., 2005) including non-restrictive relative clauses and appositive phrases. It will be argued that presuppositions are a natural class that comprises meanings which are backgrounded, strongly committed to, and not necessarily speaker-oriented.

PROJECTIVITY   The behavior most associated with presuppositions is their projectivity: when triggers are embedded in sentences under the scope of entailment canceling operators, the meaning conveyed by their presuppositions are preserved (Chierchia & McConnell-Ginet, 2000). For example, we can compare (1-a) and (1-b). The unembedded utterance in (1-a) commits the speaker to the asserted content that Logan ran in the Boston Marathon, as well as the presupposed content, that Logan has participated in the Boston Marathon in a previous year. When the whole sentence is placed under a possibility modal, as in (1-b), it no longer commits the speaker to the asserted content, but it does still commit the speaker to the presupposition.

(1)   a.   Logan ran the Boston Marathon again this year.

                Entails: Logan ran in the Boston Marathon this year.

                Presupposes: Logan has run in the Boston Marathon in a previous year.

b. Logan might have ran the Boston Marathon again this year.

    Does not entail: Logan ran in the Boston Marathon this year.

    Presupposes: Logan has run in the Boston Marathon in a previous year.

But there are two problems with projectivity as a possible diagnostic: First, there is some material not traditionally analyzed as presuppositional that projects, including all conventional implicatures. But more worryingly, it seems that not even all presuppositions project in all circumstances. Consider the sentence in (2), adapted from Abusch (2002).

(2) I don't know if Logan participated in the Boston Marathon, but if she won it she will have won more marathons than anybody else I know.

The verb *win* is typically taken to presuppose participation (that is, *x won y* presupposes that *x participated in y*), and the antecedents of conditionals are entailment canceling environments from which presuppositions typically project. Putting these two facts together we might expect that triggers uttered in the antecedents of conditionals commit speakers to their presuppositions. But this does not seem to be the case in (2), where even though the speaker explicitly denies the presupposition, the whole sentence is interpretable. Facts like these make it difficult to use projection as a diagnostic for presupposition.

NON-TARGETABILITY   We now turn to diagnostics that successfully differentiate presuppositions from other forms of meaning. The first of these is associated with the claim that presuppositions introduce information that is backgrounded, not "at-issue" or not the main point of an utterance (Beaver et al., 2021). One of the main empirical bases for this claim is that presupposed material cannot be easily targeted with discourse-level negation. For example, in (3), B's objection targets the at-issue proposition that Alex *won* a marathon, not the presupposition that she participated in one.

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(3)   A: Alex won a marathon.

        B: No she didn't.

That is, B's response is typically taken to mean "No, she didn't win" not, "No, she didn't participate." This is our first diagnostic: If a piece of material can be targeted by discourse-level negation then it is not a presupposition. This diagnostic will differentiate presuppositions from at-issue entailments; however it does not distinguish between presuppositions and conventional or conversational implicatures, which we turn to below.

NON-DENIABILITY   Another property of presuppositions is that they strongly commit the speaker to the truth of the presupposed material. A good diagnostic for this aspect of their behavior is that presuppositions are more difficult to deny than implicated entailments, when the presupposition and the denial are in the same sentence, and the presupposition isn't under the scope of an operator. To illustrate this point, consider the variation in acceptability between denying the presuppositions of *again* in (4-a) and the scalar implicature set up by *some* in (4-b). It is typically judged that denial of the presupposition results in a contradiction, whereas denial of the scalar implicature leads to something more akin to clarification.

(4)   a.   #Alex won a marathon again ...but she hasn't won one before.

        b.   Alex ran some of a marathon ...in fact she ran the whole thing.

Now we have two diagnostics, and using them we can reliably differentiate presuppositions from asserted content and conversational implicatures. Next, we turn to conventional implicatures, and discuss two potential ways to distinguish them from presuppositions.

NON-NOVELTY   Presuppositions usually convey information that is not novel to a discourse, either because it has been previously established or because it is common knowledge. This property could

potentially separate them from Conventional Implicatures, which usually contribute novel informa-tion (Potts et al., 2005). However, there are a number of presuppositions—dubbed the *informative presuppositions*—which can readily be used to add new information to a discourse in many situations. The case of informative presuppositions will be given a longer treatment when we discuss the Novelty Problem in Section (6) below. for now, we note that this property is much like projection: something which has been at the heart of semanticists' intuitive notion of what it means to be a presupposition, but which is not directly observable at least for all presupposition triggers.

OBLIGATORY LOCAL EFFECT   Conventional Implicatures are *speaker-oriented*, whereas presuppo-sitions are not. To tease apart this difference between the two classes of meanings, we use the Oblig-atory Local Effect diagnostic discussed in Tonhauser et al. (2013). Material that has a local effect is necessarily contributed to the local context when it appears under the scope of an operator, whereas non-local material can be contributed only in the global context. To illustrate this point, compare the variation in available meanings between (5-a) and (5-b) below.

(5)   a.   Alex believes that Ari won a marathon again this weekend.

       b.   Alex believes that Ari, who won a marathon previously, won one this weekend.

In (5-a), both the presupposition and the asserted content must be true in all of Alex's belief worlds. That is, she must believe that Ari both won a marathon this weekend, and has one one on a previous weekend. This is not true in (5-b). Here, even though the conventional implicature is introduced under the scope of *believe*, there is a possible reading of the sentence where Alex believes that Ari has won exactly one marathon.

Thus, we have our three properties for presuppositions with three reliable diagnostics to identify them: They are backgrounded and cannot be targeted with discourse level negation; they are strong speaker commitments, which cannot be denied or canceled; and finally they are not speaker or speech-

act oriented, and will always have an obligatorily local effect in addition to whatever projective properties they may possess.

1.2.2 Three Open 'Problems' for a Theory of Presuppositions

Now that I have introduced the behavior that defines presuppositions, this section discusses why they are of interest to theories of meaning. In particular, I turn to three open problems for the study of presuppositions: The Triggering Problem, the Projection Problem and the Novelty Problem, which is the main focus of this dissertation.

The Triggering Problem   While perhaps the most fundamental of our three problems, the triggering problem has received the least amount of discussion in the literature on presuppositions. The triggering problem asks: Why do some lexical items introduce presuppositional content, whereas other do not? What is the origin of presuppositional (and perhaps more broadly, projective) material? Answers to these questions fall into two broad clusters, described below.

The first type of answer, and the reason why the triggering problem has received less attention historically, is to assume that presuppositions, like other types of semantic contribution, are arbitrary mappings between form and meaning. Thus, questions about why *angry that* presuppose the truth of its compliment whereas *heard that* does not, are perhaps interesting within the context of child language-learning, but not necessarily central to semantic theory. The main argument for this approach to the problem has to do with the heterogeneity of the items that introduce presuppositions. As noted above, presupposition triggers are a diverse group, and at first glance, it seems unlikely that single triggering algorithm could explain why these items (as opposed to others) presuppose. Indeed, no proposal for a productive triggering algorithm covers anywhere near all the triggers. Another argument for the necessity of at least *some* arbitrary mapping, comes from pairs of words that differ only in their presupposed content. For example, *know* and *believe* differ only in that the former car-

ries a veridicality presupposition. Because, other than the presupposition, these items carry the same entailments, the differences between them cannot be explained via algorithmic mechanisms.

The second approach assumes that, while an item's entailments are arbitrary mappings between form and meaning, which of those entailments ends up getting presupposed is the result of a systematic process. Much of this work stems from the observation that many presuppositions constitute conceptual preconditions for their corresponding asserted content (these are, roughly, the *lexical* triggers of Zeevat (1992)). So, for example, not only does *x won y* presuppose *x participated in y*, but it is hard to imagine how one statement could be true without the other. Schlenker (2021) argues that these relationships are best captured in terms of a systematic algorithm, as they are both flexible and productive; for example, comprehenders may infer presuppositions when they encounter novel iconic gestures. A different approach, taken by Abrusán (2011) and Abrusán (2016), assumes that instead of conceptual structure, the central core of the triggering algorithm is *aboutness*. Thus, *win* presupposes *participate* because it constitutes an entailment that is about a secondary event time, namely the events leading up to, but not including the *winning* event. One attractive feature of these algorithmic approaches is that, by rooting the process in (presumably) universal cognitive operations—conceptual preconditions, aboutness—they can explain crosslinguistic similarities in triggering phenomena, for example why *win* presupposes *participate* in multiple languages. Of course, the best theory may combine arbitrary mappings together with algorithms, the former to explain presuppositions of additive particles, scalar items and determiners, the latter to explain presuppositions of verbs and crosslinguistic generalizations.

THE PROJECTION PROBLEM   The projection problem is the problem of determining the presuppositions of complex sentences from the presuppositions of their parts, with much of the focus on sentences joined by the classical logical connectives *and*, *or*, *not* and *if...then*. Although solving the projection problem has perhaps been *the* central endeavor in research on presuppositions in the last

fifty years, it is not the main focus of this thesis, and so it will receive only a brief treatment below.

The first major step towards resolving the projection problem was Karttunen (1973)'s classification of sentence-building operators into *plugs*, *holes* and *filters*. Plugs are operators that block presupposition projection. Commonly cited plugs include verbs of saying and direct quotation. For example, the sentence "I heard Amos say 'my horse likes sugar cubes'" doesn't commit the speaker to the proposition that Amos has a horse, merely that he uttered the reported speech. Opposite to plugs, *holes* are operators that always pass their presuppositions on to the global level. Examples of holes include negation and modals of possibility (*might*, *possible that*, *maybe*). Finally there are *filters*. Filters are operators that act like holes in most cases, but their projectivity behavior is sensitive to the entailment relationships between the sentences that they combine. For example, Sentence (6-a) combines two sentences, one with the presupposition that Amos has gone to the beach previously, the other that Amos has a brother, and appears to presuppose both of them. Thus, we might want to be tempted to say that the presuppositions of the complex sentence are the presuppositions of each operand. However, things change if the left sentence entails the presuppositions of the sentence on the right, as in (6-b). In this case the whole sentence seems to presuppose nothing.

(6)   a.   Amos went to the beach again yesterday, and brought his brother with him.

       b.   Amos went to the beach three days ago, and went again yesterday.

How are filters to be treated, theoretically? Initial efforts proposed writing rules for the compositional properties of presuppositions for each logical connective. For example, if we take $\mathcal{P}(x)$ to be the presuppositions of x, then we can capture the behavior of "and" with the following algorithm:

$$\texttt{If } (a \vdash \mathcal{P}(b)) \texttt{ then } \{\mathcal{P}(a \wedge b) = \mathcal{P}(a)\} \texttt{ else } \{\mathcal{P}(a \wedge b) = \mathcal{P}(a) \wedge \mathcal{P}(b)\} \tag{1.1}$$

There are two types of criticism for this approach: First, there are a number of different filters (Karttunen (1973) discusses three: *and*, *either...or* and *if...then*), and different rules for presupposition passing needs to be specified for each. Second, as pointed out in Gazdar (1979) and Heim (1983), the rules for filtering presuppositions are independent from the rules for determining the truth conditional content. So language learners would need to learn two sets of rules—one for determining the truth conditions for the complex sentence, and another for determining its presuppositions. This is undesirable both because it seems overly complex, and because it doesn't seem to be sufficiently explanatory. Surely, Heim states, "a more explanatory theory would not simply stipulate [the inheritance properties] as a lexical idiosyncrasy of [the connective], but would somehow derive it on the basis of general principles and the other semantic properties of [the connective]."

Most contemporary accounts of the projection problem attempt to follow up on this charge by developing a single mechanism that handles compositionality of both presupposed and asserted material. I will mention two below. The first, Dynamic Semantics (Kamp, 1981; Heim, 1983), treats sentences not as denoting a truth value, but as functions from conversational contexts to new conversational contexts (modeled as sets of worlds). Presuppositions are requirements on the domain of these functions, so the function denoting the sentence "Amos went to the beach again" is only defined for contexts where Amos has been to the beach previously. Under this approach, the operator *and* is an instruction for successive context update of first the left operand and then the right operand. One advantage of this approach is that it explains why sentences like (6-b) bear no global presuppositions, without having to stipulate an additional rule for presupposition filtering: the presuppositions of the second conjunct have been satisfied when the context has been updated with the first conjunct. Taking a different approach, Schlenker (2008) maintains classical semantics, and derives the projection properties from left-to-right processing considerations plus two competing pragmatic pressures, *Be Articulate!* (that is, explicitly state what it is you presuppose) and *Be Brief!*. Because this approach relies on Gricean-style maxims that operate universally, it also eliminates the need for special projection

rules for each logical connective.

The Novelty Problem (Missing Accommodation, Contextual Felicity)   The Novelty Problem is the core empirical puzzle taken up by this dissertation. Because theoretical approaches to this problem will be discussed at length in Section 1.4, this section will merely introduce the problem without outlining previous attempts to solve it. The core of the novelty problem is that while most triggers are allergic to environments where their presuppositions are not entailed, some triggers are happy to occur in such environments. Thinking about novelty effects from the perspective of presupposition in discourse, another way to state the novelty problem is that some presuppositions can be used to communicate novel information (i.e. information that is not entailed by the context) whereas other presuppositions cannot. An example of this variation is given in (7), where both continuations presuppose the same content (that someone spilled coffee on Alex's blazer), but the first is a more natural continuation given the minimal context.

(7)   Alex is having a bad morning at work...

   a.   ... she is annoyed that someone spilled coffee on her blazer.

         Presupposes: Someone spilled coffee on Alex's blazer.

   b.   #... it was Amos who spilled coffee on her blazer.

         Presupposes: Someone spilled coffee on Alex's blazer.

One difficulty in addressing the novelty problem is that it has been discussed by various names and in multiple different frameworks. Some researchers view the problem as the breakdown of an accommodation mechanism (which we will introduce at-length in Section 1.3.1, but for now we can think about it, non-technically as "going along with" the presuppositions of a sentence). They use the term "missing accommodation" to describe the phenomenon. Others use "informative presupposition", while still others have questioned whether informative triggers even bear presuppositions at all, and

use the more theory-neutral term Contextual Felicity Constraint variation or (CFC variation). To be as clear as possible, this work will use the latter term when discussing theory neutral aspects of the problem, like the results of experiments, but will sometimes adopt the "missing accommodation" terminology when discussing the problem from the perspective of the accommodation framework.

Further complicating things is the fact that novelty effects likely arise from a variety of causes. Three that have been discussed previously in the literature include (i) social aspects of situation, such as the amount of trust between speakers or the local goals of the conversation (Von Fintel, 2008); (ii) information theoretic properties of the trigger, such as how much information it communicates and how likely that information is (Lassiter, 2012; van der Sandt & Geurts, 2001); and (iii) formal aspects of the trigger itself, such as the syntax of the sentence in which it is uttered, the semantic relationship between the presupposed and the asserted content, as well as local information-structural considerations (Blutner, 2000; Göbel, 2020). As (iii) will be the main focus of Section 1.4, we will hold briefly on (i) and (ii) here, and introduce each in greater detail.

Discussing CFC effects from with the framework that views them as the success or failure of an *accommodation* mechanism, Von Fintel (2008) discusses multiple reasons why people may or may not accommodate. One primary constraint on accommodation is that people will not accommodate material they know to be false. However, Von Fintel further discusses situations in which people may choose to accommodate material about which they are unopinionated, and has the following to say:

> Informative use of presupposition may be successful in two particular kinds of circum-
> stances: (i) the listeners may be genuinely agnostic as to the truth of the relevant propo-
> sition, assume that the speaker knows about its truth and trust the speaker not to speak
> inappropriately or falsely; (ii) the listeners may not want to challenge the speaker about
> the presupposed proposition because it is irrelevant to their concerns and because the
> smoothness of the conversation is important enough to them to warrant little leeway.

Although these are certainly not the only claims being made in this paragraph, the two pieces that I want to draw out here are the suggestion that trust between interlocutors, as well as knowledge of each interlocutor's local goals may influence a presupposition's contextual felicity. That is, extra-linguistic social factors can influence the acceptability of a presupposition-bearing utterance.

Turning now to information-theoretic influences, there is a longstanding hypothesis in the literature that when presuppositions *can* felicitously introduce novel information into the discourse, the information must unsurprising, uncontroversial or high probability (Singh et al., 2016; van der Sandt & Geurts, 2001). For example, B's response in (8-b) is infelicitous in a context where A does not know that Isaiah has a civet (a type of nocturnal animal indigenous to Southeast Asia that would not make a good pet), but this may be unrelated to the form of the presupposition, which (as we will see in later chapters) can be used informatively in many situations.

(8)   A: What's new with Isaiah?

   a.   B: He had to take his cat to the vet this weekend.

   b.   B: He had to take his pet civet to the vet this weekend.

Caching this out in technical terms, Lassiter (2012) suggests that novelty constraints may be related to the information content of the presupposed proposition, specifically to its *surprisal* (or its negative log probability given the conversational context). One point that seems to be overlooked when examples like this are given is that it's not necessarily the case that high surprisal content can be introduced felicitously into a discourse, even if it's not presupposed. Simply asserting that one has a pet civet and expecting this information to be accepted without further elaboration would be very odd. Still, the interaction between plausibility and presupposition has been demonstrated experimentally by Singh et al. (2016), who show that participants have a harder time accepting implausible material if it is presupposed, rather than asserted.

While we take these aspects of the novelty problem—social factors and information-theoretic factors—

to be undoubtedly important, this thesis primarily explores the influence of formal properties on CFC effects. I will attempt to control for information theoretic issues by limiting our discussion to examples (and experimental materials) that introduce broadly plausible presuppositions, within the domain of daily activities within the North American context such as going to a park, graduating from high school, shopping for shoes, etc.

1.3   Theories of Presupposition

In this section, I will turn to theories of presuppositions and models that implement those theories within formal frameworks. The approaches discussed here fall into three broad clusters. The first assigns a special status for the pieces of meaning introduced presuppositionally by a trigger. These theories include the three-valued logic approaches, the dynamic semantic approaches and the presuppositions-as-anaphors approach. The second cluster of theories posits that presuppositions are just regular-old entailments, and that their unique behavior is derived from the special relationship these entailments have *vis a vis* various aspects of the discourse, such as aboutness or at-issueness. These two clusters of theories will be referred to as semantic approaches and pragmatic approaches. This section will outline each in turn, before introducing a third cluster—hybrid approaches that blend multiple theories together. It concludes by outlining a few additional properties of presuppositions.

1.3.1   Semantic Approaches

Three-Valued Logic Approaches   The first models for the meaning of presuppositions were largely developed within the context of finding solutions to the projection problem. In this approach, formal bivalent semantics was augmented by adding in a third truth value, #, which has a status that is neither true nor false (one way to conceptualize it is as "undefined" or "impossible to say"). Sentences whose presuppositions are not met are given this truth value. For example, given a world with three

	T	#	F
T	T	T	T
#	T	#	#
F	T	#	F

Table 1.1: Strong Kleene Truth Table for *or*

people, Adam, Bracha and Claire and a set of tennis players { Claire }, the sentence "Adam plays tennis" would be false, "Claire plays tennis" true, and "*Claire* also plays tennis" (with focus on *Claire*) to have our third truth value, #.

This reason why this three-valued approach was attractive, at least at first, was because it naturally extends to complex sentences formed from logical connectives. Strong Kleene Logic (Kleene, 1952) defines the behavior of logical operators that preserves their classical behavior for bivalent truth conditions and was consistent with semanticists' intuitions for more complex sentences. For example, take the Strong Kleene truth table for the logical connective *or* given in Table 1.1. Under this logic, the sentence "Either Claire went to the museum again, or she went to the beach," would be true in a world where Claire has never gone to the museum before but did indeed go to the beach.

But although the Strong Kleene logic works well for the *or* relationship, it has some difficulty in explaining the behavior of other filters, especially *and*. Remember, the presuppositions of a complex sentence consisting of two embedded sentences joined with *and* depends not just on the presuppositions of the embedded sentences, but their order. One of the reasons why Strong Kleene logic is attractive is that it preserves many of the properties of classical logic, including the commutativity of both *and* and *or*. Thus, the three-valued logical approach predicts correctly that the truth value of a sentence with the logical form $\# \wedge T$ is # in all cases, but incorrectly that the sentence $T \wedge \#$ is also #. As we have seen, when the first sentence does not presuppose, and it entails the presuppositions of the second operand, the whole sentence bears no presuppositions. For example, the sentence "Alex saw something out of the window and it was a robin that she saw" is taken to not presuppose anything,

but this is not captured by strong Kleene logic based approaches. While these and other shortcomings have lead to the development of alternative semantic theories, discussed below, there are modern implementations that attempt to keep the spirit of the three-valued approach while dealing with its shortcomings (George, 2008).

Dynamic Semantics   Dynamic semantic frameworks (Heim, 1983; Kamp, 1981) were developed to address a series of empirical phenomena, including the behavior of certain anaphoric elements that could not be captured under (then) standard theories, as well as certain asymmetries associated with conjunction. These frameworks are compatible with a larger shift in the ontological status of semantic utterances, from logical forms that correspond to the state of the world, to instructions about how to update a shared set of beliefs, called a *context set*. A context set is typically modeled as the set of worlds compatible with all the previous utterances in the conversation. A single utterance is an instruction to intersect one's context with the set of worlds denoted by the utterance, thus reducing the size of the context set and increasing the amount of shared information between the conversational participants. Utterances, then, are functions from sets of worlds to sets of worlds, or from contexts to contexts. One attractive aspect of this perspective is that it is a theory of meaning rooted in a theory of how language is used—to increase mutual information between participants.

Under the dynamic semantics perspective, presuppositions are modeled as lexical components of triggers that impose requirements on the domain of the context update function. Let's take some of the behaviors most associated with presuppositions (projectivity, backgroundedness and non-novelty), and see how the dynamic approach accounts for each. If presuppositions are constraints on the context set then they must have been satisfied either because they were entailed by a previous utterance in the discourse, or because all participants' context sets entailed the presupposition when the discourse started (they were "common knowledge"). That takes care of non-novelty. Presuppositions are projective because they impose requirements that must be met before the utterance can be interpreted;

thus, their meaning scopes outside the asserted content, and any truth-canceling operations that it may contain. Similarly, because in this framework presuppositions are a precondition on meaning, and not part of the utterance meaning proper, they can never be the main point of the utterance.

One attractive feature of the dynamic approach is that it can cover the asymmetric behavior of presupposition projection from conjunction in an intuitive way. Under the dynamic approach, conjunction is modeled as successive context update of each operand, so for context C, with utterance u "u_1 and u_2", target context $C' = (C \cap u_1) \cap u_2$; that is the context first updated with the left operand and then updated with the right operand. If u_1 entails the presuppositions of u_2, then these will be met by the time u_2 is applied to the context, and presupposition failure will not occur.

Thus, by re-framing presuppositions as restrictions on domains of functions and utterance interpretation as successive context update, the dynamic approach can avoid many of the problems of the three-valued approaches. But this simple reformulation has some problems, in particular it makes the system too brittle. If presuppositions are requirements on the context, then presupposition-bearing sentences should never be able to be uttered in cases where their presuppositions are not met. While a great many sentences do impose hard novelty constraints, there are many cases where triggers can be successfully used to introduce new information into the discourse (the aforementioned "informative presuppositions"). To account for this behavior, a pre-update mechanism called *accommodation* is invoked (Lewis, 1979). We will have more to say about accommodation later, but will introduce it here as it is important for both the dynamic theory and the presuppositions-as-anaphors approach, discussed below. Accommodation was first introduced in the following way:

> If at time t something is said that requires presupposition P to be acceptable, and if P is not presupposed just before t, then—*ceteris paribus* and within certain limits— presupposition P comes into existence at t. (Lewis, 1979)

This is the full dynamic theory (also called the *constraints* + *accommodation* approach or the *sat-*

isfaction based approach): Presuppositions are constraints on a context set, but these constraints can be flexibly satisfied by an accommodation mechanism that pre-updates the context prior to utterance interpretation. Of course, caching out the "certain limits" acknowledged by Lewis is crucial. It will be the central claim of of Section 1.4 that no satisfactory account has been given, and then one of the main objectives of the rest of the thesis to provide one.

ANAPHORIC APPROACH   This approach treats presuppositions as anaphors, different only from pronouns in that they have more descriptive content (Van der Sandt, 1992). While the proponents of this approach reiterate that it treats presupposition as a phenomena that is neither fully semantic nor fully pragmatic, it is grouped here with the other semantic theories for two reasons: First, presuppositions have a special status when they are introduced into the semantic derivation, which requires that they must be bound, like other anaphoric items. Second, instances where no such item is present in the discourse are handled by an accommodation mechanism, like the satisfaction approach discussed above. Thus, the major high-level theoretical differences between the two theories is that in the satisfaction approach presuppositions are a semantic category unique to themselves, whereas in the anaphoric approach they are part of a broader set of anaphoric expressions. Because the machinery used to bind presuppositions is required on outside grounds (i.e. to bind anaphoric expressions generally) the approach is arguably more parsimonious.

Much of the work in the anaphoric framework is conducted within Discourse Representation Theory (DRT) (Kamp, 1981). DRT treats conversation as the joint construction of Discourse Representation Structures (DRSs), which include three elements: discourse markers (entities that can serve as referents), conditions (predicates, logical relationships), and sets of further embedded DRSs. Interpretation includes merging the DRS for an incoming sentence with a main DRS and resolving the anaphoric elements by associating them with discourse markers. One elegant feature of the anaphoric approach is that this resolution mechanism is the same mechanism invoked for accommodation, but

in reverse. When a sentence with a presupposition is interpreted, the presupposition is resolved by walking up through the embedded DRSs towards the most global DRS. If a suitable referent is encountered, then the content of the presupposition is transferred to that referent, and interpretation can continue. If no suitable referent is found by the time the mechanism reaches the top-level DRS, then a referent is created at this location, and the information content associated with the presupposition is transferred to it. If, for some reason, creating such a referent is impossible because it would violate general constraints on binding, then the path is re-traversed, and a referent is added at the next lowest DRS where no such violation would occur.

One attractive feature of this approach is that it explains comprehender preference for more global accommodation (Beaver & Zeevat, 2007; Atlas, 1976), a tendency which has been verified by some experimental evidence (e.g. Chemla & Bott (2013)). For example, take the two interpretations of (9), which are given below. Comprehenders tend to favor the reading in (9-a), where the count actually dueled Sergei previously, over (9-b), where the two merely dueled in Alexei's belief worlds.

(9)   Alexei believes that the count will challenge Sergei to a duel again.

    a.   Global Interpretation: The count challenged Sergei to a duel before and Alexei believes he will do it again.

    b.   Local Interpretation: Alexei believes that the count challenged Sergei to a duel before and will do it again.

The anaphoric approach explains why: Understanding this sentence requires accommodation, as no *dueling* discourse referent exists prior to interpretation. Because the accommodation mechanism first attempts to form a referent at the main DRS, the global interpretation is predicted.

Before we moving on to discuss the pragmatic approaches to presupposition, I will briefly mention one influential argument that has been put forth in favor of the anaphoric approach over dynamic approaches. The argument, first offered in Kripke (2009) notes that there are some sentences whose

presuppositions should be trivial to accommodate under satisfaction-based approaches, but are not. Two examples are given below:

(10)   a.   A : Who had dinner out last night?

               B: # Grandma had dinner out, too.

        b.   A: What did Grandma do today?

               B: ? She went to the super market again.

Assuming that *too* focus-associates with the *Grandma*, (10-a) presupposes that there exists someone other than the grandmother who had dinner out last night. This bland fact should be either entailed by the context set, or easily admitable into the context. Yet the sentence seems infelicitous nonetheless. Similar logic applies to (10-b), where it should be very easy to admit that a woman old enough to be a grandmother has gone to the super market at some point before in her life. Kripke takes the relative unacceptability of these two sentences as evidence that the satisfaction conditions are not relevant for predicting when triggers can appear felicitously in a discourse.

Although this argument will be discussed at greater length in Chapter 3, I want to point out, briefly, at the outset that this criticism comes from a misread of the presuppositional content posed by satisfaction-based theories. This argument assumes the presupposition of (10-a) is that someone (anyone!) other than Grandma had dinner in New York, and that for (10-b) that Grandma had dinner at some point before in her lifetime. However, most semantic accounts qualify these existential requirements with either an implicit domain restriction (for *again*), or by stipulating that they must come from the set of focus alternatives (for *too*). (See, e.g. the denotations for *too* and *again* in Bade (2016) and Aravind & Hackl (2017).) Presumably, these restrictions are provided by the context, and are related o the local information structure of the discourse. On the reading that B's response in (10-a) presupposes that someone *in the focus alternatives to Grandma* went to New York last night, the presupposition no longer becomes trivial to accommodate. Similarly, on the reading that the re-

sponse in (10-b) presupposes that Grandma ate dinner previously *within some local time of interest*, the sentence is no longer entailed by common knowledge.

1.3.2 Pragmatic Approaches

Pragmatic approaches to presupposition derive the core presuppositional behavior not from a special meaning status associated with the presupposed content, but from the structure of the conversation or the attitude of conversational participants. The pragmatic approach was first offered in Stalnaker (1973) (and developed in Stalnaker et al. (1977); Stalnaker (1996)), who defines presupposition in the following way: "A speaker presupposes *P* at a given moment in conversation just in case they are disposed to act in their linguistic behavior, as if they takes the truth of *P* for granted, and assumes that their audience recognizes that they are doing so" (p.448). There are two crucial aspects of Stalnaker's proposal: First, presuppositions are entailments of the same variety as asserted content, and differ not with respect to their semantics but with respect to the attitude conversational participants hold about them. Second is the recursive aspect of presuppositions mentioned at the end of the quote. Under this view, presuppositions are not just those entailments that the *speaker* takes for granted, but that the speaker assumes their interlocutor will take for granted. (And assumes that their interlocutor will assume they take for granted, and so on *ad infinitum*... Stalnaker (2002)).

One problem with the basic Stalknarian perspective is that the simple definition presented above does not admit a place for informative presuppositions. If a speaker utters a sentence with the intent to inform, then as per the definition above none of its entailments can be presuppositions. Stalnaker (1996) and Simons (2003) address this issue, the latter reforming presupposition along the following lines: "A speaker presupposes *p* in uttering *U* only if they believe that *p* will be common ground following their utterance" (p 15). But this raises a different set of issues, *when* must the speaker expect the presupposition to enter the common ground? How justified must their belief be? In response to these concerns, various alternative pragmatic proposals have been developed. These maintain the

assumption that presuppositions do not have a special semantic status, but seek to derive their special behavior from pragmatic aspects other than speaker attitude. Below, we will review two of these proposals, the Information Structure approach of Simons et al. (2010) and the Attention Structure approach of Abrusán (2011, 2016).

Information Structure Approach   Simons et al. (2010) attempt to situate presupposition within a larger theory of projective content, which includes Conventional Implicatures. They propose this material projects because it is not at-issue. Because this approach sees projectivity as stemming from the way that information is organized within the discourse, I will refer to it as the *information structure* theory of presupposition and projection. At-issueness is defined in relation to the Question Under Discussion (QUD) (Roberts, 2012), or a semantic question (set of alternatives) that corresponds to the current discourse topic. For a proposition p, if the proposition provides a partial or complete answer to the QUD, then it is at-issue. For a question q, if answering the question would provide a partial or complete answer to the QUD, then q is at-issue. Their proposal, which focuses on embedded sentences, is the following:

- All and only those implications of (embedded) sentences which are not at-issue relative to the Question Under Discussion in the context have the potential to project.
- Operators (modals, negation, etc.) target at-issue content.

To examine the predicitons of this theory, we walk through an example, given in (11).

(11)   A: How is Lee feeling?

         B: She is sad that her brother is crying.

Here the QUD is *How is Lee feeling?*, which we can take as the set denoted by all the possible feelings that Lee can have, {x : Lee feels x}. B's response contains three entailments, {*Lee is sad*, *Lee has a*

brother, *Lee's brother is crying*}, of these only the first is a partial answer to the QUD, thus, it is predicted to not project whereas the others are predicted to project.

How does this theory account for the basic properties of presuppositions? Because the proposal grounds presuppositions in their irrelevance to the QUD, it predicts that all presuppositions will be backgrounded. The answer is similar for projection. As far as non-novelty, the theory presented in Simons et al. (2010) makes no explicit predictions about non-novelty nor offers a reason for why presuppositions should appear to be non-novel. But this is a feature of the approach, not a bug. Remember Simons et al. attempt to provide a theory for all projective material, not just presuppositions. The projective content other than presuppositions they are attempting to incorporate under their framework (non-restrictive relative clauses and appositive phrases) can be used to introduce novel content felicitously, and so it is reasonable that they don't attempt to derive novelty constraints.

In support of the information structure approach, Tonhauser et al. (2018) investigate nine different structures (including many traditionally analyzed as presuppositions) and find a correlation between between judgements of not-at-issueness and projectivity, both of which were assessed using indirect measures. Despite this empirical verification, there are a few outstanding challenges for the information structure approach. Under this approach, backgroundedness (and thus projectivity) is modulated by the local information structure, such that pieces of meaning can have their background/foreground status changed by modulating the QUD. Simons et al. (2010) predict that when this happens, material which is made at-issue with respect to the QUD should lose its projectivity. This is tested in (12), where the presupposition of the definite determiner (that there is a King of France) is rendered at-issue by A's question.

(12)   A: Does France have a monarchy?

        B: If the King of France hears you asking that question, he'll throw you in irons!

The problem for the information structure approach is that, even though the sentence may seem a

little coy on B's part, it's pretty clear that the presupposition projects out of the conditional. That is, the sentence as a whole conveys the information that France has a king, and thus is a monarchy. It does so, even though the content of the presupposition is *at-issue* according to the definition in Simons et al. (2010).[1] While a further investigation of the data is required, this example provides some evidence that certain pieces of backgrounded content project regardless of whether they are *at-issue* or not, something that is not predicted under the information structure approach.

ATTENTION STRUCTURE APPROACH   This approach was developed in Abrusán (2011) to predict the behavior of the so-called *soft* presupposition triggers (Abusch, 2002, 2010), but could be extended to provide a generalized account of triggering for most (or all) presuppositions (Abrusán, 2016). While Abrusán states that this proposal should not be thought of as a pragmatic approach, it is categorized with the information structure approach as it treats presuppositions as regular-old entailments that gain a special status due to their role in the attentional-structure of the sentence. Taking inspiration from research on vision, Abrusán notes that there are certain factors (both bottom-up and top-down) that focus attention during the processing of a visual scene. Likewise, she suggests that grammatical, semantic and pragmatic factors focus attention during linguistic processing, too, and presuppositions are those parts of the sentence which are not the focus of attention. She defines presuppositions as the "entailments of a sentence S that can be expressed by sentences that are not necessarily about the event time of the matrix predicate of S (i.e. they are either not about it or only accidentally so)" (Abrusán (2011), p. 509).

This definition needs to be unpacked: First, Abrusán uses a technical definition of *aboutness*, introduced by Demolombe & Fariñas del Cerro (2000), which is a formalization of the intuition that if a sentence is not about an entity e, then the truth of the sentence should not change if we change the facts about e. Furthermore, two event times of entailments expressed by an utterance may be the same, but

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[1] That is *France has a king* provides an answer to the question *Is France an Monarchy?*

one will still presuppose if this is only a contingent fact. For example, for the sentence "Amos knew that it was raining", Amos' knowledge and the raining event could be co-located in time, but they don't need to be. However, for the sentence "Amos managed to solve the problem" the *managing* and the *solving* events must be co-temporal. One attractive feature of this approach is that defining triggering in terms of event times gives a very intuitive notion as to why iterative and additive particles, and verbs that require preparatory activities (e.g. *win*) all trigger presuppositions.

Running through our core properties of presupposition triggers, the attention-structure approach explains presuppositions' background status by defining presuppositions as whatever the sentence is not about. Although Abrusán (2011) does not address projection explicitly, presumably the same strategy employed by Simons et al. (2010) would work here, namely that semantic operators target only those entailments that share *aboutness* with the matrix predicate (*aboutness* replacing *at-issueness*). But as with the information structure approach, non-novelty is not obviously captured under the proposal, as it is not clear why there should be overlap between those parts of the sentence which are not attended to, and those parts of the sentence which are non-novel. That being said Abrusán makes it clear that this theory is intended to address the issue of triggering alone and not projection and novelty (although see Simons (2013) for a critique of this program).

Conceptual Precondition Approach   Like the approach discussed above, the Conceptual Precondition approach introduced in Schlenker (2021) assumes that presuppositions are regular-old entailments, or beliefs, that are rendered as presuppositions by a productive triggering algorithm. He makes a number of arguments for the necessity of such a triggering algorithm, including that presuppositions that can be generated by novel *pro*-speech gestures (i.e. gestures that replace spoken words during communication). For example, given the gesture UNSCREWLIGHTBULB in which a producer mimics unscrewing a lightbulb from the ceiling, the utterance "Alex got shocked because she UN-

SCREWLIGHTBULB" could presuppose that the outlet is on the ceiling.[2] If presupposition is a class of inferences that go beyond conventionalized communication systems, and can be found in novel, iconic gestures, then they must arise from a cognitively general process. Schlenker proposes the following algorithm (here, the underscores represent time values, where $t-1$ proceeds t): Given an entailment p from an expression E_t in context c_{t-1}, if E contextually entails p relative to c, then p will be a presupposition if one antecedently believed c_{t-1} and acquired the belief that E_t, there is a high enough chance that one antecedently believed p_{t-1}. Formulating this as a conditional probability, we can say that if $P(p_{t-1}|c_{t-1}\&E_t) > \alpha$ (where α is some threshold value), then p will be presupposed.

Like the attention-structure approach discussed above, this approach is potentially powerful for explaining crosslinguistic similarities between presupposition triggers. Specifically, Schlenker (2021) discusses the fact that, in every language investigated, bivalent time predicates like *stop* in English or *ârreter* in French, presuppose the predicate associated with their earlier times. This is predicted under both these approaches, but would need to be stipulated for many of the semantic approaches.

There are, however, a number of conceptual issues with this proposal. The first is that it is not clear what E is doing in the formal probabilistic formulation of the theory. That is, assuming one's beliefs cannot be altered by future events, then $P(p_{t-1}|c_{t-1}\&E_t)$ should be equal to $P(p_{t-1}|c_{t-1})$, in which case presuppositions are just those things that are (probabilistically highly) entailed by the context. Second, it is not clear whether, on this theory, presupposition is an individual-oriented or population-oriented phenomena. Schlenker formulates the conditional probability in terms of beliefs of a "relevant individual or individuals" but then describes it later as "the probability that a random agent who learned that [E], relative to the beliefs c had a prior belief that p..." So it is not clear whether presupposition is a property that holds of a situation just in virtue of what an idealized agent would believe, or in virtue of the specific beliefs of the individuals actually involved. Finally, there are a number of

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[2] Of course, the fact that the lightbulb is on the ceiling could just be part of the asserted portion of the utterance.

seeming counter-examples to the proposal, most notably the informative presuppositions generated by possessive pronouns. Sentences like p' = "At the party, Alex introduced us to her brother" seem to presuppose p = *Alex has a brother*, but given a neutral context it seems improbable that anyone who acquired p' would have the antecedent belief p.

1.3.3 Heterogenous Approaches

The approaches discussed in the previous two subsections treat the underlying meanings introduced by presupposition triggers as homogeneous, and attempt to derive any differences in behavior between the triggers as a result of the pragmatic, semantic and syntactic context in which they occur. We now turn to proposals that view presuppositions as a fundamentally heterogeneous category. Different triggers introduce different kinds of meaning, which happen to appear the same. Often, these approaches recruit one or more of the semantic/pragmatic theories discussed above to explain the behavior of a certain sub-class of presupposition triggers. We will proceed in roughly chronological order from earliest to most recent proposals.

Lexical vs. Resolution Triggers   Zeevat (1992) distinguishes between lexical and resolution triggers. Lexical triggers are those associated with contexts that have certain applicability conditions whereas resolution triggers are those whose job it is to set up relationships between different parts of a text, or discourse. For example, it is a precondition on the usages of the word *bachelor* that its referent is male, but this is due to its conceptual structure, not to its role in any particular discourse. On the other hand, short definite descriptions with common nouns like *the man*, are used to link novel information to previous discourse referents. Typically, lexical triggers include sortal restrictions on verbs and nouns as well as emotive factives. Resolution triggers include definite descriptions, factive adverbial clauses and clefts. Although Zeevat (1992) categorizes resolution triggers separately from anaphoric triggers, presumably both could be modeled within the anaphoric approach discussed in Section 1.3.1. It is

not clear how lexical triggers' presuppositions should be modeled; within the DRT framework, for example, they cannot be introduced as regular entailments, because that leaves unexplained the fact that they resist entailment-canceling operations like negation. One option might be to combine the anaphoric modeling paradigm with one of the pragmatic paradigms, positing, for example, that lexical preconditions are always not at-issue or not the focus of attention.

While the lexical vs. resolution distinction is intuitive, it suffers from a lack of clarity. Indeed, Zeevat (1992) does not give diagnostic criteria for distinguishing between the two categories of triggers. And while many triggers are obviously lexical or obviously resolution, there are many triggers which may be hard to categorize. For example, *win* may be used to link the final state (victory) and a process (participation), which would identify it as a resolution trigger. However, participation is also a conceptual precondition on victory, a fact which would identify it as a lexical trigger. Now, one possible work around is to say that *win* can be used as both a resolution trigger and a lexical trigger, and thus that people can presuppose the same information in multiple different ways. Evidence for this stance could be recruited from the series of presuppositions having to do with time, which come in discourse particle/verb pairs: still/continue, back/return, again/re-. In this cases, each of these pairs presupposes the same content, but arguably in different ways—one through establishing an anaphoric link, the other via preconditions on an open-class lexical item. If this approach were to be pursued, then the first step would have to be developing a set of diagnostic criteria that could categorize between the different uses of the presupposition trigger.

SOFT VS. HARD TRIGGERS   Abusch (2002) distinguishes between soft and hard triggers. She notes that the presuppositions of some triggers (the soft ones) can be suspended, whereas the presuppositions of other triggers (*hard* triggers) cannot. (13) gives an example, with the soft trigger *win* in (13-a) and the hard trigger *too* in (13-b).

(13)   a.   I don't know if Ari participated in the race, but if she won it then she will have more

titles than anybody else.

b. #I don't know if anybody else went to the meeting, but if Ari did too, then I'm sure they'll complain about it afterwards.

This distinction has been previously explained as a difference in whether a trigger is capable of being accommodated locally, or must be interpreted in the global semantic scope (Heim, 1983). The problem for this approach is that it is not clear why triggers like *win* should have a propensity towards local accommodation, whereas *too* should not. By way of a solution, Abusch (2002, 2010) proposes that the two presuppositions are derived differently: The presuppositions of hard triggers are *bona fide* presuppositions, which impose semantic constraints on their context (and are interpreted globally), but the presuppositions of soft triggers are the result of pragmatic reasoning from lexical alternatives. For example, *win* exists in a lexically-based alternative set with the verb *lose*. When a comprehender hears the utterance "Ari won the race", its alternative "Ari lost the race" is activated. Because, "[t]ypically, some alternative in a topical alternative set is assumed to be true" and in this case both alternatives convey that Ari participated in the race, the whole sentence conveys that *Ari participated in the race* is true. The reason why such a conclusion can be suspended is that it is a merely a pragmatic inference, and not a hard-and-fast semantic constraint. Romoli (2015) extends this approach by proposing that the soft presuppositions form semantic scales with their weaker alternatives. In this case, the relevant scale is the Horn Scale *<participate, win>*. When the stronger alternative is embedded under negation, an inference is derived that the weaker item still holds, just in the same way that the sentence "Ari didn't eat every cookie" produces the inference that she did eat some of the cookies. Soft triggers typically include cognitive factives, aspectual verbs, achievement verbs and intonational focus. Hard triggers typically include *too*, *again*, *even*, clefts, and emotive factives.[3] (There is disagreement about

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[3] Although one could argue that emotive factives should be categorized as soft triggers on the assumption that the emotive terms participate in scales with other cognitive states, for example ⟨disappointed that, angry that, furious that⟩

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the definite determiner (Göbel, 2020).)

One attractive feature of the hard/soft approach is that it has the possibility of explaining trigger variation without stipulating any additional theoretical machinery. Reasoning from alternatives is a general linguistic process, which could be needed to explain a broad set of phenomena (for example, scalar implicatures), thus incorporating it into a theory of presupposition is relatively parsimonious. One challenge for this approach is that experimental results consistently show differences between the processing of implicatures and soft presupposition triggers. This experimental work is built on the insight from Bott & Noveck (2004) and Bott et al. (2012) that implicatures take longer to process than entailed content. Extending these results, numerous studies have tested the relative processing times between presuppositions and scalar implicatures (Schwarz, 2014; Chemla & Bott, 2013; Romoli & Schwarz, 2015; Bill et al., 2015). While the data is messy, the general consensus is that presuppositions tend to be processed more quickly than implicatures and that, combined with evidence from acquisition and aphasia, the data are "in line with the traditional perspective of seeing the two phenomena as distinct in nature" (Bill et al. (2015), p.1). One possible response to this concern is that soft-triggers are still inferences, but they are amortized or pre-compiled processes, which have been shown to be used in other domains of cognition (Gershman & Goodman, 2014). This is still an active area of research, both theoretical and experimental.

Discourse vs. Content Presuppositions   In two sets of studies, Göbel (2020) notes that focus-associating triggers like *even*, *too*, and *only* behave differently than non-focus associating triggers. First, focus-sensitive triggers impose stronger Contextual Felicity Constraints (they are harder to accommodate globally), both measured in terms of acceptability judgements and in terms of chunked reading-time experiments. Second, they are sensitive to the salience of the Question Under Discussion to which their alternative set provides a (partial) answer. In line with a suggestion from Beaver & Zeevat (2007), to account for these differences between the two classes of triggers, Göbel proposes the

Focus Presupposition Antecedent Hypothesis (FoPAH): "Focus-sensitive presupposition triggers require a linguistic antecedent in the discourse model, whereas triggers lacking Focus-sensitivity merely require their presupposition to be entailed by the Common Ground." In this case, common ground is the one defined in Stalnaker (2002), an unordered set of propositions which are mutually-assented to for the purposes of conversation. The Discourse Model, on the other hand, is a structured representation that keeps track of previous referents and questions under discussion. It is more difficult to update than the common ground, which is why focus sensitive presuppositions are more difficult to accommodate than their non-focus alternatives. Thus, presuppositions are of two different species: non-focus associating presuppositions are essentially satisfaction-based presuppositions, whereas focus-associating presuppositions are (or could easily be) modeled as anaphoric presuppositions within a DRT-style framework. Göbel also makes it clear that the framework is compatible with Abusch (2002)'s soft/hard distinction, making room for potentially three fundamental categories of presupposition triggers.

1.3.4 ADDITIONAL PROPERTIES OF PRESUPPOSITION TRIGGERS

WEAK VS. STRONG   Glanzberg (2005) argues that while a single theoretical mechanism can account for all presuppositional phenomena, the particulars of how the presuppositional content relates to the asserted content of a trigger results in two distinct categories of presuppositions. He introduces the notation ↓, which picks out a discourse referent in a context, much like how pronouns pick out anaphoric elements. He notes that for some presupposition triggers, no further predication is performed on the target of ↓. For example, in this system the sentence "Alex went to a movie, too" requires that the comprehender use the ↓ to select some alternative to Alex who went to a movie (or check that it is in the context), but do no more with it. On the other hand, some presuppositions predicate over the result of the ↓ operation. For example, "Alex saw the movie" requires that the comprehender use the ↓ operator to select a unique, salient movie m from their context, but then also requires that this

object participate in the predication *see(Alex)(m)*. Primarily interested in how expressions can fail to make meaning, and in discourse repair, Glanzberg argues that presuppositions like *the* induce obligatory discourse repair whereas presuppositions like *too* only induce optional repair. The former category includes demonstratives, clefts, possessive pronouns and factive verbs, while the latter category includes focus-sensitive triggers *even*, *only*, as well as iterative triggers, like *again*, *still* and *back*.

Building on this insight, Domaneschi et al. (2014) make the distinction between *weak vs. strong* triggers, where strong triggers require discourse repair and weak triggers do not. Tiemann et al. (2015) further suggest that the relevant facts for *strong* vs. *weak* are determined by the semantic role of the presupposition trigger. Triggers that change semantic type of their arguments cannot be ignored and are strong, whereas semantic adjuncts can be ignored and are weak. The intuition is that because they play a more central role in the computation of the semantic object, the presuppositions introduced by these triggers are more difficult to ignore. Tiemann et al. present a self-paced reading time study for the German presupposition *wieder* ('again') with offline comprehension questions supporting this hypothesis. However, the weak vs. strong distinction has been critiqued on empirical grounds, most notably by Bacovcin et al. (2018) who find that presuppositional content is accommodated, even when it is not necessary for answering a target question.

ENTAILING VS. NON-ENTAILING   Sudo (2012) distinguishes triggers that entail the contents of their presuppositions versus triggers that do not. While the difference can be hard to demonstrate, contexts like (14) can prove illuminating, at least for the trigger *stopped*.

(14)   Exactly one student in the class stopped using Mac (Sudo (2012), p. 59)

If the trigger *stopped* did not entail its presupposition, then (14) would be true only in cases where one student used to use Mac, and all the other students currently do use Mac. However, intuitively the sentence is also true in situations where some students never used Mac at all, which is predicted in this

case if the trigger not only presupposes but also entails its presupposition. Entailing presuppositions include *stop*, *know*, and certain triggers that presuppose gender features such as *curtsy* and *widow*. Non-entailing presuppositions include *even*, *also*, and definite descriptions.

Obligatory vs. Non-Obligatory   Bade (2016) distinguishes between *obligatory vs. non-obligatory* triggers based on their relationship with the information structure of the local context. It has long been noted that presupposition triggers are required in many cases where they form minimal pairs with non-presuppositional bearing sentence. Heim (1991) attributes these patterns to a general pressure, which she dubs *Maximize Presupposition!* (MP). Bade (2016), however, argues that some presuppositions are required to draw focus away from constituents which, if focused, would trigger contradictory exhaustivity inferences. For example, in (15), without the presence of *too*, the sentence would have to be interpreted exhaustively, following focal placement of *Francis*, denoted with the underscore $_F$. This would lead to the stronger interpretation that Francis was the *only* one who went to the party, contradicting the information of the previous sentence.

(15)   Holly went to the party. Francis$_F$ went to the party (too).

One attractive feature of this story is that it predicts the relaxation of obligatoriness in downward entailing environments, as exhaustivity inferences are usually blocked in these situations for outside reasons. Evidence from German as well as Ga (a language spoken in southern Ghana) indicates that, indeed, it is optional under negation and in the antecedents of conditionals, something that is not predicted under the MP account (Bade, 2018; Bade & Renans, 2021).

The Obligatory Implicatures approach predicts that obligatory triggers include *too*, *again*, *even*, *still* and *back*.[4] Pressures like *Maximize Presupposition!* may still be required to explain the distribution

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[4]We run through the logic quickly for each of these triggers. For *even*: "Francis went all over town. She (even) went to the hardware store." If *even* were omitted, we would derive an exhaustivity implicature that contradicts the content of the first sentence. For *still*: "Amos was asleep when I left. He is (still) asleep now." Omitting *still* would derive the implicature that Amos was not asleep previously, resulting in a contradiction.

of other triggers, such as the definite determiner.

1.4 THEORIES OF NON-NOVELTY

In this section we will take a brief tour of theories meant to address the novelty problem, the idea that some triggers can appear in environments where their presuppositions are not entailed, whereas others are allergic to such environments. Following Tonhauser et al. (2013), when triggers can appear novelly in a discourse we will say that they impose no (or a very weak) Contextual Felicity Constraint (CFC), and when they cannot appear novelly, we will say they impose a strong Contextual Felicity Constraint. There are two broad ways of approaching this problem, theoretically: The first, which be treated as a null hypothesis, is to solve the issue in the lexicon, by adding additional features onto the triggers that control novelty. The second approach, which is the majority opinion, is to assume that all presupposition triggers require their presuppositions to be supported by the context but that they can be flexibly *accommodated* in cases where this requirement is not met. After introducing the null hypothesis, this section will investigate the accommodation mechanism, and discuss two propos-als governing accommodation, the *information content* proposal and the *non-triggering alternatives* proposal. I will conclude with a brief recapitulation of the FoPAH proposal, which was developed within an accommodation framework to explain CFC strength (and was introduced in Section 1.3.3, above).

1.4.1 NULL HYPOTHESIS: TWO LEXICAL CATEGORIES

Tonhauser (2015) suggests that the novelty problem could be solved by stipulating that the triggers actually constitute two lexical categories, one of which is associated with discourse-novel content, the other associated with discourse-old content. Because this approach to variation is potentially perfectly

Finally, for *back*: "Jared was in Chicago before. Now, he is (back) in Chicago." Again, omitting the trigger would result in the inference that is was not in Chicago previously.

predictive, but less explanatory (insofar as it does not explain why some triggers are associated with constraints while others are not), we will treat it as a sort of null hypothesis.

Mainly responding to semantic-oriented theories, Tonhauser's main worry is that presuppositions do not form a natural class. Some presupposition triggers are associated with a constraint on the common ground, and others are not, and the presence or absence of an accommodation mechanism may be difficult (or impossible) to verify experimentally. The alternative approach she advocates is to treat informative presupposition not as "presuppositions, but some other kind of projective content, namely an informative, projective content," grouping them together with Conventional Implicautre, which are backgrounded, projective and not associated with a common ground requirement.

One challenge for this approach is that it explains presuppositions' common ground requirement via a different semantic mechanism than their projectivity, unlike the theories discussed next, which will attempt to unify these two behavioral traits with a common origin. Tonhauser (2015) suggests that one solution to this problem could be to assume that projectivity is contributed by separate, but independently necessary, information-structural considerations, such as the proposal developed in Simons et al. (2010).

1.4.2 Accommodation-Based Theories

We now turn to theories that make use of an accommodation mechanism. As introduced in Section 1.3.1, accommodation is hypothesized to be a process that springs into action to add information into a context in cases where sentences impose requirements on the context that are not met. The timing is important: under contemporary views, accommodation occurs when a speaker utters a sentence whose presuppositions they anticipate will be accepted as common ground prior to utterance interpretation (Von Fintel, 2000, 2008; Simons, 2003). So spelling out the relationship between our various terms: the success or failure of the accommodation mechanism is what gives rise to Contextual Felicity Constraints, informative presuppositions being triggers for whom the accommodation

mechanism generally succeeds, and missing accommodation being cases where it fails.

Accommodation has been subject to a number of different criticisms, of which we will focus on two: The first is that accommodation is often invoked as a repair mechanism or a last-resort mechanism when regular utterance interpretation is doomed to fail, but it occurs so frequently that it seems theoretically odd to give it this last-resort status (Abbott, 2006). The second critique is that accommodation is arbitrary—sometimes it works and sometimes it doesn't. As long as its success or failure needs to be stipulated, positing an accommodation mechanism doesn't make the theory any more parsimonious than say, the null-hypothesis advocated in Tonhauser (2015).

Responding to the first criticism, Von Fintel (2008) quotes at length from Thomason (1990), who notes that pretense and accommodation—and their associated risks—are a central component to many spheres of human social interaction. The example is illustrative, so I will repeat it at length:

> People can be accommodating, and in fact there are many social situations in which the best way to get what we want is to act as if we already had it. Leadership in an informal group is a good case. Here is an all-too-typical situation: you are at an academic convention, and the time comes for dinner. You find yourself a member of a group of eight people who, like you, have no special plans. No one wants to eat in the hotel, so the group moves out the door and into the street. At this point a group decision has to be made. There is a moment of indecision and then someone takes charge, asks for suggestions about restaurants, decides on one, and asks someone to get two cabs while she calls to make reservations. When no one objects to this arrangement, she became the group leader, and obtained a certain authority. She did this by acting as if she had the authority.

The point is that, given the prevalence of accommodation in social interaction, we should expect it to exist in linguistic exchange, and even though it is discussed as a repair strategy that is not meant to

give it a secondary, or degraded status *vis a vis* assertion. Just as assuming authority in a group situation is quite often the more socially conscientious strategy (at least compared to asserting one's authority), so, too, is accommodation frequently the preferred method for communicating information.

The second critique is more cutting, and I agree that without a satisfying theory of when and why accommodation fails, the standard approach to presuppositions of constraints + accommodation, is seriously lacking. The following sections discuss various proposals developed to respond to this criticism.

INFORMATION CONTENT   The first proposal for CFC variation we will discuss is the 'Information Content' approach, suggested by van der Sandt & Geurts (2001) and Geurts & van der Sandt (2004). These authors, who were working within the presuppositions-as-anaphors approach, postulate that the only difference between presuppositions and pronouns is the amount of information content they contain, and the fact that they can have an internal structure. Working from this observation, their proposal is that presuppositions can be accommodated because of their additional information content, which makes it possible to build discourse referents on the fly (i.e. to accommodate). Thus, presuppositions with higher information content should be easier to accommodate than presuppositions with lower information content.

First of all, the proposal was never implemented technically, so it is a bit difficult to derive all of its predictions. But in broad terms, it predicts that triggers that presuppose a whole clause, like cognitive and emotive factives, are easier to accommodate than additive particles like *too* and *again*, or pronouns themselves, which are relatively descriptively impoverished. There are a number of arguments against this approach, which we walk through below: The first comes from Zeevat (2002), who notes that the pronoun *her* has the exact same information content as the short indefinite phrase *a female person*, but the two differ in terms of how hard they are to accommodate, which shouldn't be predicted under this approach. So here we have a case of under-generation, where the theory predicts something should

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be difficult to accommodate when it isn't. The second, also from Zeevat (2002), recruits a number of presuppositions that attach to whole clauses, and yet are difficult to accommodate. For example (16-a) is judged as being harder to accommodate then (16-b), despite the fact that the two have exactly the same presuppositions.

(16) a. Indeed, Alex went to Lake Como.

      b. Alex regrets that she went to Lake Como.

While this case purportedly demonstrates a case of under-generation (the theory predicts that something should be easy to accommodate, when it is not), it's not clear whether *indeed* really has the presuppositional behavior claimed. It seems to exist in a class with other meta-sentential attitudinal connectives along with *surely*, *assuredly*, *indubitably*, etc., and their behavior as presupposition triggers is far from clear: First of all, when they are embedded in complex sentences, the connective cannot come before the name, and if it does then the whole sentence seems to have the quality of reported speech (author's judgement). Second, when the connective is moved, the proposition no-longer seems to project. For example "If, indeed Alex went to Lake Como, then we should go there" does not entail that Alex went to Lake Como (author's judgement). Further empirical work is needed, but at first glance, the facts look too complicated to call this a case of convincing under-generation.

The last problem we discuss are cases where information content varies, but the trigger remains difficult to accommodate. An example of one such case is given in (17), for the trigger *again*.

(17) a. Yet again, Francis walked outside.

      b. Yet again, Francis walked out of the Macy's onto 34th street on a Friday afternoon blissfully unaware that a pickpocket who had recently evaded capture by the police was following behind.

Now here is the problem: In Example (17-b), the presupposition of *again* (namely, that the whole VP

clause [walked … behind] happened before) has quite high information content, but that does not make it more felicitous in contexts where this information is not part of the common ground. Guerts and van der Sandt propose a solution to this whereby *again* carries two presuppositions: (1) Some previous event is relevant to the discourse and (2) The previous event is a walking-out-of-Macy's etc. type of event. While the second presupposition is still high information content, they argue that the first presupposition is not, and therefore explains accommodation failure. As pointed out in Beaver & Zeevat (2007), this work-around still has a number of empirical problems. Most notably, it predicts that triggers like *too* and *again* can be bound by a broad set of discourse referents, for example by *Jane* in the sentence pair "Jane likes Bill. Bill is having dinner in New York, too."

The problem with this approach is that it tries to ground variation in presupposition accommodation in *absolute* information content. In the next section, we will move on to an approach that aims to find more success by seeking to situate the triggers in *relative* positions compared to non-triggering alternatives.

Non-Triggering Alternatives   This approach to CFCs, which was developed with the presuppositions-as-anaphora account, posits a competition mechanism, where trigger-bearing sentences compete with non-presupposing alternatives. In cases where non-presupposing alternatives are available, the presupposing utterance is blocked and accommodation fails. As this theory was originally framed within a special variant of Optimality Theory (Prince & Smolensky, 2004), called Bidirectional Optimality Theory, we will first introduce the framework, and then discuss the predictions that it makes.

Optimality Theory (OT) is a constraint-based grammar that relates a set of candidate inputs to an optimal output. It consists of three components: The **Gen**erator which, given a single input creates a set of candidate outputs; the **con**straints, against which each candidate can be evaluated and the **Eval**uator, which ranks (or selects) the candidates based on the constraints. In classic OT the constraints are arranged in a hierarchy and candidates are dispreferred more if they violate higher-ranked

constraints. In classic phonology OT, the set of constraints are assumed to be universal across languages, but their relative ordering is language specific, and learned during acquisition. Constraints can be of two types: There are faithfulness constraints, which favor outputs that are close to their inputs (or underlying forms), and markedness constraints, which favor simpler or more easily-articulated outputs (Kager, 1999).

Bidirectional Optimality Theory BiOT (Blutner, 2000) re-works classical OT to consider multiple perspectives, specifically both production and comprehension of utterances. Inputs consist of form-meaning pairs, $\langle f, m \rangle$ and constraints rank form/meaning pairs in terms of their harmony (where $x \succ y$ means "x is more harmonic than y"). Now, a form, meaning pair $\langle f, m \rangle$ is optimal if (i) there is no other $\langle f', m \rangle$ such that $\langle f', m \rangle \succ \langle f, m \rangle$ and (ii) there is no other $\langle f, m' \rangle$ such that $\langle f, m' \rangle \succ \langle f, m \rangle$. It's possible to think about these two criteria in terms of production and comprehension, or in terms of speaker-optimality and listener-optimality. Under this view, (i) is a production requirement, saying that for a form/meaning pair to be optimal there cannot be a more economical or better form to express the meaning. Similarly, (ii) can be thought of as a comprehension requirement, disallowing the pair if there are other meanings more optimally associated with the form. If the form/meaning pair is both speaker-optimal and listener-optimal, then it is said to be *super optimal*.

We walk through two simple examples, both of which discussed by Blutner, which demonstrate how the BiOT framework can predict preference for global accommodation. Each consists of a form, f, which has two possible meanings, one corresponding to a more global presuppositional interpretation (m_1) and one corresponding to a more local interpretation (m_2). The intuition is that in (18) the more global interpretation m_1 is preferred whereas in (19) the more local interpretation m_2 is preferred.

(18) f = "Alex dreamed that her cat can catch mice."

        a. m_1: Alex has a cat, and dreamed that it can catch mice. (global interpretation)

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      b. m_2: Alex dreamed that she has a cat and that it can catch mice. (local interpretation)

(19) f = "If Alex has a cat, her cat can catch mice."

      a. m_1: Alex has a cat and it can catch mice (global interpretation)

      b. m_2: Either Alex does not have a cat, or she does and it can catch mice (intermediate interpretation)

Now, in order to get the BiOT framework off the ground, we need to specify constraints that can induce the ordering relationships signified by $\succ$. Blutner proposes two: The first is Avoid Accommodation (AvoidA), which assigns a penalty for each time an anaphor is associated with a discourse marker via accommodation. The second is BeStrong, which evaluates pairs with stronger meanings higher than weaker ones (where strength is determined by entailment). Crucially, AvoidA is ranked higher than BeStrong.

Turning to (18), we evaluate the optimality of each candidate in the tableau below. For $\langle f, m_1 \rangle$, it is speaker-optimal because there are no other forms associated with its meaning. Furthermore, it is comprehension-optimal because the other meaning associated with the form violates BeStrong (both sentences require accommodation, but the global interpretation is compatible with fewer possible worlds, and thus stronger). Therefore, we can say it is *super optimal*.

		AvoidA	BeStrong
☞	$\langle f, m_1 \rangle$	*	
	$\langle f, m_2 \rangle$	*	*!

Turning to (19), we first inspect $\langle f, m_1 \rangle$. Here, it is speaker-optimal because there are no other forms associated with its meaning. However, it is not listener-optimal, because there is a higher-ranked candidate for m_2, given f, namely the pair $\langle f, m_1 \rangle$, which violates the lower-ranked constraint BeStrong, as opposed to the higher-ranked AvoidA. Thus, the pair is not *super optimal*. Applying the same logic to $\langle f, m_2 \rangle$ we derive that it *is* super optimal. Thus, using BiOT and two constraints, we

can derive the observed variation in utterance interpretation.

		AᴠᴏɪᴅA	BᴇSᴛʀᴏɴɢ
	$\langle f, m_1 \rangle$	*!	
☞	$\langle f, m_2 \rangle$		*

We now turn to the issue of which triggers can be accommodated, which is discussed in Blutner (2000) and elaborated upon in Zeevat (2002). Consider the variation in acceptability between the dialogues in (20), and, following Blutner (2000) let's assume for the moment that the two have identical meanings, differing only in terms of whether or not they accommodate.

(20)   A: What did Alex do yesterday?

    a.   B: She listened to an opera.

    b.   #B: She listened to the opera.

Using the same constraints outline above, we can create the following tableau for the two form/meaning pairs. Because there is only one message, both will be listener-optimal. But because 'the' violates AᴠᴏɪᴅA, 'a' will be the only speaker optimal candidate, and thus will be *super optimal*.

		AᴠᴏɪᴅA	BᴇSᴛʀᴏɴɢ
☞	$\langle \mathrm{a}, m \rangle$		
	$\langle \mathrm{the}, m \rangle$	*!	

Starting from this simple example, we can derive the fact that, under this approach, when two utterances convey the same message, if they differ only in that one presupposes and the other doesn't, then the presupposing alternative will always be blocked. This leads to **Blutner's Theorem** (Beaver & Zeevat, 2007): If a presupposition trigger has simple expression alternatives that do not presuppose, the trigger does not accommodate.

What predictions does Blutner's Theorem make? As with all competition-based approaches, the details lie in which alternatives we allow to enter the competition. Zeevat (2002) states that the alterna-

tives must be "simple non-triggering expression alternatives with the same meaning" but no formal algorithm for determining alternatives is given. In order to formalize alternative selection, we adopt the grammatical alternatives approach from Katzir (2007), with the addition of negation as a single substitution[5] But defining a set of structural alternatives is only half the challenge, for the non-presupposing alternatives have to have *the same meaning* as the presuppositional sentence. There are two possible ways to construe this requirement. For presupposing sentence $p + p'$ with asserted content p' and presuppositions p we can say that non-presupposing alternative q has the same meaning with respect to the whole content (that is $q \models p' \wedge p$) or just the asserted content ($q \models p$). Given that Zeevat (2002) considers the utterance "indeed p" and "p" as alternatives to each other, it is clear that he intends the same-meaning requirement only to cover asserted content, so it is this later requirement that we will use to construct inputs into our competition mechanism.

Let's walk through a number of triggers and see what predictions are made by this fleshed-out version of the theory. Below, I enumerate the triggers that do not accommodate, and for each provide a simple non-presupposing alternative as well as an example:

Triggers that are predicted to not accommodate:

- Additive and Scalar Particles (*too, only, back, again, still, even, etc.*)

  Alternative: Bare utterances

  Example: Alex went to the beach, too. / Alex went to the beach.

- Clefts

  Alternative: Bare utterances

  Example: It was Alex that went to the beach / Alex went to the beach.

- Wh-Questions

---

[5] Otherwise change-of-state verbs, which are traditionally thought to be a single class, would be split: *Continue* would have a simple non-presupposing alternative (*Alex continued to sing/Alex sang*) but *stop* would not (*Alex stopped singing/Alex **did not** sing*). This is fixed by counting negation as a single substitution.

Alternative: Polar Questions

Example: Who went to the beach? / Did someone go to the beach?

- Definite Articles, Possessive Pronouns

  Alternative: Indefinite Articles

  Example: Alex listened to the/my opera / Alex listened to an opera.

- Change of State verbs (stop, continue, begin)

  Alternative: Progressive or Negated Progressive

  Example: Alex stopped listening to opera / Alex doesn't listen to opera.

- Cognitive Factives (know, is aware that)

  Alternative: Non-factive cognitive predicates (believe, think)

  Example: Alex knows that Lee loves opera / Alex believes that Lee loves opera.

- Emotive Factives (is angry that, is sad that)

  Alternative: Utterance with just the emotive term.

  Example: Alex is upset that Lee loves opera. // Alex is upset.

The only trigger that seems not to have simple non-presupposing alternatives are accomplishment verbs like *win*, *pass*, *fail*, which presuppose some sort of preparatory activity (e.g. participating in a tournament before one can win it, taking a class before one can pass or fail it). These are quintessential lexical triggers, and there seems no way to communicate the end state without committing to the preparation; thus, there are no simple presupposing alternatives. Therefore, we can conclude that accomplishment verbs are predicted to accommodate, whereas all the other triggers considered should not.

Discourse vs. Content Presuppositions   To close off this section, we briefly recapitulate the proposal from Göbel (2020), that there are two categories of triggers—one which imposes constraints

on the context set, and one that imposes constraints on the discourse model. Göbel introduces the Focus Presupposition Antecedent Hypotheses (FoPAH), which states that focus-sensitive items require an antecedent in the discourse model (where they operate more like anaphors), whereas non-focus sensitive triggers merely require that their presuppositions be entailed by the context. If we assume that the discourse record is harder to amend on-the-fly than the common ground, then we can derive the variation in CFC strength between focus-sensitive and non focus-sensitive triggers. A suggestion related to this approach is advocated by Beaver & Zeevat (2007) and Von Fintel (2008), who states "[T]here cannot be accommodation with presuppositions that do not just target what is in the [context] but concern facts in the world that no manner of mental adjustment can bring into being. A particular case of that is the actual history of the conversation (the conversational record)..." The hypothesis, here, is that because the discourse model concerns shared facts about what has been said previously, the truth or falsity of these facts will be known to all members of the conversation, and will be harder to amend via accommodation.

Although this approach must postulate two categories of presupposition and thus introduce more complexity into the semantic theory, it derives CFC behavior from independent facts about the triggers (i.e. their focus-sensitivity) so it is arguably less stipulative than the null-hypothesis. There are however, two potential issues: The first is that, just like the context, interlocutor representations of the discourse model may involve inference over uncertainty. While the facts of the conversation are something that might be irrevocable, the structural representation of the conversation into topics, Questions Under Discussion and discourse relationships may be something that a participant is agnostic about. Given the fact that conversations are messy, and may involve miscommunication at meta-level (What are we talking about?) as well as at the content level (What information was communicated?), further work may be needed to explain why the latter accepts accommodation while the former does not. The second issue is that while this approach predicts some triggers should be harder to accommodate than others, the theory as proposed in Göbel (2020) does not explain why some trig-

gers seem to be accommodated easily in all (or most) contexts, i.e. the informative presuppositions. As it stands, then, this approach is best suited to explaining variation within triggers that impose some CFC strength, and not how CFCs can disappear all-together.

1.5 Conclusion

This chapter has provided a background on theoretical issues in the literature on presuppositions, with a particular focus on areas that will be central to this thesis, including the novelty problem and Contextual Felicity Constraints. I have argued that presuppositions are a natural class of meanings, and have described their main theoretical treatments—semantic, pragmatic and hybrid. I introduced the notion of an accommodation mechanism, and described proposals for when and why the accommodation mechanism sometimes fails. One problem for research on presupposition, and in particular research on Contextual Felicity Constraints, is the lack of high-quality data. Without data that allows for cross-trigger comparisons, evaluating the empirical coverage of these proposals is impossible. In the next chapter, I turn to these empirical issues and introduce methods for measuring CFC strength across a broad set of presupposition triggers.

2

Experimental Approaches for Assessing Contextual Felicity

2.1 Introduction

In order to assess the theoretical approaches to presupposition and accommodation laid out in the previous section, we need to know which presupposition triggers are subject to Contextual Felicity

Constraints. That is the aim of this chapter. As discussed previously, it is assumed that three sets of factors can affect the contextual felicity of an utterance bearing a presupposition: (i) Social factors such as the amount of trust between interlocutors (Von Fintel, 2008) or the intent of the communicative act; (ii) the information content of the presupposition trigger (Lassiter, 2012; Geurts & van der Sandt, 2004); (iii) the way that the presupposition was packaged, including its relationship to local information structure and the logical-semantic properties of the presupposition trigger itself. While social and information content properties are no doubt important to processing of presuppositions, I set them aside and focus purely on the third item, which will be referred to as the 'formal' aspects of contextual felicity.

This chapter proceeds as follows: Section 2.2 discusses previous empirical work investigating the processing of presuppositions, grouping studies by the dependent measure used. Various dependent measures are discussed and it is argued that acceptability judgements are both simple and flexible enough to enable robust cross−trigger comparison. Section 2.3 introduces a novel experimental paradigm for studying CFCs based on a conjunctive criteria between two contrasts that have been studied previously in the literature. Using this paradigm, the strength of CFCs is measured for cases when they appear in matrix clauses, finding that all triggers except factive predicates and possessive pronouns impose some CFC. Looking at effect sizes of CFCs, I find good correlations between the experimental paradigm presented here and corpus-based production data, providing ecological validity for the approach. Section 2.4 presents the second study, which asks whether CFCs are stable across environments that correspond to the family-of-sentences tests for projectivity (Chierchia & McConnell-Ginet, 2000). I find that the stability of CFCs correlates with the effect size from both this and the previous experiment. Section 3.5 proposes a ranking of presupposition triggers' Contextual Felicity Constraints that synthesizes the results from both studies. I propose that additive particles (like *even* and *too*) impose the strongest CFCs, followed by exclusives, open-class "soft" verbal triggers (such as *win* and *stop*) and finally factive predicates and possessive pronouns. The implications for this ranking

are discussed with respect to previous accounts of accommodation and contextual felicity. Section 2.6 concludes.

2.2   Background: Experimental Approaches to Presuppositions

There are many challenges facing experimental work on presuppositions. As has been emphasized previously, presupposition triggers are a heterogeneous group, making it difficult to construct experimental items that allow for balanced cross trigger comparison. One of the most theoretically interesting properties of presuppositions—their projectivity—means that triggers may be embedded in complex test items that are difficult to process. And because a single lexical item (like *again*) may introduce a complex proposition with multiple contextually-resolved variables, its content may be difficult to control experimentally. This section provides a brief background on previous experimental approaches to presupposition, categorizing different experiments based on their dependent measures, including online processing studies, time-course studies and offline processing studies. Three different approaches have been used to assess issues of Contextual Felicity Constraints and accommodation. I lay the groundwork for subsequent experimental approach by arguing that acceptability judgements can provide an intuitive, neutral dependent measure that is flexible enough to test a wide variety of triggers in different syntactic environments.

Online processing studies measure participant behavior as they read a sentence, largely using the time it takes to process each word as the dependent measure. Researchers have successfully deployed self-paced reading studies (Schwarz, 2007; Schwarz & Tiemann, 2017; Tiemann et al., 2011) and eye-tracking studies (Schwarz & Tiemann, 2017) to investigate various aspects of presuppositions. Singh et al. (2016) combines a self-paced reading task with an online implausibility judgement, where participants are instructed to click a button when the sentence 'stops making sense.' Many of these studies have focused on issues of trigger support and accommodation, demonstrating that participants take

longer to process a trigger in cases where its presuppositions are not entailed by a proceeding context. The advantage of this methodology is that it can shed light into the time-course of presupposition processing, and does not rely on participants' intuitive judgements of *true/false* or *acceptable*, like the offline studies discussed below. However, this approach also has its limitations: First, different triggers span different amounts of material (for example *again* vs. clefts), and may occur at different points in the sentence, making it difficult to create balanced items that test multiple triggers. Additionally, whether or not the trigger is supported by the context may not be apparent at the trigger itself, which could create further difficulties for making robust cross−trigger comparisons. For example, the sentence prefix "Alex sliced her…" could be continued with *finger* in which case the presupposition (Alex has a finger) is highly probable based on common knowledge. But it could also produce an unsupported presupposition with a continuation like *papaya*, in which case the presuppositions (Alex has a papaya) might need to be accommodated.

Another technique that has been used to measure the processing presuppositions is what we will refer to as 'time-course' studies. In these experiments, participants read a sentence and are asked to verify it as either *true* or *false* as quickly as possible. The time it takes has been used to investigate preferences for accommodation location (local vs. global) in presupposition processing (Chemla & Bott, 2013), and processing-time comparisons between presuppositions and scalar implicatures (Romoli & Schwarz, 2015). While this experimental paradigm can be extremely revealing, it is best suited to test theories that make different predictions about processing time. Thus, we set it aside for the purposes of testing Contextual Felicity Constraints and accommodation, where the time-course properties are less established than, say, for scalar implicatures (Bott & Noveck, 2004)

Finally, we turn to the largest experimental category: offline studies in which participants are allowed to fully process a sentence containing a presupposition and are then asked to perform a task (typically a judgement), with different tasks deployed to assess different theoretical properties. For studying projectivity, the most common task is an inference judgement, where participants are given

a premise and a conclusion, and asked to rate whether the latter follows from the former (for example "Alex didn't see only Sue" → "Alex saw Sue"). However, inference tasks have also been used to study the quantificational scope of presuppositions (Chemla, 2009), as well as whether or not a presupposition can be supported by material that follows it (Chemla & Schlenker, 2012). Additionally, projection has been assessed using other inferential tasks, such as inferences to speaker certainty (Tonhauser et al., 2018).

For issues of contextual felicity and accommodation, two widely-used offline measures are comprehension questions and acceptability judgements. Multiple studies have tackled the issue of whether accommodation is mandatory by presenting a story with unsupported presupposition triggers, and then asking participants comprehension questions about what they have heard. The hypothesis is that participants will be better at answering questions about material they have accommodated. While some studies find variation between triggers with respect to participant recall (Domaneschi et al., 2014; Tiemann et al., 2011), another finds that presuppositions are accommodated even when they are not necessary (Bacovcin et al., 2018). These disparate results suggest that even though comprehension studies may be an intuitive way to assess accommodation, subtle changes in the experimental setup can lead to different conclusions. In acceptability judgement studies, participants are instructed to rate a target sentence based on how natural or acceptable it sounds given a context, with most studies creating experimental conditions by factorially varying the relationship between the target sentence and its context. Acceptability judgement studies have assessed when presuppositions in questions can be targeted by an answer (Cummins et al., 2012, 2013; Amaral & Cummins, 2015), as well as when presuppositions can successfully introduce discourse novel information as the answer to a question (Göbel, 2020).

I elect to use acceptability ratings for a number of reasons. First, acceptability is the measure most directly linked to felicity/infelicity, which is our theoretical property of interest. Second, acceptability judgements are relatively intuitive and require little training for naive participants to produce. Third,

acceptability judgements have been used successfully to make comparisons across a wide range of triggers: For example both Cummins et al. (2013) and Göbel (2020) use acceptability to compare 8 different presupposition triggers, which make them the largest cross−trigger comparisons reported previously in the literature. Finally, because acceptability judgements are a relatively simple offline measure they have been deployed to study contexts where presupposition triggers are embedded in complex semantic environments (Bade, 2016). While issues of contextual felicity and accommodation could be approached through multiple experimental paradigms, acceptability ratings are theory-neutral, simple, and will provide room for flexible item creation that can target different syntactic structures and semantic environments.

2.3   Experiment 1: Presupposition Triggers in Matrix Clauses

This section introduces a basic experimental paradigm for assessing Contextual Felicity Constraints of presupposition triggers in matrix clauses, and presents tests for thirteen English triggers. The results indicate that, except for factive predicates and possessive pronouns, all triggers are subject to some CFCs. Results are compared to production data from a large-scale corpus. A strong correlation between the strength of the CFCs from the experiment, and the proportion of times a trigger is supported in the production data, providing ecological validity for the experimental setup.

2.3.1   Methods

Design   To assess the strength of Contextual Felicity Constraints, a 2x2 experimental design was employed testing acceptability of a sentence that either contained a presupposition trigger or not (+TRIGGER vs. −TRIGGER) and in which the immediate preceding context either supports the presupposition or not (+SUPPORTING vs. −SUPPORTING).[1] A context is taken to "support" a pre-

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[1] These are the same as what Tonhauser et al. (2013) call NEUTRAL (here, −SUPPORTING) and POSITIVE (here, +SUPPORTING)

supposition if it either entails the content of the presupposition or if it provides the trigger with a discourse referent. Example (1) gives a sample for the trigger *even* in each of the four possible conditions, with the context sentence on the left and the target sentence underlined. More information about construction of the materials is given in the paragraphs below.

(1)   a.   What did Josh do today? <u>He went to the grocery store.</u>

[−SUPPORTING, −TRIGGER]

b.   What did Josh do today? <u>He even went to the grocery store.</u>

[−SUPPORTING, +TRIGGER]

c.   Josh went all over town today. <u>He went to the grocery store.</u>

[+SUPPORTING, −TRIGGER]

d.   Josh went all over town today. <u>He even went to the grocery store.</u>

[+SUPPORTING, +TRIGGER]

The logic of the design is as follows: If a trigger imposes a Contextual Felicity Constraint, then by definition a trigger-bearing sentence should be more acceptable in a context where its presupposition is supported than in a neutral context where it is not supported. Thus, (d) should be rated as more acceptable than (b). In addition, if a trigger imposes a CFC, then in a non−supporting context, a trigger-bearing sentence should be less acceptable than a minimal-pair sentence that does not contain a presupposition trigger. Thus, we expect (a) to be rated as more acceptable than (b). Each of these two contrasts has been deployed in previous experimental setups for testing CFC strength: Tonhauser et al. (2013) investigates the (d) vs. (b) contrast, which will be referred to as the *+trigger* contrast. Additionally, Göbel (2020) investigates the (a) vs. (b) contrast, which will be referred to as the *-supporting* contrast.

One problem with each of these previous studies is that looking at binary contrasts may lead to incorrect conclusions about CFC presence or CFC strength. For example, it may be the case that par-

ticipants rate +*trigger* sentences worse than −*trigger* sentences in −*supporting* contexts, producing a large -*supporting* contrast. However, without checking that +*trigger*/+*supporting* sentences, we cannot rule out the possibility that participants merely give low ratings to sentences with the trigger across the board. Thus, in order to rule out potential confounds, this study employs a *conjunctive criteria* when assessing CFC presence. That is, in order to be confident that a trigger is imposing a CFC we look for a significant +*trigger* contrast and a significant -*supporting* contrast. If both are present, then we conclude the trigger is subject to a Contextual Felicity Constraint.

Given our experimental design, one other option is possible, and that would be to look for a significant interaction between trigger and support. The problem with this measurement for CFC strength is that it runs into issues with trigger obligatoriness in +*supporting* conditions. Trigger obligatoriness may arise for a number of different reasons including pressures like Maximize Presupposition (Heim, 1991) or to cancel inferences of exhaustivity (Bade, 2016). If a trigger is obligatory, then +*supporting*/−*trigger* sentences like (c), above, could be rated lower, resulting in deviant interaction effects. For example, if participants rate sentences (a) and (b) equivalently, but (c) as lower than (d), an interaction analysis would indicate that the trigger is subject to a Contextual Felicity Constraint. However, this would be entirely due to pressures imposed on the trigger when its presuppositions are supported. The question of trigger obligatoriness is undoubtedly related to contextual felicity, however such pressures are moot if participants find no differences between +/−*trigger* sentences in −*supporting* contexts. Thus, in order to avoid these pitfalls, we avoid interaction tests and stick to conjunctive criteria for -*supporting* and +*trigger* contrasts.

The study employed the presentational design advocated in Marty et al. (2020), who report that joint presentation of conditions with a continuous scale and labeled endpoints draw out robust contrasts between conditions in a rating task of this type. There are two advantages worth highlighting about this experimental paradigm: First, it draws out robust contrasts because it allows for direct comparison between conditions on a single screen, enabling participants to report small judgement

What did Josh do today?

He went to the hardware store.   Least acceptable ——————●——— Most acceptable

He even went to the hardware store.   Least acceptable ——————●——— Most acceptable
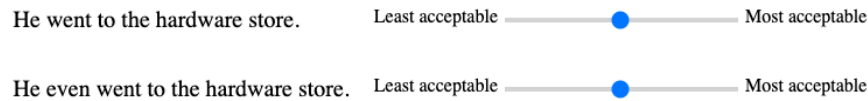
→ Click here to continue

Figure 2.1: Sample item for the *even* trigger in the *—supporting* condition.

differences even if judgments might cluster together amid a wider context of possible ratings. Second, it highlights the aspect of the judgement which the experimenter intends the participant to focus on. These advantages come at the expense of participant naivety—by situating both conditions on a single screen the experimenter draws back the curtain to reveal which aspects of the sentence should be most important to the judgement.

For each trial participants were shown the context, in bold, at the top of the screen, and asked to rate the two possible continuations (+*trigger* and −*trigger*), which were presented below in a random order with continuous response bars at right. The slider bar responses were stored as an integer from 0-100, with 0 being "least acceptable" and 100 being "most acceptable". Figure 2.1 gives an example for the trigger *even*, in a *—supporting* context. At the beginning of the experiment participants were instructed to think about acceptability as how well the sentence fits with the preceding context, following the instructions given in Göbel (2020). After the instructions, participants were given three warm-up trials, two of which involved a grammatical number mismatch between the context and one of the target sentences.

MATERIALS AND PARTICIPANTS   Items were created for thirteen English presupposition triggers, which are given in the example items below. These are the same triggers that will be used in the next experiment, except for factive predicates, which will be split into *emotive factives* and *cognitive factives*.

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For each trigger 5 items were created. The following standards were used when creating experimental items: Each context sentence introduced a character, and the target sentence provided further information about the character's recent activities. Neutral contexts were constructed using wh-questions, which are associated with speaker ignorance. Positive contexts were constructed with simple past-tense statements that satisfied the target trigger's presuppositions. Characters were introduced using first names familiar to English readers. When noun phrases were repeated between the context and target sentence they were turned into pronouns, if the change was judged to increase semantic felicity. +*Trigger* target items consisted of simple past-tense statements that included the presupposition; −*trigger* items were created using the non-presupposing alternatives from the list in Section 3.2 of the previous chapter, with two differences: For accomplishment verbs the non-presupposing alternative was a verb describing the participatory action (e.g. *win/participate*, *pass the test/take the test*), and for factive predicates the non-presupposing alternative consisted in a mix of non-veritical predicates (e.g. *suspect*, *believe*, *think*).

The following examples give sample items for each trigger, which are presented in alphabetical order. When the item contains multiple sentences only the last sentence was rated by participants as the target sentence.

Accomplishment verbs were taken to presuppose a preparatory activity, and included *win*, *pass* (as in "pass the class") *fail* and *find*. For this example, experimental conditions are written below each item. Subsequent examples preserve the same ordering of conditions, but omit explicit labels for experimental conditions.

(2)   Accomplishment verbs

    a.   Hope is looking for her high school yearbook. She looked for it in the garage.

       [+SUPPORTING, −TRIGGER]

    b.   Hope is looking for her high school yearbook. She found it in the garage.

[+SUPPORTING, +TRIGGER]

    c.   What was Hope up to yesterday? She looked for her high school yearbook in the garage.

        [−SUPPORTING, −TRIGGER]

    d.   What was Hope up to yesterday? She found her high school yearbook in the garage.

        [−SUPPORTING, +TRIGGER]

Again was taken to presuppose that its prejacent has happened at some point previous to the time index associated with the matrix verb. Note that in −*trigger*/+*supporting* conditions, target sentences for *again* and other additive presuppositions are often redundant. While this condition is largely present as a control (it does not figure into the *-supporting* or *+trigger* contrasts), it could artificially boost ratings in the *+trigger/neutral* condition. Care was taken in the subsequent experiment to reduce redundancy effects where possible.

(3)   Again

    a.   Kendra baked a pumpkin pie recently. What did she do last weekend? She baked a pumpkin pie.

    b.   Kendra baked a pumpkin pie recently. What did she do last weekend? She baked a pumpkin pie again.

    c.   What did Kendra do last weekend? She baked a pumpkin pie.

    d.   What did Kendra do last weekend? She baked a pumpkin pie again.

Back is taken to compose with sentences that have locative prepositional phrases and presuppose that the subject was in the specified location at some point previous to the time index associated with the matrix verb.

(4)   Back

    a.   Georgia was at her parents house last month. What did she do last week? She drove to

her parent's house.

    b.   Georgia was at her parents house last month. What did she do last week? She drove back to her parent's house.

    c.   What did Georgia do last week? She drove to her parent's house.

    d.   What did Georgia do last week? She drove back to her parent's house.

It-Cleft structures were taken to presuppose the existence of one of the elements of the focus value of its prejacent.

(5)   Clefts

    a.   Avi took a class last spring. He took an engineering class.

    b.   Avi took a class last spring. It was a engineering class that he took.

    c.   What did Avi do last spring? He took an engineering class.

    d.   What did Avi do last spring? It was a engineering class that he took.

The definite determiner (i.e. *the*) was taken to presuppose familiarity in the recent linguistic context.

(6)   Definite determiner

    a.   Irina often hangs out a coffee shop on the corner. Today, she had lunch at a coffee shop.

    b.   Irina often hangs out a coffee shop on the corner. Today, she had lunch at the coffee shop.

    c.   What did Irina do last weekend? She had lunch at a coffee shop.

    d.   What did Irina do last weekend? She had lunch at the coffee shop.

Even was taken to presuppose the existence of one of the alternatives of its prejacent. Even also introduces scalar presuppositions, to the effect that its prejacent is notable or unlikely, however scalar presuppositions were not explicitly controlled for in these items.

(7)   Even

   a.   Robert baked a lot of things last weekend. He made a cake.

   b.   Robert baked a lot of things last weekend. He even made a cake.

   c.   What did Robert do last weekend? He made a cake.

   d.   What did Robert do last weekend? He even made a cake.

Factive predicates were taken to presuppose the truth of their complements. Factive predicates included *discover that*, *learned that*, *happy that*, and *glad that*

(8)   Factive Predicates

   a.   Julia will get a promotion. She suspected that she will get a promotion.

   b.   Julia will get a promotion. She discovered that she will get a promotion.

   c.   What's up with Julia? She suspects that she will get a promotion.

   d.   What's up with Julia? She discovered that she will get a promotion.

Only was taken to presuppose its prejacent. For this experiment, items in the *+supporting/-trigger* condition repeated the character's activity twice. This repetitiveness was amended in the subsequent experiment.

(9)   Only

   a.   Alexandra baked a pie last weekend. She made a pie.

   b.   Alexandra baked a pie last weekend. She only made a pie.

   c.   What did Alexandra do last weekend? She made a pie.

   d.   What did Alexandra do last weekend? She only made a pie.

Possessive pronouns were taken to presuppose that their referent possesses the NP that they head. In these items, possessive pronouns were contrasted with definite determiners in *+supporting* sentences,

where a referent had been established previously. Although definite articles also carry presuppositions, they were included because determiners may be subject to obligatoriness constraints, like Maximise Presupposition (Heim, 1991), and indefinite articles would sound infelicitous in these contexts.

(10)   Possessive pronouns

    a.   Mike recently bought a new car. Last night, he drove around in the car.

    b.   Mike recently bought a new car. Last night, he drove around in his car.

    c.   What did Mike do last night? He drove around in a car.

    d.   What did Mike do last night? He drove around in his car.

Wh-questions were taken to denote a set of alternatives (Dayal, 2016), and presuppose that at least one of the alternatives is true.

(11)   Questions

    a.   Logan built something in his woodshop last week. Tell me, did he build a cabinet?

    b.   Logan built something in his woodshop last week. Tell me, What did he build?

    c.   Logan was up to something last week. Tell me... Did he build something in his woodshop?

    d.   Logan was up to something last week. Tell me... What did he build in his woodshop?

State Change Verbs included a mix of three predicates: *stop*, *continue* and *finish*. All of these verbs share the presupposition that their complement was true of their subject previously. They however differ in terms of their asserted content. The subsequent experiment will look only at *stop*, which is the most frequently studied change of state verb.

(12)   State-Change verbs

    a.   Last night, Louis was cleaning out the attic. Today, he was cleaning out the attic as

well.

    b.   Last night, Louis was cleaning out the attic. Today, he stopped cleaning out the attic.

    c.   What was Louis doing last night? He was cleaning out the attic.

    d.   What was Louis doing last night? He stopped cleaning out the attic.

Still was taken to presuppose that its prejacent was true previously and up until the time variable associated with the matrix verb.

(13)   Still

    a.   Earlier Tessa was taking a nap. She is taking a nap as well, now.

    b.   Earlier Tessa was taking a nap. She is still taking a nap.

    c.   What's Tessa doing? She is taking a nap.

    d.   What's Tessa doing? She is still taking a nap.

Too was taken to presuppose the existence of one of its focal alternatives.

(14)   Too

    a.   Rebecca baked cookies last weekend. John made cookies.

    b.   Rebecca baked cookies last weekend. John made cookies, too.

    c.   What did John do last week? He made cookies.

    d.   What did John do last week? He made cookies, too.

32 participants were recruited from Amazon Mechanical Turk. Participants were all located within the US, were US High School graduates and had a lifetime MTurk completion rate of above 90%. They were instructed that they could only participate in the survey if they were native English speakers. The survey took about 20 minutes to complete and participants were paid for their participation. To make sure that participants were using the scale bar correctly, participants were filtered if they did not

Experiment 1: Ratings by Trigger

context ● -support ▲ +support   trigger ●─ -trigger ●─ +trigger
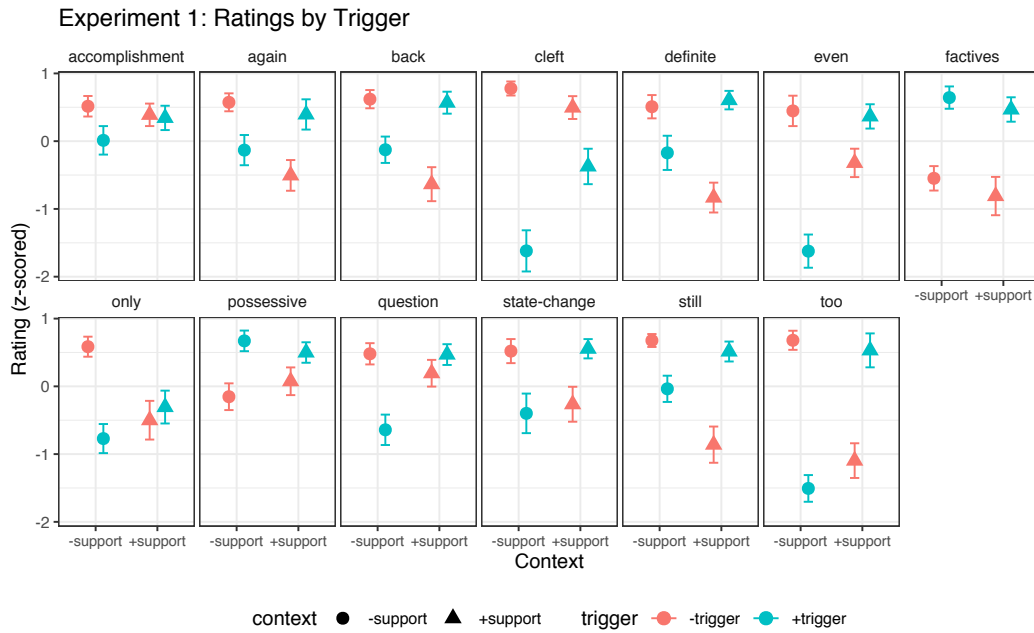
Figure 2.2: Results from the rating study, standardized within participant. Points are the means of each condition, error bars are 95% confidence intervals. The triggers are ordered alphabetically.

rate the number mismatched warm-up sentences in the bottom quartile of the response bar, which resulted in filtering out 6/32 participants, or about 18%.

2.3.2 Results

Results   The results from the study can be seen in Figure 2.2, with triggers arranged in alphabetical order. The x-axis indicates whether or not the context supports the presupposition and the y-axis participants' ratings, which have been standardized (i.e. z-scored) for each participant to control for cross-subject variation. Red points are *−trigger* ratings and blue points are *+trigger* ratings. Error bars are 95% confidence intervals pooled by subject. Comparing across triggers, we find three types of patterns. The first, are cases where there is (visually) no interaction between the two experimental conditions—*+trigger* conditions are rated more highly than *−trigger* conditions, regardless of

support. This category includes possessive pronouns and factive predicates. The second are cases of spreading interactions, where there appears to be a main effect of +/− *trigger* that is enhanced in the −*supporting* context. Triggers with spreading interactions include clefts, *only* and accomplishment verbs. More common are cases of cross-over interactions, where the relative felicity of the +/− *trigger* targets are reversed between the −*supporting* and +*supporting* contexts.

In order to provide statistical assessment for which triggers are subject to a Contextual Felicity Constraint, linear mixed effects models were fit that correspond to the *-supporting* and +*trigger* contrasts discussed previously. Models were fit using the following methods: All models had participant rating as the response variable and used the single crucial contrast as the sole predictor after filtering out data that was not relevant for the metric. (For example, for the +*trigger* contrast data from the −*trigger* condition was filtered out.) I included by-participant and by-item random slopes for these models, and report the significance value of the sole predictor variable. [2] If significant contrasts are found for both contrasts, then I conclude that the trigger is subject to a CFC.

Significant *-supporting* contrasts were found for all triggers: $p < 0.001$ for back, clefts, factive predicates, even, only, possessive pronouns, questions, and too; $p < 0.01$ for again and still; $p < 0.05$ for accomplishment, definite and state-change verbs. For factive predicates and possessive pronouns the estimate is in the wrong direction than would be predicted if these items were subject to CFCs. For the +*trigger* contrast, significant effects were found for all triggers, except factive verbs and possessive pronouns: $p < 0.001$ for back, clefts, the definite determiner, even, questions and too; $p < 0.01$ for still; $p < 0.05$ for accomplishment verbs, again, only and state-change verbs. These results indicate that all triggers are subject to CFCs except factive predicates and possessive pronouns.

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[2] An example lmer formula for the +*trigger* contrast: `rating ~ supporting + (supporting || participant) + (supporting || item)`
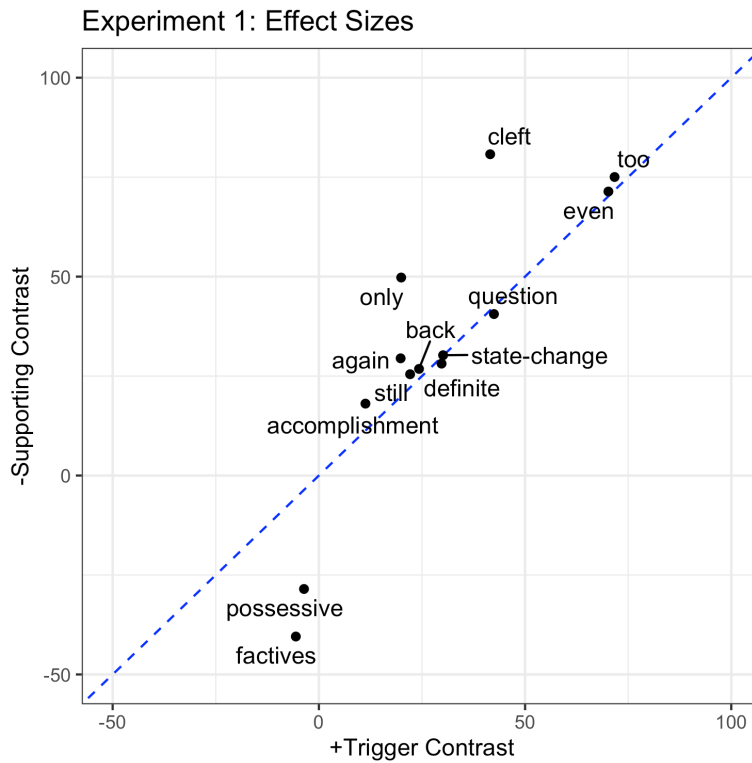
Figure 2.3: Effect sizes for both critical contrasts from Experiment 1. Dots represent differences between conditions after averaging across subjects and items.

2.3.3 DISCUSSION

EFFECT SIZES   In addition to knowing whether a trigger is subject to a CFC, we might want to know the relative strength that the CFC imposes. CFC strength could be estimated by looking at the size of differences between conditions. But which contrast to use, +*trigger* or -*supporting* ? In order to get a sense of agreement between the two, Figure 2.3 shows effect sizes, with the -*supporting* contrast on the y-axis and +*trigger* contrast on the x-axis. Effect sizes were computed by taking the relevant differences between conditions after averaging across trials and participants for each trigger. Based on their proximity to the y=x line (which is shown in dotted blue), its clear that both metrics agree for the majority of triggers. There are two points of difference: First, we find larger -*supporting* contrasts

for clefts and *only*, which are above the dotted line. Second, we find smaller *-supporting* contrasts for possessives and factive predicates, which are below the line. However, even though effects for these latter two triggers are under-estimated by the *-supporting* contrast, both metrics still associate them with the weakest CFC effects.

Based on these data, three clusters of triggers emerge. The first cluster contains *too* and *even*, which are associated with the largest CFC effects. The second cluster contains all of the other additive particles, questions, state-change verbs, accomplishment verbs and the definite determiner. Although these items are associated with CFCs, they are weaker than those for the first cluster. Finally, the third cluster includes possessive pronouns and factive predicates, which are not associated with CFCs.

Only and clefts are difficult to categorize. Based on *+trigger* contrasts, they pattern with the other medium-CFC triggers in the central cluster, but based on *-supporting* contrasts, they pattern closer to *even* and *too*. One reason why these two metrics may disagree is that these triggers may be associated with strict Question/Answer congruence conditions. For example, the Q/A pair: "Who did Amos talk to? He only talked with Zack" may appear infelicitous, but not necessarily because the presupposition trigger imposes a CFC. In this case, use of the form *only* is blocked by the presuppositionless alternative ("He talked to Zack"), which conveys the same content if it is exhaustified with respect to the question. One reason to think that it is Q/A congruence and not CFC strength that is driving lower ratings are cases like (15) below, in which the unsupported use of *only* is acceptable (author's judgement). In this case, the presuppositionless alternative may not successfully convey the exhaustive meaning, and the variant with *only* becomes available, even though its presuppositions are not supported by the context.

(15)   *Two people are at a party with their friend Amos, who is a social butterfly. Person B knows that Amos talked to Zack and nobody else at the party.*

A: Amos must have talked to a lot of people. Who did he talk to?

B: He talked only with Zack.
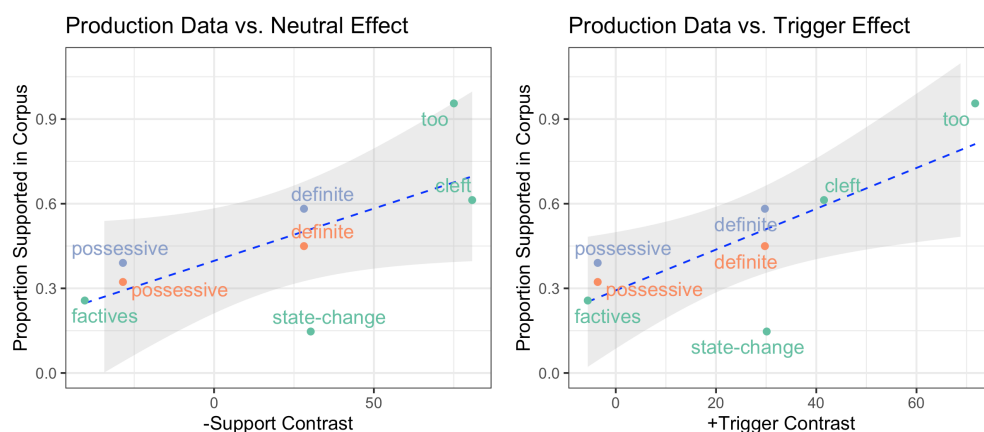
Figure 2.4: Comparison between *+trigger* and *-supporting* contrasts to corpus production data. Both metrics show strong correlation coefficients above 0.6, but the correlation is only significant for the *+trigger* metric ($p < 0.05$).

COMPARISON TO PRODUCTION DATA   As with any online comprehension study, there may be questions about the ecological validity of the experimental paradigm for capturing naturalistic uses. In this section, I validate the methods against production data from Spenader (2002), who collected data from the London-Lund Corpus of Spoken English, and hand coded them as to whether each trigger's presuppositions were supported in the preceding context. Following Spenader, for each trigger, I report the proportion of times it was supported in the corpus.[3] Data was collected for only a subset of the triggers tested in the study: possessive pronouns, factive predicates, the definite determiner, change of state verbs, clefts, and *too*. The assumption is that if a trigger imposes strong Contextual Felicity Constraints, then it will be costly for speakers to use and listeners to interpret in cases where its presuppositions are not supported by the context. Speakers would be expected to avoid such costly uses and thus we predict a correlation between the proportion of supported use in the production data and the strength of the CFC, as measured in the study.

The comparison between production data and the effect-sizes of the two metrics can be seen in Figure 2.4, with the proportion of support on the y-axis, and the results of our study on the x-axis.

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[3]Data is take from Table 5 and Table 6 of Spenader (2002), section 5.1

Color-coding of triggers in the figure corresponds to three different annotators: One annotator for *too*, factives, clefts and change of state verbs; and two annotators each for possessive pronouns and the definite determiner. Overall, the results show strong relationship between the strength of the CFC, as measured in our experiment, and the proportion of times a presupposition is used with contextual support in production as measured in Spenader (2002). For the *+trigger* contrast we find $cor = 0.77$ ($p < 0.05$); for the *-supporting* contrast we find $cor = 0.69$ ($p = 0.06$).

2.3.4 Conclusion

This experiment has provided an initial answer for which triggers impose CFCs. It was argued that the proper way to measure the presence of a CFC was to use a conjunctive criteria, looking for both *+trigger* and *-supporting* contrasts. Under this criteria, all presuppositions are subject to some CFC, except for factive predicates and possessive pronouns. Looking further at the effect sizes for both contrasts, it was argued that triggers which do impose CFCs could be further categorized into two groups, with *too* and *even* imposing stronger CFCs than other triggers. *Only* and clefts were hard to categorize. However given that the *+trigger* effect showed a stronger correlation to production data, and under this metric the two patterned with the medium-CFC triggers, I tentatively conclude that they impose weaker CFCs than *even* or *too*.

2.4 Experiment 2: CFCs in Embedded Clauses

One of the most studied features of presuppositions are their projection properties. This section assesses the interaction between projection and Contextual Felicity Constraints by running an experiment similar to the one presented above, but in which presupposition triggers are embedded inside entailment canceling operators. The operators we use follow the *Family of Sentences* test (Chierchia & McConnell-Ginet, 2000), which are traditionally used to diagnose projectivity properties. They are:

the scope of negation, antecedents of conditionals, the scope of possibility models and polar questions. The experiment also includes vanilla matrix clause contexts against which the results from the embedded contexts can be compared.

In this experiment, I will assume that the CFCs imposed by a trigger in matrix clauses are its base properties, and investigate how constraints in the base case may differ in more complex embedded environments. If we observe no change between base case and any of the family-of-sentence environments, then we can conclude that the CFC behavior of the trigger is stable. If we observe differences between matrix clauses and embedded environments, there are a number of potential explanations. First, it may be the case that the embedded environment suspends the presupposition, as, for example, has been argued for the case of accomplishment verbs in conditional environments (Abusch, 2002). If the presupposition is suspended, then we would not expect it to impose any CFCs. We can call this CFC-reduction due to suspension. Second, it may be the case that the trigger imposes CFCs in all contexts, but the CFCs are ignored when sentences are difficult to process. We can call this CFC-reduction due to processing cost. It is well established, for example, that negated sentences are more difficult to process than affirmative sentences, especially when presented with only minimal context like the items in this experiment (Carpenter & Just, 1975; Kaup & Dudschig, 2020). Because of this difficulty in processing, it may be the case that when assessing semantic acceptability for complex sentences, participants focus on the relationship between the asserted content and the truth-canceling operators, and fail to factor in contextual felicity when making their judgement. Third, it may be the case that CFCs are not ignored due to processing cost, but may be treated differently in different environments due to discourse-structural properties. For example, the sentences "Alex went to the beach" and "Alex didn't go to the beach" have different distributions in conversation, insofar as they are appropriate answers for different questions or QUDs. It may be the case that participants modulate how sensitive they are to unsupported presuppositions based on the inferred role of the sentence in the local discourse context. We can call this CFC-reduction due to information structure. Finally,

it may be the case that the different embedding environments impact the strength of a CFC due to the way that they change the logical structure of a sentence. We can call this CFC-reduction due to logical structure.

Although it may be possible to devise an experiment that can tease apart the cause for CFC change between environments, that is not the objective of the present study.[4] Rather, the point of this exercise is to further investigate the strength of a CFC by assessing whether it is stable across environments. It is assumed that if a CFC is stable, then it should resist reduction, regardless of the cause. If the CFC of a trigger changes in zero or just one environment, then we can conclude that it is stable. If a CFC changes two or more times between the base environment and other environments we conclude that the mechanism responsible for the CFC is not stable. Generally, the experiment finds that the triggers associated with the strongest and weakest CFC effects from Experiment 1 are stable, while the middle-ground triggers are subject to more variation based on family-of-sentences environment.

2.4.1 Methods

Design and Participants   The experimental design employed was the same used in the previous section, crossing the presence or absence of a presupposition trigger in a target sentence (+*trigger* vs. −*trigger*), with whether or not the presuppositions of the trigger were supported in a context sentence (+*supported* vs. -*supported*). In addition, the *environment* was included as an additional factor in this experiment. I used the same experimental methods as the experiment in the previous section, and created all-new items for the *matrix* environment. The one difference between this experiment and the previous one was the inclusion of attention-check items. Instead of using our practice trials to assess whether participants were using the response bar as intended, eight attention check items were dispersed randomly throughout the experiment. Attention check items were shown to participants

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[4]For example, if CFCs are reduced because of processing cost, then we might expect further reduction in situations where participants need to make speeded judgements.

using the same presentational paradigm as target items, but instead of a +*trigger* and −*trigger* condition, they contained a *match* and *mismatch* between a grammatically gendered noun in the context and a pronoun in the target. Below, (16) gives an example.

(16)   Yesterday, a nun visited our school.

    a.   We heard her speak in our class on world religion. [MATCH]

    b.   We heard him speak in our class on world religion. [MISMATCH]

249 participants were recruited on Prolific, who were all self-identified native English speakers with IP addresses inside the United States. Because this experiment involves a large number of items, it was divided it into six sub-experiments, which took about 20 minutes to complete. Subjects were not allowed to participant in more than one sub-experiment and were excluded if their responses for the *match* condition were not in the top quartile, or *mismatch* not in the bottom quartile of the slider, on average. This came to a total of 40 participants, or ∼16% of the total, which was a similar to the previous experiment.

MATERIALS   Six items were created for each trigger/environment pair using the same basic construction and non−triggering alternatives as in the previous section. Triggers were the same, except for this experiment split the single trigger category *factives* into emotive factives (e.g. *angry that*, *sad that*) and cognitive factives (*know*). Below, (17)-(21) give examples for presupposition trigger *again* in the critical −*trigger*/−*supporting* condition for each of the five projective environments tested. These are intended to just give an overview for how items changed by environment. More fine-grained examples for each trigger/condition/environment pair are given when discussing the results in the next section.

For items in the *matrix* environment, as in (17), the same design was used as in the previous experiment. This experiment included all new items.

(17)   What did Alex do over the weekend?

She went to the beach again. [Matrix]

Negated sentences are often judged to be degraded answers to simple wh-questions because they do not provide exhaustive or maximal information, which may be necessary under some semantic theories of questions (Dayal, 2016). For example "What did Alex do over the weekend? She didn't go to the beach" may sound unnatural to participants. To avoid these sorts of question/answer pairs, I modified the −*supporting* context to better set up expectations for negation by using *why not* questions. An example is given in (18) below.

(18)   Why didn't Alex get sunburned this summer?

        She didn't go to the beach again. [Negation]

For triggers embedded under possibility operators I used a mix of possibility modals including *might have*, *maybe* and *it's possible*. (19) gives an example.

(19)   What did Alex do this summer?

        She might have gone to the beach again. [Possibility]

For presupposition triggers embedded in the antecedents of conditionals, there were two important constraints. First, the consequent of the conditional had to answer the question in the −*supporting* context, and second it had to follow from the antecedent. To accomplish this, questions and consequents were framed around a target character's mood. (20) gives an example.

(20)   How is Alex feeling?

        If she went to the beach again this weekend, she'll be in a good mood. [Possibility]

For presuppositions embedded in polar questions I changed the −*supporting* context from a wh-question to a simple stative sentence that did not entail the presupposition. (21) gives an example.

(21)   Alex had a great summer.

         Did she go to the beach again?   [QUESTIONS]

FOLLOW-UP TRIALS   After the six sub-experiments had been run, I noticed that there were un-
accounted for confounds with some of the items. In order to correct for these issues, I ran a single
follow-up experiment with the same methods outlined above. In the graphs in the section below,
follow-up trials will be presented in a different facet from data collected in the initial round, and an
explanation will be given for why I thought a follow-up trial was necessary.

2.4.2   RESULTS

This section walks through the results trigger-by−trigger in alphabetical order, focusing on how each
item's behavior changes between the base context and the four family-of-sentences environments. For
each trigger, before discussing the results, I give example items for each of the five environments and
describe any considerations that were included when creating the items. Example items follow the
order below:

(22)   a.   [+SUPPORTING, +TRIGGER]

         b.   [+SUPPORTING, −TRIGGER]

         c.   [-SUPPORTING, +TRIGGER]

         d.   [-SUPPORTING, −TRIGGER]

As with the first experiment, a conjunctive criteria is used to determine whether a trigger is subject to
a Contextual Felicity Constraint. For *+trigger* and *-supporting* contrasts, significance was determined
by fitting a linear mixed-effects regression model with the same methods outlined in the previous ex-
periment. Generally, if zero or one differences (in terms of the presence or absence of a CFC) is found
between environments, I conclude that the CFC is relatively stable. If two or more differences are
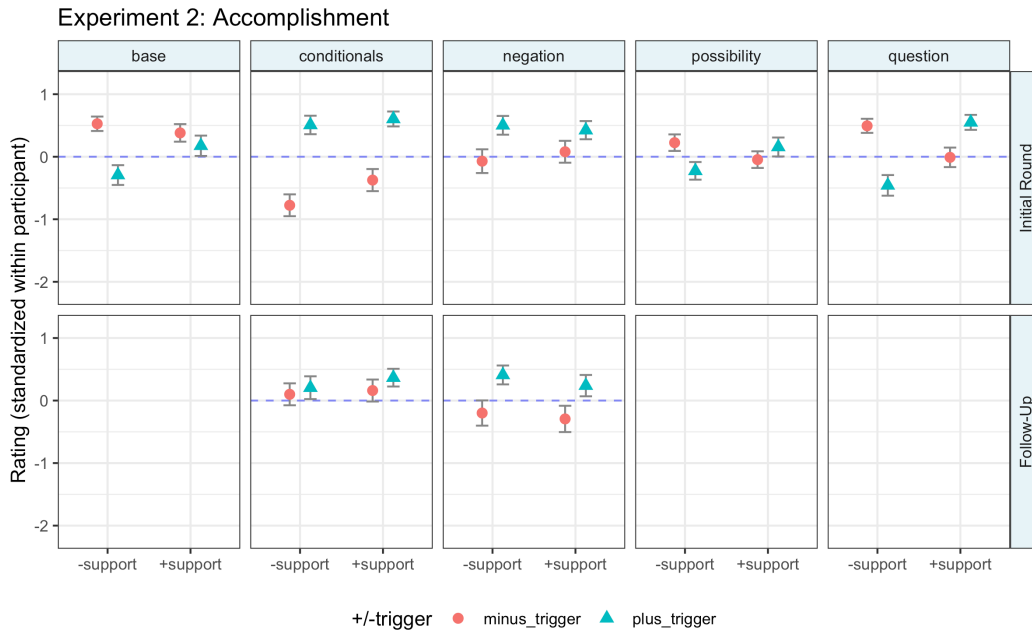
Figure 2.5: Results for accomplishment verbs indicate this trigger imposes weak CFCs that are not stable across environments.

found, I conclude that the CFC is weaker.

ACCOMPLISHMENT VERBS   Items testing CFCs for accomplishment verbs were created following Examples (23) - (27). Except for negation (which will be discussed at greater length below), accomplishment verbs included a mix of *win*, *find* and *pass* (as in "pass the class" or "pass the exam").

(23)   Matrix Clauses

    a.   Marion participated in a chess tournament last weekend. She won it.

    b.   Marion participated in a chess tournament last weekend. She enjoyed participating in it.

    c.   What did Marion do last weekend? She won a chess tournament.

    d.   What did Marion do last weekend? She participated in a chess tournament.

(24)   Negated Environments

     a.   Lou was working on a school assignment. She didn't finish it, though.

     b.   Lou was working on a school assignment. She didn't enjoy working on it, though.

     c.   Why is Lou's father upset at him? He didn't finish a school assignment yesterday.

     d.   Why is Lou's father upset at him? He didn't do a school assignment yesterday.

(25)   Antecedents of Conditionals

     a.   Sarah participated in a charity race. If she wins it, she'll be in a good mood.

     b.   Sarah participated in a charity race. If she enjoys it, she'll be in a good mood.

     c.   How is Sarah doing? If she wins the charity race, she'll be in a good mood.

     d.   How is Sarah doing? If she participated in the charity race, she'll be in a good mood.

(26)   Possibility Modals

     a.   Seth participated in a tennis tournament. Maybe he won the tournament.

     b.   Seth participated in a tennis tournament. Maybe he enjoyed participating in it.

     c.   What did Seth do this weekend? Maybe he won a tennis tournament.

     d.   What did Seth do this weekend? Maybe he participated in a tennis tournament.

(27)   Polar Questions

     a.   Hannah took her Physics exam last weekend. Did she pass it?

     b.   Hannah took her Physics exam last weekend. Did she study hard for it?

     c.   Hannah was very busy last week in school. Did she pass an exam?

     d.   Hannah was very busy last week in school. Did she study hard for an exam?

There were two points of concern with these items, which resulted in two follow-up experiments. However, neither of the follow-up experiments produced different results from the initial round of

data collection, indicating that the effects are robust to different items. First, for *negation* contexts, only one verb, *finish* was used. While *finish* does denote accomplishment, it can combine with any predicate and thus has a wider range of distribution than the verbs used in the *matrix* experiment. In order to test that *finish* patterns with these other verbs, a second experiment was conducted using similar items with the verb *win*, along the lines of (28), below.

(28)   Negation, Follow-Up

      a.   Carlos took part in a school spelling bee. He didn't win it, though.

      b.   Carlos took part in a school spelling bee. He didn't enjoy himself, though.

      c.   Why is Carlos upset? He didn't win the school spelling bee.

      d.   Why is Carlos upset? He wasn't asked to participate in the school spelling bee.

A second concern was that for *conditional* items in the *−trigger/+supporting* conditions, mere participation in the activity may not sufficiently set up the consequent. (That is, just because someone *participates* in an activity, they may not necessarily be in a good mood about it.) In order to correct this second potential confound, a further batch of items were created for this environment, following (29), below. For these items, the consequent of the conditional did not report the mood of the character, following (29) below:

(29)   Conditionals, Follow-Up

      a.   Jaden played a golf game today. If he won it, he'll want to talk about it.

      b.   Jaden played a golf game today. If he had a good time, he'll want to talk about it.

      c.   What will Jaden want to talk about over lunch? If he won a golf game, he'll want to talk about it.

      d.   What will Jaden want to talk about over lunch? If he played a golf game, he'll want to talk about it.

The results of this experiment can be seen in Figure 2.5, with the initial experiments on the top row, and the subsequent follow-up experiments on the bottom row. This is the same presentational paradigm that was used for Experiment 1: The x-axis indicates +/−*supporting*, and colors indicate +/−*trigger*. The y-axis shows mean rating, which has been standardized (i.e. z-scored) within participant. Thus, a rating of 1 means that sentences in this condition were rated 1 standard deviation higher than the mean rating for that participant. Error bars are 95% confidence intervals.

The behavior for this trigger can be clumped into two categories: In matrix, question and possibility environments behavior was consistent with CFCs. All three environments produced significant *-supporting* contrasts ($p < 0.01$ for matrix, questions; $p < 0.05$ for possibility); and all but questions produced significant +*trigger* contrasts ($p < 0.001$). For questions, the +*trigger* contrast was approaching significance ($p = 0.079$). The second cluster contained conditional and negation environments. Here, *-supporting* effects were in the opposite direction than predicted, and +*trigger* effects were not significant. These results are compatible with accomplishment verbs producing weak Contextual Felicity Constraints, which although present in the base case can disappear in certain environments. Furthermore, the disappearance of CFCs in conditional environments is compatible with the interpretation of these items as *soft* triggers (Abusch, 2010), whose presuppositions are triggered from lexically-salient alternatives and may be suspended in conditionals. That being said, CFC-reduction due to suspension may not be able to explain behavior in the negated environments, where soft triggers are not predicted to be attenuated.

AGAIN   Items testing CFCs for *again* were created following the examples in (30) - (34). In these items a character either went to a local event, such as an art exhibit or a craft fair, or they went to a vacation spot, such as the mountains or the beach.

(30)   Matrix Clauses

85
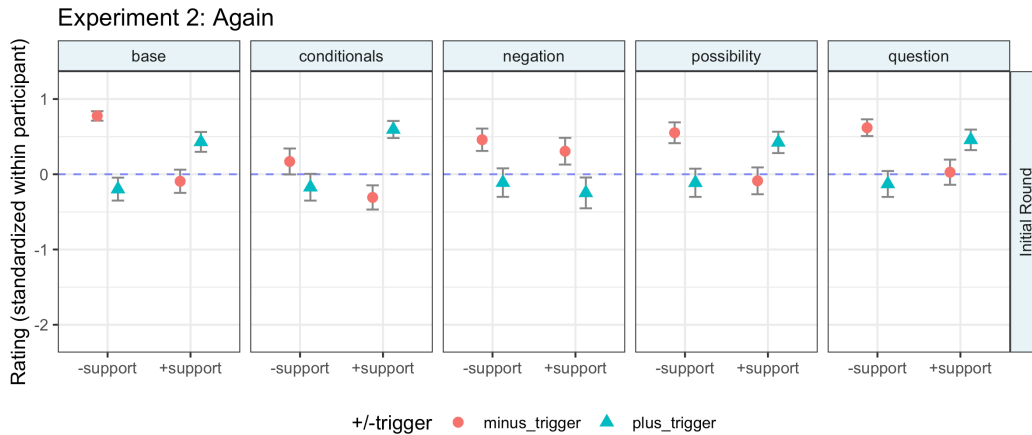
Figure 2.6: Results for *again* indicate this trigger imposes moderate CFCs that are stable across environments.

a. Devon went to an art exhibit last week. What did he do yesterday? He went to an art exhibit again.

b. Devon went to an art exhibit last week. What did he do yesterday? He went to an art exhibit.

c. What did Devon do yesterday? He went to an art exhibit again.

d. What did Devon do yesterday? He went to an art exhibit.

(31) Negated Environments

a. Kyla went to the beach last summer. This summer, she didn't go there again.

b. Kyla went to the beach last summer. This summer, she didn't go there.

c. Why did Kyla not get sunburned? She didn't go to the beach again this summer.

d. Why did Kyla not get sunburned? She didn't go to the beach this summer.

(32) Antecedents of Conditionals

a. Levi went to work yesterday. If he goes there again today, he'll be tired.

b. Levi went to work yesterday. If he spends time there today, he'll be tired.

c. How is Levi feeling? If he goes to work again today, he'll be tired.

d. How is Levi feeling? If he goes to work today, he'll be tired.

(33) Possibility Modals

a. Rex went to the mountains last summer. This summer, he might have gone there again.

b. Rex went to the mountains last summer. This summer, he might have gone to the beach.

c. What did Rex do last summer? He might have gone to the mountains again.

d. What did Rex do last summer? He might have gone to the mountains.

(34) Polar Questions

a. Last December, Remy went to the craft fair. Did he go again this year?

b. Last December, Remy went to the craft fair. Did he visit it this year?

c. Remy is doing lots of holiday shopping. Did he go to the craft fair again?

d. Remy is doing lots of holiday shopping. Did he go to the craft fair?

The results of these five experiments can be see in Figure 2.6. Participant behavior is relatively stable across environments: −*supporting/−trigger* sentences are rated slightly above the mean for each participant. −*supporting/+trigger* sentences are rated lower, generally just under the mean rating. In the +*supporting* condition, this pattern is switched, with −*trigger* sentences rated just below the mean, and +*trigger* sentences rated more highly. The one exception to this pattern is the *negation* context, where no inversion occurs between −*supporting* and +*supporting* conditions. Significant -*supporting* contrasts were observed for all environments ($p < 0.001$, except conditionals where $p < 0.05$) except negation ($p = 0.097$). Similarly, significant +*trigger* contrasts were observed for all environments ($p < 0.001$) except negation. The results of this experiment indicate that *again* is subject to a moderate CFC in all environments except negation.
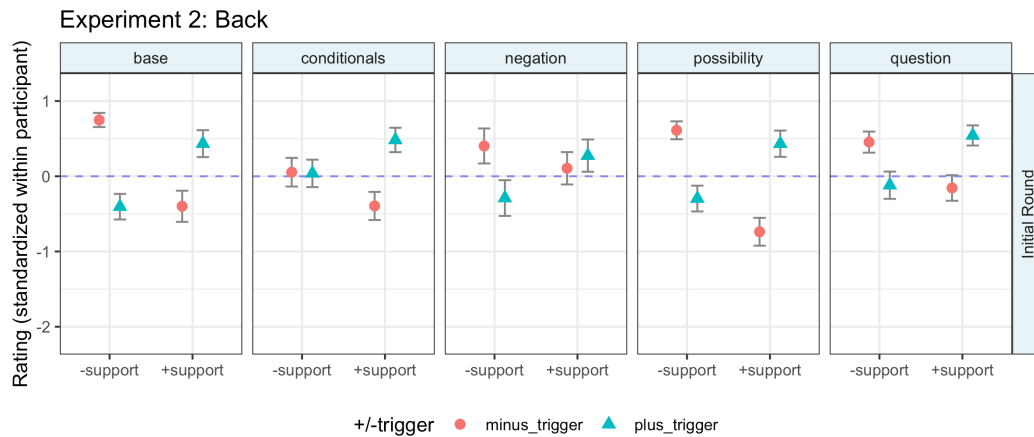
Figure 2.7: Results for *back* indicate this trigger imposes moderate CFCs, but the constraint is not robust across all environments.

Why do we find reduced effects in negated environments for this trigger? One hypothesis is this is being caused by interpretation difficulty associated with syntactic ambiguity. In these conditions, *+trigger/+supporting* sentences are ambiguous between high attachment of the particle (where *again* modifies the negation) and low attachment (where *again* modifies the VP). If this ambiguity is not able to be resolved by the context, it may cause participants to rate structurally ambiguous sentences lower than non-ambiguous ones. However, if this line of explanation were explored, it would have to be reconciled with evidence from real-time processing of syntactic ambiguities, which has found that such material is not associated with a processing slowdown (Clifton Jr & Staub, 2008; Van Gompel et al., 2000).

BACK   Items were created following Example (35) - (39), below.

(35)   Matrix Clauses

  a.   Yvette was in Houston this week. What about last week? She flew back to Houston for a conference.

b.   Yvette was in Houston this week. What about last week? She flew to Houston for a conference.

c.   What did Yvette do this week? She flew back to Houston for a conference.

d.   What did Yvette do this week? She flew to Houston for a conference.

(36)   Negated Environments

a.   Harold was in Chicago last week. He missed his flight. So he didn't make it back there this weekend.

b.   Harold was in Chicago last week. He missed his flight. So he isn't spending time there this weekend.

c.   Harold missed his flight. So he isn't going back to Chicago this weekend.

d.   Harold missed his flight. So he isn't going to Chicago this weekend.

(37)   Antecedents of Conditionals

a.   Val was in Cleveland last week. If he flies back there this week, he'll visit with friends.

b.   Val was in Cleveland last week. If he is hanging out there this week, he'll visit with friends.

c.   What's Val up to? If he flies back to Cleveland, he'll visit with friends.

d.   If he flies to Cleveland, he'll visit with friends.

(38)   Possibility Modals

a.   Yvette was in Houston last week. What about this week? Maybe flew back to Houston for a conference.

b.   Yvette was in Houston last week. What about this week? Maybe she flew to Houston for a conference.

c.   What did Yvette do this week? She flew back to Houston for a conference.

d.   What did Yvette do this week? She flew to Houston for a conference.

(39)   Polar Questions

    a.   Stacey was in Boston last week. Is she going back there this week?

    b.   Stacey was in Boston last week. Is she going to be spending time there this week?

    c.   Stacey has a busy work schedule this week. Is she going back to Boston for work?

    d.   Stacey has a busy work schedule this week. Is she going to Boston for work?

The results for this trigger can be seen in Figure 2.7, and fall into two categories. For *matrix*, *possibility* and *question* environments, there is a crossed interaction— +*trigger* sentences are rated lower than −*trigger* sentences in −*supporting* conditions and the pattern is reversed in +*supporting* conditions. For these triggers, we observe both significant *-supporting* and +*trigger* contrasts in all environments. ($p < 0.001$ for all, except for +*trigger* contrasts in matrix environments and contrasts in question environments where $p < 0.01$). The second category of environments includes conditionals and negation, where we find a spreading interaction. For conditionals, only the +*trigger* contrast is significant ($p < 0.01$) For negation, even though effects are in the right direction for both contrasts, neither is significant. Like *again*, these results indicate that back is subject to a moderate CFC, but the CFC is not stable across all environments tested.

CLEFTS   Items testing the CFCs of clefts were created following the examples in (40) - (44).

(40)   Matrix Clauses

    a.   Hannah baked something last weekend. It was muffins that she made.

    b.   Hannah baked something last weekend. She made muffins.

    c.   What did Hannah do last weekend? It was muffins that she made.

    d.   What did Hannah do last weekend? She made muffins.
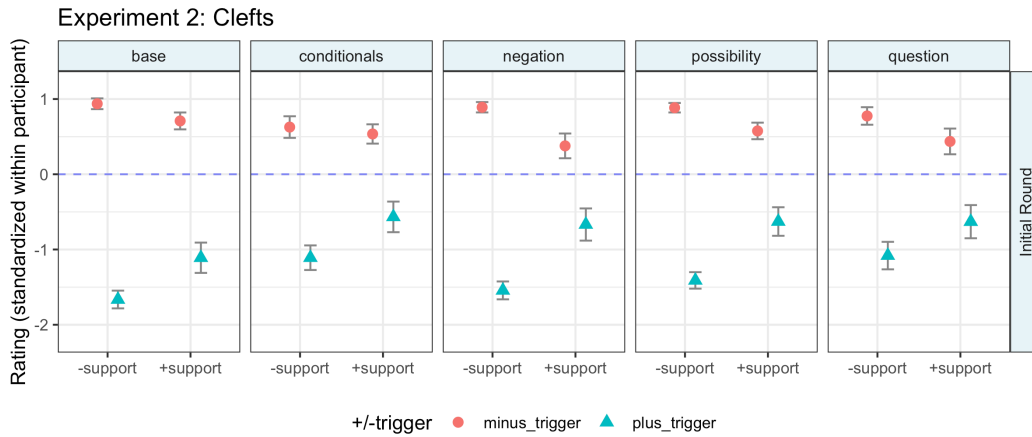
Figure 2.8: Cleft constructions impose moderate-to-strong CFCs, which are stable across environments.

(41)   Negated Environments

    a.   William avoided someone at the family reunion. It was his cousin, who he didn't talk with.

    b.   William avoided someone at the family reunion. He didn't talk with his cousin.

    c.   Why are people mad at William? It was his cousin who he didn't talk with at the family reunion.

    d.   Why are people mad at William? He didn't talk with his cousin at the family reunion.

(42)   Antecedents of Conditionals

    a.   Nora went out somewhere. If it was the park where she went, she'll be hungry when she comes back.

    b.   Nora went out somewhere. If she went to the park, she'll be hungry when she comes back.

    c.   How's Nora doing? If it was the park where she went, she'll be hungry when she comes back.

    d.   How's Nora doing? If she went to the park, she'll be hungry when she comes back.

(43)   Possibility Modals

    a.   Hannah baked something last weekend. It might have been muffins that she made.

    b.   Hannah baked something last weekend. She might have made muffins.

    c.   What did Hannah do last weekend? It might have been muffins that she made.

    d.   What did Hannah do last weekend? She might have made muffins.

(44)   Polar Questions

    a.   Trisha left something at home. Was it her phone charger that she left?

    b.   Trisha left something at home. Did she leave her phone charger?

    c.   Trisha is angry with herself. Was it her phone charger that she left at home?

    d.   Trisha is angry with herself. Did she leave her phone charger at home?

The results for these items can be seen in Figure 2.8. Participant responses are very stable across conditions. In each case, there is a main effect of trigger and a larger difference between +/−*trigger* variants in the −*supporting* condition. +*Trigger/−supporting* sentences produced some of the lowest ratings for any of the triggers, between 1 and 2 standard deviations lower than the participant's mean rating, on average. There is a significant -*supporting* contrast for all environments ($p < 0.001$). The +*trigger* contrast is not significant for conditional environments ($p = 0.09$), but is for all other environments ($p < 0.001$ except for questions where $p < 0.05$). These results indicate that cleft structures are subject to a CFC, which is stable across environments.

Cognitive Factives   Items testing the CFCs of cognitive factive predicates were created following the examples in (45) - (48). These items all used the factive predicate *know*, and contrasted it with the non-factive predicates *suspect*, *think* or *believe*.

Experiment 2: Cognitive Factives
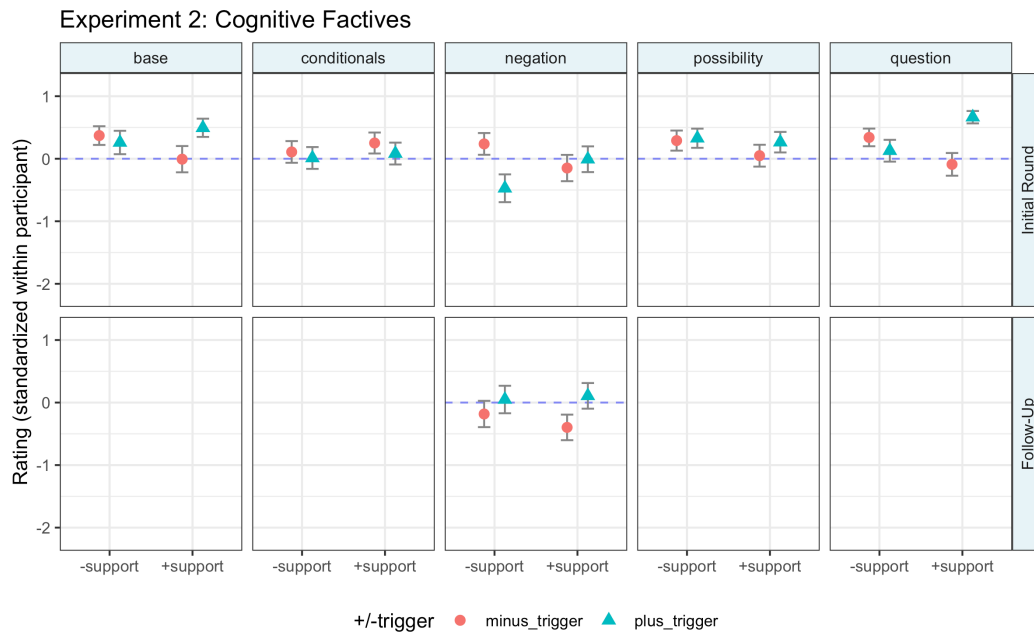
Figure 2.9: Cognitive Factives do not impose CFCs. This effect is stable across all environments tested.

(45)   Matrix Clauses

　　　a.　　Desmond stole Jill's guitar. She knows that he stole it.

　　　b.　　Desmond stole Jill's guitar. She suspects that he stole it.

　　　c.　　Why is Jill upset? She knows that Desmond stole her guitar.

　　　d.　　Why is Jill upset? She suspects that Desmond stole her guitar.

(46)   Negated Environments

　　　a.　　Liam failed his math test. But he doesn't yet know that he failed.

　　　b.　　Liam failed his math test. But he doesn't believe that he failed.

　　　c.　　How did Liam react to his test score? He doesn't yet know that he failed.

　　　d.　　How did Liam react to his test score? He doesn't believe that he failed.

(47)   Antecedents of Conditionals

a.　　Harold stole Marie's book. If she knows that he stole it, she will tell on him.

　　　b.　　Harold stole Marie's book. If she suspects that he stole it, she'll tell on him.

　　　c.　　What's up with Marie and Harold? If she knows that he stole her book, she'll tell on him.

　　　d.　　What's up with Marie and Harold? If she suspects that he stole it, she'll tell on him.

(48)　　Possibility Modals

　　　a.　　Dimitri accidentally broke Shivani's microwave. Maybe she knows he broke it.

　　　b.　　Dimitri accidentally broke Shivani's microwave. Maybe she suspects that he broke it.

　　　c.　　Why is Shivani mad at Dimitri? Maybe she knows that he broke her microwave.

　　　d.　　Why is Shivani mad at Dimitri? Maybe she suspects that he broke her microwave.

(49)　　Questions

　　　a.　　Mo copied Gina's test answers. Does she know that he copied them?

　　　b.　　Mo copied Gina's test answers. Does she suspect that he copied them?

　　　c.　　Gina is mad at Mo. Does she know that he copied her test answers?

　　　d.　　Gina is mad at Mo. Does she think that he copied her test answers?

A follow-up experiment was conducted for *negation* items for the following reason: All of the −*supporting* context sentences asked about a character's reaction to an outcome (e.g. getting a test score back in Example (46)), implying that the character may know what the outcome is. However, −*trigger* sentences state that the character does not have a belief about the outcome. In fact, in the example above, the +*trigger* sentence seems to be answering the question indirectly by implying that the character hasn't reacted to the test scores yet because he doesn't know what they are. In order to fix these potential problems, a follow-up experiment was conducted, with items created following Example (50), below. In these items, +*supporting* context sentence explicitly mention that the character has not received
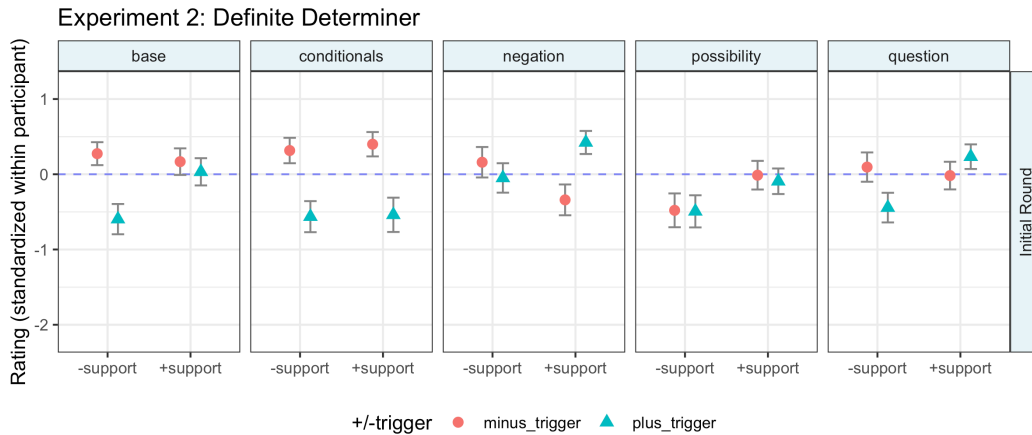
Figure 2.10: The definite determiner imposes moderate CFCs in some cases, but these effects are not robust across all environments tested.

information about the outcome of the event.

(50)   a.   Martha's candidate lost an election. But she doesn't yet know that they lost.

       b.   Martha's candidate lost an election. But she doesn't suspect that they lost.

       c.   Martha will read about the local elections in tomorrow's paper. She doesn't yet know that her candidate lost.

       d.   Martha will read about the local elections in tomorrow's paper. She doesn't suspect that her candidate lost.

The results for these experiments can be seen in Figure 2.9, with the initial experiment on the top row and the follow-up experiment on the bottom row. No *-supporting* contrast was found in any environment. Significant *+trigger* contrasts were found for questions ($p < 0.001$), and for negated contexts in the first round of experiments ($p < 0.05$), however no effect was found for the follow-up experimental items. These results indicate that cognitive factives are not subject to a CFC, and this lack of effects is stable across environments.

95

Definite Determiner   Items testing CFCs for the definite determiner were created following Examples (51) - (55). All of these items set up referents in a similar way: Context sentences mentioned a character and a location (like a workplace or a dance rehearsal), and +*supporting* contexts provided two sets of possible referents, one group (e.g. "some students") and one singular, which was introduced with an indefinite article (e.g. "an auditor"). Target sentences either used a mass noun, like "students", in −*trigger* conditions, or else combined the definite determiner with the singular referent from the context sentence. There has been some discussion in the literature about what precisely the presuppositions of the definite determiner are, with various proposals advocating for existence, uniqueness, familiarity, or a combination of the three (Strawson, 1950; Roberts, 2003; Elbourne, 2013; Coppock & Beaver, 2015). Because −*supporting* conditions do not establish the referent at all, neither uniqueness, familiarity or existence is supported, and these items should be compatible with different approaches to the determiner's presuppositions.

For negation, the −*supporting* sentences were set up with very broad *What's up with X?* questions. It was assumed that these questions could be answered felicitously with any statement about X. For items in the *conditional* environment, the gender-neutral pronoun *they* was used in the consequent to refer to antecedents mentioned in the antecedent (see Example (53)).

(51)   Matrix Clauses

    a.   There are some students and an auditor in Carla's class. The auditor really likes the course.

    b.   There are some students and an auditor in Carla's class. Students really like the course.

    c.   Carla is taking an Economics course. The auditor really likes the course.

    d.   Carla is taking an Economics course. Students really like the course.

(52)   Negated Environments

    a.   Mark has five engineers and a forklift operator on his shift. He doesn't see the forklift

operator much in his area.

b.   Mark has five engineers and a forklift operator on his shift. He doesn't see engineers much in his area.

c.   What's up on Mark's shift at work? He doesn't see the forklift operator much in his area.

d.   What's up on Mark's shift at work? He doesn't see engineers much in his area.

(53)   Antecedents of Conditionals

a.   Max has an auditor and five students in his class. If the auditor asks questions, that's OK.

b.   Max has an auditor and five students in his class. If the students ask questions, that's OK.

c.   How does Max feel about questions in his class? If the auditor asks them, that's OK.

d.   How does Max feel about questions in his class? If students ask them, that's OK.

(54)   Possibility Modals

a.   There are seven students and a visitor in Tracy's class. Maybe the visitor is struggling in the course.

b.   There are seven students and a visitor in Tracy's class. Maybe students tend to struggle in the course.

c.   Tracy signed up for a Physics class. Maybe the visitor is struggling in the course.

d.   Tracy signed up for a Physics class. Maybe students tend to struggle in the course.

(55)   Polar Questions

a.   There are three waiters and a chef on Jamie's shift. Does the chef like the shift?

b.   There are three waiters and a chef on Jamie's shift. Do waiters tend to like the shift?

c.   Jamie just got assigned a new shift at her restaurant. Does the chef like working the shift?

d.   Jamie just got assigned a new shift at her restaurant. Do waiters like working the shift?

The results for this trigger can be seen in Figure 2.10. They vary quite a bit between the different environments tested: For matrix clauses, both the *-supporting* and *+trigger* contrasts are significant ($p < 0.001$). Both contrasts are significant for the question environments as well (*-supporting* contrast: $p < 0.001$, *+trigger* contrast: $p < 0.05$), indicating that the definite determiner is subject to a CFC in these contexts. However, results differ for negation, possibility and conditional environments. For conditionals, the *-supporting* contrast is significant ($p < 0.001$), but the *+trigger* contrast is not. For negation and possibility environments this pattern is flipped: the *-supporting* contrast is not significant, but the *+trigger* contrast is ($p < 0.05$). Given that the two critical contrasts were significant in matrix and question environments, these results indicate that the definite determiner is subject to at least a mild Contextual Felicity Constraint, but that these effects are relatively unstable and can disappear based on the larger sentential context.

One possible explanation for participant behavior in the conditional environments is that gender neutral pronouns were used to refer to singular referents in the antecedent. While the use of gender neutral singular *they* is on the rise in American English (Bradley et al., 2019; LaScotte, 2016; Bjorkman et al., 2017), it may still be dispreferred compared to overtly-gendered singular pronouns, thus driving down ratings.

EMOTIVE FACTIVES   Items were created following (56) - (60). These items were constructed in the same way as the items for Cognitive Factives, discussed above. Emotive terms used to construct items were all negative, and included *angry that*, *annoyed that*, *mad that* and *pissed that*. This was chosen because these negative terms work well with questions like *what's wrong with...?* and *what's up with...?*, which serve as our $-$*supporting* environments.
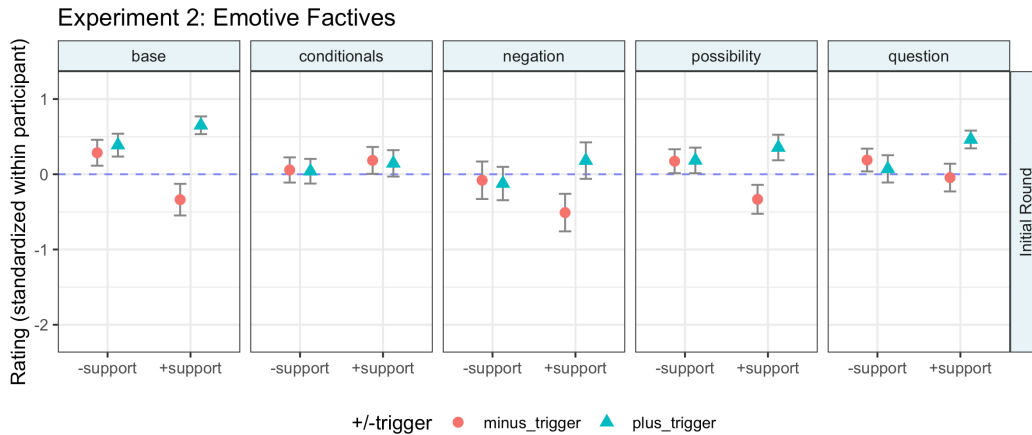
Figure 2.11: The results for emotive factives indicate that these triggers are not subject to CFCs regardless of environment.

(56) Matrix Clauses

    a.   Raymond stole Kira's doll. She's angry that he stole it.

    b.   Raymond stole Kira's doll. She suspects that he stole it.

    c.   What's wrong with Kira? She's angry that Raymond stole her doll.

    d.   What's wrong with Kira? She suspects that Raymond stole her doll.

(57) Negated Environments

    a.   Gina's team lost the soccer match last week. But she isn't too upset that they lost.

    b.   Gina's team lost the soccer match last week. She doesn't believe that they lost.

    c.   What was Gina's reaction to the soccer match? She isn't too upset that her team lost.

    d.   What was Gina's reaction to the soccer match? She doesn't believe that her team lost.

(58) Antecedents of Conditionals

    a.   Leo stole Daisy's blender. If she's angry that he stole it, she's not letting on.

    b.   Leo stole Daisy's blender. If she suspects that he stole it, she's not letting on.

    c.   What's up with Leo and Daisy? If she's angry he stole her blender, she's not letting on.

    d.   What's up with Leo and Daisy? If she suspects he stole her blender, she's not letting on.

(59)   Possibility Modals

    a.   Isabella took Zayn's favorite toy car. Maybe he's upset that she took it.

    b.   Isabella took Zayn's favorite toy car. Maybe he suspects that she took it.

    c.   What's up with Zayn? Maybe he's mad that Isabella took his favorite toy car.

    d.   What's up with Zayn? Maybe he suspects that Isabella took his favorite toy car.

(60)   Polar Questions

    a.   Akash took Franny's hat. Is she annoyed that he took it?

    b.   Akash took Franny's hat. Does she suspect that he took it?

    c.   Franny is talking to Akash. Is she annoyed that he stole her hat?

    d.   Franny is talking to Akash. Does she suspect that he stole her hat?

The results for this experiment can be seen in Figure 2.11. The *-supporting* contrast is not significant for any of the environments. For question environments the *+trigger* contrast is significant ($p < 0.001$); a *+trigger* contrast is visually apparent for base environments as well, but the effects are not significant. Based on these results it is evident that emotive factive predicates are not subject to Contextual Felicity Constraints, and this lack of CFCs is robust across family of sentence environments.

EVEN   Items for the five family of sentences environments were created following (61) - (65), below. Because *even* contains both an existential and scalar presupposition, for these items situations were chosen that explicitly evoke a scale, either proceeding through a competition or receiving grades in a
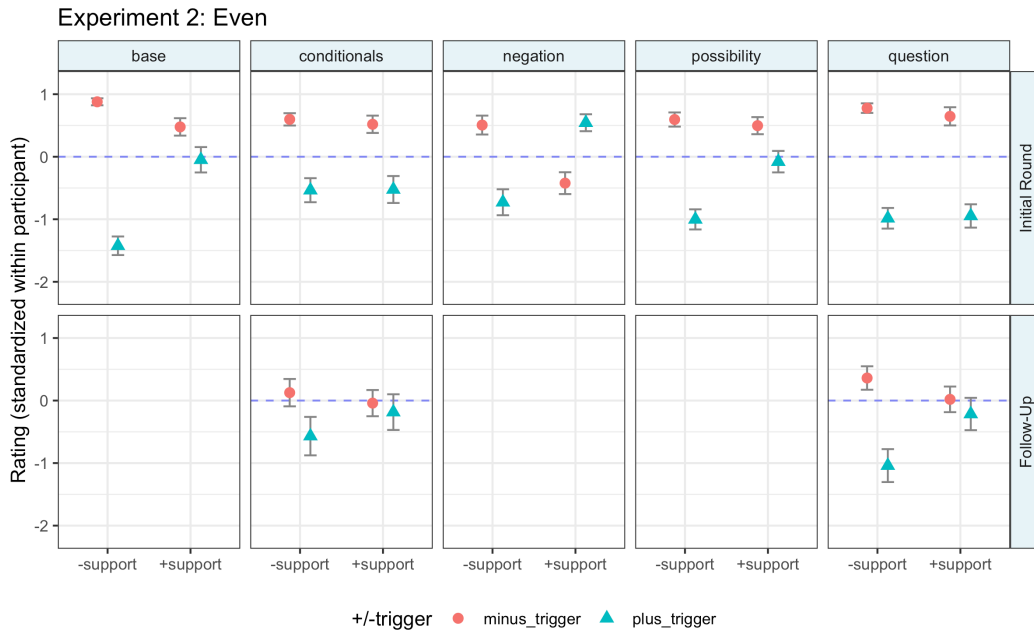
Figure 2.12: The results for *even* indicate this trigger is subject to strong CFCs, and the effects are robust across environments tested.

course at the end of the semester. Therefore, these items are a little bit different from those in Experiment 1, where *+supporting* contexts met the existential presupposition, but scalar presuppositions were not controlled.

(61)   Matrix Clauses

　　a.　Valerie's team played hard in the tennis tournament. They even made it to the final game.

　　b.　Valierie's team played hard in the tennis tournament. They made it to the final game.

　　c.　How did Valerie's team play in the tennis tournament? They even made it to the final game.

　　d.　How did Valerie's team play in the tennis tournament? They made it to the final game.

(62)   Negated Environments

      a.   Oliver failed a number of classes this spring. He didn't even pass his English class.

      b.   Oliver failed a number of classes this spring. He didn't pass his English class.

      c.   Why is Oliver upset? He didn't even pass his English class.

      d.   Why is Oliver upset? He didn't pass his English class.

(63)   Antecedents of Conditionals

      a.   Cullen ran hard at the track meet. If he even places he'll be happy.

      b.   Cullen ran hard at the track meet. If he places, he'll be happy.

      c.   How does Cullen feel about his performance at the track meet? If he even places he'll be happy.

      d.   How does Cullen feel about his performance at the track meet? If he places, he'll be happy.

(64)   Possibility Modals

      a.   Akash's team played well in the lacrosse tournament. Maybe they even made it to the semi-final game.

      b.   Akash's team played well in the lacrosse tournament. Maybe they made it to the semi-final game.

      c.   How did Akash's team do in the lacrosse tournament? Maybe they even made it to the semi-final game.

      d.   How did Akash's team do in the lacrosse tournament? Maybe they made it to the semi-final game.

(65)   Polar Questions

      a.   Ari's soccer team played unusually well. Did they even make it to the playoffs?

b. Ari's soccer team played unusually well. Did they make it to the playoffs?

c. Ari played on a soccer team this season. Did they even make it to the playoffs?

d. Ari played on a soccer team this season. Did they make it to the playoffs?

There was, however, an issue with these items that necessitated follow-up experiments. The problem was that scale inversion was not properly controlled for in conditional and question environments. In these contexts, as well as in negated contexts, *even* prefers to modify a predicate that forms the low end of a scale (still presupposing that even meeting this minimal element is unlikely, surprising, or notable in some way). For example "If Ali even passes, he'll be happy" sounds more natural than "If Ali even gets an A+ he'll be happy" (author's judgement). In order to make the low-end presuppositions of *even* supported, *+supporting* contexts need to establish that it is unlikely that the character would meet the minimal element on the scale. Thus, "Ali did badly in class. If he even passes he'll be happy." sounds natural, whereas "Ali did well in class. If he even passes he'll be happy" does not. Originally, *+supporting* contexts were written along the lines of the latter sentence. This was fixed in two follow-up experiments, with items written following (66) and (67), below.

(66)   Follow-up: Conditionals

a. Rowan's team played **badly** in their soccer bracket. If they even make it to the second round, he'll be happy.

b. Rowan's team played **badly** in their soccer bracket. If they make it to the second round, he'll be happy.

c. Rowan's team played in a soccer bracket. If they even make it to the second round, he'll be happy.

d. Rowan's team played in a soccer bracket. If they make it to the second round, he'll be happy.

(67)   Follow-up: Questions

      a.   Ariella did **poorly** at the spelling bee. Did she even get a single word correct?

      b.   Ariella did **poorly** at the spelling bee. Did she get a single word correct?

      c.   Ariella participated in a spelling bee. Did she even get a single word correct?

      d.   Ariella participated in a spelling bee. Did she get a single word correct?

The results of this experiment can be seen in Figure 2.12. There are significant *-supporting* contrasts for all environments ($p < 0.001$), and significant *+trigger* contrasts for all environments except conditionals ($p < 0.001$ for matrix, question; $p < 0.01$ for possibility, negation). These results indicate that *even* is subject to strong CFC effects, which are robust across environments.

One point of caution is in order: although contrasts are significant for negation environments, it is not appropriate to conclude that *even* is subject to a CFC when under negation. This is because of ambiguities in negated environments, where two scopal readings are possible. On the wide-scope reading, *even* modifies the whole negated VP, for example presupposing that there was a class other than English that Oliver did not pass for the sentence "Oliver didn't even pass English class". On the narrow-scope reading, *even* remains under negation, and presupposes that Oliver *did* pass a class other than English. *+Supporting* sentences were constructed to support the wide scope readings and based on participants' high ratings for this condition ($\sim$0.5 standard deviations above mean ratings across all items in the experiment), it seems likely that they were getting wide scope interpretations for these items. Thus, while these sentences do indicate that when *even* presupposes content with negation in it, CFCs persist, it does not tell us whether CFCs persist when *even* is under the scope of negation.

ONLY   Items were created following (68) - (72), below. Materials were fairly different from those for *only* in Experiment 1, where *+supporting/−trigger* sentences were highly repetitive and received low scores from participants (for example: "Gabriella went to the hardware store. She went to the
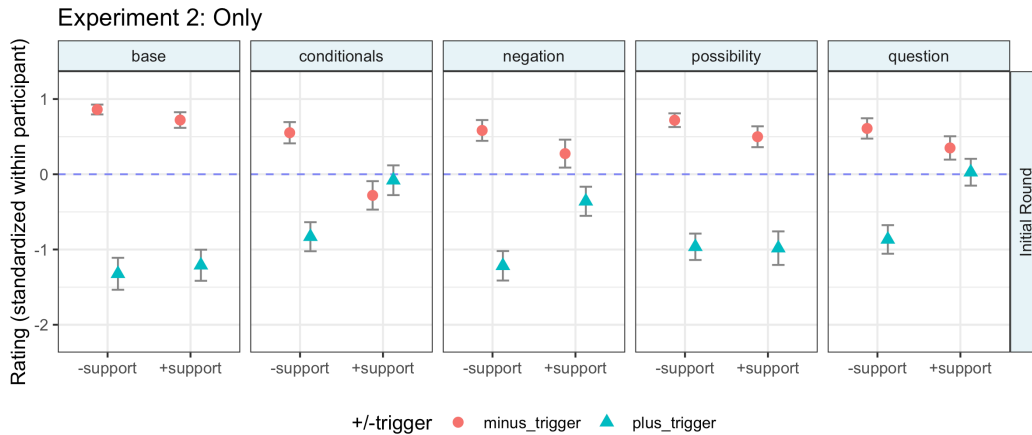
Figure 2.13: The results for *only* indicate that it is subject to a moderate CFC, but the effects are not stable across environments.

hardware store."). To create items without as much repetition *+supporting* sentences mentioned a characters plan or intent to do something, such as (68-a), below. Although these sentences produced less redundancy, their drawback is that they do not strictly entail the presupposition of *only*, but rather highly contextually entail it.

(68)   Matrix Clauses

    a.   Terry went off to go shopping. On his way, he decided to go only to the grocery store.

    b.   Terry went off to go shopping. On his way, he decided to go to the park.

    c.   What did Terry do yesterday? He went only to the grocery store.

    d.   What did Terry do yesterday? He went to the grocery store.

(69)   Negated Environments

    a.   George likes chocolate ice cream. But he doesn't only like chocolate.

    b.   George likes chocolate ice cream. But he doesn't like vanilla.

    c.   What are George's ice cream preferences? He doesn't only like chocolate.

    d.   What are George's ice cream preferences? He doesn't like chocolate.

(70)   Antecedents of Conditionals

    a.   Gabriel left for the hardware store. If he decided to go only there, that's where he is now.

    b.   Gabriel left for the hardware store. If he then decided to go to the post office, that's where he is now.

    c.   What's Gabriel up to? If he decided to go only to the hardware store, that's where he is now.

    d.   What's Gabriel up to? If he decided to go to the hardware store, that's where he is now.

(71)   Possibility Modals

    a.   Deirdre left for the bank. It's possible on the way she decided to go only there.

    b.   Deirdre left for the bank. It's possible on the way she decided to go to the library instead.

    c.   What did Deirdre do yesterday? It's possible that she only went to the bank.

    d.   What did Deirdre do yesterday? It's possible that she went to the bank.

(72)   Polar Questions

    a.   Tessa likes watching tennis on TV. Does she only watch tennis?

    b.   Tessa likes watching tennis on TV. Does she watch it a lot?

    c.   Tessa watches a lot of TV. Does she only like watching tennis?

    d.   Tessa watches a lot of TV. Does she like watching tennis?

The results for these items can be seen in 2.13. A significant *-supporting* contrast was found for all environments ($p < 0.001$). For conditionals, negation and questions, a significant *+trigger* contrast was found ($p < 0.001$); but the contrast was not significant for matrix and possibility environments. These results indicate that while *only* is subject to some CFCs, these effects are not stable across envi-
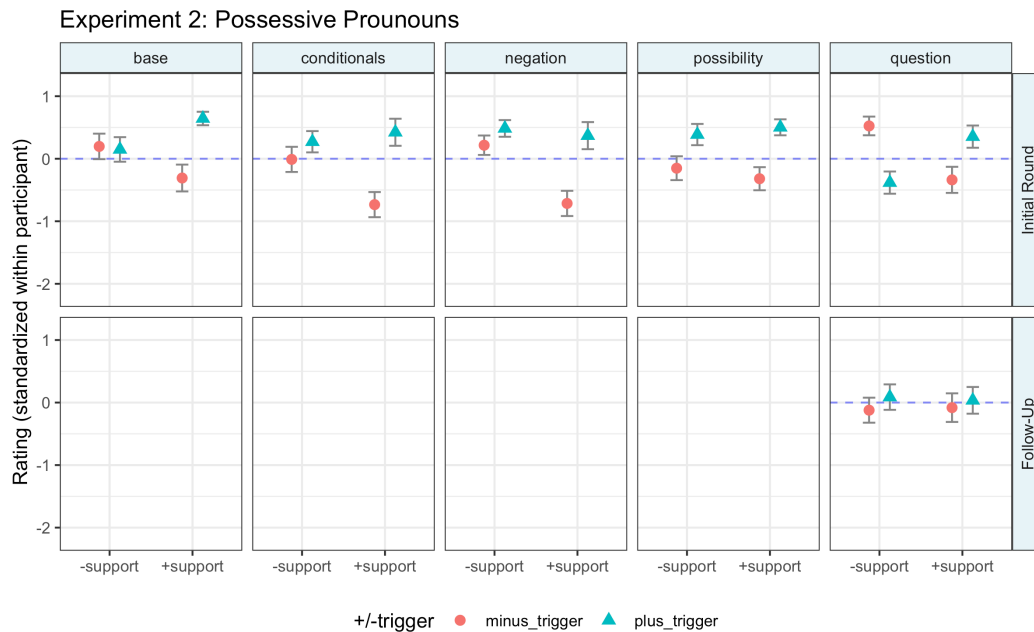
Figure 2.14: The results for possessive prounouns indicate that these triggers are not subject to CFCs in any environment.

ronments, and may disappear in some cases.

Possessive Pronouns   Items were created following (73) - (77), below. A mix of masculine and feminine third person possessive pronouns were used.

(73)   Matrix Clauses

a.   Rachel got a new guitar last week. She asked a friend how to tune her guitar.

b.   Rachel got a new guitar last week. She asked a friend how to tune a guitar.

c.   What did Rachel do yesterday? She asked a friend about how to tune her guitar.

d.   What did Rachel do yesterday? She asked a friend about how to tun a guitar.

(74)   Negated Environments

a.   Recently, Francis got a new coat. Yesterday it was warm, so Francis didn't put on her

coat when she went outside.

b.   Recently, Francis got a new coat. Yesterday it was warm, so Francis didn't put on a coat
      when she went outside.

c.   Yesterday it was warm, so Francis didn't put on her coat when she went outside.

d.   Yesterday it was warm, so Francis didn't put on a coat when she went outside.

(75)   Antecedents of Conditionals

a.   Zach submitted a cartoon to the newspaper. If he sees his cartoon in tomorrow's paper,
      he'll be happy.

b.   Zach submitted a cartoon to the newspaper. If he sees a cartoon in tomorrow's paper,
      he'll be happy.

c.   How is Zach these days? If he sees his cartoon in tomorrow's paper, he'll be happy.

d.   How is Zach these days? If he sees a cartoon in tomorrow's paper, he'll be happy.

(76)   Possibility Modals

a.   Raj got a new printer recently. It's possible he asked a friend about how to set up his
      printer at work.

b.   Raj got a new printer recently. It's possible he asked a friend about how to set up a
      printer at work.

c.   What did Raj do yesterday? It's possible he asked a friend about how to set up his
      printer at work.

d.   What did Raj do yesterday? It's possible he asked a friend about how to set up a printer
      at work.

(77)   Polar Questions

a.   Jill got a new printer at home. Has she set up her printer already?

> b. Jill got a new printer at home. Has she set up a printer before?
>
> c. Jill said that printers can be tricky to set up. Has she set up her printer already?
>
> d. Jill said that printers can be tricky to set up. Has she set up a printer before?

The results for these experiments can be seen in Figure 2.14. For matrix, conditional, negation and possibility contexts the *-supporting* contrast is either not significant, or significant but in the opposite direction than predicted. The *+trigger* contrast is only significant for matrix environments ($p < 0.01$). For question contexts, there was a significant *-supporting* and *+trigger* contrast. However, because this result differed from the other four contexts, the stability of these results were re-assessed with slightly different materials, following (78), below.

(78) Follow-up: Polar Questions

> a. Annie has a couch, but moved apartments recently. Did she take her couch?
>
> b. Annie has a couch, but moved apartments recently. Did she buy a new couch?
>
> c. Annie moved apartments recently. Did she get rid of her old couch?
>
> d. Annie moved apartments recently. Did she buy a couch?

For these materials, there was neither a significant *-supporting* contrast nor *+trigger* contrast, indicating that while possessive pronouns may be subject to some CFCs in question environments, the constraint is not stable to reproduction. Overall, these results indicate that possessive pronouns do not impose CFCs, and this lack of constraints is robust across environments tested.

WH-QUESTIONS   Items were created following (79) - (84). Wh-questions are assumed to carry existential presuppositions, and are contrasted with polar questions. Following the design employed in Experiment 1, questions in matrix clauses are introduced with the prefix *I wonder...* and are followed by question marks. Narrator-level ignorance is set up explicitly with phrases like "I'm not sure..." or "I don't know...", like Example (79):
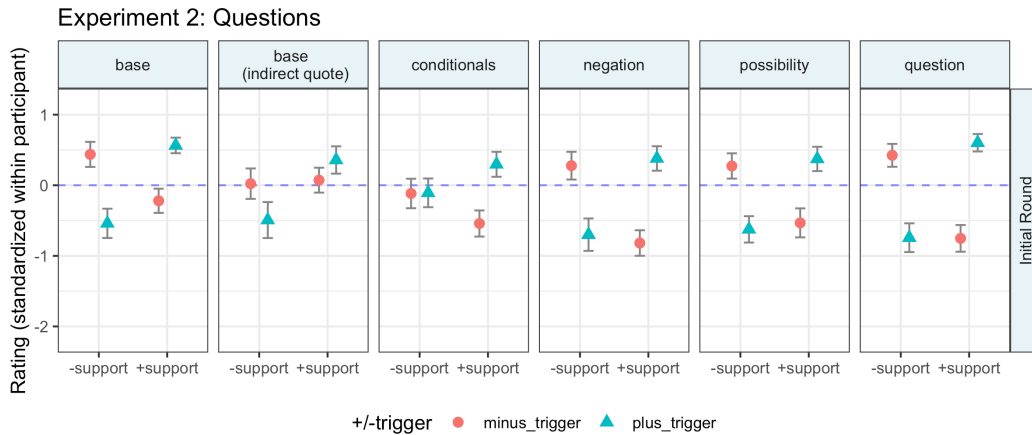
Figure 2.15: Results for wh-questions indicate that they are subject to a moderate CFC that is stable across environments tested.

(79) Matrix Clauses (indirect quote)

    a.   Aisha baked something last week. I wonder, what did she bake?

    b.   Aisha baked something last week. I wonder, did she bake muffins?

    c.   I don't know if Aisha baked anything last week. I wonder, what did she bake?

    d.   I don't know if Aisha baked anything last week. I wonder, did she bake muffins?

This sort of indirect quotation works well for matrix clauses, however it might be difficult to embed in the other family of sentence environments. To test a potentially more flexible experimental setup, predicates with wh-questions were embedded under CP-complement verbs, following (80). (These are *base* environments, where the environments above are referred to as *base (indirect quote)* environments. For conditional, possessive and question environments, questions were also embedded under *wonder*; for negation contexts, they were embedded under "doesn't care", "doesn't bother wondering" or "doesn't concern himself wondering".

(80) Matrix Clauses

    a.   Someone stole Alice's phone. She wonders who did it.

b.	Someone stole Alice's phone. She wonders if they were caught on camera.

c.	Alice can't find her phone. She wonders who stole it.

d.	Alice can't find her phone. She wonders if someone stole it.

(81)	Negated Environments

a.	Someone copied the answers on Frank's test. He doesn't care who did it, though.

b.	Someone copied the answers on Frank's test. He doesn't care if they were caught, though.

c.	Frank is thinking about his recent math test. He doesn't care who copied his answers.

d.	Frank is thinking about his recent math test. He doesn't care if someone copied his answers.

(82)	Antecedents of Conditionals

a.	Someone stole Sarah's yard sign. If she wonders who stole it, she'll ask us.

b.	Someone stole Sarah's yard sign. If she wonders if they have been caught, she'll ask us.

c.	Sarah is worried about her yard sign. If she wonders who stole it, she'll ask us.

d.	Sarah is worried about her yard sign. If she wonders whether it has been stolen, she'll ask us.

(83)	Possibility Modals

a.	Someone stole Harrison's gym bag. He might wonder who did it.

b.	Someone stole Harrison's gym bag. He might wonder if they were caught.

c.	Harrison can't find his gym bag. He might wonder who stole it.

d.	Harrison can't find his gym bag. He might wonder if someone stole it.

(84)	Polar Questions
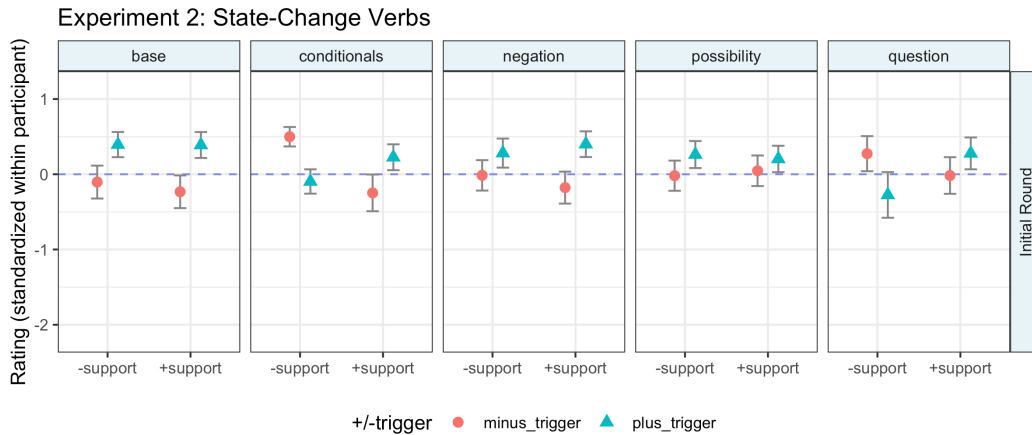
Figure 2.16: The results for state-change verbs indicate that they are not subject to a CFC, regardless of environment.

a.   Someone stole Gina's phone. Does she wonder who stole it?

b.   Someone stole Gina's phone. Does she wonder if they were caught?

c.   Gina can't find her phone. Does she wonder who stole it?

d.   Gina can't find her phone. Does she wonder if someone stole it?

The results for these items can be seen in 2.15. Significant *-supporting* and *+trigger* contrasts were found for base, base (indirect quote), negation, possibility and question environments (all $p < 0.001$, except base (indirect quote) *-supporting* contrast where $p < 0.01$). For conditionals, the *+trigger* contrast was significant ($p < 0.01$), however the *-supporting* contrast was not. These results indicate that questions impose CFCs, and that the constraints are stable across environments.

STATE CHANGE VERBS   Items were created following (85) - (89). For all items *stop* was used as the state-change verb. For conditional and question environments the complements of *stop* were household chores; for matrix and possibility environments, the complements of *stop* included various habits, like smoking or gambling.[5] For negated environments, $-supporting$ contexts introduced locations

---

[5] This because these items were originally mistakenly written with the accomplishment verb *win* and had to be re-written.

that were compatible with an activity the character could stop doing (like swimming at the beach).

(85)   Matrix Clauses

    a.   Amos used to smoke. This year, he stopped smoking.

    b.   Amos used to smoke. This year, he read up on the health risks of smoking.

    c.   What's new with Amos? He stopped smoking recently.

    d.   What's new with Amos? He read an article on smoking's health risks recently.

(86)   Negated Environments

    a.   Gale was swimming at the beach. Even though a storm was on the horizon, she didn't stop swimming.

    b.   Gale was swimming at the beach. Even though a storm was on the horizon, she didn't worry about it.

    c.   At the beach, Gale saw a storm on the horizon. Even though, she didn't stop swimming.

    d.   At the beach, Gale saw a storm on the horizon. Even though, she didn't worry about it.

(87)   Antecedents of Conditionals

    a.   Xavi was cleaning the garage. If he stopped, he's relaxing now.

    b.   Xavi was cleaning the garage. If he's by the pool, he's relaxing now.

    c.   What's Xavi up to? If he stopped cleaning the garage, he's relaxing now.

    d.   What's Xavi up to? If he's by the pool, he's relaxing now.

(88)   Possibility Modals

    a.   Edward used to gamble at the local casino. It's possible that he stopped gambling.

b. Edward used to gamble at the local casino. It's possible that he is trying to change his habits.

c. What's new with Edward? It's possible that he stopped gambling.

d. What's new with Edward? It's possible that he is trying to change his habits.

(89)   Polar Questions

a. Edward used to gamble at the local casino. Did she stop mowing the lawn?

b. Edward used to gamble at the local casino. Did she go check the weather forecast?

c. Virginia was outside and heard some thunder. Did she stop mowing the lawn?

d. Virginia was outside and heard some thunder. Did she go check the weather forecast?

The results for this experiment can be seen in Figure 2.16. For the *-supporting* contrast, none of the environments are significant except conditionals ($p < 0.001$). For the *+trigger* contrast conditionals and questions are significant ($p < 0.05$). These results indicate that state-change verbs are not subject to CFCs, and that this behavior is robust across both testing environments, as well as type of predicate that combines with the trigger.

STILL   Items to test the Contextual Felicity Constraints of *still* were created following (90) - (94), below. For negation, possessives and question contexts, *+supporting* conditions mentioned explicit times at which characters were doing an activity. This was done to set up the temporal sequencing of events. In −*supporting* conditions, no temporal sequencing was needed (because the trigger was not supported), so no times were mentioned. Although this was done to keep −*supporting* conditions as short as possible, it does introduce some variation between the two conditions, other than the context. Furthermore, in order to make items sound natural in *+supporting/-trigger* conditions, separate activities were mentioned in the context and target sentences (e.g. "working on a report" vs. "practicing the piano" in (90)). This makes *+supporting* conditions somewhat different from *-supporting*
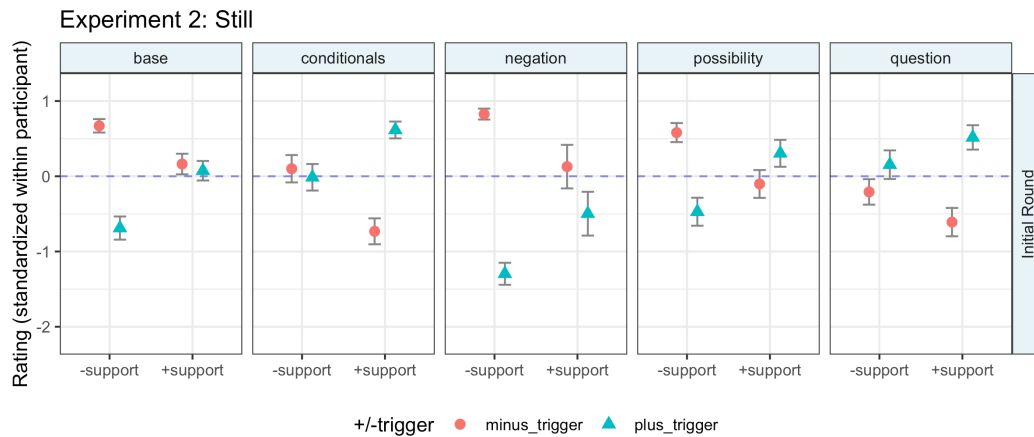
Figure 2.17: Results for *still* indicates that it imposes moderate CFCs, but these effects are not stable across environments tested.

conditions, where target sentences mention the same activity (e.g. "working on a report" in (90)).

(90)   Matrix Clauses

     a.   Isabel was working on a report after dinner. Later, she was still working on it.

     b.   Isabel was working on a report after dinner. Later, she was practicing the piano.

     c.   What was Isabel doing after dinner? She was still working on a report.

     d.   What was Isabel doing after dinner? She was working on a report.

(91)   Negated Environments

     a.   Sammy was writing her report after dinner. But at 10:00pm she wasn't still working on it.

     b.   Sammy was writing her report after dinner. But at 10:00pm she wasn't working on it.

     c.   Why did Sammy's dad get mad at her? She wasn't still working on her report.

     d.   Why did Sammy's dad get mad at her? She wasn't working on her report.

(92)   Antecedents of Conditionals

a. Earlier, Orlando was playing basketball with friends. If he's still playing, he'll be in a good mood.

b. Earlier, Orlando was playing basketball with friends. If he's stretching now, he'll be in a good mood.

c. How's Orlando doing? If he's still playing basketball, he'll be in a good mood.

d. How's Orlando doing? If he's playing basketball, he'll be a good mood.

(93) Possibility Modals

a. Willie was watching a movie on TV after dinner. At 9pm, it's possible he was still watching TV.

b. Willie was watching a movie on TV after dinner. At 9pm, it's possible he was doing his homework.

c. What is Willie up to tonight? It's possible he is still watching TV.

d. What is Willie up to tonight? It's possible he is watching TV.

(94) Polar Questions

a. Sierra was working on homework after dinner. At 10, was she still working on her homework?

b. Sierra was working on homework after dinner. At 10, was she reading in bed?

c. Sierra ate dinner and went to her room. At 10, was she still working on her homework?

d. Sierra ate dinner and went to her room. At 10, was she working on her homework?

The results for these items can be seen in Figure 2.17. A significant *-supporting* contrast was found for matrix, negation, and possibility environments ($p < 0.001$). A significant *+trigger* contrast was found for conditional, matrix and negation environments ($p < 0.001$), as well as and possibility environments ($p < 0.05$) environments. The contrast was approaching significance for question contexts
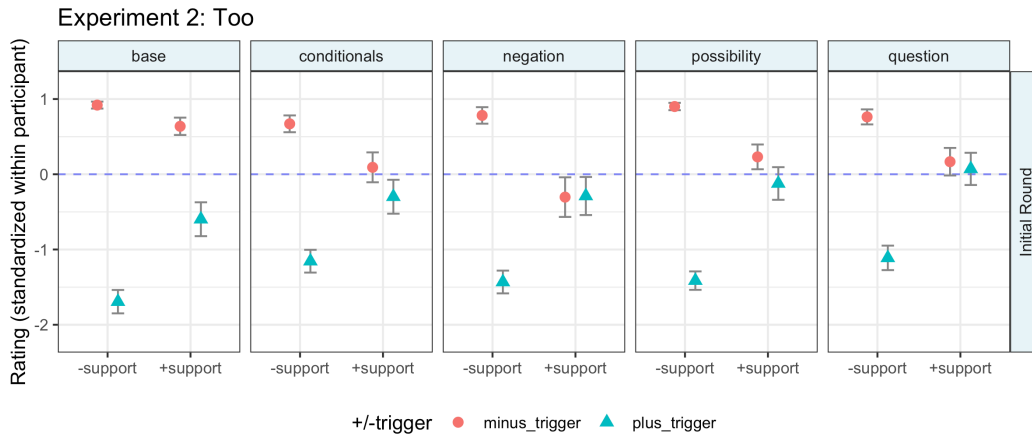
Figure 2.18: The results for this experiment indicate that *too* imposes a strong CFC, which is stable across environments.

($p = 0.065$). These results indicate that *still* is subject to CFCs in matrix, negation and possibility environments, but not in conditional or question environments. Thus, while the trigger is subject to some CFCs, they are not stable across environments tested.

Too   Items testing the CFC of *too* were created following (95) - (99), below. In Experiment 1, *+supporting/−trigger* target sentences consisted of bare matrix clauses, which, if interpreted exhaustivaly, would contradict the context sentence. (For example: *Jonathan went to a concert. He went to a party*.) In order to avoid this, items were created that involved temporal sequencing and added the connective *then* in both conditions. For negated environments, instead of *too*, *either* was used, as this was judged to sound more natural.

(95)   Matrix Clauses

    a.   Jonathan went to a concert. He then went to a party, too.

    b.   Jonathan went to a concert. He then went to a party.

    c.   What did Jonathan do last night? He went to a party, too.

    d.   What did Jonathan do last night? He went to a party.

(96)   Negated Environments

   a.   Tammy didn't clean the dishes. Because of this, she didn't dry them either.

   b.   Tammy didn't clean the dishes. Because of this, she didn't try them.

   c.   Why is Tammy's mom mad at her? She didn't dry the dishes either.

   d.   Why is Tammy's mom mad at her? She didn't dry the dishes.

(97)   Antecedents of Conditionals

   a.   Tira went to a bar after work. If she then went to a restaurant too, she'll be in a good mood.

   b.   Tira went to a bar after work. If she then went to a restaurant, she'll be in a good mood.

   c.   How is Tira doing this evening? If she went to a restaurant too, she'll be in a good mood.

   d.   How is Tira doing this evening? If she went to a restaurant, she'll be in a good mood.

(98)   Possibility Modals

   a.   Sahil went to a concert. Maybe he then went to an arcade, too.

   b.   Sahil went to a concert. Maybe he then went to an arcade.

   c.   What did Sahil do yesterday? Maybe he went to an arcade, too.

   d.   What did Sahil do yesterday? Maybe he went to an arcade.

(99)   Polar Questions

   a.   Eduardo went to the bank. Did he then go to the post office, too?

   b.   Eduardo went to the bank. Did he then go to the post office?

   c.   Eduardo was in a rush. Did he go to the post office, too?

   d.   Eduardo was in a rush. Did he go to the post office?

	Base (Matrix)	Possibility	Questions	Negation	Conditionals	
Too						5/5
Even						4/5
Questions						4/5
Clefts						4/5
Again						4/5
Only						3/5
Back						3/5
Still						3/5
Definite Determiner						2/5
Accomplishment						2/5
State Change Verbs						1/5
Possessive Pronouns						0/5
Cognitive Factives						0/5
Emotive Factives						0/5

Table 2.1: Summary of results from Experiment 2. If both contrasts are significant, the cell is colored green. If only the *-supporting* contrast is significant, the cell is colored apricot. If only the *+trigger* contrast is significant it is colored orange. If no contrasts are significant, it is colored red.

Significant *-supporting* and *+trigger* contrasts were found for all environments tested ($p < 0.001$). These results indicate that *too* is subject to strong CFCs, which do not change based on context. The effects for *too* were some of the strongest observed across all triggers.

2.4.3 DISCUSSION

Two summary visualizations give an overview of the results of this second experiment. First, Table 2.1 shows the results of our statistical tests for each trigger/environment pair. If both *-supporting* and *+trigger* contrasts are significant (i.e. the conjunctive criteria is met), we conclude that the trigger imposes a CFC and the cell is colored green. If only the *-supporting* contrast is significant, the cell is colored apricot, and if only the *+trigger* contrast is significant it is colored orange. If neither contrast is significant, then the cell is colored red. The far right column indicates the proportion of environments in which CFCs were found, using the conjunctive criteria. This summary table is intended to give a
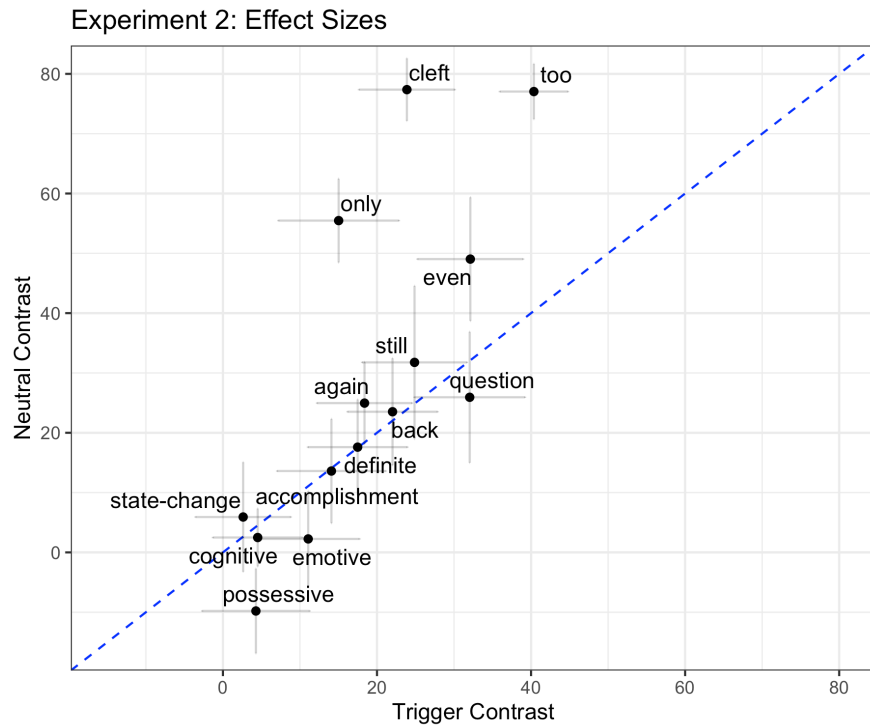
Figure 2.19: Effect sizes for Experiment 2. Points represent differences between conditions after averaging across subjects and items. Error bars are 95% confidence intervals measured across items.

sense of CFC stability across environments.

Turning to the effect size of CFCs, Figure 2.19 shows the relationship between +*trigger* contrast on the x-axis and -*supporting* contrast on the y-axis. Effects are measured by taking the relevant differences for each item after averaging across participants. Error bars show the 95% confidence intervals across items, averaging over environments. The y=x line is given in dotted blue; if metrics picked up on the same behavior then we would not expect the means for any trigger to be significantly different from this line. We can see that there is fairly good agreement between the two effects for most of the triggers, although this relationship breaks down for focus-sensitive triggers (this will be discussed at greater length, below).

The largest over-all takeaway from these summary visualizations is that there is a good agreement

between trigger stability (Table 2.1), effect size in this experiment (Figure 2.19) and effect size from Experiment 1. Possessive pronouns and factive predicates were the only two triggers found not to impose CFCs in Experiment 1, and they are the only two triggers for which no evidence of a CFC was found in any environment in this experiment. Furthermore, they cluster together at the bottom left corner of the effect size charts for both this experiment and Experiment 1. There is good agreement between the experiments and metrics at the other end of the scale, too. Triggers which imposed the larges CFC effects in the previous experiment were precisely those triggers that produced stable CFC effects across environments, here (i.e. *too*, *even*, questions and clefts). Finally, in the middle of the scale, the same triggers have variable CFC stability and moderate effect sizes, including *again*, only, *back*, *still* and the definite determiner.

There are two points of difference between the results of this experiment, and those from the first experiment: The first is that based off effect sizes and CFC stability, accomplishment verbs and change of state verbs pattern more closely with possessive pronouns and factives. In particular, state-change verbs were found not to impose CFCs in matrix clauses in this experiment, whereas they did impose CFCs in Experiment 1. (In Experiment 1, accomplishment verbs also imposed CFCs, but their effect size was relatively small.) The difference for state-change verbs between the two experiments may be due to the type of verb used. Experiment 1 used a mix of state-related verbs, including *continue*, which carries a state-related presupposition, but does not assert cessation of the state. Experiment 2 used only *stop*, which is more narrowly related to changes of state. Because state-change verbs are more commonly associated with habitual activities, and with the cessation of those activities (hence their name), we take the behavior in Experiment 2 to be more indicative of their use in typical conversation. Indeed, this is backed up by the production data from Spenader (2002), where state-change verbs were found to be explicitly supported in the corpus only about 13% of the time.

The second major difference between this experiment and the last was the effect size of the focus-sensitive particles *too* and *even*. In the previous experiment, it was found that the *-supporting* contrast

produced larger effect sizes for *only* and clefts than the *+trigger* contrast, and it was hypothesized that this had to do with question/answer congruence. In this experiment, *too* and, to a lesser extent, *even* were found to be associated with larger *-supporting* contrasts (they are significantly above the y=x line in Figure 2.19). These differences can be partially explained by redundancy effects in the *−trigger/+supporting* condition. In the first experiment, no care was taken to avoid redundancy in these sentences. Because they sounded unnatural, participants rated them low, and *+trigger/+supporting* sentences very high by contrast, producing a crossed interaction, with large *-supporting* and *+trigger* contrasts. In this experiment, however, care was taken to avoid redundancy effects, and all four contexts produced a spreading interaction, with trigger contrasts that were still very large, but smaller than in Experiment 1. Because items in the second experiment were more carefully controlled, the results of this experiment are likely better estimates of the underlying effect sizes, and reveal that *-supporting* contrasts are prone to producing larger effect sizes for some triggers, especially focus-sensitive ones.

How should this difference between *-supporting* and *+trigger* contrasts for focus-sensitive items affect our interpretation of the results? This effect is less of an issue for *too* and *even*. Even though their *-supporting* contrasts are much larger than their *+trigger* contrasts, both metrics produce similar relative rankings (that is, they are in the upper-right hand side of the chart). The over-estimation of *-supporting* contrast, however is more problematic for *only* and clefts. Going off *-supporting* contrasts, one would be tempted to conclude that they pattern with *too* and *even*. However, looking at *+trigger* contrasts, they pattern closer with the middle-ground triggers, like *again* and the definite determiner. Given that, in production data, clefts were found to be used with support only about 60% of the time, whereas *too* was found to be used with support more than 95% of the time, it seems inappropriate to clump these two triggers together in the same category. Furthermore, Tonhauser et al. (2013) argue that *only* is not associated with a CFC, and present data from both English and Paraguayan Guarani that suggests it can be used to felicitously introduce new information. Taking this larger suite of empirical evidence into account, when it comes time to establish a ranking of triggers in Section 3.5, I

will propose that exclusives impose weaker CFCs than the additives.

What this data tell us about the relative behavior of CFCs in different family of sentences environments? Looking at the number of triggers whose CFC properties change from matrix clauses, we find only one change for questions (*still*) and two changes for possibility modals (the definite determiner and accomplishment verbs). Between matrix clauses and negated environments, we find four changes (again, back, the definite determiner and accomplishment verbs). The most flips were found for conditional environments, where more than half of the triggers were found to exhibit different CFC patterns than in matrix clauses (*even*, questions, clefts, only, *back*, *still*, the definite determiner accomplishment verbs and state-change verbs.) The majority of cases were due to triggers which did impose CFCs in matrix clauses loosing their CFC effects when they were embedded in antecedents of conditionals. There are a couple places where we could look to explain this effect: First, it may be the case that sentences with conditionals are more difficult to process, and that participant behavior might be a case of CFC-reduction due to processing cost, which was discussed at the outset of this section. However, negation is more strongly associated with processing costs than conditionals in the literature, so it seems unlikely that conditional environments would produce a more widespread reduction of effects than negated environments, if this were the cause.

One alternative hypothesis that might be worth exploring is that the reduction in effects is due to discourse-structural properties, differences in which stem from the different questions used to set up −*supporting* environments. For matrix and possibility environments −*supporting* contexts were introduced with "What did X do?" questions. For conditionals, the most common question used was "How is X feeling?", and the structure of the target sentence was something like "If p then q" where p is sentence describing an activity that bears a presupposition and q is a sentence about their emotional state or mood. It may be the case that participants perceive the antecedent as less related to the topic of the discourse (X's mood), and are therefore more willing to accommodate or ignore presuppositions in this structural location. This hypothesis assumes that CFCs are related to information structure

of the sentence relative to a local question or question under discussion, something which has been explored previously for presuppositions' projectivity properties (Simons et al., 2010). However, for now I will set this hypothesis aside and ask whether the results from both experiments are compatible with previous theoretical proposals for contextual felicity and accommodation.

2.5 General Discussion

2.5.1 Ranking the Triggers

Turning to the question that motivated these experiments in the first place, we are now in a position to answer the question "Which triggers impose CFCs?" From the results of the experiments it is clear that the vast majority of triggers do impose some Contextual Felicity Constraints. Significant +*trigger* and -*supporting* interactions were found in the majority of contexts tested for *too*, *even*, clefts, *only*, questions, *again*, *back*, *still* and the definite determiner. On the other hand, it is equally clear that some triggers do *not* impose CFCs, including factive predicates and possessive pronouns. Finally, although the first experiment found evidence of CFCs for change of state verbs and accomplishment verbs, in the second experiment these two triggers were found to pattern more closely with the non-CFC triggers. Given that the second experiment contained a wider range of environments and concurs with the lack of support for state-change verbs in production data, I conclude that if these triggers do impose CFCs, they are very weak.

Beyond asking asking about the mere presence or absence of CFCs, we want to know about the relative strength of the constraint. In order to rank triggers based on their CFCs, we first break them down into clusters (roughly, from strongest CFCs to weakest):

- From the results of both experiments, it's clear that the focus-sensitive additives, *too* and *even* impose the strongest CFCs. They were associated with the largest effect sizes, for both -*supporting*

and +*trigger* contrasts in both experiments, and their CFCs were stable across family of sentence environments.

- Next, we have additive presuppositions that are not associated with focus, including *back*, *still* and *again*. These triggers were found to impose CFCs in matrix clauses under the scope of possibility models and (except *still*) in polar questions, however their CFCs may be attenuated in negated contexts or in conditionals. They are associated with moderate effect sizes.

- Third, we have the focus-sensitive exclusives, *only* and cleft constructions. These impose CFCs in the majority of environments tested. They are associated with large -*supporting* effects, but with only moderate +*trigger* effects, and production data and previous elicitation on the part of Tonhauser et al. (2013) indicates that they are associated with a weaker CFC than the focus-sensitive additives. One reason why they may be associated with large -*supporting* contrasts is that they have strong question/answer congruence conditions, giving rise to infelicity in our −*supporting* conditions.

- Fourth, we have the verbal triggers, including accomplishment verbs and change of state verbs. These triggers impose CFCs in only one or two family-of-sentences environments. They are associated with medium effect sizes the first experiment, but weaker effect sizes in the second experiment.

- Finally, we have possessive pronouns, cognitive factives and emotive factives. These triggers do not impose CFCs in any of the family of sentences environments, and are associated with the weakest effect sizes.

- There are two triggers whose behavior is difficult to cluster with others. These are questions and the definite determiner. Questions were found to impose CFCs robustly across family of sentence environments, and had relatively large effect sizes for both -*supporting* and +*trigger*

	Semantic Category	Examples
STRONGEST CFC	Focus-Sensitive Additives	*too, even*
	Wh-Quesitons	*who, what*
	Iteratives, non-Focus Additives	*again, back, still*
	Exclusives	*only*, clefts
	Definite Determiner	*the*
	"Soft" Verbal Triggers	*win, finish, stop*
WEAKEST CFC	Factives, Possessives	*his, her, know that, angry that*

Table 2.2: Ranking of triggers from strongest CFC (top) to weakest CFC (bottom)

contrasts in both experiments. Like the focus sensitive triggers they are traditionally analyzed as being associated with a set of structural alternatives (Dayal, 2016), however unlike these triggers it has been argued that their presuppositions are not lexical (that is, they are *soft* triggers). And like *only* and clefts, their presuppositions are merely existential, not additive.

The second trigger that may be hard to categorize is the definite determiner. Ratings for this trigger varied quite widely between different family of sentences contexts. CFC effects were found in only two environments, and the trigger was associated with smaller contrasts than the non-focus additive particles, at least in the second experiment. This indicates that, although it imposes a CFC, it may be weaker than the CFCs imposed by *again*, *still* and *back*.

Taken together, these considerations suggest the following ranking of triggers based on their CFCs, from strongest to weakest (also shown in Figure 2.2): {too, even} > wh-questions > {again, back, still} > {clefts, only} > the definite determiner > {win, finish, stop} > { his, her, know, angry that, etc.}. Focusing on the clusters discussed above, and on the shared semantic properties of each cluster, we conclude that additive particles impose the strongest CFCs, followed by exclusives, soft verbal triggers, and finally complement-taking verbal triggers and possessives.

Before moving on to the theoretical implications of our results, I briefly mention one open issue. The results clearly indicate that focus-sensitive additive particles impose stronger CFCs than their

non-focus counterparts. This pattern is also empirically supported by Göbel (2020), who explicitly tests the relative CFCs of focus/non-focus particles in a single, controlled experiment. However, following up on the hypothesis that CFC strength might be modulated by local information-structure considerations, this conclusion might merit reconsideration. Consider the experimental setup from Göbel, used to test variation in CFC strength between *too* and *again* in (100), which illustrates a crucial issue. Here, the presupposition of (a) is directly relevant to the question insofar as it provides a partial answer to it, but the presupposition of (b) does not.

(100)   Who is having dinner in New York?

      a.   #Logan is having dinner in New York, too. (less acceptable)

      b.   ?Logan is having dinner in New York, again. (more acceptable)

If participants are sensitive to local information structure when interpreting presuppositions, then we cannot rule out relevance to the QUD as a possible confound, both with these previous results, and with the experiments presented in this section. When items are reformulated so that the presuppositions of both *too* and *again* address the question, the difference in CFC strength may be attenuated as in (101), below (author's judgement).

(101)   When has Logan meet with the chair this semester?

      a.   #They met yesterday again.

      b.   #They met yesterday, too.

Although for now, we will stick with the ranking proposed in Figure 2.2, we flag this issue as something that will be addressed theoretically in Chapter 3 and experimentally in Chapter 5.

2.5.2 Theoretical Implications

Before discussing the implications of the proposed ranking, I will briefly recapitulate the three candidate proposals for Contextual Felicity Constraint strength discussed in the previous chapter. All three of these theories work within the semantic approach to presuppositions, and seek to root the empirical phenomena of Contextual Felicity Constraints in the success or failure of an accommodation mechanism that can pre-update a context prior to utterance interpretation. In general, we make the linking hypothesis that successful accommodation results in no CFCs as measured by the conjunctive criteria, and accommodation failure results in weak and strong CFCs, which allows us to translate between the predictions of each theory and our data. The *Information Content* approach of Geurts & van der Sandt (2004) postulates that presuppositions cannot be accommodated if they are semantically impoverished, which makes it difficult to build discourse referents on the fly. However, this proposal suffers from a number of technical challenges, and has never been formulated generally enough to make clear predictions for a broad range of triggers. So while we acknowledge that the proposal is theoretically well-motivated, I will set it aside for lack of predictive power. The *Non-Presupposing Alternatives* approach (Blutner, 2000) treats accommodation as the result of a competition mechanism, in which non-presupposing alternatives compete with and potentially block presuppositional utterances. For a list of triggers and their simple non-presupposing alternatives, see the previous chapter. All presuppositions are predicted to not accommodate, except for accomplishment verbs, for which there are no simple non-presupposing alternatives. Finally, Göbel (2020) proposes that ease of accommodation varies with whether or not a trigger focus-associates. If it does, then the presupposition requires an antecedent in a structured discourse model; if not, it only requires that its presuppositions be entailed by the common ground. Under the assumption that the structured discourse model is more difficult to amend on the fly, this theory predicts that focus-associating triggers should be more difficult to accommodate than non-focus associating triggers.

The predictions of these two proposals are shown in Table 2.3. In addition to the two theories that address the issue of accommodation failure directly, the table includes categorizations from two prominent hybrid proposals for presuppositions: the soft/hard distinction of Abusch (2002) and the weak/strong distinction of Domaneschi et al. (2014). The triggers are ordered with respect to their propsed CFC strength, with triggers that impose the strongest CFCs at the top of the table and triggers that impose no CFCs at the bottom. How should we evaluate match between candidate proposals and the experimental data? Ideally, a single theory should be able to account for the total range of variation, for example explaining both why *too* imposes stronger CFCs than *the* and why *the* imposes stronger CFCs than *know*. However, all of the candidate theories propose only a binary distinction between presupposition triggers. Thus, for these theories to be compatible with the data, they should make a linear separation in the proposed CFC ranking, with all the triggers in one group stronger than all the triggers in the other group. It may be the case that by combining multiple theories, we could explain a larger range of the experimental data.

First, let's compare experimental results to the distinctions made by the hybrid theories (soft vs. hard and strong vs. weak). Because neither of these two makes explicit predictions about accommodation, our data does not provide direct evidence for or against them. Rather, we inspect the way they cut up the presupposition triggers and ask whether their categorization aligns with our empirical results. If so, then the study may provide additional evidence in favor of these theories, and give us a clue as to what causes CFC variation. We briefly recapitulate each proposal: First, the soft/hard distinction (Abusch, 2002) was developed to explain why the presuppositions of some triggers can be canceled more easily than others. It proposes that while some triggers (the *hard* ones) are *bona fide* semantic presuppositions, other presuppositional behavior results from alternative-based pragmatic reasoning. Second, the weak/strong distinction (Glanzberg, 2005) was proposed to explain why some cases of missing accommodation result in interpretation failure and obligatory context repair (for *strong* triggers), whereas for other, *weak*, triggers, context repair is optional. For our purposes, these two cate-

Trigger	Abusch (2002) Hard/Soft	Glanzberg (2005) Weak/Strong	Blutner (2000)	Göbel (2020)
Even	Hard	Weak	No Accom	No Accom
Too	Hard	Weak	No Accom	No Accom
Wh-Questions	Soft	Strong	No Accom	Potential Accom
Back	Hard	Weak	No Accom	Potential Accom
Again	Hard	Weak	No Accom	Potential Accom
Still	Hard	Weak	No Accom	Potential Accom
Only	Hard	Weak	No Accom	No Accom
It-Clefts	Hard	Strong	No Accom	No Accom
The X	Hard	Strong	No Accom	Potential Accom
State Change Verbs	Soft	Strong	No Accom	Potential Accom
Accomplishment Verbs	Soft	Strong	Accom	Potential Accom
Possessive Pronouns	Hard	Strong	No Accom	Potential Accom
Emotive Factives	Hard	Strong	No Accom	Potential Accom
Cognitive Factives	Hard	Strong	No Accom	Potential Accom

Table 2.3: Predictions of various theoretical proposals with the results of our study, which are ordered from strongest CFC triggers (top) to weakest CFC triggers (bottom).

gories can be cast in terms of type-based semantic frameworks, with semantic adjuncts as weak triggers and non-adjuncts as strong triggers.

So what categorizations do these two approaches make? Starting with the soft/hard distinction, we find some good overlap between the relevant categories and our results: Of the three soft presupposition triggers, the two open-class verbal items impose weak or no CFCs and Wh-Questions impose middle to strong CFCs. While this does split up soft triggers into different CFC categories, there might be a potential explanation for this: Presuppositions associated with state change and accomplishment verbs are said to be triggered by implicit alternative reasoning, whereas wh-questions introduce alternatives explicitly in their semantics. Thus, triggering through alternatives could be affected by the way in which those alternatives are introduced. Furthermore, because the notion of alternative-based reasoning was developed to explain the cancellation properties of verbs like *stop* and *win*, it makes sense that their CFCs would be weak and easy to suspend. Thus, the soft/hard distinction presents a theoretically-grounded story for CFC variation that is compatible with our data.

The one problem for adopting soft/hard distinctions as a main locus of CFC variation is that not all of the triggers that fail to impose CFCs are soft. If this line were to be pursued, then cognitive factives, emotive factives and determiners would have to be categorized as weak triggers. Traditionally, suspension in antecedents of conditionals is a diagnostic for weak triggers, and as demonstrated in the examples below, attempting to suspend these triggers results in semantic infelicity (author's judgement).

(102)   a.   #I don't know whether Nina spilled coffee, but if she's upset that she spilled coffee, we should cheer her up.

b.   #I don't know whether Nina has a car, but if her car is broken, we should give her a ride.

Thus, while the soft/hard distinction may be able to explain why some triggers impose weaker CFCs,

it leaves important questions about CFC variation unanswered.

Turning now to the weak/strong approach, all of the strong triggers like determiners, complement-taking predicates and open-class verbs are associated with the smallest CFCs. Inversely, the most robust CFCs are all associated with weak triggers, like additives and iteratives. The ony exception to this trend are wh-questions, which are strong triggers à la Glanzberg (2005), but associated with more robust CFCs. However, as discussed above, questions are a bit of a special case. They are associated with complex syntactic operations and may trigger their presuppositions via explicit introduction of alternatives into the semantic derivation. So, granting questions as the possible exception, the weak/strong approach does seem to separate triggers in a way that is consistent with CFC effects.

That being said, it is not immediately clear, at least within the theory proposed by Glanzberg (2005), *why* this should be the case. The most likely link between the weak/strong hypothesis and CFC variation is to assume that weak triggers, which require only optional discourse repair, are easier to accommodate. But this is precisely the opposite of what we find! On the assumption that CFC strength measures ease of accommodation, we get that weak triggers are *hard* to accommodate, and strong triggers are *easy* to accommodate. This presents a puzzle, which we set aside for the moment, and return to after discussing the results of the two theories that make explicit predictions about accommodation.

The first of these two theories is the Focus Presupposition Antecedent Hypothesis (FoPAH), which predicts that focus-sensitive triggers should be difficult to accommodate. The FoPAH has found previous empirical support in Göbel (2020), who used an experimental setup similar to our *-supporting* contrast to test CFC strength (Göbel discusses this strictly in terms of accommodation). If only *-supporting* contrasts were to be used, then the results would support the FoPAH, however the experiment deployed a broader set of criteria to determine CFC strength, including the *+trigger* contrast and a conjunctive criteria between the two. As discussed above, these results suggest that *-supporting* contrasts can over-estimate CFC effects for focus-associating triggers, which may be more sensitive to

question/answer congruence (Abrusán, 2016). Looking at CFC effects using the +*trigger* contrast, as well as comparison with production data, I argued that focus sensitivity does not necessarily result in larger CFC effects, and group the exclusive triggers (*only* and clefts) in the middle of our CFC ranking.

That being said, focus sensitivity is clearly important for presuppositional phenomena, and we do find that, among the additive particles, focus-sensitive triggers tend to produce larger and more stable CFC effects than non-focus triggers. One possible reason for this is that because of necessary focus/question congruence (Roberts, 2012), the presuppositions of focus sensitive triggers will always be at-issue with respect to the question that sets up -*supporting* conditions. As has been suggested before to explain the reduction of CFC effects in the antecedents of conditionals, participants may be sensitive to whether a presupposition is at-issue or not. Because the presuppositions of *too* and *even* will always be at issue, they might be predicted to impose CFCs in a higher proportion of contexts, compared to non-focus additives like *again*, whose presuppositions may or may not address the local QUD.

Finally, we turn to the Non-Presupposing Alternatives Proposal, which says that failure to accommodate is the result of a competition mechanism between presupposing and non-presupposing sentence variants. As it was formulated in Blutner (2000), the predictions of the proposal are not compatible with our data, predicting only that accomplishment verbs should be accommodateable and therefore impose no CFCs. However, drawing on insight from the weak/strong distinction, it may be possible to re-formulate this proposal to better account for our results. Given that all of the weak presupposition triggers are semantic adjuncts, it is possible to create sentence variants by simply removing them. Because the semantic function of additives is largely just to add presuppositions into the derivation, these trigger-less sentence variants would be semantically equivalent to their trigger-bearing counterparts, at least as far as the asserted content. Thus, one could re-frame Blutner's proposal using only alternatives that were available via *deletion* (and not substitution). Under this approach one would derive the fact that all the semantic-adjunct triggers should impose stronger CFCs,

which is precisely the conclusion of the study. A theory along these lines would be exciting because it would combine the insight from Glanzberg (2005) with the perspective from Blutner (2000) that accommodation is the result of a competition mechanism.

2.6 Conclusion

This chapter has attempted to answer the question "Which presuppositions are subject to Contextual Felicity Constraints?" It introduced a novel 2x2 experimental paradigm and argued that CFCs should be assessed by taking the conjunctive criteria between two contrasts that have been studied previously in the literature. Using this paradigm, an experiment measured the strength of CFCs in matrix clauses, finding that all triggers except factive predicates and possessive pronouns imposed some CFC. Looking at effect sizes of CFCs, the results showed good correlations between the proposed experimental paradigm and corpus-based production data, providing ecological validity for the approach. Experiment 2 asked whether CFCs were stable across family of sentences environments. The results of a large-scale experiment found that the stability of CFCs across environments correlated with the effect size for *+trigger* and *-supporting* contrasts. The chapter concluded by proposing a ranking of triggers based on CFC strength.

Theoretically, I argued that no previous proposal can capture the full range of variation observed in our data. While the soft/hard distinction of Abusch (2002) can explain the lack of CFCs for soft triggers, it leaves other variation unaccounted and the weak/strong distinction of Glanzberg (2005) is theoretically misaligned with the data. While the role of focus is clearly important for presupposition trigger processing, the experimental results indicate that focus-sensitive exclusives impose smaller CFC effects than some non-focus triggers, which is not predicted by the FoPAH of Göbel (2020). Finally, although the original formulation of Blutner (2000)'s competition mechanism is not aligned with the results, I proposed a reformulation that draws on insight from the weak/strong distinction and

provides good empirical coverage.

Moving forward, there is one empirical question that these results leave unanswered, and that is the strength of the CFC contributed by the exclusives *only* and clefts. Tonhauser et al. (2013) has argued that these triggers don't impose any CFCs, citing fieldwork with speakers of Paraguayan Guarani. The data presented here indicate that these items are subject to a moderate CFC, however these results may be driven by the smaller range of contexts in which exclusives can appear. The constraints on the distribution of exclusives in question-answer situations likely fall under the rubric of CFCs, but they are not ones necessarily related to presupposition. Thus, further experimentation will have to tease apart the role of presuppositional vs. non-presuppositional Contextual Felicity Constraints in the distribution of these items.

3

Explaining CFCs with a
Maximality/Accommodation Clash

3.1 Introduction

Chapter 2 tested the the influence of trigger type on how easily a given presupposition could be used to communicate novel information. The results of two studies found substantial trigger-by-trigger

variation in terms of Contextual Felicity Constraints (CFCs) ([Tonhauser et al., 2013](#)), or the extent to which triggers require their presuppositions to be contextually supported. Crucially, this variation broke down by functional semantic category, with like triggers clustering together (e.g. both of the additives tested imposing strong CFCs). A ranking of triggers was proposed, from those which can be used to successfully introduce novel content in a broad range of contexts (e.g. possessives, factives) to those whose presuppositions must be supported in almost all cases (e.g. *too*, *even*).

This chapter will embark on a theoretical explanation for the observed novelty effects, working within the *satisfaction* framework to presuppositions ([Heim, 1983](#)). Under this framework presuppositions are definedness conditions on utterances, placing a constraint on the context in which they can be uttered. In cases where these constraints are not met, an accommodation mechanism pre-updates the context prior to utterance interpretation. The hypothesis pursued here is that during conversation, comprehenders are subject to two pragmatic pressures: The first is to be accommodating and, in the words of [Von Fintel](#) ([2008](#)), to update their context to incorporate presupposed material "quietly and without fuss." The second pressure is to interpret contributions to a discourse as maximally informatively as possible. Because of the way that certain triggers structure the relationship between their asserted content and presupposed content, these two pragmatic factors are sometimes pitted against each other, giving rise to a discourse clash. Comprehenders are sensitive to this clash; and it is responsible for many of the observed Contextual Felicity Constraints. I'll refer to this hypothesis as the "Maximality/Accommodation Clash" Approach for CFC effects (or the MAC for short).

The MAC approach is aligned with and builds on insight from recent work arguing that presuppositional phenomena must be understood in light of how they interact with focus and information structure. Early work sought to identify presuppositions and build robust theories for their projective behaviors, largely treating the phenomena as uniform. Starting in the 90s, however, various researchers began to observe that presuppositions are not a homogeneous category, and began to explore numerous internal divisions, looking at anaphoricity ([Zeevat, 1992](#)), repairability ([Glanzberg, 2005](#)), and

cancelability (Abusch, 2002). Recently, it has been argued that many of these internal divisions can be explained through the interaction between presupposition and local information structure, with recent work investigating this link for presuppositions' projective properties (Simons et al., 2010), as well as variation in their cancelability (Abrusán, 2011, 2016), accommodation (Göbel, 2020) and obligatoriness (Bade, 2016). The MAC approach builds on and fine-tunes these recent approaches, proposing a role for the interaction between presupposition and information structure within the satisfaction-based framework for presuppositions.

Although it builds on recent proposals, the MAC approach is novel in a variety of ways. The primary distinction is that the MAC explains novelty effects while shifting focus away from the failure of the accommodation mechanism itself. Previous approaches to CFCs have postulated that presuppositions come in two or more types, and root variation in either a failure of the accommodation mechanism or participant unwillingness to accommodate one of these two types (Kripke, 2009; Tonhauser et al., 2013; Göbel, 2020). The MAC , on the other hand, is compatible with a uniform treatment of presuppositions. Furthermore, it postulates that CFCs do not result from a failure of accommodation, but rather from downstream consequences of *successful* accommodation. At the highest level, accommodation has generally been understood to be a last-resort mechanism, one that kicks into gear in order to save utterance interpretation in the face of failure (Lewis, 1979). The MAC however, is compatible with a different view of accommodation, one that views it as a routine part of utterance update. Under this approach, it is participant *willingness* (as opposed to unwillingness) to accommodate that results in a pragmatic clash.

The rest of this chapter will proceed as follows: Section 3.2 will outline previous theoretical proposals for novelty effects, and explain how the Maximality/Accommodation Clash fits into this theoretical landscape. Section 3.3 will introduce the modeling assumptions, as well as the formal version of the approach, instantiated in a context-update algorithm. Section 3.4 will walk through eight triggers, outlining the predictions of the MAC approach and comparing its theoretical coverage to alternative

proposals. Shortcomings and some further considerations are discussed in Section 3.5.

3.2 Background

Satisfaction Based Approaches: Presuppositions as Constraints   This framework treats presuppositions as requirements that certain sentences place on the context in which they are uttered (Heim, 1983). Following Stalnaker (1978), contexts are taken to be unstructured sets of information which has been mutually assented-to previously during discourse. If a sentence with a presupposition is uttered in a context where its presuppositions are not met, then an accommodation mechanism is invoked, which pre-updates the context prior to utterance interpretation (Lewis, 1979; Von Fintel, 2008). Traditionally, variation in accommodation is based on the success or failure of this mechanism, which is assumed to operate "within certain limits" (Lewis, 1979). One current weakness for this approach is that there is no explanatory theory for these limits. Von Fintel (2008) does point out that participants are unlikely to accommodate material that they know to be false (and know their interlocutors know to be false, and know their interlocutors know they know to be false *ad infinitum*). But experimental data, including the data from the previous chapter, indicates that the constraints on accommodation are broader than merely an unwillingness to accommodate false information, and include substantial trigger-by-trigger variation, suggesting that the accommodation process is driven, at least in part, by formal aspects of the trigger itself.

Presuppositions as Anaphors   This approach treats presupposition triggers as anaphors, which must be bound by an antecedent in the discourse context (Van der Sandt, 1992). Novelty effects are explained by an accommodation mechanism similar to the one above: When no suitable antecedent exists, one is created on-the-fly, which is then used to bind the trigger. This approach to presuppositions comes in two forms: Under the strong form, all presupposition triggers are anaphors (Van der Sandt, 1992), while under the weak form only some triggers are assumed to impose constraints while

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others are anaphoric (Zeevat, 1992; Kripke, 2009), with particular attention having historically been given to the additives *too* and *again* (we will discuss this below, under "Heterogeneous Approaches"). The problem with the strong version of this approach—where all triggers are taken to be anaphoric—is that, like the satisfaction-based framework above, it has a hard time explaining trigger-by-trigger variation. If all triggers are equally anaphoric than why are some harder to accommodate than others?

HETEROGENEOUS APPROACHES   These approaches posit that triggers give rise to presuppositions in multiple ways, typically through a blend of the two frameworks discussed above. One recent hypothesis (Göbel, 2020) (the Focus Presupposition Antecedent Hypothesis, or FoPAH) draws the distinction between focus-associating and non focus-associating triggers. According to the FoPAH, non focus-associating triggers impose constraints on an unstructured context while focus triggers are anaphoric to antecedents in a structured discourse model. Another heterogeneous approach is the hybrid anaphor/constraints approach discussed above. Like the FoPAH, this approach postulates that some triggers impose constraints on the context and are easy to accommodate, whereas others are anaphoric and are more difficult to accommodate. Generally, heterogeneous approaches are better at deriving CFC variation: one category of presuppositions is chosen to be easy to accommodate, while the other category is difficult to accommodate. Potential problems for these approaches lie in explaining why one category should be more difficult to accommodate than the other. Göbel (2020) argues that discourse anaphoric items pose more of a challenge because the facts of the discourse are common knowledge. Thus, all discourse-level presuppositions will be known to participants as either true or false, whereas context-level presuppositions may not be.

NOT PRESUPPOSITIONS   While the three views discussed above try to connect the backwards-looking and discourse-old properties of presuppositions with their projective properties, the final framework hypothesizes that these behaviors do not share a common origin. Tonhauser (2015) proposes that

some material is associated with a constraint on the common ground, but that this constraint is not related to the mechanism that causes some material to project over entailment canceling operators. Projectivity, Tonhauser suggests, may be due to local information structure, as proposed in Simons et al. (2010). The problem with this approach is that, while it can potentially capture a broad range of CFC effects, it does not have much explanatory power. That is, it does not explain why *too* is associated with a strong common ground constraint, whereas possessive pronouns are not.

In summary, the heterogeneous approaches and the not-presuppositions approaches are able to capture some CFC variation, but this comes at the cost of a more complex theory or a lack of explanatory power. In practice, the variation that these approaches predict match the data with varying degrees: Focusing just on the two heterogeneous approaches, the FoPAH correctly predicts that focus-sensitive triggers tend to impose stronger CFCs, but incorrectly predicts that non-focus additives, like *again*, should impose weak (or no) CFCs. The hybrid constraints/anaphor approach provides a better fit to the data, correctly predicting that additives should all be more difficult to accommodate than exclusives, regardless of focus association. But this approach doesn't predict further variation that does seem to be focus sensitive, namely that *again* is easier to accommodate than its focus-associating counterparts, *too* and *even*. The right theory needs to explain both why additives are more difficult to accommodate, and also the role of focus-sensitivity within additive triggers. Turning to the homogeneous approaches, we find that, as articulated currently in the literature, they lack any ability to explain by-trigger variation in contextual felicity.

Given the theoretical landscape described above, the MAC approach is theoretically productive for two reasons. First and foremost, it articulates a theory for novelty effects from within the perspective of a satisfaction-based framework, rooting the variation in the interaction between presupposition triggers and local information structural considerations. Because it hypothesizes that CFC variation arises due to downstream contradictions that occur after accommodation, it is a perspective on CFC

variation that is compatible with a homogeneous view of presupposition. Below, I will argue that the empirical coverage of the MAC approach is at least as broad as that of other proposals, giving the satisfaction-based framework as much empirical coverage as the alternatives outlined above. Second, because the MAC approach recruits pragmatic mechanisms (accommodation, maximality) that are already assumed by many semantic theories, it can explain the relevant data without adding any additional technical apparatus. For that reason, it is possible to view the current proposal as one of dissolution—it argues that current mainstream theories already possess the right pieces to explain the data, they just need to be combined in the right way.

3.3 The Proposal

3.3.1 Modeling Assumptions

This proposal is framed within a dynamic model of discourse: Conversation takes place against a backdrop of mutually assented-to information called the Common Ground, or Context set (Stalnaker, 1978). The Common Ground (*CG*) is the set of propositions that have been previously accepted in the conversation. The Context set (*C*) is the intersection of all these propositions, i.e. a set of worlds compatible with previous utterances. For the current proposal, we focus on two types of discourse moves—assertions and questions. Assertions are taken to be propositional, denoting a set of worlds. Questions are taken to denote sets of possible answers, i.e. sets of propositions. If an assertion is accepted by discourse participants then its propositional content is intersected with the context set, resulting in a smaller—and thus more informative—context set (Heim, 1983; Chierchia, 2009; Beaver, 2001). Under this model, the *telos* of a conversation is to slowly winnow down the context set thereby increasing the amount of shared information between interlocutors.

Conversation does not proceed haphazardly, but by raising and answering questions. Questions can be both explicit and backgrounded (Roberts, 2012). Questions are stored in a stack-like data

structure, with the question at the top of the stack, or the question being actively resolved by discourse participants, called the Question Under Discussion (QUD). Assertions must be relevant to the QUD. Following Kadmon (2001), we can say that a proposition is relevant to a question if it is a partial or complete answer to it. A proposition p is a partial answer to a question Q if p contextually entails the truth value of at least one element in Q. Similarly, a proposition is a complete answer to a question Q if it contextually entails the truth value for every element of Q.

Based on this notion of relevance, it is clear how the current QUD constrains the possible assertions that conversational participants can make at any given point—they must be relevant to the QUD! But what about questions themselves? At the very least we can say that the introduction of QUDs is also constrained, insofar as answering a given QUD must move the conversation forward. Büring (2003) formalizes this notion with the following constraint:

(1)   Don't ask trivial questions!

A question Q is trivial in context C if $\forall p \in Q[p \cap C = C \vee p \cap C = \emptyset]$.

That is, a question is trivial if answering it either does not change the context thereby contributing information to the discourse (the left half of the disjunct), or if answering it produces an empty context (the right half of the disjunct). Following this insight, I will assume that this second requirement also applies to assertions—propositions that, if intersected with the context, produce an empty context set, are not felicitous contributions to a discourse (i.e. they produce a discourse clash).

There is one more component to the system that needs to be introduced before we move on to discussions of accommodation and maximality proper, and that is the role of focus. Following Rooth (1992), utterances that carry prosodic focus (or focus marking; denoted with an underscore X_F) have both an ordinary semantic value and a focus semantic value. The ordinary semantic value is just the meaning of the sentence (i.e. a set of worlds). The focus semantic value is obtained by replacing the focused constituent with alternatives of the same semantic type. Thus, the focus semantic value of an

utterance is a set of propositions—the same logical type as a question. For proposition α, we can write its focus semantic value as $[\![\alpha]\!]^f$.

Focus constrains an utterance in a number of key ways. Relevant for our discussion are points (a) and (d) from Rooth's (1992). *Focus Interpretation Principle*: Point (a) is the *Focusing adverb constraint*. It says that if $\mathcal{A}$ is a domain of quantification of a focusing adverb with an argument α, then $\mathcal{A} \subseteq [\![\alpha]\!]^f$.[1] That is, focus sensitive adverbs quantify over a subset of the focus semantic value of their arguments, which provided by the local context. For example, consider the sentence "I certainly *read* Ulysses," with focus on the verb *read*. This sentence is taken to communicate that the speaker read, but did not understand Ulysses by evoking the alternative set {read, understand}. In this case, the domain of quantification $\mathcal{A}$ is only a subset of the focus value of the sentence, which would include a larger set of verbs including {ponder, see, hate, burn, eat, . . . }[2]

This will be crucial, as many of the presupposition triggers discussed below are focusing adverbs, including *even*, *only* and *too*. The second point of relevance, is the *Question–answer Constraint*. It says that in a question-answer pair, pair $\langle \psi, \alpha \rangle$, $\psi \subseteq [\![\alpha]\!]^f$. That is, for an response to be congruent with a question, the question must be a subset of the utterance's focus semantic value. The focusing adverb constraint and the question–answer constraint will work together to drive the difference in contextual felicity between focus-associating and non focus-associating additive particles.

3.3.2 ACCOMMODATION

Under the standard dynamic semantics approach to conversation, assertions can come in two types: Some are total functions, mapping all worlds to either true or false. Others are partial functions, applicable only to a subset of worlds for which certain properties are true. In cases where partial function assertions are applied to a context that contains worlds under which they are not defined, utterance

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[1] The variable C is often used to denote the domain of quantification for a focusing adverb, i.e. its set of contextually restricted alternatives. However as C is being used to represent the context set, $\mathcal{A}$ is used here.

[2] This example is adapted from Rooth (1992) who uses *The Recognitions* instead of *Ulysses*.

interpretation fails. Problematically, this simple update algorithm is far more brittle than what is actually observed 'in the wild.' In many situations, participants are willing to go along with the context requirements imposed by an utterance, even if they are not antecedently entailed by the context. This willingness to play along is modeled by a process called *accommodation*, wherein contexts can be pre-updated prior to utterance interpretation.

In a dynamic semantics framework, accommodation is a relatively straightforward process. For a context C and utterance with assertions u and presuppositions p, a new context C' is derived with the following update function:

$$C' = (C \cap p) \cap u \qquad (3.1)$$

First, the worlds that are in the context set are intersected with the words denoted by the presupposition. The resulting context is updated by intersecting it with the worlds denoted by the assertion, resulting in a new context set. There are two important things to note: First, accommodation does not add worlds to the context set, insofar as material cannot be accommodated if it is known to be false. If it is common ground that Alex has never tried sushi previously, then the utterance "Alex tried sushi again last night" cannot be accommodated. The second thing to note is that, formally, accommodation looks a lot like conjunction. Indeed, under a dynamic semantics framework context update for conjunction and accommodation are *exactly the same*—the only difference is that conjunction sequentially updates a context with operands, while Equation 3.1 sequentially updates a context with presuppositions and then assertions. Under an approach to accommodation that views it as always taking place, presupposing is something akin to covertly asserting a conjunct at the beginning of an utterance.

3.3.3 MAXIMALITY

In addition to accommodation, the other important pragmatic factor is *maximality*, or the tendency to interpret utterances in the most informative manner possible. To give a brief example, in a scenario where three friends—Amos, Beth and Carl—went out for dinner, if someone asks "Who ordered pasta?" the response "Amos$_F$ ordered pasta" (with focus on *Amos*) is usually taken to mean that Amos ordered the pasta and Beth and Carl did not; that is, it is given a maximal reading along the lines of "*Only* Amos ordered pasta". There are three approaches to maximality that are prevalent in current literature on the subject: Neo-Gricean approaches, Iterated Rationality approaches and Grammatical approaches. Each is introduced briefly in the following paragraph.

Neo-Gricean approaches attempt to derive the effect from underlying rules of conversation, or Maxims (Grice, 1975). In this case, the relevant maxim is that of Quantity, or the pressure to be as informative as possible. For the example above, under the assumption that the speaker is knowledgeable about who ordered what, then, under the maxim of Quantity, the speaker would have said so if Beth or Carl had ordered pasta. But the speaker did not say so. Therefore, it must be the case that neither Beth nor Carl ordered pasta. Iterated Rationality approaches to maximality attempt to derive the effects by modeling interpretation as a recursive reasoning process that balances various communicative tradeoffs, such as the utility of an utterance and its cost (Goodman & Frank, 2016; Scontras et al., 2021). Under simple models, the phrase "Amos$_F$ ordered pasta" could possibly get a maximal interpretation because, even though it is literally compatible with worlds where Beth or Carl ordered pasta, it is a low cost way of communicating the world where only Amos did (Wilcox & Spector, 2019; Cremers et al., 2022). (Low cost, here meaning that it is shorter than more informative alternatives that communicate the world where only Amos ordered pasta, such as "Amos ordered pasta, but Beth and Carl did not" or even "Only Amos ordered pasta.") Finally, grammatical approaches to maximality effects view them as arising from the presence of a covert exhaustivity operator, *exh*, semantically sim-

ilar to *only*, except that its prejacent is asserted rather than presupposed (Chierchia et al., 2012). While other approaches to maximality view it as resulting from pragmatic processes that may take place after compositional semantic interpretation, this approach views them as embedded in the grammar itself, hence its name. (Note, there are also hybrid approaches that combine grammatical approaches with iterated rationality approaches, for example, models that view the insertion of an *exh* operator as something speakers and listeners reason about in an iterated rationality setting (Champollion et al., 2019)).)

In subsequent sections, a detailed account of the Maximalty/Accommodation Clash approach to CFC effects will be presented from within the grammatical perspective. However, this should not be taken to mean that the ideas presented here are only compatible with this approach to maximality inferences. In the next chapter I will return to the Neo-Gricean and Iterated Rational perspectives, introduce them in greater detail and present a sketch of how the MAC could be implemented in each. Indeed, one strength of the approach is that it does not depend on the origin of maximality effects.

Turning back towards the grammatical approach, a denotation for the *exh* operator is given below; it takes a proposition p and a contextually-derived set of alternatives, $\mathcal{A}$, which is a subset of the focus value of p. It asserts that the prejacent is true, and that all propositions in $\mathcal{A}$, which are not entailed by p are false.

(2) $[\![\, \mathrm{exh} \,]\!] = \lambda\mathcal{A}\,\lambda p\lambda w : p(w) \wedge \forall r[r \in \mathcal{A} \wedge (p \nrightarrow r) \rightarrow \neg r(w)]$

Because the tendency to exhaustify will be the basis for the maximality/accommodation clash, it is important to clarify when exhaustification takes place during discourse. Following recent proposals for the distribution of additive markers (Bade, 2016; Aravind & Hackl, 2017), I will assume that exhaustification occurs obligatorily with the presence of nuclear focus, unless it is accompanied by explicit hedging. Additionally, utterances that bear overt exhaustification are assumed not to also involve covert exhaustification.

3.3.4 Update Algorithm

Now that these two pieces, exhaustivity and maximality, are in place, we can combine them in a formal algorithm for context update within a dynamic semantics framework. Building off Equation 3.1, the algorithm takes the following ingredients: A context C, which is a set of worlds; an utterance with assertions u, contextually-restricted focus-alternatives $\mathcal{A}$, and presuppositions p. The algorithm produces a new context C'.

$$C' = (C \cap p) \cap exh(\mathcal{A})(u))$$
(3.2)

Context update proceeds by first intersecting the worlds denoted by the utterance's presuppositions with the context, and then intersection these worlds with the worlds denoted by the exhaustified version of the utterance's assertions. There are two points to note about this update algorithm: First, utterances are exhaustified only with respect to their asserted content. Second, the presuppositions are always accommodated. These two points are how our two pressures, accommodation and maximality, are baked into the update algorithm.

Two more pieces of groundwork need to be laid before we can step through a few examples: The first has to do with the contextually-restricted alternative sets $\mathcal{A}$, which are taken to be subsets of the focus value of the utterance. Because both the exhaustivity operator and focus-sensitive presupposition triggers use such sets as one of their arguments, we will assume that they operate over the same set of alternatives. That is, the $\mathcal{A}$ used in exhaustification and the $\mathcal{A}$ used in denoting the presuppositions of *too* or the assertions of *only* are assumed to be the same set.

The second piece of groundwork is to make explicit what is meant by the term *discourse clash*. Following the discussion in Section 3.3.1 it is assumed that the purpose of conversations is to coordinate about joint commitments. Thus, in order for a conversational move to be felicitous, it must produce a non-empty context set. If utterance update *does* result in an empty context, then the conversation has

entered a defective state and discourse repair must be initiated. In order to link this theoretical stance to empirically observable behavior, we can say that utterances which produce an empty context set (i.e. a 'defective' context) are likely to be rated as less acceptable than utterances which do not.

3.4 TRIGGERS

With the update algorithm in place, this section tests the predictions of the MAC by applying it to eight presupposition triggers. The triggers tested are a subset of the ones from the previous section, given in the table below along with their relative CFC strength.[3] To provide continuity with the experimental paradigm in the previous section, the behavior of presupposition triggers is inspected in responses to overt wh-questions. This is done for two reasons: First question-answer contexts make the QUD overt. Second, questions, which are associated with speaker ignorance, are a reliable way to set up contexts in which the target presupposition is not locally entailed.

The ranking of presupposition triggers from the previous section is as follows:

	Semantic Category	Examples
STRONGEST CFC	Focus-Sensitive Additives	*too*, *even*
	Iteratives, non-Focus Additives	*again*, *back*, *still*
	Exclusives	*only*, clefts
	"Soft" Verbal Triggers	*win*, *finish*, *stop*
WEAKEST CFC	Factives, Possessives	*his*, *her*, *know that*, *angry that*

We proceed from triggers that impose the strongest CFCs (the top of the table) to triggers that impose the weakest CFCs (the bottom of the table). For each trigger, examples are given in a toy dialog between two characters (Xavi and Zeno), who are discussing three friends (Alex, Sam and Lee) and sentences with focus in subject position are taken to be associated with contextually restricted

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[3] The definite determiner is discussed in Section 3.5

alternatives, which are propositions about these individuals. For example, the set of alternatives, $\mathcal{A}$, associated with "Alex$_F$ laughed" is {*Alex laughed*, *Sam laughed*, *Lee laughed* }. In formal examples of context update, { $C(w)$ } is used to denote "start worlds", or worlds that are in the context set at the beginning of the dialog. Following the injunction not to ask trivial questions, it is assumed that the context is netural with respect to the relevant presuppositions and assertions.

3.4.1 Focus-Associating Additives

Let's start by looking at the focus-associating additives *even*, and especially *too*, in situations where their presuppositions are not entailed by the context; like (3), below.

(3)   *Context: Xavi does not know who laughed; Zeno knows that someone other than Alex laughed.*
        Xavi: Who laughed?
        Zeno: # Alex$_F$ laughed, too.

Instead of moving directly to the predictions of the update algorithm, we'll first look at the various proposals for the semantics of additive particles. Below, I will present two theoretical treatments— one which views them as imposing presuppositional constraints and the other which views them as primarily anaphoric. I will argue that the presuppositional approach does a better job of capturing the distribution of additives in discourse, including their obligatoriness properties. Then, we will return to the MAC and discuss its predictions.

Too: Anaphor or Presupposition Trigger?   *Too* has traditionally been analyzed in one of two ways: As mentioned in Section 3.2, the first views *too* primarily as an anaphoric element, with some theories suggesting that it does not introduce any presuppositions in the sense of constraints on the context set. The second approach views *too* as introducing an existential presupposition that one of its focus alternatives is true (or, in the case of dynamic semantics entailed by the context). The

strongest argument for the treatment of additive presuppositions as anaphoric comes from Kripke (2009), who recruits sentences like (4), below, to make his argument:[4]

(4)   *It's a cold winter day in Montreal. Two people, Xavi and Zena are waiting for the bus on an empty street. Xavi's head is bare, but Zena is wearing a warm hat.*

        Xavi: #I see you$_F$ wore a hat today too.

            Assertions: Zena wore a hat today.

            Presuppositions: Someone other than Zena wore a hat today.

As Kripke points out, under the approach which treats presuppositions as requirements on a local context, the presuppositions of (4) should be easy to accommodate. Surely it is already either in the context, or easy to adjust the context to accommodate the fact that more than one person is wearing a hat in Montreal. Thus, this approach does not predict that (4) should sound particularly bad. Under the approach that views *too* as anaphoric, however, there is no salient referent in the local context and thus *too* is predicted to produce infelicity.

While the observation that (4) is infelicitous is certainly correct, the argument sketched above relies on a particular assumption about the presuppositions that *too* might introduce. Note that in order for the argument above to hold, it should be reasonably easy for the presuppositions of (4) to be accommodated, and framing them broadly—*somebody* else wore a hat—produces this effect. However, in most satisfaction based approaches for *too*, its actual presuppositions are not so broad. Rather, they are constrained by the local context. Below, (5) gives the denotation for *too* from one recent theoretical paper that discusses its semantics (Bade, 2016).

(5) $[\![\text{too}]\!] = \lambda \mathcal{A} \, \lambda q \lambda w : \exists p [p \in \mathcal{A} \wedge p(w) \wedge p \neq q].q(w)$

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[4]Kripke invites his readers to consider the sentence "*John is having dinner in New York, too* [...] uttered out of the blue; no context is being presupposed in which we are concerned with anyone else having dinner in New York." Rather than trying to imagine a context-less situation, I find it easier to provide a context that supports the necessary claim.

Under this view, *too* is a function that takes a world, a proposition and a set of alternatives $\mathcal{A}$. As discussed previously, $\mathcal{A}$ is a contextually-supplied set of propositions which are introduced into the derivation at logical form (Rooth, 1992). The propositions that constitute $\mathcal{A}$ are taken to be a subset of the focus value of the sentence. That is, for our sentence "You$_F$ wore a hat." the focus value is the set of propositions { x wore a hat, y wore a hat, etc. }. Crucially for our purposes, though, $\mathcal{A}$ is not predicted to be the whole focus value, but rather a highly contextually restricted subset of the focus value of the sentence (see, for example the discussion on page 17 and 18 of Rooth (1992)). Thus, under this approach to the meaning of *too*, the presuppositions of (4) are not that someone other than Zena wore a hat; they are not even that someone other than Zena wore a hat *in the city of Montreal*. Rather, they are that someone other than Zena wore a hat within the contextually-restricted set of alternatives. If we take $\mathcal{A}$ to look for contexts that are either minimal, or else locally salient, we would expect to find the alternative either at the bus stop or perhaps on the street. But the context establishes that no such person exists; thus, the constraints-based approach, too, predicts that (4) should be unacceptable.

To frame this another way, it's clear that additive presuppositions cannot be supported by common knowledge, or by things like general facts about the world. Rather, they need to be supported by information that is local to the particular situation in which they are uttered. By working with contextually-supplied alternatives satisfaction-based approaches can accurately model the locality requirements imposed by additive presuppositions.

Extending these arguments a little further, I want to provide two examples suggesting that the anaphoric-only approach to additive particles does not properly capture their distribution. That is, not only can the correct distribution of additive particles be predicted by non-anaphoric accounts; anaphoric accounts are susceptible to over-generation (our first example) where they predict some sentences to be felicitous when they are in fact not; as well as under-generation (our second example), where they predict some sentences to be infelicitous when they are not.

Our first example concerns anaphoric and presuppositional licensing in sentences with disjunction.

Below, Example (6-a) demonstrates that material on the left half of a disjunct can serve as a possible referent for a pronominal anaphor in the right half. Now, if presuppositions were anaphoric then we would expect that they should be licensed by these contexts as well, and that material in the left half of a disjunct could serve as a possible referent for a presuppositional anaphor in the right half. However, such sentences end up being infelicitous, as shown in (6-b) (author's judgement).

(6)   a.   Either Alex went to the museum or she went to the park.

        b.   #Either Alex went to the museum or Lee went to the museum too.

This infelicity is well-predicted under a presuppositional approach to additive triggers within the dynamic framework. Unlike with conjunction, disjunction does not trigger sequential context update of each operand. The left half of the disjunct cannot satisfy the presuppositions in the right half, and therefore the whole sentence is predicted to be infelicitous.

A similar case is given in (7) (for pronouns) and (8) (for presuppositions), below. The logic is as follows: In order for anaphors to be licensed there needs to be a salient, often linguistic, antecedent in the local context. This feature of anaphoricity is elegantly captured by (7), which has been modified from the original example, attributed to Barbara Partee:

(7)   *Two people are playing a board game when the dog comes in and knocks it on the ground. They scramble to pick up the pieces.*
        Xavi: Only seven out of ten marbles are back in the bag.
        Zeno: # They are under the couch.

Here, although the existence of three missing marbles is entailed by Xavi's utterance, they are not made salient enough for the pronoun, *they* to co-refer. Because of this, the pronoun in Zeno's utterance is unbound, and the whole utterance sounds infelicitous as a result. However, consider a variant of this sentence where *too* takes the place of the pronoun.

(8)   *Two people are playing a board game when the dog comes in and knocks it on the ground. They*
       scramble to pick up the pieces.

       Zavi: Only seven out of ten marbles are back in the bag.

       Xeno: The dice$_F$ are missing, too.

Here, focus marking is placed on *dice* to help draw out the low-scope reading of Zeno's utterance, which presupposes that some alternative to the the dice is missing. There is an alternate, high-scope reading, under which *too* associates with the whole sentence, presupposing that something other than the dice missing is wrong. Both sentences are acceptable (author's judgement), but it is the low scope reading that is relevant to the argument. Under this reading, if *too* were anaphoric, it would require a salient antecedent in the discourse. Furthermore, because of the congruence conditions imposed by focus, this antecedent would have to have the property of being missing. The seven marbles that are back in the bag couldn't be this antecedent, as they don't meet this requirement (they are not missing). The three missing marbles also couldn't be its antecedent, as they are not salient enough to license anaphoric co-reference, as we saw with (7). Thus, on the assumption that the same types of linguistic contexts that license pronominal anaphora also license propositional anaphora, then the sentence is predicted, incorrectly, to be infelicitous.

Taking both of these arguments into consideration, the rest of this section will adopt the denotation of *too* in (5) advocated in Bade (2016) (reproduced below) that treats it as non-anaphoric and as introducing an additive presupposition that one of its prejacents focus alternatives is true.

(9) $\llbracket \text{ too } \rrbracket = \lambda \mathcal{A} \, \lambda q \lambda w : \exists p[p \in \mathcal{A} \wedge p(w) \wedge p \neq q].q(w)$

Obligatoriness Effects   Before moving on to discuss Contextual Felicity effects, we need to discuss how this proposal handles a set of related empirical phenomena known as *obligatoriness effects* of additive particles. In cases where their presuppositions are met, additive particles are not only

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felicitous, but they are obligatory, as in (10), below.

(10)   a.   Alex$_F$ came to a party. # Lee$_F$ came to a party.

        b.   Alex$_F$ came to a party. Lee$_F$ came to a party, too.

There are two prominent approaches to obligatoriness effects. The first roots the behavior in a general conversational principle, *Maximize Presupposition!* (or MP), that pressures speakers to presuppose in cases where they can (Heim, 1991). The second approach, called the *Obligatory Implicatures* (or OI) proposes that certain triggers are necessary to block inferences that, if left to their own devices, would result in a defective conversational state (Bade, 2016). To give a brief example, consider the sentence in (10-a). Under the assumption that focus triggers obligatory exhaustification, the second sentence will be exhaustified to mean something like "Lee and nobody else came to the party", which, if added to the context, would contradict the first utterance (namely, that Alex went to the party). The hypothesis from Bade (2016) is that the addition of *too* in (10-b) blocks the exhaustification from taking place. Thus, the second sentence can be intersected with the context while avoiding a defective conversational state.

One piece of evidence in favor of the OI approach is that it (correctly) predicts obligatoriness requirements to be suspended where a presupposition trigger is embedded under negation, such as in the sentence pair "Alex$_F$ went to a party. Lee$_F$ did not go to a party" where it is argued that interpreting the second utterance exhaustively would not lead to a contradiction with the first sentence. One thing to note, however, is that the OI approach was developed specifically to account for the distribution of additives and iteratives, and both proponents of OI and MP agree that other pressures like MP must be at play for other presuppositions, such as the definite determiner.

The problem with this formulation of the OI approach is that it makes a number of incorrect empirical predictions, of which I will focus on two below: First, according to the hypothesis presented in Bade (2016), (10-b) should actually be predicted to be unacceptable. The logic is as follows: When

the comprehender hears the first utterance, "Alex$_F$ came to the party", they are going to interpret it exhaustively. (After all, the utterance bears focus on *Alex*) Next, the comprehender hears the second utterance "Lee$_F$ came to the party, too." Under the OI approach, they would have interpreted the utterance exhaustively, too, but because of the additive particle, exhaustification is blocked. But all is not well, for the unexhaustified utterance contradicts what was just said, namely that Alex and nobody else came to the party.

The second potentially incorrect prediction of the basic OI approach is that it seems like there are many instances where *too* does not block exhaustivity effects. Take, for example, this question-answer pair from Aravind & Hackl (2017) (p. 10):

(11)   A: Give me the names of everyone who got 100 on the exam.

         B: Bill got a 100. Sue did, too.

They argue that B's utterance is most naturally construed as meaning "Bill got 100, Sue got 100, and nobody else in the class did." However, under Bade's proposal it should merely mean that Bill and Sue got 100, leaving open the possibility that other students also got 100.

In order to account for these empirical shortcomings, I am going to re-work the original proposal from Bade (2016) by assuming that instead of *blocking* exhaustification, the addition of additive particles changes the scope of exhaustification. Additive particles are assumed to be instructions to the listener that their prejacents should be exhaustified together with all alternative utterances that occur in the local context. In many ways, this re-working makes the proposal similar in spirit to the amendment offered in Aravind & Hackl (2017), who propose that *too* contains both a presupposition and a propositional anaphor. In contexts where the anaphor is identified with an antecedent, φ, a sentence's *exh* operator scopes over both its assertions as well as φ. Based on the arguments in the previous section, the current proposal does not make use of anaphoricity, and instead assumes that a single *exh* operator scopes over multiple sentences. Following this approach, the logical forms for the

two motivating examples in (10) are the following:

(12)   a.   Alex came to a party. Lee came to a party.

       Exh($\mathcal{A}$)(Alex came to a party) $\wedge$ *Exh*($\mathcal{A}$)(Lee came to a party)

       b.   Alex came to a party. Lee came to a party, too.

       Exh($\mathcal{A}$)(Alex came to a party $\wedge$ Lee came to a party too)

For (12-a), because the second sentence occurs without the additive marker, each is interpreted separately, and exhaustified individually. As described before, this results in a contradiction. For (12-b), on the other hand, because the second sentence includes an additive marker, it is exhaustified together with alternative utterances that precede it in the local context. The resulting logical form is that Alex came to a party, Lee came to a party, and nobody else in the alternative set did. *Too*, then, is obligatory in contexts like (12-a) to trigger scope widening of *exh*, and avoid interpretations that would result in a contradiction.

Note that by associating *too* with a larger scope for the *exh* operator, the two empirical challenges of the OI approach are solved. First of all, the exhaustified reading of the first utterance no longer contradicts the assertions of the second utterance, because the two are assumed to be exhaustified together. Second, because the *exh* operator is still present, the logical form of the utterance is still exhaustive. Turning back to the objection raised in Aravind & Hackl (2017), sentences like "Bill got 100. Sue did too" are now predicted to communicate that nobody else in the class got 100 on the exam.

Before moving on to our discussion of Contextual Felicity Constraints, it is worth mentioning that this approach to obligatoriness effects does hinge on the assumption that comprehenders only undertake scope widening for *exh* when additive triggers are present. If we admit that they can flexibly negotiate the scope of *exh* whenever they want, then there's nothing to stop them from interpreting both utterances in (12-a) under the scope of a single *exh* operator. While this is an assumption of the

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current proposal, I want to note that similar assumptions must be needed for the original formulation of OI in Bade (2016) as well as for the alternative proposal in Aravind & Hackl (2017). The assumptions for each proposal are as follows: Under the original formulation of OI, *too* blocks *exh* because the exhaustive reading of an utterance typically creates a contradiction with the presuppositions of *too*. (This contradiction is the core of the MAC approach, as we shall see in the next section.) If we admit that comprehenders can choose to not interpret sentences exhaustively in order to avoid a contradiction, then what's stopping them in cases like (12-a)? For this proposal to work, we need to assume that the *too*/*exh* contradiction is resolved by removing *exh*, but that the *exh*/*exh* conflict in (12-a) cannot be resolved similarly, hence the obligatoriness of *too*. Turning now to the alternative offered Aravind & Hackl (2017), this proposal assumes that *too* is both anaphoric and presuppositional, and associated with a process of domain widening. For sentences like "(i) Alex$_F$ danced. (ii) Lee$_F$ danced too", comprehenders are assumed to exhaustify (i) against a smaller domain that does not include Lee. When interpreting (ii), the additive is anaphorically identified with (i), and the whole sentence is exhaustified against a larger domain that includes both Lee and Alex. Thus (i) does not contradict the assertions of (ii), and because the *exh* operator in (ii) scopes over both the propositions *Alex danced* and *Lee danced*, it will not contradict (i). For this proposal to work, however, we need to make certain assumptions about flexible reasoning with domains. That is, if we admit that participants can choose domains to avoid a contradiction, there's nothing to stop them from picking a domain that does not include Lee when interpreting (i) exhaustively, and a domain that does not include Alex when interpreting (ii) exhaustively. In order for *too* to be obligatory, then, we have to assume that domains can only be widened, or added to, during the course of discourse. The take-away point is that no matter what theoretical approach one takes, one is required to make certain assumptions about different properties of the *exh* operator—either its distribution in discourse, or how it is associated with its domain.

Contextual Felicity Effects   With everything in place we can, at long last, turn to Contextual

Felicity Constraints of additive particles. An example of our target sentence from above is reproduced

in (13).

(13)   *Context: Xavi does not know who laughed; Zeno knows that someone other than Alex laughed.*

    Xavi: Who laughed?

    Zeno: # Alex$_F$ laughed, too.

Using the denotation of too from (5), Zeno's response in the example above has the following deno-

tation:

(14) $[\![Alex_F \text{ laughed, too}]\!] = \lambda w : \exists q[q \in \mathcal{A} \wedge q(w) \wedge q \neq laugh(Alex)] . laugh(Alex)$

When this sentence is exhaustified, we get the following denotation, which has been broken into sub-

parts on each line:

(15) $[\![\text{exh}(\mathcal{A})(\text{Alex}_F \text{ laughed, too})]\!] =$

    ''$\lambda w: \exists q[q \in \mathcal{A} \wedge q(w) \wedge q \neq laugh(Alex)] .$ (a)

    $laugh(Alex) \wedge$ (b)

    $\forall r[(r \in \mathcal{A} \wedge laugh(Alex) \nrightarrow r) \rightarrow \neg r(w)]$ (c)

In words: (a) The utterance presupposes that there is a true proposition in $\mathcal{A}$ that is not "Alex laughed".

(b) It asserts "Alex laughed." Finally, (c), it asserts that for all propositions in $\mathcal{A}$, if the proposition is

not entailed by (b) then it is false. Recall from earlier that $\mathcal{A}$ is taken to be { Alex laughed, Lee laughed,

Sam laughed }.

Now, what happens when we apply our update procedure? The result is that a conflict is going to

arise between (a) and (c), that is between accommodating the presuppositions and interpreting the ut-

terance maximally. First, (a) is accommodated by intersecting the worlds denoted by the context with

the presupposition. Given our restricted alternatives in this case the presupposition is semantically equivalent to "Sam laughed or Lee laughed." Next, we interpret the assertions in (b) by intersecting these worlds with worlds where Alex laughed. For (c), let's step through the propositions in the alternative set one-by-one. "Lee laughed" is not entailed by (b), so it is negated. Likewise "Sam laughed" is also not entailed by (b), so it is negated. Thus, we derive that the whole proposition presupposes that "Lee laughed or Sam laughed" and asserts that "Alex laughed and Sam did not laugh and Lee did not laugh", which is a contradiction. This step-by-step update is schematized in (16), below.

(16) $\mathcal{A} = \{\, laugh(Alex), laugh(Sam), laugh(Lee) \,\}$

   $\{\, w{:}\ C(w) \,\}$

   $\cap \{\, w{:}\ \exists q[q \in \mathcal{A} \wedge q \neq laugh(Alex)] \,\}$ presuppositions (a)

      "Sam or Lee laughed"

   $\cap \{\, w{:}\ laugh(Alex) \,\}$ assertions (b)

      "Alex laughed"

   $\cap \{\, w{:}\ \forall r[(r \in \mathcal{A} \wedge laugh(Alex) \not\rightarrow r) \rightarrow \neg r] \,\}$ maximality (c)

      "Lee did not laugh and Sam did not laugh"

   $= \{\}$

The crucial piece of the mechanism is the following: Because of the *exh* operator, the utterance will wind up conveying the negation of all the (contextually-restricted) focus values of its prejacent that are not entailed by its assertions. However, this conflicts with the presupposition, which requires that there is at least one true member of the focus alternatives. It is this tension between the presupposition and the *exh* operator that winds up producing an empty context, and sending the conversation into a defective state.[5]

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[5] This proposal works for various scopes of F-marking. Consider the Q/A pair "What did Alex do? / She [went to the beach]$_F$, too" where the focus takes wide scope over the whole VP. In this case, the alternatives are formed by substituting out constituents of the same semantic type of the F-marked phrase, e.g. $\mathcal{A} = \{$ Alex

What happens when the presupposition is supported in the context, such as in (17)?

(17)   *Context: Xavi does not know who laughed; Zeno knows that someone other than Alex laughed.*
        Xavi: Who laughed?
        Zeno: Lee$_F$ laughed. Alex$_F$ laughed, too.

In this case, it is assumed that because of the presence of the additive operator, *exh* now scopes over both sentences in the response. Because the first sentence satisfies the presuppositions of the first sentence, taken together, no presuppositions are produced. Furthermore, the exhaustified version of these sentences has a meaning akin to "Lee laughed and Alex laughed and Sam didn't laugh" (given our world with three individuals in it), which no longer contradicts the presupposition of "Alex$_F$ laughed too", namely that someone other than Alex laughed.

By adopting a standard semantics for *too*, as well as the simple assumption that additive particles are associated with scope widening of *exh*, the MAC approach predicts a semantic contradiction in the case of unsupported additive triggers, one which results in an empty context set. Focus plays an important role. Because *too* introduces a presupposition which is about the focus alternatives of the asserted content, when that asserted content is exhaustified, it will always clash with the trigger's presuppositions. In the next section, we will turn to additive particles that are not focus sensitive, and see how decoupling the presupposition from the focus alternatives of the asserted content changes the predictions of the MAC .

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played tennis, Alex went home, Alex danced, etc... }. The response presupposes that one of these alternatives are true; it asserts that Alex went to the beach, and furthermore that any alternative in $\mathcal{A}$ not entailed by "Alex went to the beach" is false. As before, a clash is produced between the presupposition and the exhaustified version of the asserted content.

3.4.2 Non-Focus Additives

The current approach proposes that contradictions arise for focus-associating additives because *exh* and the additive particle both operate over the same focus values of an utterance. This raises the question of what predictions are made for presuppositions that are additive, but are not focus associating, like *again*, *back* and *still*. Remember, sentences with these triggers were found to produce Contextual Felicity Constraints, but the strength of the CFCs weren't as strong as for their focus-associating cousins.

As we shall see, one strength of the present approach is that it predicts the reduction of CFC effects for non focus-associating additive triggers. To understand why, lets walk through an example of context update for the non-focus additive *again*, given in (18).

(18)   *Context: Xavi does not know when Alex napped.*

Xavi: What did Alex do on Tuesday afternoon?

Zeno: She napped$_F$ again.

Because we are now dealing with a situation where temporal ordering is important, we introduce time variables into our denotations. VPs not only need to be saturated with argument structure roles, but also with event-times. *Again* is taken to presuppose a proposition, which is the same form as its prejacent, only that it occurred at an event-time previous to the event-time of the prejacent. Thus, Zeno's response in (18) is taken to presuppose that there is some true proposition that Alex napped at some time t_0, where $t_0 < t_1$, and assert that Alex napped at t_1.

(19) $[\![\text{Alex napped}_F \text{ again}_i]\!] = \lambda w.\exists q[q = napped(Alex)(t_0)(w) \wedge t_0 < t_1].napped(Alex)(t_1)(w)$

During interpretation, the utterance is exhaustified with respect to focus. Because focus now falls on the verb, the focus value of the utterance is different from the focus value of the utterances containing

too. In this case, the utterance is exhaustified with respect to all the activities that Alex could have done, e.g. { *laugh*(*Alex*), *nap*(*Alex*), *dance*(*Alex*) . . . }. When exhaustified with respect to this alternative set, we get that that Alex napped at a particular time on Thursday afternoon, and she did not do anything else in the alternative set (on Thursday afternoon).

(20) $[\![\mathrm{exh}(\mathcal{A})(\text{Alex napped}_F \text{ again})]\!] = \lambda w.\exists q[q = napped(Alex)(t_0)(w) \wedge t_0 < t_1].napped(Alex)(t_1)(w) \wedge$
    $\forall r[r \in \mathcal{A} \wedge (napped(Alex)(t_1)) \nrightarrow r) \rightarrow \neg r(w)]$

Because focus additives presuppose an element of $\mathcal{A}$ is true, we are guaranteed to derive a contradiction when the assertion is exhaustified with respect to $\mathcal{A}$. However, because no such strict congruence exists for non-focus alternatives, the ultimate derivation of a contradiction depends on how the sentence is interpreted. If the proposition "Alex napped at t_0" ends up being in the alternative set for the proposition "Alex napped at t_1," then the subsequent updating of common ground with the presupposition and the exhaustified alternatives will produce an empty context set. That is, the utterance will communicate both that Alex napped at t_0 is true (via presuppositions), and that it is false (via exhaustified assertion). If, however, the presupposition is not taken to be a focus alternative, then no contradiction will be produced.

Because, in this case, we are dealing with exhaustification over temporal segments, all of this hinges on the contextual resolution of the time variable associated with the presupposition. In the example above, if the presupposition is understood by the comprehender to mean "Alex napped (at t_0) in the afternoon on Thursday", then the presupposition conflicts with the exhaustive interpretation of the asserted content, which communicates that Alex did nothing of import other than napping (at t_1) on Thursday afternoon. If however, the presupposition is taken to mean that "Alex napped on Wednesday" or "Alex napped on Thursday morning", then no conflict arises. More generally, if the variable is understood to fall within the temporal window picked out by the question, then then a contradiction

is produced. If not, then then there is no contradiction.[6] When interpreting utterances like (18), comprehenders are sensitive to the fact that (a) the temporal variables are not explicit and must be inferred from context, and (b) that certain choices will result in a defective conversation. Non-focus additive presuppositions are predicted to be infelicitous because they can result in a defective conversational state, but they are not as bad as focus-associating additives because this is not a foregone conclusion, and interpretation can be salvaged by a particular resolution of the temporal variable.

To provide some additional support for the idea sketched above, (21) gives an example where the relative felicity of non-focus additive presuppositions is subject to variation based on the type of question it answers, and thus the set of alternatives against which their asserted content will be exhaustified.

(21)   *A school administrator is interviewing a student about their progress in the program.*

    a.   Administrator: What did you do yesterday afternoon?

        Student: I met with my advisor again.

    b.   Administrator: When have you met with your advisor this semester?

        Student: #We met again yesterday.

For the question in (21-a), which is framed similar to (18), the response is marked, but easily salvageable under the (quite plausible) interpretation that *again* refers to some time previously in the semester before the previous afternoon. However, when the question is changed to ask specifically about times, as in (21-b), responses with *again* are more marked. This is because no matter what time is chosen for the resolution of the presupposition, it will be at-issue to the question. Chapter 5 (Experiment 2) will look in more depth at the influence of local information structural considerations on the contextual felicity of *again*, and provide empirical evidence that supports the judgement given above.

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[6]Technically, this depends on a further linking assumption that two events of the same type are going to wind up as focus-alternatives of each other, but this seems sensible one to me.

3.4.3 Exclusives

We now turn to a series of triggers that are predicted to felicitously introduce novel information under the MAC, but for different reasons. To give a brief preview of the next three sections: Exclusives, such as *only* and it-clefts are predicted to not produce a discourse clash because their presuppositions are not negated by an exhaustive interpretation of their asserted content. "Soft" verbal triggers like *win*, *stop* and *finish* are predicted to not produce a discourse clash because their presuppositions are entailed by their assertions, and thus compatible with an exhaustive interpretation of their asserted content. And finally, possessive pronouns and factive predicates are predicted to not produce a discourse clash because their presuppositions answer a disjoint set of questions from their asserted content, and thus will (typically) not be targeted by exhaustivity inferences.

First, we turn to the exclusives—it clefts and *only*. Because exclusive operators are focus associating, their presuppositions are at-issue to the same sets of questions as their asserted content. However, because of the way these items structure the relationship between their assertions and their presuppositions, when their asserted content is interpreted maximally, it *strengthens* their presuppositions rather than contradicting them. To start, consider the case of it-clefts in (22), below. It is taken that the response in (22) presupposes that someone laughed and asserts that this person was Alex.

(22)   *Context: Xavi does not know who laughed. Zena knows that Alex laughed and nobody else did.*
        Xavi: Who, if anyone, laughed?
        Zena: It was Alex$_F$ (who laughed).

(23)   ⟦ It was Alex$_F$ who laughed ⟧ $= \lambda w.\exists x[laughed(x)] : laughed(Alex)$

After exhaustification, the utterance is strengthened to presuppose that someone laughed, and to assert that Alex laughed and nobody else in the alternative set did.

(24)   ⟦ exh($\mathcal{A}$)(It was Alex who laughed)⟧ = $\lambda w.\exists x[laughed(x)]$: $laughed(Alex) \wedge \forall r[(r \in \mathcal{A}$

$\wedge laugh(Alex) \nrightarrow r) \rightarrow \neg r(w)]$

Both the presupposition and the asserted content are compatible with worlds where Alex laughed and

everybody else in the alternative set did not laugh. No contradiction is derived, and the conversation

does not enter a defective state.

The exclusive *only* operates in a similar way. Because *only* is an explicit exhaustifier, it is assumed

that it does not trigger covert exhaustification via the *exh* operator, which would be redundant. Thus,

sentences with *only* presuppose their prejacent and assert that all of its alternatives are false. As with

it-clefts this logical form is compatible with worlds where the prejacent is true and all of its alternatives

are false.

3.4.4   "Soft" Verbal Predicates

Open-class verbal triggers include change-of-state verbs (e.g. *stop*, *continue*), which presuppose a previ-

ous state, and accomplishment verbs (e.g. *win*, *finish*), which presuppose a preparatory activity. These

verbs are typically grouped together in typologies of presupposition triggers, based on the suspend-

ability of their presuppositions in certain situations (Abusch, 2010). Relevant for our discussion, it

is typically argued that accomplishment verbs entail their presuppositions (see e.g. p. 2 of Abusch

(2002)), although Abrusán (2016) suggests that the preparatory activities associated with these verbs

are not presuppositions at all, but rather contextual inferences. For change-of-state verbs, the argu-

ment that they entail their presuppositions comes from Sudo (2012), who considers the following

sentence:

(25)   Exactly one student (in the class) stopped using Mac.

Sudo considers two hypothesis: Hypothesis (a) is that this sentence asserts that exactly one student

does not currently use Mac, and presupposes that this student used to use Mac. That is, the presupposition is not entailed by the assertions. Hypothesis (b) is one where the sentence asserts that exactly one student used to use Mac and no longer uses Mac, and also presupposes that this student used to use Mac. The crucial intuition is the following: (25) seems compatible with a situation where some students never used Mac. Say, they were PC users the whole time. However this is impossible under Hypothesis (a), because at the time of the utterance only one student in the class can be a non-Mac user. Thus, Hypothesis (b) seems to be correct, and we conclude that *stop* entails its presuppositions.

Turning to contextual felicity, we can consider the following situation, where Xavi's question is taken to denote the set of notable propositions that are true of Alex, under a recent temporal restriction ({ Alex went on a trip recently, Alex went out to dinner recently, . . . }).

(26)   *Context: Xavi does not know Alex very well, including what OS she uses.*

        Xavi: What's new with Alex?

        Zeno: She [stopped using Mac]$_F$ recently.

Under the interpretation that *stop* entails its presuppositions, Zeno's response presupposes that Alex used to use Mac. At the same time, it asserts that she used to use Mac and that she currently does not use Mac. When this is exhaustified it is strengthened to mean that Alex used to use Mac, no longer does, and all other recent notable propositions about Alex are not true. Because the presupposition is entailed by the scope of the *exh* operator, it is not negated, and thus no discourse clash is produced.

3.4.5   Factives Predicates, Possessive Pronouns

Both possessive pronouns and factive predicates were found to be associated with almost a complete lack of Contextual Felicity Constraints in the previous chapter. Under the MAC , these two triggers are predicted to not produce a discourse clash for the same reason: Because of the way each of these two lexical items packages the information that they convey, presuppositions and asserted meanings

will be at-issue to a disjoint set of questions. Thus, if one or the other is exhaustified, no contradiction results.

POSSESSIVE PRONOUNS   Consider the following dialog that includes a possessive pronoun, with focus taking wide scope over the whole NP constituent.

(27)   *Context: There was a party last weekend. Xavi does not know about Alex's siblings or who came to the party.*

Xavi: Who came to the party?

Zeno: [Alex and her brother]$_F$ came.

The logical form of Zeno's response is given below. It is taken to presuppose that Alex has a brother, and to assert that both Alex came and the brother of the pronominal referent came, where the pronoun co-refers with Alex.

(28) $[\![$ [Alex and her$_i$ brother]$_F$ came. $]\!] = \lambda w.has(brother)(Alex).come(Alex \wedge \iota x[brother(y_i)(x)])$

When exhaustified, it gets the interpretation in (29), roughly, that Alex and her brother were the *only* ones (among the relevant alternatives) who came to the party.[7]

(29) $[\![$ exh($\mathcal{A}$)([Alex and her brother]$_F$ came.) $]\!] = \lambda w.has(brother)(Alex).come(Alex \wedge \iota x[brother(y_i)(x)]) \wedge$
        $\forall r[r \in \mathcal{A} \wedge come(Alex \wedge \iota x[brother(y_i)(x)]) \nrightarrow r) \rightarrow \neg r(w)]$

Because Alex having a brother is compatible with worlds where nobody other than he and Alex went to the party among relevant alternatives, no contradiction arises between the presupposition and a

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[7] Although the gender presuppositions of pronouns are not the focus of the current discussion, gendered possessive pronouns also presuppose the gender of their referent (Sudo, 2012). The MAC hypothesis predicts that these presuppositions should not produce discourse clash and thus be associated with mild CFC effects for the same reason being discussed here, namely that they are at-issue to a disjoint set of questions than the assertion.

maximal interpretation of the asserted content.

One important thing to note is that when possessive pronouns *do* address the QUD, sentences with them become much worse (although this was not tested in the previous chapter). For example, in the following utterance, the (30-a) response, where the presupposition provides a partial answer to the question, is much worse than the (30-b) response, where there is no presupposition. (This framing was chosen because the asserted content *does* answer the question. Otherwise the sentence would be infelicitous because it does not answer the QUD, a potential confound.)

(30)   What siblings does Alex have?

      a.   #She has a brother, who dislikes her sister.

      b.   She has a brother, who dislikes her.

FACTIVE PREDICATES   Example (31) gives a dialog with an emotive factive predicate, *angry that*. Instead of *who* questions, the dialog is framed with a *how* question, to preserve Q/A congruence between the question and the asserted portion of the response.[8] The same strategy was used to construct neutral contexts for the experiments in the previous chapter. It is assumed that emotive factives do not assert the cause relationship between their asserted and presupposed contents, as causal inferences can be canceled by negation, possibility modals etc. Thus, the response in (31) is taken merely to presuppose that Sam is late and assert that Alex is upset.

(31)   *Context: Xavi does not know how Alex is feeling, or anything about Sam*

    Xavi: How is Alex feeling?

    Zena: She's upset$_F$ that Sam is late.

(32) $[\![$ Alex is upset that Sam is late. $]\!] = \lambda w.late(Sam) : upset(Alex)$

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[8] For example "It's possible that Alex is upset that Lee is late" presupposes that Lee is late, but does not entail that their being late causes Alex to be angry. After all, the possibility modal leaves open whether or not Alex is angry in the first place.

This utterance is strengthened to produce the following meaning, with the local alternatives being the ways that Alex can possibly feel $\mathcal{A} = \{$ happy(Alex), upset(Alex), livid(Alex) ...$\}$

(33) $[\![\operatorname{exh}(\mathcal{A})(\text{Alex is upset that Sam is late.})]\!] = \lambda w.late(Sam).upset(Alex) \wedge \forall r[r \in \mathcal{A} \wedge (upset(Alex) \nrightarrow r) \rightarrow \neg r(w)]$

The exhaustified utterance produces a scalar inference—although Alex is upset she is not *furious*, or *livid*. Crucially, these worlds are compatible with worlds where Sam is late, and no contradiction is derived. Generally speaking, because of the way that factive predicates structure the relationship between their complements and their matrix clauses, the two are relevant to a disjoint set of questions, with emotive factives being relevant to a "How is X feeling?" question and their presuppositions being relevant to a "What happened?" type question (Tonhauser et al., 2018).[9] However, there are some cases where this is not true, such as in the example, below: [10]

(34) Xavi: Who is coming to the party?

Zeno: I know that Alex is coming.

What is likely going on here is that the verb *know* can have two flavors: One truly presuppositional and one evidential. The treatment of *know* as being ambiguous between these two meanings has been proposed by multiple scholars, with dominant views that it is either caused by the syntactic location of the verb (Rooryck, 2001a,b), or else that it is a pragmatic phenomenon (Simons, 2007). One piece of evidence that that examples like (34) are, indeed, evidential, is that complements of epistemic factives can only address the local QUD when the first person pronoun is the subject of the main clause, as in (35-a), below:

(35) Xavi: Who is coming to the party?

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[9] This is, for example, why they are argued to produce projectivity effects, according to the theory proposed in Simons et al. (2010).

[10] Thanks to Shannon Bryant for pointing this out to me.

Semantic Category	Prediction	Results from Ch. 2
Focus-Sensitive Additives	Contradiction	Strong CFC
Non-Focus Additives	Potential Contradiction	Moderate CFC
Exclusives	No Contradiction	Mild CFC
"Soft" Verbal Triggers	No Contradiction	No CFC
Factives, Possessives	No Contradiction	No CFC

Table 3.1: Predictions of the Maximality Hypothesis predict the ranking of triggers based on CFC-strength from experimental data.

a. Zeno: #Sam knows that Alex is coming.

b. Zeno: Alex is coming. And Sam knows it.

3.5 Discussion

3.5.1 Coverage

The predictions of the MAC are shown in Table 3.1. Under the linking hypothesis that a discourse clash between accommodation and exhaustivity produces a Contextual Felicity Constraint, the approach does a good job of predicting the data, both in the sense that additives are predicted to impose stronger CFCs, and Factives, Possessives, soft verbal triggers and exclusives are predicted not to impose CFCs. The Maximality Hypothesis does better than alternative proposal in two key respects: First, unlike the FoPAH (Göbel, 2020), the successfully captures the fact that non-focus additives impose stronger CFCs than focus-associating exclusives, like *only* and clefts. Second, the MAC successfully predicts variation between focus-associating and non focus-associating additives, which is not captured by hybrid approaches that ground Contextual Felicity Constraints in unbound propositional anaphors.

Despite these successes, there is some variation in the data that is not explained by the current proposal. Specifically, the approach cannot explain the variation among triggers at the lower end of the

scale, for example why exclusives impose stronger CFCs than soft verbal triggers, factives and possessive pronouns. One hypothesis, compatible with the approach pursued here, is that these milder CFCs are not due to the trigger's status as introducing a presupposition *per se*, but arise due to competition with with local alternatives. To give a brief example, given the question "Who went to the party?" the two responses "Alex$_F$ did" and "Only Alex$_F$ did" are semantically equivalent, under the approach to discourse advocated in this chapter. Because the second utterance is more costly, it may strike listeners as infelicitous when the shorter utterance is just as effective at communicating the intended message. Framing this same intuition from a Neo-Gricean perspective, the second utterance could be said to break the Maxim of Manner. Of course, this line of reasoning gives rise to questions about what needs to be true of the context for sentences with *only* to be felicitous. For this, further empirical investigation is needed.

3.5.2 PREDICTIONS MADE BY THE PROPOSAL

Before concluding, I want to mention a few predictions of the MAC which would serve as a good basis for further exploration and verification of the approach. The first has to do with the behavior of *even*, which was largely left out of the discussion on focus-sensitive additives. *Even* is typically analyzed as containing two presuppositions: First that there is a true member of the prejacent's focus alternatives (an existential presupposition), and that the prejacent is unusual or unlikely (a scalar presupposition). The MAC makes an interesting prediction: While the existential presupposition of *even* should give rise to a CFC following exactly the same logic as *too*, the scalar presupposition should not produce a discourse clash. This is because information about the probability of the prejacent being true is, in most cases, not at-issue to the QUD. Intuitively, this prediction seems to be born out. Below, (36) gives examples of *even* in two contexts. In (36-a), *even*'s existential presuppositions have been satisfied, but not its scalar presuppositions. In (36-b), the scalar presuppositions have been satisfied, but not its existential presuppositions. Both use made-up rivers in a far-away land to control for familiarity.

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(36)   Alex went on a hiking trip in a far-away land…

    a.   She crossed the Byalik River. Then, she even crossed the Rurik River.

    b.   #The Rurik River is hard to cross. She even crossed it.

Introspectively, it seems that (36-a) is more felicitous than (36-b), something which is not predicted, for example, by a theory of *even* as a purely anaphoric element. Similarly, *only* is sometimes discussed as introducing scalar presuppositions, which would be likewise predicted not to be associated with Contextual Felicity Constraints.

Turning to other presuppositions not discussed in this chapter, the MAC predicts that presuppositions associated with domain size, such as *both*, as well as gender presuppositions associated with pronouns, should not produce CFCs. As with scalar presuppositions, these triggers are typically not at-issue to local QUDs, and thus will not produce a discourse clash when their asserted content is interpreted maximally with respect to that QUD. One trigger discussed in the last chapter but not here is the definite determiner. Under the MAC , this trigger is predicted not to produce a discourse clash in many cases. For example, in the Q/A pair "What did Alex do yesterday? / She went to the museum", the existential presupposition "there is a (locally salient) museum" does not clash with a maximal interpretation of the response. Experimentally, however, the CFCs associated with *the* were found to be quite variable, for example depending on the local syntactic environment. Further empirical work is needed to determine, precisely, when they produce Contextual Felicity Constraints.

3.6 Conclusion

The goal of this chapter has been to present a theory for Contextual Felicity Constraints that is compatible with a satisfaction-based approach to presupposition. I have argued that the CFCs are derived from a pragmatic clash, one that pits the pressure to accommodate against the pressure to interpret utterances exhaustively, or maximally. Looking ahead, the approach advocated here is compatible with a

larger view of presupposition and accommodation rooted in the assumption that conversational participants are fundamentally accommodating. Under this view, presupposition triggers impose constraints on the context, but people are willing most (if not all) of the time to adjust their context to meet these constraints. Problems arise not because interlocutors are unwilling to make the adjustment or because the accommodation process breaks down, but because of downstream problems that are produced when accommodation is pursued. However, at the outset of this dissertation it was mentioned that there could be other origins for CFCs, including the surprisal of the presupposed material, or the social relationship between conversational participants. Future work should, therefore, investigate how the proposed pressure to be accommodating interacts with social and information-theoretic contextual felicity.

4

Explaining CFCs from Neo-Gricean and Iterated Rationality Modeling Perspectives

4.1 INTRODUCTION

The previous chapter proposed a way to derive CFC effects for presupposition triggers by considering the clash between the pressure to accommodate and the pressure for maximality—the tendency to

interpret utterances as informatively as possible. The proposal was introduced from within the grammatical approach to maximality, which views exhaustivity as the result of an embedded grammatical operator, *exh*, semantically similar to *only*. However, as mentioned in the previous chapter, there are multiple proposals for how to derive exhaustivity effects. This chapter explores whether a grammatical approach to exhaustivity is necessary for MAC-style explanations of CFCs by asking whether alternative pragmatic frameworks could be used to derive the relevant clash.

This chapter is structured as follows: In Section 4.2 I ask whether a maximality/accommodation clash could be derived from Neo-Gricean approaches, which view utterance interpretation as the relationship between alternative utterances and conversational 'maxims' or rules. And in Section 4.3, I ask whether such a clash could be derived from Iterated Rationality Models (IRMs), which model utterance interpretation as recursive reasoning between multiple communicative layers. In this section, I will introduce an IRM using the Rational Speech Act framework (or RSA framework) (Goodman & Frank, 2016), and argue that it predicts that additive presupposition triggers like *too* would rarely be used to communicate novel information. In both cases, I conclude that these frameworks could derive the relevant clash, however they can do so only with certain assumptions about alternative utterances (in the case of Neo-Gricean approaches) and utterance cost (in the case of IRM-based approaches).

As in the previous chapter, I will consider sentences that are answers to the question "Who danced?" in a toy world with three characters—Alex, Blake and Cole. I will be considering worlds denoted with the upper-case letters of the character that dances in each world, so A denotes the world where Alex danced but Blake and Cole did not; AB denotes the world where Alex and Blake dance, but Cole did not, etc. Both Neo-Gricean and IRM approaches derive pragmatic effects through the notion of alternative utterances, or things that a conversational participant could have said but did not. Generally, the alternatives considered here will consist of the *bare* utterance ("Alex danced" / "Alex and Blake danced"), and *too*-based utterances ("Alex danced too" / "Alex and Blake danced too").

4.2   Neo-Gricean Approaches

Neo-Gricean approaches view discourse as occurring against a backdrop of conversational rules, or maxims (Grice, 1975) and derive inferences via a reasoning process that takes into account both these rules, as well as possible alternative utterances. For the examples here, the relevant maxim will be that of Quantity, or the pressure to be as informative as possible. We will operationalize informativity as the number of worlds that an utterance is literally compatible with, so the utterance "Only Alex danced" is more informative than the utterance "Alex danced" because the later is literally compatible with worlds where, say, Alex and Blake both danced.

Neo-Gricean approaches are able to derive exhaustivity effects in the following way: Say someone hears the utterance "Alex danced." This utterance is literally compatible with all the worlds where Alex danced, but is typically understood to convey the world where Alex danced, but Beth and Cole did not. Neo-Gricean approaches derive this via the following reasoning process: Under the assumption that the speaker is knowledgeable about who danced, then, by the Maxim of Quantity, they should have said so if Blake or Cole danced. But the speaker did not say so. Therefore, it must be the case that neither Blake nor Cole danced, and we can conclude that only Alex danced. Operationally, what this means is that maximal interpretations are derived by negating the alternatives to an utterance that are stronger (i.e. more informative).

How might Neo-Gricean reasoning like this be recruited to explain CFC effects with *too*? Following the assumption in the previous chapter that *exh* operates only over the asserted content, one simple option would be to assign a similar role for Neo-Gricean based reasoning. In this case, when hearing the utterance "Alex danced, too" listeners apply the reasoning mechanism sketched above to the asserted portion of the utterance, "Alex danced." They derive the maximal interpretation, namely that Alex danced and Blake and Cole did not, which contradicts the utterances' presuppositions.

But although this approach is appealing in its simplicity, it may have some undesirable theoretical

properties. First, it is generally assumed that the Neo-Gricean reasoning process operates over entire utterances, rather than just parts of utterances. Indeed, it precisely this difference that distinguishes it from the grammatical approach, which postulates that *exh* operators can be embedded into the structure of a sentence and operate over its constituent parts. In order to stay true to this basic principle of Neo-Gricean pragmatics, below I consider a variant of the reasoning sketched above that applies over whole utterances, instead of utterance parts. While this approach does require certain assumptions in order to derive the desired effects, it outlines a proposal that may be more in keeping with the Neo-Gricean perspective.

Let's consider utterance interpretation for the utterance "Alex danced too", which has the denotation { AB, AC, ABC }, indicating the worlds where Alex and Blake danced, Alex and Cole danced, and all three danced, respectively. Let's consider utterance alternatives that include *too*, such as "Alex danced too", as well as utterances with conjunction, such as "Alex and Blake danced." The Neo-Gricean reasoning goes as follows: Assuming that the speaker is knowledgeable about who danced, if it were the case that Alex and Blake danced, then the speaker would have said so under the Maxim of Quantity. After all, Quantity obligates the speaker to be as informative as is necessary, and saying "Alex and Blake danced" would be strictly more informative (in the sense that it is compatible with fewer possible worlds) than saying "Alex danced, too". However, the speaker did not say "Alex and Blake danced", so we can conclude that it is not the case that Alex and Blake danced and eliminate AB from our list of possible worlds. Likewise, if it had been the case that Alex and Cole danced, the speaker would have been similarly obligated to make the more informative contribution "Alex and Cole danced" under the maxim of Quantity. The fact that they did not, means we can eliminate AC from our list of possible worlds. Likewise for the ABC world. Therefore, we can conclude that AB is false, AC is false and ABC is false. But, problematically, if we assume that the presuppositions are accommodated, then we have just eliminated all of the worlds compatible with the interpretation of the original utterance, "Alex danced, too." Thus, we derive a similar tension between the pressure to

accommodate the presuppositions and the pressure to interpret the utterance maximally, i.e. to eliminate worlds where multiple people danced. Crucially, this reasoning works because "too" is not an informative way to communicate information that multiple people danced, especially when considered next to nearby alternative utterances that explicitly state *who* the additional dancers were.

Although the above reasoning process derives a clash between accommodation and maximal interpretation, it hinges on a couple of key assumptions. First, it only works if we allow that phrases like "Alex and Blake danced" are considered as alternatives to "Alex danced, too." The question of what alternatives should be allowed into the reasoning process has been the focus of much discussion, with dominant proposals being that the alternative-generating mechanism should be sensitive to cost (operationalized, roughly in the number of words in the alternative compared to the base utterance), or else based on the structural complexity of the alternative (Katzir, 2007). Working from scalar implicatures, most contributions have proposed that alternatives should be considered if they are less or equally costly, or less or equally structurally complex as the base utterance. Unfortunately, neither of these proposals admit "Alex and Blake danced" (or "Alex and Cole danced") as alternatives for "Alex danced, too." The *and* variant is both longer than the *too* variant, and it cannot be generated with the structural approach to alternative production advocated by Katzir (2007). That being said, other proposals that work explicitly within the Neo-Gricean framework do admit "A and B" as alternatives for "A" (see, for example Spector (2007), Section 1.2). More generally, both *too* and *and* are ways of communicating the fact that some new piece of information is additional, so it seems plausible that they are considered as alternatives to each other.

A second consideration, perhaps the most challenging, is that the above reasoning does not hold in a context where there is only one alternative. Say, instead of Alex, Blake and Cole, we consider a situation that includes only Alex and Blake with the worlds: A, B, AB. Now, the utterance "Alex danced too" unambiguously denotes the AB world, and is as informative at picking out this world as the utterance "Alex and Blake danced." In fact, it might be preferred to the alternative formed with conjunction on

grounds that it is shorter, and therefore potentially less costly to produce.[1] Although this concern

is worrisome, it can perhaps be alleviated by considering the difference between toy worlds where

alternatives are explicitly delineated, and real-world communicative situations, where alternative sets

must be inferred from a noisy and ambiguous context. Consider the following situation:

(1) Context: Xavi and Zeno are discussing what their friends did over the weekend.

Xavi: Alex and Blake went to the beach. # Alex$_F$ went swimming, too.

Setting aside the fact that this sentence is infelicitous, lets consider who Xavi could have been attempt-

ing to communicate about. Even in this case, where there are only two salient people mentioned im-

mediately prior in the discourse, it's not clear that the alternative set quantified over by *too* consists

unambiguously of Alex and Blake. For example, it may be the case that Xavi was intending to com-

municate that many beach patrons went swimming that day, and the alternative set is really {Alex,

others at the beach }. If we view all alternative sets as potentially ambiguous, then the utterance with

and will always be more informative than the utterance with *too*, because it eliminates all uncertainty

about to which entities the relevant proposition applies.

4.3   Iterated Rationality Models

Iterated Rationality Modeling approaches view utterance interpretation as recursive reasoning be-

tween multiple communicative layers that balance an utterance's *informativity* and its *cost*. The it-

erated rationality approach discussed here will be the Rational Speech Act framework (Goodman &

Frank, 2016), which has been employed to model a variety of pragmatic effects, including exhaus-

tivity (Wilcox & Spector, 2019; Cremers et al., 2022). The questions that we will be asking here are

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[1] This challenge also holds for situations where the prejacent of *too* communicates information about a group
of people j with alternative set *alt* where $|j| = |alt| - 1$. For example, with the alternative set we have been
considering that includes Alex, Blake and Cole saying "Alex and Blake danced, too" is as informative as saying
"Alex, Blake and Cole danced."

twofold: First, can RSA models derive basic exhasutivity implicatures and therefore serve as a potential alternative proposal to embedded *exh* operators? And second, can RSA models be used to derive the contextual infelicity of *too* in cases where its presuppositions are not supported?

The basic RSA model consists of three layers: At the bottom is the Literal Listener, L_0, which takes an utterance, u, and returns a probability distribution over worlds w that are literally compatible with the utterance in proportion to their prior probability. At the next layer up is a Speaker, S_1, which takes a world, w, and returns a probability distribution over messages. S_1 chooses utterances in proportion to how well it communicates world w to the Literal Listener, while at the same time preferring utterances that are low cost. This layer is further parameterized by a rationality parameter, α. At the top layer is the Pragmatic Listener, L_1, which, like the Literal Listener, returns a distribution over worlds given an utterance by reasoning about the probability that S_1 would assign to an utterance, together with the prior probability of the world itself. The equations that characterize this system, defined for an arbitrary number of layers, are given below:

1. The interpretation function $\mathcal{L}$, when applied to a message u and a world w, returns 1 if u is true in w, 0 otherwise.

2. $L_0(w|u) \propto P(w)\mathcal{L}(u, w)$.

3. $U_{n+1}(u|w) = log(L_n(w|u)) - c(u)$

4. $S_{n+1}(u|w) \propto e^{\alpha U_{n+1}(u|w)}$

5. $L_{n+1}(w|u) \propto P(w)S_{n+1}(u|w)$.

I will discuss two ways one might model Contextual Felicity effects from within the RSA framework, providing only a brief sketch of the first and a more fully articulated model for the second. The first approach that I want to outline is similar to the first Neo-Gricean model, and builds off the assumption made when introducing the grammatical approach in the previous section—that the *exh*

operator applies only to the asserted portion of the utterance. Instantiating something similar in this framework, for sentence "Alex danced too" we could assume that the pragmatic reasoning characterized by the RSA framework is carried out over the asserted portion of the utterance "Alex danced." If so, then the role of the RSA is to essentially derive exhaustivity effects for an utterance's assertions, which would then be pitted against its presuppositions.

The basic RSA framework outline above is able to capture exhaustivity effects, however its ability to do so is somewhat sensitive to the relative cost of utterances. For the sake of example, let's consider worlds where two characters, Alex and Blake could have danced { A, B, AB }. Furthermore, let's consider three possible utterances: "Alex danced" (denoting { A, AB }) , "Alex and Blake danced," (denoting { AB }) and "Alex but not Blake danced" (denoting { A }). If the first two utterances have relatively similar costs, then upon hearing "Alex danced" the L_1 layer will assign a higher posterior probability to the A world than to the AB world. This is because the utterance "Alex and Blake danced" is a more informative way to communicate the AB world, and so, provided that the cost is not too high, it will have higher utility for the speaker layer.

However, under different assumptions about utterance cost, the behavior of the model changes. As the relative cost between "Alex danced" and "Alex and Blake danced" diverges or as the cost of "Alex but not Blake danced" goes down, then the utterance "Alex danced" becomes a good, low-cost way of communicating the AB world. Under certain cost and optimally parameters, the model even produces *anti-exhaustivity* effects, where the utterance "Alex danced" is taken to communicate that Alex and some other people danced. Cremers et al. (2022) test this behavior in human subjects and find that they are not subject to the same anti-exhaustivity effects. They discuss a number of other RSA models, arguing that the best models for capturing these effects are ones with an encapsulated semantic mechanism akin to the *exh* operator.

In addition to the problems for the (baseline) RSA model in predicting the right behavior, separating an utterance's assertions from its presuppositions and applying the pragmatic machinery only

to the former may be theoretically undesirable. As with the Neo-Gricean literature, most of the RSA literature assumes that it is a process that applies to full utterances; and again, the ability to embed pragmatics into the grammar (i.e. to have it apply to *parts* of utterances) is one aspect that distinguishes the grammatical approach from other approaches to pragmatics. In order to stay true to this theoretical commitment, below, I consider a simple RSA model built to derive CFC effects that reasons over whole utterances, as opposed to utterance parts.

This RSA model will build on the one given above except that it includes an additional *lifted variable*, which determines the communicative function of the presupposition. Previous RSA models have modeled utterance interpretation as inference under uncertainty about lexical meaning—for example with *some* being lexically ambiguous between "some or all" and "some but not all" (Bergen et al., 2016). The model proposed here will take a similar approach, assuming that *too* is ambiguous between presuppositional use and informative use (or, equivalently, following Bergen et al. (2016), that there are multiple lexica, one in which *too* is purely informative and one in which it is purely presuppositional.) When *too* is used presuppositionally, it communicates merely the content of its assertions. When used informatively, it communicates its assertions, plus the fact that the proposition is true of one additional person. As before, we will consider a toy universe consisting of three individuals—A, B, C—and utterances that can be of the form "A danced", "A and B danced" and "A danced too." During utterance interpretation, listeners make inferences not only about utterances and worlds, but also about the usage of *too*, which is controlled by the lifted variable t. An implementation of the model using the programming language webppl is given in Appendix A. The model contains the following components:

1. <u>Worlds:</u> A, B, C, AB, AC, BC, ABC,

    • Where A denotes the world where just A danced, AC denotes the world where A and C danced, etc.

2. <u>Utterances</u> consist of a *Form* ('bare', 'too', 'null') and an *Argument*, which can be one of 'A', 'B', 'C', 'AB', 'AC', 'BC', 'ABC'.

    - Where, for example "Alex danced" corresponds to the Bare/A utterance, i.e. one that has a *bare* form and 'A' as an argument; "Alex danced too" corresponds to the Too/A utterance, which has a *too* form and 'A' as an argument; "Alex and Lee danced" corresponds to an utterance that has a *bare* form and 'AB' as an argument, etc.

    - The total set of utterances are: Bare/A, Bare/B, Bare/C, Bare/AB, Bare/AC, Bare/BC, Bare/ABC, Too/A, Too/B, Too/C, Too/AB, Too/AC, Too/BC, and Null

3. <u>Interpretation function</u> $\mathcal{L}$, when applied to a message u, lifted variable t a world w.

    - If the form is 'bare' return 1 if the arguments of $u \subseteq w$.

    - If the form is 'null' return 1

    - If the form is 'too':

        - If $t = 1$ return 1 if the arguments of $u \subseteq w \wedge |w| > |u|$, otherwise return 0

        - If $t = 0$ return 1 if the arguments of $u \subseteq w$, otherwise return 0

The interpretation function gives the following meanings to utterances: If the utterance is 'null' then it is vacuously assumed to be true. 'Bare' refers to utterances such as "Alex danced" or "Alex and Blake danced", which are formed without the additive. If the utterance is bare, then its argument must be equal to or a subset of the true world. That is, if we have the world AB, then the bare utterance "A danced' is true, but the utterance "Alex, Blake and Cole danced" is false. The lifted variable t does not affect the interpretation of bare utterances. Finally, we have utterances with *too*. The interpretation function says that if *too* is being used informatively (that is if $t = 1$), then the number of people who danced must be greater than the number of people specified by the prejacent. If *too* is being used

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presuppositionally, then the number of people who danced from our alternatives A, B and C, must be equal to or a subset of the people specified by the prejacent. (In this case, it is assumed that information about an additional dancer is already in the common ground.)

Utterance interpretation is characterized with the following equations:

1. $L_0(w|u,t) \propto P(w)\mathcal{L}(u,w,t)$.

2. $U_{n+1}(u|w,t) = log(L_n(w|u,t)) - c(u)$

3. $S_{n+1}(u|w,t) \propto e^{\alpha U_{n+1}(u|w,t)}$

4. $L_{n+1}(w|u,t) \propto P(w)S_{n+1}(u|w,t)$.

In order to show the behavior of the model, I will walk through a few results, first discussing model behavior for bare/conjunctive sentences ("Alex danced", "Alex and Sam danced"), and then discuss model behavior for sentences with *too*. The results discussed here are for $\alpha = 5$, although model behavior is robust to different settings of alpha. For now, I will assume equal cost between the bare and *too* utterances, although cost will be discussed in greater detail below.

Upon hearing bare utterances such as "Alex danced" or "Alex and Sam danced", the model produces expected exhaustivity effects, shown in Figure 4.1 and 4.2. In 4.1, the model places the majority of the posterior distribution on the A world, and in 4.2, on the AB world. Interestingly, for both cases, the model infers that we are in a situation where *too* is used informatively. Focusing on interpretation of the utterance "Alex danced" in 4.1, this is because, if we were in a situation where *too* were only presuppositional, then, given a speaker who wanted to communicate the A world, we would expect to hear "Alex danced too" with equal frequency to "Alex danced" (the two utterances are semantically equivalent in such a situation). But we did not hear "Alex danced too", so it is more likely that we are in a world where *too* is informative.

Turning to "Alex danced too", we can make the following prediction: If the RSA framework is a well-tuned model of human communication, then: (a) If people can use *too* informatively, we should
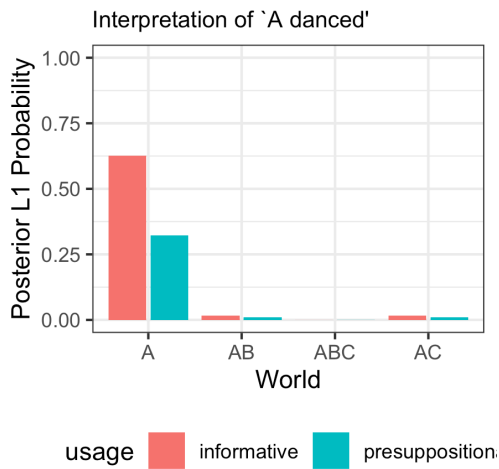
Figure 4.1: L_1 interpretation of "A danced", α = 5. The high posterior probability on the A world indicates an exhaustive interpretation of the sentence.
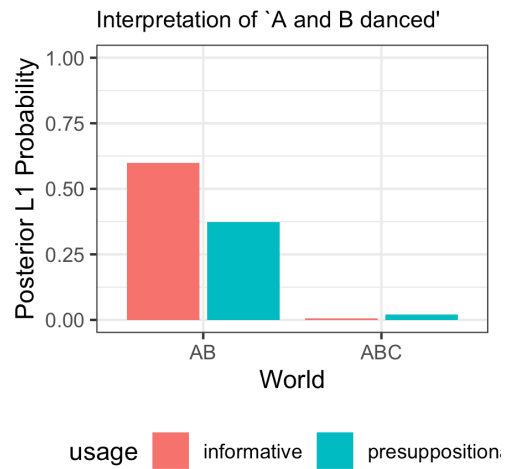

Figure 4.2: L_1 interpretation of "A and B danced", α = 5. The high posterior probability on the AB world indicates an exhaustive interpretation of the sentence.

expect about equal probability for the informative and presuppositional usage after hearing sentences like "Alex danced too." (b) If people cannot use *too* informatively, then we expect the model to assign a low posterior probability to the informative usage of *too*. Now, we know from Chapter 3 that participants assign low acceptability judgements to unsupported (i.e., in this context *informative*) usage of *too*. Furthermore, we know from production data that participants use *too* without contextual support only about 5% of the time (Spenader, 2002). Thus, we should expect (b), above—the model should assign a low posterior probability to informative usage of *too*.

The results for sentences with *too* are in Figure 4.3 ("A danced too") and 4.4 ("A and B danced too"). Focusing just on 4.3, the model assigns high probability to the A/presuppositional situations, with much lower probability to the AB/informative, AC/informative, or ABC/informative situations. (The probability is so low for the ABC world that it is not even visible on the graph.) Focusing just on the interpretation of "Alex danced, too", the reasoning is as follows: If *too* is being used presuppositionally, then the utterance is a good way to communicate the A world, following the basic
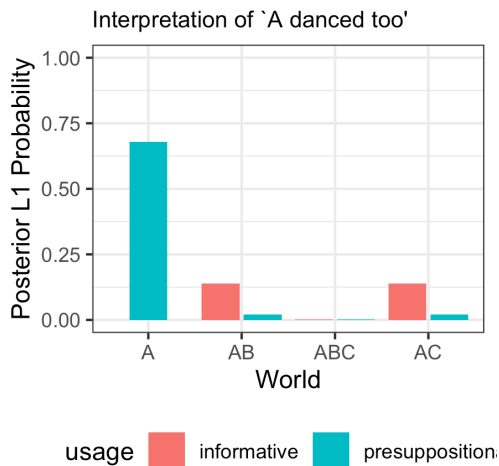
Figure 4.3: L_1 interpretation for utterance "A danced too", $\alpha = 5$. L_1 puts lower posterior mass on the informative use of the utterance.
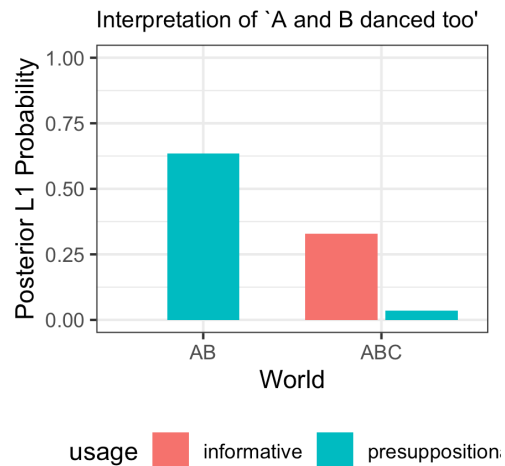
Figure 4.4: L_1 interpretation for utterance "A and B danced too." L_1 puts lower posterior mass on the informative use of the utterance.

exhaustivity effects captured by the model. If, however, *too* is being used informatively, then the utterance must be communicating either the AB, AC, or ABC worlds. Crucially, though, it is not a very good choice for any of these, due to presence of the more informative alternatives "Alex and Blake danced", "Alex and Cole danced", etc. Thus, it is much more likely that *too* has a presuppositional usage and we are in the A world, than an informative usage and we are in an AB, AC or ABC world.

Looking just at the presuppositional/informative marginals in Figure 4.5, we can see that the model assign about a 0.72 probability to the presuppositional use and only a 0.28 probability to the informative use, bearing out the prediction made above. Importantly, this trend does not change with the value of α: When α is 1, the posterior on presuppositional use is ~ 0.62, and as α grows, it approaches 1.

The takeaway point is that just based on principles of informativity (we will get to cost in a minute), this simple RSA model never predicts that *too* should be used informatively. This is for similar reasons discussed above when looking at Neo-Gricean approaches—it is an imprecise way of communicating
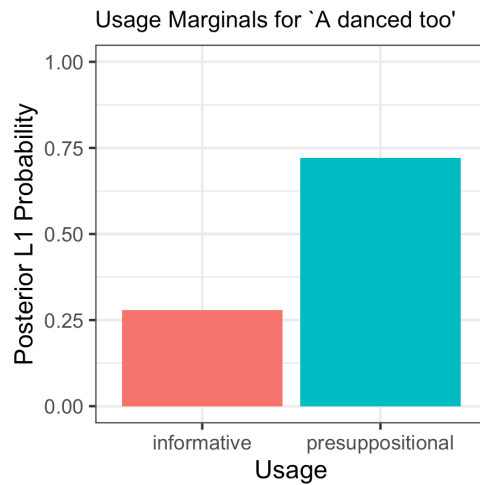
Figure 4.5: Marginals over usage for 'too' for the utterance "Alex danced, too."

novel information about the world, especially compared to nearby possible alternative utterances, such as "A and B danced" which are more informative.

There are two considerations that I want to discuss briefly. First, how do we link the behavior of this model to participant behavior in experiments, or to presupposition accommodation in natural discourse? I see two possible ways: The first is to assume that participants are unwilling to accept unsupported sentences with *too* because they are are a relatively inefficient way of communicating information. Taking this route, however, requires making certain assumptions about the relationship between informativity and acceptability. In principle it seems possible that that under-informative and over-informative messages can drive lower acceptability ratings, however this link would need to be validated with further experimental work. The second route would be to assume that participants make active inferences along the lines of the lifted "usage" variable, about whether presuppositions are being used informatively or not. If participants infer that a presupposition is not being used informatively, then they would not be willing to accommodate it. Because *too* will always be assumed to be presuppositional, it will never be accommodated, and a discourse clash will arise in cases where its presuppositions are not supported. This second line of reasoning drives CFC effects through a

discourse clash, and through reasoning about informativity, however the additional assumptions it makes about participant reasoning over informative vs. presuppositional usages of triggers means that it is not directly equivalent to the Maximality/Accommodation Clash hypothesis discussed in the previous chapter.

The second consideration I want to discuss is one of cost. So far, I have been exploring model results under the assumption that the cost of "Alex danced too" and "Alex and Blake danced" are equal. Given that both of these utterances have a similar number of syllables (4 vs. 5) this seems like a fair assumption, but what happens if we change it? As discussed with the base model for deriving exhaustivity effects, when the cost of the utterance with *and* increases, then shorter, ambiguous messages start to be preferred over longer, more explicit messages. For example, we can change the cost of the utterance to be proportional to the number of arguments it contains. So the utterance "Alex danced" and "Alex danced, too" both have cost 1, and "Alex and Blake danced" has a cost of 2. In this context, upon hearing "Alex danced too", the Pragmatic Listener still assigns the highest probability (0.25) to the A/presuppositional situation, but now it assigns the next highest posterior probabilities to the AB/informative and AC/informative situations (both 0.2). Looking at the marginals of usage, now, the model assigns only ~ 0.54 to the presuppositional usage, and ~ 0.46 to the informative usage of *too*. The takeaway here is that, although the models works under reasonable assumptions about cost, it fails to derive a strong effect under other, also possibly reasonable, assumptions about cost.

4.4 DISCUSSION

In this section, I have explored how Neo-Gricean and Iterated Rationality Modeling approaches could capture CFC effects for the presupposition trigger *too*. Unlike the grammatical approach explored at-length in the previous chapter, these models attempt to derive CFC effects through reasoning al-

gorithms that consider alternative utterances[2], together with different notions of *informativity*. For Neo-Gricean models, informativity is captured in the the Gricean maxim of Quantity. Under the assumption that speakers are following this maxim, When listeners hear a message, they negate its more informative alternatives. Problematically, for messages with *too*, this results in a contradiction, where all the more informative utterances are negated, even though *too* requires that one of them must be true. To capture effects with Iterated Rationality Models, I proposed a RSA model that reasons about worlds and utterances, as well as *usage* of the presupposition. The model predicts that *too* should never be used to communicate novel information because messages with *too* are not very informative compared to nearby alternatives.

Although, in Chapter 3, I walked through predictions of the *exh*-based model for many presupposition triggers, for the IRM and Neo-Gricean models, I have discussed the issue only for *too*, here. Extending these types of analyses to other triggers may be possible—for example, triggers that entail their presuppositions (accomplishment verbs, change-of-state verbs) as well as exclusive triggers, are as informative as their non-presupposing counterparts, and thus should be predicted to not impose CFC effects for that reason. However, extending these analyses to all the triggers may require further modeling components that take the Question Under Discussion into account, for example, to capture CFC variation with *again*.

The final consideration I want to discuss is the issue of ignorance. Both Neo-Gricean and IRM based approaches require that the speaker be knowledgeable about (in our example) who danced, as well as the listener to know that the speaker is knowledgeable, etc. For the Neo-Gricean reasoning, this was stated explicitly as an assumption, and for the RSA model this was encoded into the speaker layer, which is given one world as ground-truth to communicate to the Literal Listener. If we admit that the speaker might not be knowledgeable, then for both models utterances with *too* may produce

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[2] Although *exh*-based approaches to maximality make use of focus-evoked alternative sets, they do not factor these into reasoning processes about what could have been said, but wasn't in the same way as Neo-Gricean and IRM approaches

ignorance inferences. That is, saying "Alex danced too" would be a good (and potentially low-cost) way to communicate that a speaker believes they are in the AB, AC, or ABC world, but does not know which one.

We can highlight this issue by contrasting presupposition to a different pragmatic phenomena: the ignorance inferences associated with disjunctive sentences like "Alex or Lee danced." Sentences of this type are typically taken to communicate not only that Alex or Lee danced, but additionally, that the speaker does not know which one. Under a Neo-Gricean framework, the reasoning is very similar to the one sketched above for *too*. If the speaker knew that Alex danced, then they should have said so. Therefore, we can conclude that Alex did not dance. Likewise, if Lee danced, then the speaker should have said so. So we can conclude that Lee did not dance. However, instead of taking the next step and concluding that the utterance is contradictory, a Neo-Gricean analysis of this data would say, rather, that the speaker must be ignorant, which is why they did not communicate their message with the nearby, more informative alternatives. So one challenge for both of these approaches is to explain why additive presuppositions produce infelicity and not ignorance inferences, while disjunction produces ignorance inferences and not infelicity.

I will briefly sketch out a possible answer to this question. The first part appeals to the anaphoric status of additive presuppositions. Many approaches to the meanings of additive presuppositions assume that they are partially anaphoric (Kripke, 2009; Aravind & Hackl, 2017). In general, referential terms like anaphors tend not to be associated with ignorance about their referent on the part of the speaker. For example, even if a listener can't determine the referent of a pronoun, they likely assume that the speaker has a particular referent in mind. More generally, if anaphoric elements were able to be used to convey ignorance, then we would expect pronouns to be good, low-cost ways of conveying such information. However, it is marked for a speaker to say "They entered the room" to convey the information that someone entered the room and the speaker does not know who that person is. Relatedly, one could assume that speaker knowledgeability is the norm during discourse, and

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that speaker ignorance needs to be marked with either higher-cost utterances or with explicit markers of ignorance. This perspective has some crosslinguistic evidence; most languages use one particular type of expression—epistemic indefinites—to convey speaker ignorance, which are hypothesized to produce ignorance by triggering a pragmatic reasoning process (Alonso-Ovalle & Menéndez-Benito, 2013). In the absence of these particular forms comprehenders may assume that the producer is not in a state of ignorance.

5

Experimental Assessment of Theoretical

Predictions

5.1 Introduction

This chapter presents two experiments that test the theoretical approaches for presupposition and contextual felicity discussed in previous chapters. The first experiment builds on the anaphoric ap-

proach to presupposition (Zeevat, 1992; Van der Sandt, 1992), which was first introduced in Chapter 1 and discussed at length in Chapter 3. It investigates the relationship between an additive presupposition trigger (*too*) and anaphora by asking whether the trigger, like pronouns, can enter into cataphoric dependencies, where the pronoun precedes its co-referential R-expression. The results confirm the standard view that pronominal anaphora are available in cataphoric environments. However, the same pattern was not found for presupposition triggers; instead, the results suggest that *too* requires immediate contextual support and that it cannot enter into cataphoric-like dependencies. These results pose a challenge for theoretical accounts of presupposition that treat them as theoretically similar to pronominal anaphora. They support the hypothesis that *too* introduces constraint on the context in which it is uttered, suggesting that the satisfaction perspective on presuppositions (Heim, 1983) is necessary (although perhaps not sufficient) to explain the distribution of focus-sensitive additive triggers.

The second experiment directly assesses the Maximality / Accommodation Clash (MAC) hypothesis developed in Chapter 3 by investigating the effect of local information structure on the acceptability of sentences with presuppositions. The MAC proposes that contextual felicity effects are rooted in a clash between two pressures: the pressure to interpret an utterance in a maximally informative way, and a pressure to accommodate. Crucially, maximal interpretation is taken to occur with respect to a question, or a set of semantic alternatives, and the composition of this set is one factor that determines whether clash is predicted. By keeping responses constant and manipulating their associated questions, this experiment demonstrates that local information structural considerations contribute to a presupposition's contextual felicity, as predicted under the MAC approach.

Taken together, these two experiments lend support for the view that presupposition triggers, specifically additive presupposition triggers, (a) impose constraints on the context in which they are uttered, and (b) that their contextual felicity is modulated by local information structural factors—the two key ingredients for the MAC approach introduced in Chapter 3. The data suggest that the dis-

tribution of additive presuppositions cannot be explained without (a) and (b). However, at the same time, they suggest that approaches such as the MAC, may not be able to explain all of the observed variance; they are necessary but not sufficient. In each experiment we will see effects not predicted by the MAC, which could be predicted under a view of presuppositions as anaphors. In Chapter 3, I adopted a view of additive presuppositions that viewed them purely as introducing a constraint on the context of interpretation. These data suggest that, while satisfaction and information-structural based approaches to contextual felicity are still needed, anaphoricity may still be a crucial ingredient in explaining the full distribution of CFC effects.

5.2   Experiment 1: Cataphora and Presupposition

5.2.1   Introduction

In previous chapters, we have contrasted numerous theories for the origins of presuppositional phenomena, focusing in particular on additive presuppositions like *too*. One dimension along which these theories vary is the extent to which presuppositions should be likened to anaphora. At one end, the satisfaction approach left room open for *too* to possess no anaphoric properties, with its distribution entirely governed by the satisfaction of its presuppositions by the context. In contrast, the proposal from Aravind & Hackl (2017), which I eventually endorsed in Chapter 3, modeled *too* as containing both an anaphoric element as well as presuppositional constraints which needed to be satisfied. At the anaphoric end of the scale, multiple authors have proposed theoretical analyses of additives that treat them purely as anaphors (Kripke, 2009; Zeevat, 1992; Van der Sandt, 1992), with Kripke (2009) using this analogy to drive additive's CFCs. Of these, Van der Sandt (1992) perhaps present the strongest position by treating all presuppositions as *pronominal anaphors*, stating that they "only differ from pronouns ... in that they have more descriptive content."

This experiment assesses how anaphor-like additive presuppositions are by investigating their abil-

ity to form backwards, or *cataphoric*, dependencies. I take what is arguably the strongest candidate for analysis as anaphora, the presupposition trigger *too*, and compare its behavior to pronominal cataphora, in order to understand how the conditions that support strong presupposition triggers like "too" compare to those that support pronominal resolution.

Cases of cataphora studied include sentences like "Whenever she$_i$ dances, Bridgette$_i$ has to concentrate" or "If she$_i$ dances, Bridgette$_i$ has to concentrate," where the pronoun is in a wh-headed adverbial phrase or a conditional clause (the *subordinate* clause), and the referring expression (R-expression) is in the sentence's matrix clause. Linguistic analysis of these sentence treats the subordinate clause as a fronted unit that was base-generated in a lower position from which the R-expression can bind the pronoun. From the perspective of psycholinguistic processing, the important point is that, when processing the utterance, people do not need to have a potential referent active in the context at the moment the pronoun is processed. Rather, they can delay identification of the pronoun and its referent until later on during sentence interpretation without causing a degradation in acceptability of the sentence. If the same processing mechanism used to bind pronominal anaphora were also deployed for additive presupposition triggers, then we would expect them to form similar dependencies, without a decrease in acceptability.

5.2.2 METHODS

The experiment consisted of a sentence acceptability judgement task for conditional sentences of the type "If X, Y" or "Whenever X, Y". There were four conditions, given for presuppositions in (1) and for pronouns in (2), below. The target pronouns/presupposition trigger could come in the matrix or subordinate clause; or be placed in the first or second clause, in terms of linear order. Pronouns used were either *he* or *she*, and the presupposition used was *too* for all experimental items. For pronouns, items were created with the intention of biasing participants away from exophoric interpretations of pronouns, thus increasing sentence unacceptability in cases where the pronoun and its R-expression

could not co-refer. For example, in (2), it is less likely that Bridgette has to concentrate when *someone else* is dancing tango, compared to when she is dancing tango.

(1)   Experimental Conditions: Presupposition

    a.   Bridgette dances tango too, whenever Javier dances tango. [MATRIX, FRONT]

    b.   Whenever Javier dances tango, Bridgette dances tango too. [MATRIX, BACK]

    c.   Whenever Javier dances tango too, Bridgette dances tango. [SUBORDINATE, FRONT]

    d.   Bridgette dances tango, whenever Javier dances tango too. [SUBORDINATE, BACK]

(2)   Experimental Conditions: Pronouns

    a.   She dances tango, whenever Bridgette has to concentrate. [MATRIX, FRONT]

    b.   Whenever Bridgette dances tango, she has to concentrate. [MATRIX, BACK]

    c.   Whenever she dances tango, Bridgette has to concentrate. [SUBORDINATE, FRONT]

    d.   Bridgette has to concentrate, whenever she dances tango. [SUBORDINATE, BACK]

50 participants were recruited on Prolific to take the experiment. On each screen participants used a continuous slider to rate a sentence from "acceptable" to "unacceptable." 19 filler items and 20 target items were included, 10 each for pronouns and presuppositions. Filler items were either natural and grammatical or included an unexpected gender mismatch between a gendered subject NP and a reflexive anaphora (e.g. "My uncle saw herself ...")

The following behavior was predicted: For pronouns, an interaction was expected between *linear relation* and *hierarchy relation*, with lower sentence acceptability when the pronoun is both in the matrix clause and fronted, as in (2-a). In these sentences, co-reference between the pronoun and the R-expression is ruled out by Condition-C Effects (Chomsky et al., 1982), and the pronoun must be interpreted (less plausibly) as being exophoric, which was predicted to drive down participant ratings. (Even though the R-expression does not C-command the pronoun in (2-d), co-reference is still avail-

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able through discourse binding.) If additive presupposition triggers can form cataphoric dependencies, then for the items with *too* we should expect either (i) no effect of the experimental conditions on sentence rating, if the additives are not subject to the same Condition-C effects or, (ii) an interaction between *linear* and *hierarchy* relations similar to the one predicted for pronouns.

If the results for presupposition triggers differ from pronouns, we might expect them to differ in two ways. First, it may be the case that presupposition triggers are sensitive only to *linear* order. This would still be consistent with a view of presupposition triggers that treats them as anaphors, on the assumption that for (1-b) and (1-d), the linearly first clause in the sentence introduces a dynamic variable that can bind the presupposition in the second clause, regardless of the hierarchical relationship between the two. On the other hand, it may be the case that presupposition triggers are sensitive to *hierarchical* relationship and not linear order. This would be consistent with the view of presuppositions that treats them as constraints within a dynamic semantics context. Although dynamic semantic approaches to meaning are sensitive to linear order for some complex sentences (for example, the relationship between operands connected via conjunction), these approaches treat part of the interpretation of conditional sentences as the subsequent update of local context with first the subordinate clause and then the matrix clause, regardless of surface realization order. So for example, for the sentence "Alex sang if she is happy", dynamic approaches propose that, as part of utterance interpretation, a context is first intersected with worlds where Alex is happy and the result is then intersected with worlds where Alex sang. Under such an approach, if the trigger is in the matrix clause, its presuppositions will be entailed by the context when it is interpreted, regardless of the surface linear relationship between the subordinate and matrix clause.

5.2.3 Results

The results for the experiment can be seen in Figure 5.1, with results from the filler items in Figure 5.2. For both experiments, the y-axis shows participant rating, and the x-axis (as well as color) shows
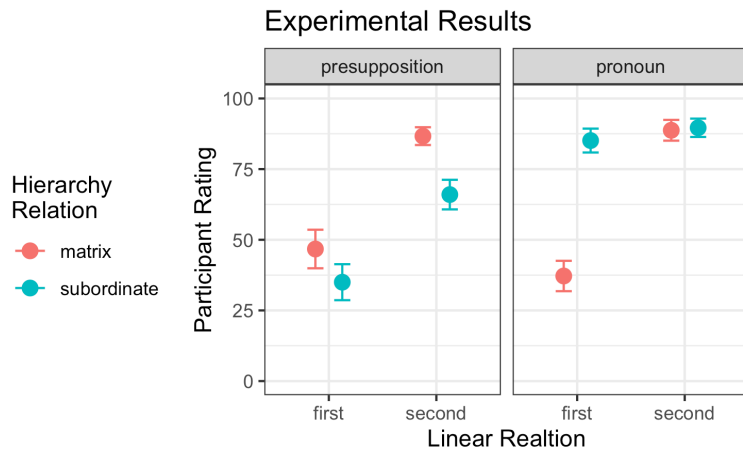
Figure 5.1: Participant ratings of target items: Continuous sliders were underlyingly 0-100. Error bars are 95% confidence intervals. Pronouns are subject to an interactive effect, presuppositions are subject to two main effects, but no interaction.
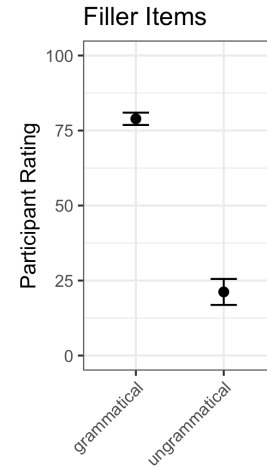
Figure 5.2: Participant ratings of filler items.

experimental conditions. Error bars are 95% confidence intervals. First, looking at the results for pronouns, the results match the prediction quite clearly: Conditions are rated on par with grammatical fillers, except for the MATRIX/FIRST condition, which is rated roughly on par with ungrammatical fillers. Turning to presupposition triggers, it is clear that, at the highest level, results do not match those for pronouns. Most noticeably, there is a large effect of linear order. However, there appears to be a secondary main effect of hierarchical relation as well, with sentences where the trigger is in the *matrix* clause rated higher than sentences with the trigger in the *subordinate* clause, as predicted under dynamic approaches to interpretation.

For statistical tests, linear mixed-effects regression models were fit with participant rating as the dependent variable and experimental conditions as predictors, with random slopes for participant and item.[1] Results for statistical tests confirm the trends visually evident in the figures. For pronouns, an interaction was found between linear and hierarchical relation ($p < 0.001$), as predicted. For pre-

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[1] The formula for fitting the model: `rating ~ linear-relation * hierarchical-relation | (linear-relation + hierarchical-relation || item) + (linear-relation + hierarchical-relation || subject)`

suppositions, there were two main effects: one of linear relation ($p < 0.001$) and one of hierarchical relation ($p < 0.001$), but no interaction between the two.

5.2.4   DISCUSSION

The first take-away from these data is that they confirm basic accounts of cataphora: When interpreting sentences with personal pronouns, participants do not necessarily require active antecedents at the moment when the pronouns are encountered; instead, co-reference can be resolved more globally without causing a decrease in sentence acceptability. The sentences in which the referent of the pronoun was processed after the pronoun itself was processed were in fact rated on-par with grammatical filler sentences (with the exception of Condition-C violating sentences, as expected).

Turning to the relationship between pronouns and presuppositions, these data demonstrate substantial differences between the two. The significant effect of linear order for presupposition triggers supports the interpretation that, unlike pronouns, participants require the presupposition to be supported at the time that it is processed, and violation of this strong, local effect cannot be salvaged even if subsequent material supports the presupposition. This requirement for support at the time the trigger is processed is compatible with other studies of presupposition that have investigated the time course of presupposition processing, finding that slowdowns due to unsupported presuppositions show up very quickly during processing, at the order of 200-300 milliseconds (Schwarz, 2007, 2015). Thus, one contribution of this study is that it is able to find traces of these online effects in an offline setting.

How does this interpretation of the data fit with theoretical accounts of presupposition? First, it is not compatible with the strongest account of Van der Sandt (1992) that directly analogizes presuppositions and pronominal anaphora, and which predicts that presuppositions can enter into cataphoric dependencies. The results *are* compatible with an approach that treats presuppositions as anaphoric, however the anaphora would have to be taken as different from pronominal anaphora, which impose

restrictions such as Condition-C effects.[2] Such an implementation might predict the observed main effect of linear order under the assumption that triggers must be bound, and can be done so dynamically by preceding material, regardless of hierarchical relationship. Crucially, however, an approach like this would not be able to explain the significant effect of hierarchical structure, which is best explained by a constraints-based approach.

Overall, these data may be best explained by approaches to additive triggers that associate them with both anaphoric as well as constraint-based requirements. One way to operationalize this would be to assume that the anaphoric requirement is a online constraint that must be met at the moment the trigger is processed, while the satisfaction-based requirements are constraints on semantic interpretation. Such a theory, compatible with the denotation for *too* presented in Aravind & Hackl (2017), fits with the high-level argument of this chapter, namely that satisfaction approaches to presuppositions are necessary, but perhaps not sufficient, to explain the behavior of participants in targeted experiments.

One final comment is that, although although these data demonstrate that the analogy between additive particles and pronominal anaphora faces some empirical challenges, it may be possible to analogize *too* to VP-anaphora. Examples of VP-anaphora for each of the four experimental conditions are given below:

(3)   a.   Bridgette does so, whenever Javier dances tango. [MATRIX, FRONT]

       b.   Bridgette dances tango, whenever Javier does so. [MATRIX, BACK]

       c.   Whenever Javier does so, Bridgette dances tango. [SUBORDINATE, FRONT]

       d.   Whenever Javier dances tango, Bridgette does so. [SUBORDINATE, BACK]

To this author, (3-a) is relatively bad, whereas (3-b) - (3-d) are all good, indicating that that pronominal and VP anaphora pattern similarly, and unlike presupposition triggers. However, further experimen-

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[2]In the discussion of Chapter 3, I noted another way in which presupposition triggers, if anaphoric, would have to differ from pronominal amphora, namely presupposition triggers can be supported by material that is not made linguistically salient in the context.

tal work would provide a more solid empirical basis for these judgments and would be a good avenue for future research.

5.3 Experiment 2: Sensitivity to the Question Under Discussion

5.3.1 Introduction

In this section, we shift from the debate about satisfaction vs. anaphoric approaches to presupposition, towards a targeted assessment of the Maximality/Accommodation Clash (MAC) approach to contextual felicity, proposed in Chapter 3. The MAC proposes that CFC effects arise when the pressure to interpret utterances maximally and the pressure to accommodate are pitted against each other. Crucially, maximal interpretation occurs against a question (or a backgrounded Question Under Discussion; QUD), which is a set of non-asserted semantic alternatives. When an utterance's presupposition is at-issue to this question, a clash can be produced: Listeners want to both accommodate the presupposition as well as to negate it to derive a maximal interpretation of the utterance with respect to the QUD. Some presupposition triggers will always find themselves in the middle of these two conflicting pressures because of their required focus structure. For example, in Chapter 3, the trigger *too* was discussed at length. Because *too* always associates with focus, the presupposition it introduces is always at-issue to the local QUD and thus always negated when the utterance is interpreted maximally, producing a discourse clash.

In this experiment, I turn away from focus-sensitive operators, and investigate non-focus additives, specifically *again*. Because this item does not obligatorily associate with focus, it can be used in contexts both where the QUD will force a clash between the presupposition and a maximal interpretation of the utterance, as well as contexts where the two are not in conflict. Crucially, the MAC approach predicts that these two types of situations should result in different contextual felicity profiles. In the former, *again* should pattern like *too* and produce strong CFC effects. In the latter, *again* should not

be associated with a CFC.

In order to explain the predictions of the MAC in greater detail, let's look at two examples and walk through whether each is predicted to produce CFCs:

(4)   A: Why were the fans cheering Sam during the soccer game?

        B: She scored again the second half.

(5)   A: When did Sam score during the soccer game?

        B: She scored again in the second half.

In (4), let's take A's question to ask for an exhaustive answer for the reasons the fans cheered Sam. B's response asserts that it is because she scored in the second half, and presupposes that she scored previously during the game. When the response's assertions are exhaustified against the question, we get the interpretation that Sam's scoring in the second half is the only reason why fans are cheering for her. Crucially, this is logically compatible with the utterance's presupposition, that she scored previously. (It merely means that this is not the reason why the fans are cheering for her.) There is an alternative, mention-some, interpretation of this question, in which the question asks not for an exhaustive list of the reasons why fans are cheering for Sam, but merely for *a* reason or *the most salient* reason. If this is the case, then the answer is not exhaustified, and, again, no discourse clash is produced.

Turning to (5), let's take A's question to ask for an exhaustive list of the times when Sam scored. The exhaustive nature of the question is intended to be highlighted with the adverbial phrase "during the soccer game." B's question asserts that she scored in the second half, and presupposes that she scored previously during the game. In this case, when B's response is exhaustified with respect to A's question, a contradiction is produced: We derive the interpretation that Sam scored only in the second half, but also that she scored in the first half. What this example demonstrates is that the MAC

approach predicts that CFC effects are not only sensitive to the type of presupposition trigger, but also to the information structure environment in which the presupposition is uttered.

These sorts of Q/A pairs are useful for theory testing because they are cases where MAC makes differing predictions from alternative theories, particularly ones that view triggers as anaphoric. Anaphoric approaches to presupposition view CFCs as arising because triggers are not bound by material in the preceding context. Relevant to our discussion, neither (4) nor (5) provide material that could bind *again*, and so these theories predict that the trigger should be equally unacceptable in each context. The goal of this experiment, then, is to compare these two theoretical approaches by assessing whether human participants judge sentences like (5) as less acceptable than sentences like (4).

5.3.2   METHODS

The goal of this experiment was to assess whether the local QUD can influence the contextual felicity of *again*, as predicted by the Maximality/Accommodation Clash hypothesis. One complicating issue for this experiment was that, while *who* and *what* questions are typically understood to be exhaustive, *when* questions are not necessarily interpreted exhaustively. For example, Moyer & Degen (2021) assess exhaustive interpretation of questions through a paraphrase task, finding that participants paraphrase questions like "When have you skied?" as "When is *a time* that you have skied?" or "When is *the time* that you have skied?" at much higher rates than "When is *every time* you have skied?", which they take as evidence that *when* has a non-exhaustive bias. In fact, *when* questions are paraphrased with *every* at lower rates than all the other wh-questions in their experiment. This is not necessarily a problem for the MAC, which predicts that no CFCs should arise for answers to questions that are not interpreted maximally. However, given that the goal of this experiment is to assess the ability of the MAC to predict cases where CFCs *do* arise, it was important to create question contexts that would be interpreted exhaustively by participants.

In order to create contexts that would lead to exhaustive interpretations, items were created with

questions that quantified over time-limited or state-limited sports games, including football, basket-ball, soccer and others. Questions could either ask *when* a character did a certain activity or *why* people were reacting a certain way to the character's actions. Crucially, each of the questions contained the adverbial phrase *during the game*, or a similar phrase, to explicitly convey that the questioner was inquiring about event times over that particular period. Responses included sentences that either contained the presupposition trigger *again* (+Trigger) or no presupposition trigger (-Trigger), following the experimental paradigm in Chapter 2. Responses included time periods that were a subset of the total game (the half, the period, the quarter). A sample item with conditions is given in (6).

(6)   a.   Why were fans cheering for Sam during the soccer game? She scored again in the second half. [Why/+Trigger]

   b.   Why were fans cheering for Sam during the soccer game? She scored in the second half. [Why/-Trigger]

   c.   When did Sam score during the soccer game? She scored again in the second half. [When/+Trigger]

   d.   When did Sam score during the soccer game? She scored in the second half. [When/-Trigger]

These items were designed to draw out differing predictions of the MAC, and alternative candidate proposals. Under the hypothesis that presuppositions are anaphoric, and less acceptable in situations where they are not bound by preceding material, we should expect a main effect of +/-trigger, but no interaction between trigger and question type. Under the MAC, however, we would expect an interaction between +/-trigger and question type, where sentences with *again* are worse in the *when* condition than in the *why* condition. If the MAC is *solely* responsible for CFC effects, then we might expect a further prediction, which is that the difference between the +trigger and -trigger ratings disappears under the *why* question type.

50 participants were recruited to take the experiment, which was hosted on Prolific and took about 5 minutes to complete. The experiment included 8 items, 8 fillers, and 3 catch items that contained a gender mismatch between an overtly-gendered subject in one of the responses (e.g. "What did you talk to your aunt about? I talked to him about where he grew up.") On each screen participants were presented with a question and two responses, which were shown next to a slider bar with endpoints marked "Most Acceptable" (right side) and "Least Acceptable" (left side). They were instructed to drag the slider towards either side to rate the sentence, with the slider initially starting in the middle. Underlyingly, the slider ranged from 0-100, with the indicator starting at 50 for each screen. For target questions, the responses included one +trigger variant and one -trigger variant, presented in random order, following the design advocated in Chapter 2. Filler items contained answers to questions that were either embedded under a factive predicate (know, discover, learned), or a non-factive predicate (think, believe, bet). Subjects were paid for their participation. Subjects were excluded if their average rating for ungrammatical catch items were not in the bottom quarter of the slider. Results from from 4/50 participants (8% of the total) were excluded for this reason. The low number of exclusions was taken to indicate that participants were using the slider in the intended manner.

5.3.3   Results

The results for this experiment can be seen in Figure 5.3. The x-axis and colors show experimental conditions; the y-axis shows the mean rating in each condition. Error bars are 95% confidence intervals. For both *when* and *why* questions, the -trigger sentences are rated very highly, above 90/100 for both. For *why* questions, +trigger sentences were rated lower, at about 50. Ratings were even lower for *when* +trigger questions, with the average response around 29 on the scale.

Statistical tests were conducted with a linear mixed-effects regression model with experimental conditions as predictors, random by-participant and by-item slopes and 1/0 sum coding. The tests found a significant effect of +/-Trigger ($p < 0.001$) and a significant interaction between trigger and ques-
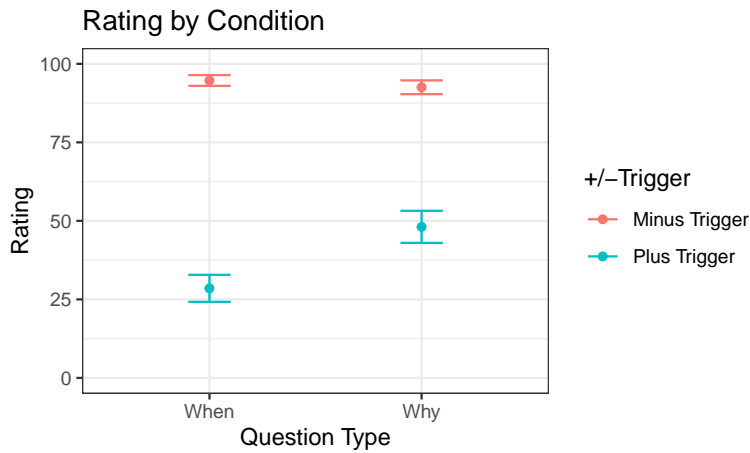
Figure 5.3: Participant ratings of target items in Experiment 2. Continuous sliders were underlyingly 0-100. Error bars are 95% confidence intervals.

tion type ($p < 0.001$).

5.3.4 Discussion

The significant interaction between trigger and question type supports the hypothesis that local information structure, in particular the set of alternatives against which a question response gets exhaustified, can influence contextual felicity. Even though *again* is unsupported in both contexts, participants rate it substantially lower when its exhaustified asserted content conflicts with its presupposition compared to when the two do not conflict, behavior which is predicted under the MAC approach but not under approaches that view contextual felicity as determined by whether or not an anaphoric trigger is bound or unbound.

There is one issue that these data do not resolve: If the conflict between maximality and accommodation is the sole origin of CFCs for presupposition triggers, then we might expect the difference between +trigger and -trigger ratings to vanish in the *why* condition. Yet, participants give higher ratings to -trigger conditions, regardless of question type. Below, I discuss two potential explanations for

this effect.

The first reason for the main effect in the *why* condition suggests that, although the +trigger response is semantically acceptable, it is rated lower than the -trigger conditions for non-structural reasons, including plausibility or likelihood of the situation that it conveys. Remember, an exhaustive interpretation of the *why* questions (just focusing on our example sentence (4)) conveys that Sam scored two goals during a soccer match, but that fans are only cheering her for the second goal. This situation may seem less plausible to participants than a situation where fans cheer her for scoring both goals, or, more generally, for playing well. Thus, it may be the more complicated causal structure and lower plausibility of the *why* answer that drives down participant ratings, not that *again* is infelicitous in context.

The second interpretation is that, although the MAC can explain the significant interaction between trigger and question type, some other semantic mechanism is needed to explain the main effect of +/-trigger. The most natural candidate is that *again* is anaphoric, and incurs an acceptability violation if it occurs without a referent in the local context.

In sum, this experiment suggests that approaches that root contextual felicity in local information structural considerations, such as the MAC, are necessary to explain the distribution of *again*. It leaves open, however, whether such approaches are sufficient to explain all the observed variance. As with the first experiment, the data may be explained equally well by approaches that incorporate both anaphoricity and constraints, and allow both aspects of the trigger to influence its contextual felicity.

5.4   General Discussion

The experiments presented in this chapter provide evidence in favor of an approach to presuppositions that views them as items which impose constraints on the utterance in which they are uttered (Experiment 1), and whose contextual felicity is governed by local information-structural considera-

tions (Experiment 2). At the same time, they leave open the possibility that additive presuppositions are, indeed, anaphoric elements, which must be bound by previous material. If this latter hypothesis is correct, then a question arises: What aspects of contextual felicity are due to information-theoretic considerations such as the MAC, and what aspects are due to presuppositions' anaphoric status? One way to gain traction on this answer may be to look at the difference in ratings between *too* and *again* from the experiments in Chapter 2, or, similarly, between *again* in the *when* condition and *why* condition from Experiment 2 presented here.

Looking back to Chapter 2, in Experiment 1 we find that both *too* and *even* had a +Trigger Contrast and -Supporting Contrast of about 75, which means that, on average, participants rated conditions where presuppositions were not supported about 75/100 points lower than conditions where there either was no trigger, or there was a trigger and it was supported. (We can refer to this contrast the Information-Structure Violating or IS-violating contrast, for the sake of convenience.) Meanwhile non-focus additive items, including *again*, *back* and *still*, had +Trigger and -Supporting Contrasts of around 30 points. (We can refer to this contrast as the non IS-violating contrast.) Interestingly, differences between conditions were similar for Experiment 2, above. (Both experiments collected participant responses on a slider bar that was underlyingly 0-100.) In the *when* condition, which is IS-violating, the contrast between +/-trigger conditions was about 66 points. For the *why* condition, which is *not* IS-violating, the difference was about 44 points. That is, in each case, the magnitude of the non IS-violating contrast is between 1/3 and 2/3 of the IS-violating contrast.

Assuming that the difference in the non IS-violating cases is contributed solely by anaphoric effects, and the difference for the IS-violating contrasts is being contributed both by anaphoric and MAC effects, we can calculate that the magnitude of the CFC due to maximality/accommodation discourse clash and the magnitude of the CFC due to unbound anaphors are about equally as strong. Similarly, looking at the sizes of the effects from the regression model for Experiment 1, we see that the term for the linear relation (plausibly explained by a trigger's anaphoricity) has an estimate of $\sim$ 30, whereas the

term for hierarchical relation has a estimate of ~ 20. Again, this supports the hypothesis that if CFCs are being contributed by two mechanisms, the magnitude of their contributions are roughly equal to each other. (Although these numbers suggest that the contribution from anaphoricity is larger.)

With this in mind, the conclusions from this chapter could be strengthened in the following way: First, satisfaction based approaches and information-structure based approaches, like the MAC, are necessary to explain the observed CFC effects for additive triggers. Second, even if these types of approaches are not fully sufficient to explain all of the observed variance, the data suggest that these considerations contribute between a third and a half of the observed CFC effect. Thus, by looking at the magnitude of effect sizes across experiments, we are able to make testable hypotheses about the underlying causes of contextual felicity, as well as their relative contributions to participant judgements.

6
Conclusion

I want to begin this discussion by asking a simple question: Why would someone presuppose? That is, given that a producer wants to communicate a certain piece of information during discourse, why would they frame that information as a combination of presuppositions plus asserted content, rather than just asserted content? Although this question has not been the main focus of the dissertation, it has lingered in the background, especially during our discussion of additive triggers. We are now in a position to answer it, and answering it is important: Any theory that attempts explain when people

should *not* presuppose, will have to grapple with why they might presuppose in the first place.

Broadly, the answer that I want to endorse is that presuppositions are useful for keeping a discourse on track. More specifically, we can divide the reasons for presupposing into two categories: The first includes additive particles, like *too*, *even*, *again*, *back* and *still*. The reasons why these triggers not only *can* be used but sometimes *must* be used were discussed in section 3.4.1 of Chapter 3 (in the "Obligatoriness Effects" paragraph). They keep things on track by blocking unwanted exhaustivity inferences that threaten to produce a defective conversational state, and thus derail the discourse. The second category includes exclusives like *only* and clefts, verbal predicates, factives, definite articles and possessive pronouns. What I would like to propose here is that these items keep the conversation on track by giving the speaker opportunities to convey important pieces of information without having to open up a new question under discussion, or new sub-topics.[1] Let me illustrate this with a brief example.

Say that a producer is telling a story to a comprehender. The two don't know each other very well. The producer has been hearing strange sounds inside her walls and wants to tell about how she looked throughout her apartment to find their source. When enumerating where she looked the producer could say something like the following: "My apartment has a bathroom and I looked there. My apartment has a back stairwell and I looked there..." However, doing so—packaging every new piece of information as an assertion—would require constantly raising and answering new QUDs. One way to think about this is that because raising the existence of a back stairwell requires expressing the information in a linguistic form with a focus structure, the choice necessarily raises a backgrounded question that will be congruent with the focus. If we were to make all the QUDs explicit, the structure of the previous two sentences would look something like the following:

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[1] Items like *even*, which introduce existential and scalar presuppositions are a blend: I assume that the existential presupposition makes the first contribution (blocking exhaustivity), while the scalar presupposition makes the second contributions (introducing information without raising new QUDs)

(1)   Q1: Where did I look?

        Q2: Does my apartment have a bathroom?

        A: Yes.

        Q3: Did I look in my bathroom?

        A: Yes.

        Q4: Does my apartment have a back stairwell?

        A: Yes

        Q5: Did I look in my back stairwell?

        A: Yes

There are two things to note about this discourse structure: First, it involves raising and answering a lot of QUDs, one per clause. Second, the way that the QUDs are nested into sub-QUDs is not obvious. It's clear that Q3 and Q5 are sub-QUDs of the largest QUD, Q1. However, Q2 and Q4 are not. In contrast, an alternative utterance that uses presuppositions: "I looked in my bathroom, I looked in my back stairwell" is not only more economical in terms of the number of words, but also in terms of the discourse structure associated with it. Here, all of the questions raised are relevant to the over-arching QUD, insofar as their answers are also answers to it. By framing the same content with presuppositions, the pieces of information that would otherwise be given linguistic focus, and then trigger additional QUDs, can be introduced in a way that does not distract from the main question at hand. Discourses created following this strategy might have the following structure:

(2)   Q1: Where did I look?

        A1: I looked in the bathroom, I looked in the back stairwell.

Or, assuming that every utterance has to be the answer to a polar QUD.

(3)   Q1: Where did I look?

Q1.1 Did I look in the bathroom?

A1: Yes

Q1.2: Did I look in the back stairwell?

A1.2: Yes

Presuppositions allow the producer to stay focused on the main QUD, without having to raise sub-QUDs that take away attention from the main point of the story.

Putting this together with some of the theoretical claims advocated in the main body of the dissertation, we have the following picture: Presuppositions are used to keep discourse on track by eliminating either unwanted inferences of exhaustivity or by reducing the number of QUDs that need to be raised. They are accommodated, and give rise to CFCs when they are pitted against other pragmatic pressures, specifically the pressure to interpret utterances maximally, or exhaustively.

Before concluding, I want to further develop this proposal by asking how it could be compatible with two types of CFCs, mentioned at various points in the dissertation, but not discussed in full. The first are CFCs introduced by presupposing low probability information (e.g. "I have to take my giraffe to the vet") and the second is the apparent weak CFCs introduced by exclusive operators. If, as the main thrust of this argument goes, all presuppositions are accommodated, then why do we observe some CFCs in these two cases? The response that will be given here is that while the dissertation developed a view of CFCs as arising from a clash between maximality and accommodation, I don't mean to advocate for this as the *only* pragmatic factor that can influence contextual felicity. Below, I sketch out proposals for these two other types of CFCs by considering different pragmatic influences, including the pressure to spread out information evenly over an utterance (Uniform Information Density (Jaeger & Levy, 2006; Jaeger, 2006)) and the pressure to choose succinct utterances (Grice's maxim of Manner).

The main focus of this dissertation has been how formal semantic and information-structural prop-

erties can affect accommodation. However, I have noted at a number of points, information theoretic factors may also be at play (Lassiter, 2012; Geurts & van der Sandt, 2004). They hypothesis, here, is that contextual felicity can be influenced not just by the *form* of the trigger itself, but the amount of information that the trigger conveys. Lassiter (2012) suggests that this intuition can be formalized in terms of *surprisal*, or the negative log probability of the presupposed information, given its context. The often-given example supporting this hypothesis is the following, where (4-a) is taken to be felicitous and (4-b) is taken not to be less felicitous. The only difference, the argument goes, is that (4-a) presupposes low-surprisal information whereas (4-b) presupposes high-surprisal information. Thus, it must be the case that high-surprisal information cannot be packaged presuppositionally.

(4)   a.   I have a busy weekend coming up. I have to take my dog to the vet. Then, I have to...

        b.   I have a busy weekend coming up. I have to take my giraffe to the vet. Then, I have to...

An alternative that I want to pursue is that, while presupposition and accommodation are certainly involved with this contrast, they may only be playing a secondary role. Sentence (4-b) may sound infelicitous not because it is packaging low surprisal information presuppositionally *per se* but because it introduces lots of information over a small communicative window. Recently, growing experimental evidence supports the idea that speakers expect, and listeners strive for, information to be distributed uniformly across an utterance, a proposal known as the Uniform Information Density hypothesis (Jaeger & Levy, 2006; Jaeger, 2006). While the proposal has traditionally been framed as a producer-side consideration, recent evidence has shown that uniform information density considerations are detectable in comprehension behavior too and that non-uniformity of information can contribute to lower acceptability ratings (Meister et al., 2021). The hypothesis, then, is that (4-b) seems particularly bad because packaging the information that the speaker owns a giraffe presuppositionally creates an information spike, which exceeds the normal channel capacity of linguistic communication. Framing this from an information-structural perspective, we could say that high-surprisal information is typi-

cally associated with its own QUD, as a way to spread it out over a longer message. By packaging the information presuppositionally, the speaker does not give it sufficient space in the message, with its own QUD.

But are we really to think that the difference between (4-a) and (4-b) is due to an information spike on *my giraffe*? Perhaps not, and the reason for this is that the contrast in (4) leaves out two crucial controls, namely, the two variants of the sentence that frame the same information via assertions, given in (5)

(5)   a.   I have a busy weekend coming up. I have a dog. I have to take it to the vet...

        b.   I have a busy weekend coming up. I have a giraffe. I have to take it to the vet...

It seems unlikely that a listener, hearing (5-b), would simply let the conversation continue apace. Rather, they would want to stop and open up a sub-discussion about whether the speaker really owns a giraffe and how they acquired such a pet. Connecting this to a test that was originally proposed as a diagnostic for presupposition, it seems highly likely that (5-b) would produce the response "Hey, wait a minute... I didn't know you had a giraffe!" (Von Fintel, 2004).[2] The take-away for our discussion is that the relevant contrast is not between (4-b) and (4-a), but between (4-b) and (5-b). Future experimental work should attempt to tease apart the relative contributions of presupposition and information density on utterance acceptability. If the hypothesis suggested here is correct then presuppositions may be associated with lower acceptability; but this is not because of their status as presuppositions. Rather, it is because presuppositions are tools for communicating a lot of information in short amount of space. This is useful when information is relatively likely, but it can also lead to information spikes, which in turn can make the utterance less acceptable.

Second, I want to turn to an issue that was raised in Chapter 2. Looking at the results from the two

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[2]It seems that the best way to communicate truly surprising information is to give it lots of space in conversation. For example, "There's something that you should know about me. I have an unusual pet. You're not going to believe it but it's true. I own a giraffe..."

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experiments, it appears that the +*trigger* contrast associated with *only* and clefts is similar in magnitude to the one associated with some of the non-focus additive particles, like *still* and *back*. However, the MAC approach to CFCs predicts that the two exclusive triggers should not be associated with a CFC, as there is no clash between an exhaustive interpretation of their assertions and their presuppositions. Quite the contrary in fact; for *only*, the exhaustified version of its asserted content actually *strengthens* its presupposition. So what is going on?

The answer I want to propose is that sentences with *only* may produce a discourse clash; however, instead of basing the clash in considerations of maximality, I want to suggest that the clash is based in considerations of economy. Remember, in *-supporting* conditions, sentences with clefts and *only* appeared as responses to questions, which facilitated the exhaustification of their *-trigger* counterparts, such as (6-b), below. When this sentence is exhaustified with respect to the question, it communicates *exactly the same information* as (6-a).

(6)   What did Lee do over the weekend?

    a.   She only went to the beach.

    b.   She went to the beach.

Given that these two utterances convey the same message, why does one get rated as less acceptable than the other? One reason may be the general preference for economy, embodied in Grice's maxim of Manner, specifically its injunction to "Be brief (avoid unnecessary prolixity)" (Grice, 1975). As noted briefly in Chapter 2, one argument for this interpretation of participant behavior is that minimally changing the context can lead to different judgements of felicity. If it were known that Lee were someone who loves to do a lot over the weekend and always makes multiple activities planned, then the response in (6-a) can become more felicitous. (In this case, it supports the exhaustive interpretation, which might not be derived, given a listener's strong priors that Lee did multiple activities over the weekend. Exhaustive interpretations have been shown to be subject to prior probabilities (Cremers

et al., 2022).)

The take-away from both these examples is that, the perspective I have been developing in the dissertation may not be limited to maximality. That is, if CFCs could result from a variety of pragmatic pressures coming into conflict with each other and in order to understand the full range of CFC effects, it may be necessary to bring in considerations from multiple areas of pragmatics, such as the two discussed here.

Before concluding, I want to raise a question about crosslinguistic distribution of presupposition triggers. Crosslinguistic issues have received little attention in this dissertation. While I have been framing theoretical discussions in a way that is language agnostic, I have tested the predictions only in English, and expanding this work to other languages is a necessary next step. Given the high-level picture articulated in this conclusion, one important question may be the following: Given that the purpose of presuppositions is to allow speakers to maintain the flow of information during discourse, then why is it that one particular language (or languages in general) have the repertoire of presuppositions that they do? More concretely, why does English, or any other language, give speakers the opportunity to code possession in a presupposition, and not, say, the property of being blue or the property of being heavy?

One answer to this question may involve the usual communicative needs of a discourse. During discourse, there will be certain types of information that will need to be established over and over again. This will likely involve (i) the existence of objects or agents, (ii) the relationship between the speaker and objects or agents, as well as (iii) the attitude that the speaker has towards events, facts, etc. Given that these types of messages are routine for information exchange, but may not necessarily related to the main point of the utterance, they are the types of things that are predicted to be frequently lexicalized in presupposition triggers. This proposal would explain the existence of the definite determiner for (i), possessive pronouns for (ii) and emotive and cognitive factive verbs for (iii). Furthermore, it would predict that these sorts of triggers should be likely across language as well. Testing this predic-

tion with crosslinguistic data will be an important next step.

A

RSA Model Code

```
1
2  // Uniform prior over worlds
3  var worldPrior = function() {
4    categorical ({
5      vs: [ "ABC", "AB", "BC", "AC", "A", "B", "C"]
6    })
7  }
```

```
 8

 9  // Uniform prior over utterances

10  // The 'null' utterance has a dummy argument, 'X'.

11  var utterancePrior = function() {

12    return categorical({

13      vs: [

14        {form: "bare", arg: "ABC"}, {form: "bare", arg: "AB"}, {form: "bare", arg: "AC"},

15        {form: "bare", arg: "BC"}, {form: "bare", arg: "A"}, {form: "bare", arg: "B"},

16        {form: "bare", arg: "C"},

17        {form: "too", arg: "AB"}, {form: "too", arg: "AC"}, {form: "too", arg: "BC"},

18        {form: "too", arg: "A"}, {form: "too", arg: "B"}, {form: "too", arg: "C"},

19        {form: "null", arg:"X"}

20      ]

21    })

22  }

23

24  var usagePrior = function() {

25    return categorical({ vs:["informative", "presuppositional"]})

26  }

27

28  var meaning = function(form, arg, world, usage){

29    if (form == "bare" | (form == "too" & usage == "presuppositional")){

30      return map(function(i){return world.includes(i)}, arg).every(Boolean)

31    } else if (form == "too" & usage == "informative") {

32      return (arg.length < world.length) & (map(function(i){return world.includes(i)}, arg).
         every(Boolean))

33    } else { // form == "null"

34      return true
```

```
35   }
36 }

37

38 /*
39 Literal Listener:
40 */
41 var literalListener = cache(function(utterance, usage){
42   Infer({model: function(){
43     var world = worldPrior();
44     condition(meaning(utterance.form, utterance.arg, world, usage))
45     return world
46   }})
47 })

48

49

50 // set speaker optimality
51 var alpha = 5

52

53 var cost = function(utterance) {
54   // Uncomment following line for different cost setting
55   // return utterance.arg.length
56   return 1
57 }

58

59 /*
60 Speaker
61 */
62 var speaker = cache(function(world, usage){
```

```
63    Infer({model: function(){

64      var utterance = utterancePrior()

65      //print(utterance)

66      factor(alpha * (literalListener(utterance, usage).score(world) - cost(utterance)))

67      return utterance

68    }})

69  })

70

71

72  /*

73  Pragmatic Listener

74  */

75  var pragmaticListener = cache(function(utterance){

76    Infer({model: function(){

77      var world = worldPrior();

78      var usage = usagePrior();

79      observe(speaker(world, usage) , utterance)

80      return {usage: usage, world: world}

81      //return{usage:usage}

82    }})

83  })

84

85  /*

86  Visualize model behavior

87  */

88

89  // Figure 1

90  viz(pragmaticListener({"form":"bare","arg":"A"}))
```

```
91
92   // Figure 2
93   viz(pragmaticListener({"form":"bare","arg":"AB"}))
94
95   // Figure 3
96   viz(pragmaticListener({"form":"too","arg":"A"}))
97
98   // Figure 4
99   viz(pragmaticListener({"form":"too","arg":"AB"}))
100
101  //Figure 5
102  // Comment out the return statement for the pragmatic listener
103  // And uncomment the one that is currently commented out
104  viz(pragmaticListener({"form":"too","arg":"A"}))
```

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