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Presupposition Projection From 'and' vs. 'or': Experimental Data and Theoretical Implications

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Abstract

A core issue in presupposition theory concerns the potential role of linear order for projection. This paper presents experimental evidence that conjunction and disjunction differ precisely in this regard. Presuppositions project asymmetrically from conjunction: a presupposition in the first conjunct projects regardless of any information in the second conjunct that could be used to satisfy the presupposition, while a presupposition in the second conjunct can be 'filtered' by material in the first, so that it doesn't project. We find no such asymmetry for disjunction, where presuppositions in both the first and the second disjunct can be filtered by information in the other disjunct. Theoretically, these results pose a challenge to traditional dynamic accounts, and also strongly argue against accounts that take all projection and filtering to be uniformly determined by linear order across connectives. Instead, they call for an account of projection that can differentiate between conjunction and disjunction by modulating the effects of linear order through proper consideration of the underlying truth conditions of each connective.

1 INTRODUCTION

This paper presents an experimental investigation of differences between conjunction and disjunction with respect to the role of linear order for presupposition projection. Projection from conjunction has been commonly (though not universally) thought to be asymmetric, such that material from the first conjunct can satisfy - and thereby 'filter' - a presupposition in

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the second conjunct, but not the other way around. Whether or not disjunction is asymmetric has been controversial in the literature. We will approach the issue of projection from disjunction through carefully controlled experiments (building on the paradigm employed for conjunctions by Mandelkern *et al.* 2020), which allow us to tease apart various confounding factors and possible mechanisms at play. Our results support the conclusion that disjunction and conjunction genuinely differ in terms of the role that linear order plays for projection and filtering. In particular, disjunction behaves symmetrically, allowing filtering in either direction - without any apparent cost -, whereas conjunction is genuinely asymmetric (the latter result replicates the findings by Mandelkern *et al.*). This pattern has substantial theoretical repercussions, as it poses a challenge to traditional dynamic semantics, and is inconsistent with accounts of projection based on general mechanisms that predict uniform effects of linear order across connectives, most prominently the Local Contexts theory by Schlenker (2009). In contrast, the data can be captured by the trivalent account of George (2008) and the recent *Limited Symmetry* account by Kalomoiros (2022).

The paper is organised as follows: section 2 provides theoretical and empirical background on presupposition projection. First, we review the basic projection properties of relevant connectives, as well as previously considered evidence supporting asymmetry and symmetry respectively for conjunction and disjunction. We then review two approaches to explaining symmetric projection from disjunctions in more detail: the account of Schlenker (2009), framed in his influential Local Contexts theory; and the local-accommodation-based account of Hirsch & Hackl (2014), which also builds on Schlenker's Local Contexts but offers an alternative route to account for apparent right-to-left filtering. Turning to prior experimental work, we then introduce the experimental paradigm of Mandelkern *et al.* (2020) in detail, which successfully tested the projection properties of conjunction, showing it to be strongly asymmetric. In section 3, we adapt the Mandelkern *et al.* design to test disjunction, presenting two experiments: Experiment 1 tests only disjunctions, and provides initial indications that projection from disjunction is symmetric. Experiment 2 tests minimally different conjunctions and disjunctions within a single experiment, and confirms through this more direct comparison that the two connectives indeed differ in terms of the role of linear order for projection. Section 4 looks at the theoretical implications of our results. Section 5 concludes.

2 BACKGROUND

2.1 *Basics of Projection*

Certain lexical items are associated with presuppositions, standardly taken to require that some piece of information be established in the utterance context for their use to be felicitous (modulo global accommodation). For example, the contrast between (1) and (2) shows that (1-b) is felicitous only in a context where it has been established that John has had previous research interests in Tolkien:

(1) a. ***Context:*** We know nothing about John's previous research interests.
b. #John continues having research interests in Tolkien.

(2) a. ***Context:*** We know that John has had research interests in Tolkien in the past
b. ✓John continues having research interests in Tolkien.

A key characteristic of presuppositions is that they can escape from the scope of various embedding operators, like negation, questions and conditionals (the so-called 'family of

sentences' test, Chierchia & McConnell-Ginet 2000):

(3) a. ***Context:*** We know nothing about John's previous research interests.
b. #John does not continue having research interests in Tolkien.
c. #Does John continue having research interests in Tolkien?
d. #If John continues having research interests in Tolkien, then he will be able to help us.

While the assertive component is affected by these embeddings (for instance (3-b) no longer entails that John currently has research interests in Tolkien), the presupposition that John has had previous research interests in Tolkien remains, just like in (1-b): in this case, we say that the presupposition **projects**. Importantly, presuppositions don't always project, even from one and the same embedding. Consider the following contrast in conjunctions:

(4) a. #John continues having research interests in Tolkien and he had prior research interests in Tolkien.
b. John had prior research interests in Tolkien and he continues having research interests in Tolkien.

When the first conjunct introduces the presupposition, (4-b), the sentence as a whole seems felicitous without a supporting (extra-sentential) discourse context, in contrast to (1-b), suggesting that the sentence as a whole does not carry the presupposition introduced by *continue*. However, when the first conjunct contains the presupposition trigger and the second conjunct introduces the information supporting the presupposition, as in (4-a), infelicity ensues.[1] Data like this give rise to the **projection problem**, which asks for an algorithm predicting exactly when a complex sentence will end up inheriting a presupposition of its parts (as in (4-a)), and when it will not (as in (4-b)).

An influential early approach to this problem for conjunction is due to Stalnaker: As a hearer encounters (4-b), they first parse the first conjunct and the following 'and'. At this point, they can already add the information that John had prior research interests in Tolkien to the global context represented by the common ground (construed as the set of worlds compatible with what is mutually assumed by the discourse participants). As they go on to parse the second conjunct, they thus can evaluate its presupposition relative to an updated context already including that information, meaning the presupposition is supported and its use felicitous. Thus, (4-b) comes with no relevant constraints on the contexts - the presupposition in the second conjunct gets 'filtered', in the terminology of Karttunen (1973). In contrast, in (4-a), the first conjunct gets evaluated against the global context, so it is infelicitous unless that context entails that John had prior research interests in Tolkien. The second conjunct, which supports the presupposition, seems to 'come too late' to make a difference.

Note that the context relative to which a presupposition in a complex sentence is evaluated can include information introduced by other parts of the same overall sentence. This is the 'local context' (Karttunen 1974, and much subsequent work). The question of how to precisely and systematically define what counts as the local context in a given

1 The empirical picture may be more nuanced due to other factors at play, but we will not get into this here; see Mandelkern *et al.* (2020), reviewed below, for detailed discussion and experimental data addressing potential issues and confounds.

embedded environment is at the heart of theoretical accounts of presupposition projection, and we'll turn to some detailed proposals shortly. However, taking for granted for the moment an intuitive characterisation of 'local context' as sketched above, the standard generalization about presupposition projection can be stated as follows:

(5) A presupposition must be satisfied in its local context.

In (4-a), the local context is simply the global context, so the constraints the presupposition trigger places on its local context are automatically constraints on the global context as well. However, in (4-b) the local context is the initial global context plus the information contained in the first conjunct.

As the contrast between (4-a) and (4-b) shows, not all 'other parts of the same complex sentence' seem to count equally in terms of contributing to the local context for a given presupposition. Indeed, settling which other parts of complex sentences can do this in various embedding environments is the core challenge in coming up with a precise and empirically adequate definition of the notion of local contexts. The sketch of an account of presupposition projection from conjunction, originally proposed by Stalnaker, crucially depends on the idea that the time-course of information becoming available - reflected in the linear order in written form - has a central role to play: as parts of a sentence get parsed bit by bit, information becomes available to the listener and can be added to the common ground (where appropriate). Thus, the resulting notion of local contexts is inherently an asymmetric one: earlier conjuncts form part of the local context for later conjuncts, but not the other way around. From this perspective, presupposition filtering in conjunction is asymmetric, in that left-to-right filtering of presuppositions is possible, whereas right-to-left filtering is not. A key theoretical question is to what extent this property generalizes to other connectives. The beginnings of an answer emerge when we look at connectives other than conjunction.

Consider the disjunction in (6-b), where the presupposition in the second disjunct is filtered if **the negation of the first disjunct entails the presupposition**. No infelicity arises, even in a context where the presupposition is not previously supported:

(6) a. ***Context:*** We know nothing about John's previous research interests.
b. Either John has never had research interests in Tolkien or he continues having research interests in Tolkien.

Contrary to conjunction however, switching the order of the disjuncts does not seem to affect the felicity of the sentence. Intuitively, (7) is not felt to presuppose that John used to have research interests in Tolkien, either (Hausser 1976; Soames 1982; these sentences are similar to Partee's so-called 'bathroom sentences', and as a result they are often referred to as 'bathroom disjunctions').[2]

(7) Either John continues to have research interests in Tolkien or he never had such interests.

2 The original 'bathroom sentences' referred to disjunctions exhibiting cataphoric anaphora resolution like the following, hence the name:

(i) Either it$_i$'s in a weird place or this house has no bathroom$_i$.

Setting aside possible alternative explanations of this fact (which we'll consider below), seeing this as a case of right-to-left filtering raises the question of why the role of linear order for projection differs across conjunction and disjunction, such that presuppositions in a first conjunct cannot be filtered by information in the second conjunct, while disjunction does allow filtering in a parallel configuration. However, before turning to that important theoretical question, it is very much worthwhile assessing the empirical picture more carefully, as the data are not always clear-cut and there could be confounds contributing to the observed patterns. Furthermore, alternative theoretical perspectives may derive (parts of) this pattern through mechanisms other than filtering. Thus, the main focus of the present paper is empirical, namely to experimentally explore the apparent contrast, and where possible to tease apart the candidate theoretical mechanisms that underlie it. We then turn to a brief assessment of theoretical options in light of our findings at the end.

Before diving into the experimental approach, we first need to introduce more details on how the most relevant previous accounts of presupposition projection handle in different ways (a-)symmetry effects in projection. The first account is the Local Context account of Schlenker (2009), which makes room for both asymmetric and symmetric interpretations across connectives based on processing considerations. The second account is that of Hirsch & Hackl (2014), which builds on the Local Context approach but also brings into play the mechanism of 'local accommodation' (introduced below) to account for apparent cases of symmetric filtering in disjunction.

2.2 *Symmetry and Asymmetry with Disjunction*

2.2.1 *Schlenker (2009)* The general question of what counts as a local context in various embedding environments comes with a key architectural choice point for theories of presupposition projection: given a connective that forms complex sentences, is the specification of the local context for a sub-part of the complex sentence encoded in the lexical entry of the connective? (E.g., effectively specifying 'the presupposition of the second conjunct in a conjunction is evaluated in a context that contains the information of the first conjunct' in the lexical entry of *and*.) Or is there a general mechanism that applies uniformly across sentences with connectives to derive the local contexts of their parts?

Broadly speaking, these options are associated with the labels of semantic vs. pragmatic approaches to projection. The influential early work by Stalnaker mapped out a path along the latter route; but motivated at least in part by certain shortcomings in coverage (e.g., with regards to projection from quantifiers), the context change semantics of Heim (1983) put forward a semantic approach that was more powerful. This, in turn, faced criticism for lacking explanatory adequacy, as the overall system required a stipulative choice between different options for lexical entries for connectives such as *and* (see section 4 for more details). More recently, Philippe Schlenker's work (Schlenker 2009) ventures to preserve the coverage of Heimian dynamic semantics in a pragmatic reconstruction of Local Contexts within a classical semantics, which ensures explanatory adequacy.

Following the standard Stalnakerian tradition, we will be thinking of contexts as sets of possible worlds compatible with what the interlocutors take to be the case for purposes of conversation. At the core of Schlenker's proposal is the idea that in determining what counts as a local context, there's an underlying strategy of efficiency: presuppositions are only evaluated relative to those possible worlds that are not ruled out by the already present parts of the complex sentence.

Schlenker assumes a simple propositional language with a classical bivalent semantics. The notation $C \models p$ means that the proposition expressed by p is True in every world in C. Based on the general idea above, he defines both asymmetric and symmetric variants of local contexts. Here's the definition for the asymmetric local context of an expression E (adapting the formulation of Mandelkern & Romoli 2017, for simplicity; see Schlenker 2009, for full details):

Definition 1 Asymmetric Local Context: The asymmetric local context of a sentence E in a syntactic environment a_b and global context C is the strongest proposition r such that for all sentences D and good finals b', $C \models a(r \textit{ and } D)b' \leftrightarrow a(D)b'$.

The idea is to not bother considering worlds already excluded by a when evaluating E. Thus, the Local Context r represents the smallest subset of C that one can restrict attention to after having sorted out C-worlds based on the information contained in a.

In this light, consider a conjunction (**p and q**): to calculate the local context for q in a global context C, we need to calculate the strongest proposition r such that for all sentences D and good finals b', $C \models$ (**p and** (**r and D**)**b**$'$ $\leftrightarrow$ (**p and** (**D**)**b**$'$. There is only one possible good final in this case, a closing parenthesis, ')'. We have two grounds for excluding worlds from further consideration: those that are not in the context C from the start, and those in which p is false. Thus, ${}^{c}p$ (p considered relative to C, which is just the intersection of the two) is the Local Context for q. ${}^{c}p$ indeed is the strongest proposition r we can consider in line with the definition. To see this, suppose that there is a proposition r that excludes a C-world w' that satisfies p: so p is True in w', but r is False in w'. Suppose also that D is true in w'. In this case, (**p and D**) is True in w', but (**p and** (**r and D**)) is False; but that means that it no longer holds that for all D, $C \models$ (**p and D**) $\leftrightarrow$ (**p and** (**r and D**)). Any such restriction will be too strong, and r cannot be stronger than ${}^{c}p$.

Thus, the local context for a second conjunct is the first conjunct (relativized to C). With regards to presupposition projection and filtering, this means that if the first conjunct, considered in C, entails the presuppositions of the second conjunct, then the presuppositions of the second conjunct will be satisfied in its local context, respecting the constraint in (5). Applying parallel reasoning to the first conjunct, it can easily be shown that its local context is C itself, as failing to consider any C-world could lead to failure of the contextual equivalence in Definition 1. Thus, projection from conjunction is asymmetric: p (relativized to C) matters for evaluating the presuppositions of q, but not the other way around.

Let us now turn to consider what Schlenker's definition of local context yields for disjunctions, starting with the second disjunct. Take (**p or q**): From left-to-right, p gets parsed, and then '*or*'. A disjunction is true iff at least one of the disjuncts is true. Therefore, if p is true, then the entire disjunction is bound to be true, regardless of the second disjunct. The second disjunct only winds up mattering for the overall truth value in C-worlds where p is false. Thus, the local context in which q is evaluated is the set of C-worlds where p is false. This predicts that a presupposition in q will be filtered iff it is entailed by the negation of p as considered in C. This correctly captures the standardly observed projection behavior, (6-b).

Turning to the local context of the initial disjunct, the asymmetric perspective laid out above applies in a manner entirely parallel to the case of an initial conjunct: Failing to consider any C-world in evaluating p risks breaking the equivalence required by Definition 1. Thus, just like in the case of conjunction, disjunction is asymmetric, in that the initial

disjunct *p* is crucial for the calculation of the local context for the second disjunct *q*, but not vice versa. However, as discussed in the previous section, this prediction is challenged by (7).

A theory based on Definition 1 above leaves open a limited number of options to account for this observation: first, it can make the notion of local context more flexible to make room for filtering in this case; second, it can deny that the intuitive acceptability of (7) is due to presupposition filtering by invoking another relevant mechanism. Schlenker chooses the first route (the second will be considered separately below), by defining an additional symmetric version of local contexts, where information that appears to the right of the expression whose local context is being calculated *can* be taken into account:

Definition 2 Symmetric Local Context: The symmetric local context of a sentence *E* in a syntactic environment *a_b* and global context *C* is the strongest proposition *r* such that for all sentences *D*, $C \models a(r \textit{ and } D)b \leftrightarrow a(D)b$.

By virtue of directly including the actual completion *b* here and no longer quantifying over all possible completions *b'*, this *b* is now available when considering the required contextual equivalence: the smallest subset of *C* one can restrict attention to in this case is based on what is contained in *a* and *b*. The symmetric local context of *p* in (**p or q**) – where the parenthesis (corresponds to *a*, **p** corresponds to _ , and **or q**) corresponds to *b* – thus will not include *C*-worlds where *q* holds, as their fate is already determined by the actual completion: just looking at not-*q* worlds in *C* suffices. Thus the symmetric local context of *p* here is made up of *C*-worlds where it is not the case that *q*. This symmetric definition is required if one wants to account for the felicity of (7) in terms of right-to-left filtering.

While the introduction of symmetric local contexts accounts for the felicity of (7), it also immediately raises the question of how the two definitions of local contexts relate to one another. If symmetric local contexts were freely available across the board, one might as well do away with any asymmetric notion, as any constraints that it specifically would impose could always be undone by appealing to the symmetric version. Maintaining that projection is fundamentally rooted in the incremental nature of parsing, Schlenker argues the asymmetric definition of local context to be the default. Correspondingly he posits the symmetric version to be associated with additional processing cost, due to its non-incremental nature that requires postponing presupposition evaluation to when the relevant full complex structure (e.g., a full disjunction) has unfolded.

Having both asymmetric and symmetric variants of local contexts available, though with a cost in the case of the latter, does seem to make room for accounting for the projection data for both conjunction and disjunction. But this approach makes several further key predictions: First, there should be measurable reflexes of the processing costs posited for the use of symmetric local contexts; in other words, (7) should be harder to process than (6-b).

Second the relative availability and any potential processing costs associated with the use of the two types of local contexts should be uniformly present across connectives. In other words, if it's possible to appeal to the symmetric local context for disjunction in (7), then the same should go for conjunction in (4-a), i.e., the latter, too, should allow for right-to-left filtering, invoking the same amount of processing cost as in the parallel disjunctive case. And indeed, various authors have argued for a reconsideration of the empirical status

of sentences like (4-a) in the theoretical literature (cf. Rothschild 2011). However, recent experimental work by Mandelkern *et al.* (2020), discussed in detail below, has argued that right-to-left filtering is categorically unavailable for presuppositions in conjunctions, and this work forms the starting point for our experimental investigation of disjunction. But before turning to the empirical side, we need to consider the second option for dealing with the felicity of (7) in a theory based on asymmetric local contexts.

2.2.2 *Hirsch & Hackl (2014)* Hirsch & Hackl (2014) pursue an alternative response to the challenge posed by bathroom disjunctions, which makes it possible to maintain a genuinely asymmetric filtering mechanism. Rather than explaining the presuppositional acceptability of (7) in terms of right-to-left filtering via symmetric local contexts, they derive it via local accommodation (see below). Assuming strictly incremental parsing that allows only for left-to-right filtering, they take presuppositions in the first disjunct to project in an initial step. However, this interpretation is subsequently discarded due to violation of a general pragmatic constraint, which triggers the application of local accommodation.[3] The relevant pragmatic principle they invoke is the 'Non-Opinionatedness' constraint (NO), which states that for a disjunction 'S_1 or S_2' to be felicitous the speaker must believe that both disjuncts are live options in the discourse. Consider (8):

(8) Either Sue went to the cinema or she went to the department store.

According to NO, this disjunction is infelicitous in contexts where we know that Sue went to the cinema and did not go to the department store (or the other way around). Both disjuncts must be possible outcomes. This follows from the maxim of quantity (Grice 1975): if the speaker knows that only 'Sue went to the cinema' is true, then they should just assert that, similarly for 'Sue went to the department store'. Let us now consider the impact of NO on bathroom disjunctions:

(9) Either John continues having research interests in Tolkien or he has never had research interests in Tolkien before.

As the sentence is incrementally parsed, the presupposition of the first disjunct projects in an initial step, placing the standard requirement on the global context that John used to have research interests in Tolkien. However, maintaining such a global requirement would amount to committing to the second disjunct being false in the context (as it explicitly denies that John used to have research interests), thus violating NO. As soon as this violation is detected, the hearer attempts to remedy this violation, and resorts to an operation of local accommodation, which provides an alternative means for preventing the presupposition from projecting.

A few comments about the notion of accommodation just invoked: Accommodation is a general context-updating mechanism that hearers utilize in order to silently adjust the context when they realize that their common ground and that of their interlocutor diverge (Lewis 1979). It comes in two varieties: global accommodation, where information is added to the global common ground, and local accommodation (Heim 1983). The focus for our purposes is the latter type, which is invoked in cases where a presupposition cannot be added

3 A version of this account can also be found in Schlenker (2008).

to the global context for some reason, e.g., because that would lead to an inconsistency. To illustrate:

(10) There is no King of France. Therefore, the King of France is not bald.

Even though definite descriptions such as *the King of France* typically are associated with an existence presupposition, (10) does not seem to presuppose that there is a king of France, nor does it suffer from presupposition failure of any sort. The absence of the presupposition that 'there is a king of France' cannot be due to global accommodation, given that there is no corresponding global inference. However, local accommodation has the effect of adding the information introduced by the presupposition trigger locally in the scope of the operator, meaning that it will behave just like asserted content in terms of being affected by it. Thus, the presupposition will not end up affecting the global context directly, i.e., not project. While there are different specific implementations of the particular mechanism (e.g. Beaver & Krahmer 2001; Heim 1983), this level of detail suffices for our purposes. By providing an alternative way to avoid projection, local accommodation comes to the rescue in bathroom disjunctions with apparent right-to-left filtering, as it helps to avoid the clash with NO that would arise if the presupposition were interpreted globally; effectively, it results in an interpretation that can be paraphrased as follows:

(11) Either John **used to have research interests in Tolkien** and continues having research interests in Tolkien, or he has never had research interests in Tolkien.

Importantly, local accommodation is commonly taken to be a dispreferred option, and is accordingly assumed to be associated with a processing cost by Hirsch & Hackl (first experimental data supporting this assumption was presented in Chemla & Bott 2013; Romoli & Schwarz 2015). Accordingly, their account of bathroom sentences posits an asymmetry based on disjunct order in bathroom sentences, as only the left-to-right variant involves filtering, whereas the reverse order requires local accommodation to avoid the clash with NO, and as such comes with a cost comparable to that found for local accommodation in other contexts. This, in turn, puts it on par with the proposal by Schlenker with regards to disjunction, which posits additional processing costs for symmetric filtering.[4]

2.3 *Experimental Background: Asymmetry in Conjunction*

To investigate the (a-)symmetry of disjunction experimentally, we build on the methodological approach of Experiment 3 in Mandelkern *et al.* (2020), who investigate (a-)symmetry in conjunction. They use an acceptability task, where participants are presented with a sentence in a context, and have to evaluate how natural the sentence sounds in the given context on a 7-point scale. The point of the Mandelkern *et al.* experiment was to investigate whether or not right-to-left filtering is available in conjunctions (as is arguably predicted by a uniform projection mechanism that is asymmetric by default, but symmetric underlyingly, such as

4 Note that Hirsch & Hackl (2014) report experimental data from binary forced choice preference tasks that indeed suggest that bathroom disjunctions with the trigger in the second disjunct are preferred. We do not review these details here, but see some brief comments in footnote 15.

Schlenker's).[5] The key target sentences are illustrated using the the emotive factive trigger *happy* (which presupposes its complement clause to be true):

(12) a. ***Context:*** Jacob has been traveling a lot, but I'm not sure where he is this week:
b. Ps-First (A conjunction with a presuppositional first conjunct and a second conjunct that entailed the presupposition of the first conjunct):
If Emily is happy that Jacob is in France and he is in Paris, then she will call him soon.
c. Ps-Second (A conjunction with a presuppositional second conjunct, and a first conjunct that entailed the preuspposition of the first conjunct):
If Jacob is in Paris and Emily is happy that he is in France, then she will call him soon.

The central questions were a) whether, and to what extent, the order of conjuncts affects acceptability, and b) whether the potential presuppositional support in the second conjunct helps with presuppositional acceptability at all. Two things to note: **(i)** the conjunctions containing the presupposition trigger are embedded in the antecedent of a conditional and presented in an Explicit Ignorance context. This complexity is necessary: an unembedded version of the PsFirst sentences without any context could be acceptable either because of right-to-left filtering, or because of global accommodation. Embedding the conjunction in the antecedent of a conditional (an environment from which presuppositions standardly project), and placing the conditional in a context like (12) which denies knowledge of Jacob's whereabouts, differentiates between these: A globally accommodated presupposition would project, and thus contribute globally, coming into conflict with the context in (12). In contrast, if the presupposition were filtered (right-to-left) by the following conjunct, it should not have any impact on the global context (no conflict in this case). **(ii)** the presupposition-bearing conjunct asymmetrically entails the presupposition-less conjunct, to avoid a potential confound of redundancy (Rothschild 2011).[6]

5 Experiments 1 & 2 of that work use an inferential task, where participants have to indicate whether the content of the presupposition is contributed at the global level or not. An anonymous reviewer raises concerns about the acceptability task as, at a minimum, not adding anything to the inferential results, as presuppositions in initial conjuncts could give rise to lower acceptability even if a symmetric interpretation in principle is available, due to the other conjunct-ordering choice being preferred. However, we note that the inference task results from Mandelkern et al. gave rise to other issues with surprising asymmetries and apparent projection effects in non-presuppositional controls. Furthermore, the acceptability data reported there show presuppositions in first conjuncts to be as unacceptable as controls without a conjunction that don't allow any filtering option. Finally, our main focus in the present work is on comparing conjunction and disjunction, and since the reviewer's concern would seem to apply equally to both connectives, it will not undermine the interpretation of any differences in (a-)symmetry between them.

6 As we depart from this in our Experiment 1 due to the properties of disjunction, we do not dwell on this feature here. Its motivation stems from the need to control for any potential redundancy-induced infelicities, as 'Mary is happy that Jacob is in France and Jacob is in France' could be infelicitous not because of anything related to projection, but because the second conjunct simply reiterates information that was already added to the common ground via accommodation of the presupposition of the first conjunct. Having the asymmetric entailment avoids this confound and we adopt this move in our conjunction stimuli in Experiment 2.

In order to measure the differential acceptability based on the interpretive options for the sentence in question, target sentences were preceded by two different types of contexts: an explicit ignorance context (EI, Abusch 2010; Simons 2001), which explicitly asserts that the presupposed proposition was not settled in the context, and a support context (S), which explicitly supported the presupposition.

(13) a. **Explicit Ignorance:**
Jacob has been traveling a lot, but I'm not sure where he is this week.
b. **Support:**
Jacob has been traveling a lot, and he's in France this week.

If a global accommodation interpretation were adopted, where the presupposition in the first conjunct of **PsFirst** projects, then the sentence should be unacceptable in the Explicit Ignorance context, because the speaker first explicitly states that they do not know whether *p*, and then goes on to globally presuppose that *p* in the following sentence. The **Support** context, where no such issue arises, serves as a control. In contrast, if an interpretation using right-to-left filtering were adopted, PsFirst should be acceptable in either context, since there would be no global inference in that case. Ps-Second provides a baseline of the acceptability of the overall conjunction in a case where no projection is predicted to take place (due to universally assumed left-to-right filtering; also see non-presuppositional controls serving the same purpose below). If right-to-left and left-to-right filtering were equally available, PsFirst and PsSecond should be on par in terms of acceptability. If the former is more difficult to access, then PsFirst would be expected to be somewhat less acceptable than PsSecond. In order to assess just how acceptable it might be in such a case, a necessary point of comparison is provided by a control condition that lacks the second conjunct:

(14) SimplePs (A simple presuppositional sentence):
If Emily is happy that Jacob is in France, then she will call him soon.

If right-to-left filtering is an option at all, PsFirst should be more acceptable than SimplePs, because of the existence of the right-to-left option. SimplePs also controls for potential (presumably limited and/or costly) availability of local accommodation inside the *if*-clause, as this is the only remedy for making this sentence acceptable in the Explicit Ignorance context (and this should be equally available in PsFirst).

Furthermore, to control for the general acceptability of conjunctions embedded in the antecedent of a conditional, as well as potential conjunct-order effects independent of the key presuppositional properties, non-presuppositional controls corresponding to either conjunct order were included as well:

(15) a. NoPsFirst (A conjunction like the one in PsFirst, but with no presupposition in the first conjunct):
If Emily was hoping that Jacob is in France and he is in Paris, then she will call him soon.
b. NoPsSecond (A conjunction like the one in PsSecond, but with no presupposition in the second conjunct):
If Jacob is in Paris and Emily was hoping that he is in France, then she will call him soon.

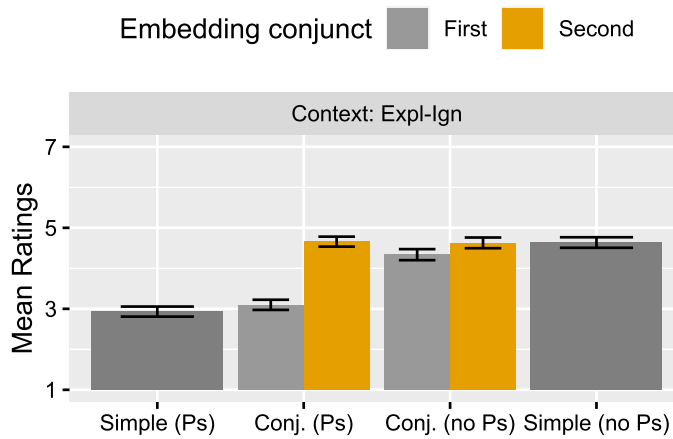

Figure 1 Mean acceptability for each condition in Mandelkern *et al.* (2020)

Across the board, the support context provides a baseline point of comparison for the acceptability of the target sentences in the absence of presupposition-related infelicities.

The results of Mandelkern *et al.* (2020) strongly support an asymmetric view of projection from conjunction. As can be seen in Figure 1, a PsFirst sentence is less acceptable than PsSecond in an EI context. There is no significant order effect in the non-presuppositional control conjunctions, but a strong order effect in the presuppositional case (giving rise to a significant statistical interaction). This suggests that the main source of the unacceptability of PsFirst is the relative unavailability of right-to-left filtering, leading to a global presence of the presupposed information (for full details, see Mandelkern *et al.* 2020).

Note that the use of Explicit Ignorance contexts is directly designed to bring out whatever availability of right-to-left filtering there might be. Since it's the only rescue for making the discourse as a whole felicitous (barring local accommodation, which is independently controlled for), comprehenders would be expected to resort to it, even if it comes at a cost. But note that the acceptability of the PsFirst sentences in EI contexts is just as low as that of the SimplePs sentences, where the only mechanism for rescuing acceptability in an EI context is local accommodation. Thus, the fact that the acceptability of PsFirst sentences parallels that of SimplePs sentences in EI contexts is evidence that right-to-left filtering is not available at all in PsFirst sentences, and that the extent to which they are acceptable is entirely attributable to the availability of local accommodation.

In sum, Mandelkern *et al.* (2020) present a strong case for filtering in conjunction to be asymmetric, and rigidly so, not just as a processing preference or default. In light of the success of this paradigm for testing projection (a-)symmetries in conjunction, we adapt this approach in order to answer the corresponding question for disjunction: Do disjunctions allow right-to-left filtering of presuppositions?

3 EXPERIMENTS ON (A-)SYMMETRY IN DISJUNCTION

3.1 *Experiment 1: Symmetry in Disjunction*

3.1.1 *Design* Our first experiment aimed at testing the (a-)symmetry of projection in disjunction. While our design adapts the general approach of Mandelkern *et al.* (2020), we

also diverged in some important details, largely due to implementation challenges specific to looking at disjunction.[7]

We present examples of our stimuli first, and then comment on the motivations for the various differences. We created 6 items using different triggers (*continue*, *again*, *aware*, *find out*, *happy*, *stop*), with variations in 6 conditions (in the examples below, the presupposition-bearing disjunct is underlined for presentational purposes only).

Our disjunction target sentences in the PsFirst vs. PsSecond conditions are instances of 'bathroom disjunctions', as illustrated in (16)-(17): If any filtering asymmetries are present in disjunction, they should show up as differences in the acceptability between these two conditions (we turn to detailed discussion of predictions of the various accounts in the following section):[8] ,[9]

(16) Either John continues having research interests in Tolkien, or he has never had an interest in Tolkien and the book is unrelated to his research. (PsFirst)

(17) Either John has never had an interest in Tolkien and the the book is unrelated to his research, or he continues having research interests in Tolkien. (PsSecond)

7 Note that experiment 2 manages to mirror the Mandelkern et al. design more closely.

8 Note that our bathroom disjunctions utilize the 'Either. . .or' configuration. As pointed out by an anonymous reviewer, if one were to take 'Either. . .or' to be *exclusive*, then this would result in a disjunction where the local context for both the first and the second disjunct would be the global context; as such, presuppositions would project equally from both disjuncts (see also Mayr & Romoli 2016; see section 4.1 for discussion and arguments against this possibility in light of our data). Consequently, taking (as we do) PsSecond disjunctions in our stimuli to allow (at a minimum, left-to-right) filtering, we are making the following two assumptions: i) 'Either. . .or' disjunctions are semantically inclusive; ii) Whatever implicature-calculation mechanism produces exclusive readings is not relevant for the purposes of presupposition calculation. As pointed out by our editor, Yasu Sudo, as well as by an anonymous reviewer, the second assumption comes with interesting complexities. To the extent that our disjunctions are interpreted exclusively there is a question where this exclusivity comes from. If it comes from an *Exh* operator, then assumption (ii) might be problematic, since Local Contexts predicts projection from both disjuncts in that case, Mayr & Romoli (2016). However, there is another potential source for the exclusivity of our disjunctions: both disjuncts cannot be true simultaneously, since in bathroom disjunctions the non-presuppositional disjunct denies the presupposition of the other disjunct. For example, in (16) below, the truth of *John continues having research interests in Tolkien* makes the sentence *John has never had an interest in Tolkien and the book is unrelated to his research* false; conversely, the truth of *John has never had an interest in Tolkien and the book is unrelated to his research* makes *John continues having research interests in Tolkien* false or undefined (depending on what we take the semantic contribution of presupposition to be). Given this complex picture, we keep to our assumption (ii) for the purposes of the current paper, and defer further exploration of the interaction between presupposition and implicature calculation in disjunctions to future research.

9 Another note on using disjunctions with an initial 'Either. . .or': we chose to focus on this in our experiments as it is the classic form in which bathroom disjunctions have appeared in the projection literature. At the same time, (as pointed out by an anonymous reviewer), this constitutes another difference to the conjunctions from Mandelkern et al. (and the ones in our Experiment 2 below), and gives rise to the question whether parallel results would be obtained in the case where 'either' was omitted. It is clear that without 'either', comprehenders do not know that they are dealing with a disjunction until later when they encounter 'or'. We don't see a strong intuitive case for symmetry in disjunction hinging on the presence of 'either', but have to leave more systematic investigation of this question for future research.

Note that in order to increase overall discourse coherence and felicity, our non-presuppositional disjunct was expanded to include a conjunction (e.g., *and the book is unrelated to his research*), which intuitively helped in situating the possibility presented in that disjunct.[10] These disjunctions were presented in Explicit Ignorance contexts, to measure potential impact of a globally projected interpretation of the presupposition on acceptability, as in the Mandelkern *et al.* design.

(18) ***Context:*** My friend John researches 20th century literature. One day, I stopped by his house and I saw a copy of Tolkien's "The Fellowship of the Ring" lying around.

a. I *don't know if John has ever had research interests in Tolkien's work*, so I thought: (EI)

Again following Mandelkern *et al.*, we included non-presuppositional disjunction variants (No-Ps), (19)-(20) to control for potential order effects on acceptability that are orthogonal to presupposition projection. These controls were also presented in Explicit Ignorance contexts.

(19) Either John has research interests in Tolkien, or he has never had an interest in Tolkien and the book is unrelated to his research. (No-Ps-First)

(20) Either John has never had an interest in Tolkien and the book is unrelated to his research, or he has research interests in Tolkien. (No-Ps-Second)

The design thus employed the two-level factors Order (First vs Second) and PsType (Ps vs No-Ps). Presupposition-related order effects in the Ps conditions, above and beyond any such potential effects in No-Ps control conditions, would be reflected in an interaction between these.

A final set of controls was provided by conditionals with simple (non-coordinated) antecedents containing a presupposition (SimplePs), (21):

(21) If John continues having research interests in Tolkien, then that's why he is reading 'The Fellowship'. (SimplePs)

These were presented both in Explicit Ignorance (EI) contexts, (18), and also in Support (S) contexts, (22), where the presupposition was already globally established. The difference in the acceptability of SimplePs sentences in EI vs S contexts provides a baseline for the

10 On a purely formal level, this may give rise to a worry about filtering: the negation of the non-presuppositional disjunct of the form $q\&r$ is logically weaker than the negation of just q, which is the part that would ensure filtering. However, the actual conjunctions all had the added conjunct constructed so as to basically render it as a consequence of the first conjunct (e.g., the book being unrelated to John's research is something that would follow from him never having had a research interest in Tolkien), making it extremely unlikely that one would consider the problematic case where q was true but r was false. Therefore, we think based on contextual entailment, which is usually taken to be what's relevant for presupposition evaluation, filtering is available as intended here. Empirical support for this take comes from the finding below that the presuppositional disjunctions are on par with their non-presuppositional controls. Furthermore, Experiment 2 below does not utilize this configuration, but renders results that are parallel in the relevant ways.

availability of local accommodation, since SimplePs is available in EI contexts only to the extent that local accmmodation is available (again as in Mandelkern *et al.*).

(22) ***Context:*** My friend John researches 20th century literature. One day, I stopped by his house and I saw a copy of Tolkien's "The Fellowship of the Ring" lying around.

a. I *know that John has been researching Tolkien* recently, so I thought:… (S)

While the core of our design parallels that of Mandelkern *et al.* (2020), there are several substantial differences in both item construction and overall setup:

(23) a. No embedding in *if*-clause
b. Fewer items (but more participants)
c. No asymmetric entailment in the support-clause
d. No Support contexts (except for SimplePs control)
e. No fillers

Starting with (a), our target disjunctions in the (No-)PsFirst/Second conditions were not embedded in the antecedent of a conditional: we found that sentences following that pattern both were difficult to construct and quickly get very complex and hard to evaluate (although see Experiment 2 below, where we managed to create more digestible stimuli of this type). But conceptually, the motivation for embedding conjunctions in conditionals also doesn't extend to disjunctions, thus making this complication unnecessary: as noted above, for an unembedded conjunction, you cannot easily differentiate whether a presupposition introduced in the first conjunct might be acceptable because it can be globally accommodated, or because it has been filtered; the information will enter the updated context either way. The same does not hold for disjunctions, due to their different truth conditions: regardless of what mechanism one holds responsible for preventing projection, presuppositions in bathroom disjunctions do NOT become part of the updated context (e.g., the sentence in (6-b) leaves open whether or not John has had prior research interests in Tolkien).

Turning to (b), even for the simplified stimuli without embedding in a conditional, bathroom disjunctions are a very particular type of sentence, and it is not easy to construct sentences and contexts that are readily comprehensible and reasonably acceptable. In addition, sentences of this sort can run the risk of participants becoming sensitive to their particular nature and adopting task-specific strategies. We therefore opted here to use a much smaller set of stimuli, and to make up for the corresponding loss in statistical power by having a greater number of participants instead. (Note that the approach in Experiment 2 in a sense balances out the relevant trade-offs here, as a more standard size set of stimuli is used.)

The third difference from Mandelkern *et al.* (2020) in our design, (c), concerns the relationship between the other disjunct and the presuppositional one: in the conjunction stimuli used by Mandelkern *et al.*, the other conjunct asymmetrically entailed the presupposition of the presuppositional conjunct (to avoid potential confounds of redundancy; see footnote 5). Neither the problem (of redundancy) nor the solution transfer directly to disjunctions, and therefore, the negation of the other disjuncts in our stimuli is equivalent to the presupposition in the presuppositional disjunct (rather than asymmetrically entailing it).

The fourth difference, (d), is that we only used the SUPPORT context with SIMPLEPs, as it is infelicitous to assert a bathroom disjunction in a context that explicitly supports the presupposition:

(24) (Uttered in a context where we know that the house has a bathroom)
Either the bathroom is in a weird place or this house has no bathroom!

This infelicity is attributable to a general constraint in disjunctions, captured, e.g., by the Non-Opinionatedness constraint of (Hirsch & Hackl 2014, discussed above): The disjunct that expresses the non-existence of the bathroom cannot be a live option if the context already establishes that there is a bathroom. Not too much is lost by this move, however, as the sole role of the SUPPORT context is to provide a baseline for what happens when no clashes due to presupposition projection arise: in the SUPPORT context, this is achieved by having the presupposition be entailed by the global context. But the NOPSFIRST and NOPSSECOND effectively serve the same general purpose, as they do not introduce any presupposition in the disjunction at all, and as a consequence, these items themselves also do not gain anything from being presented in a Support context.

The final difference, (e), between our design and that of Mandelkern *et al.* (2020) is that we did not include filler items. This decision was closely related to our choice to only present 6 items to participants, each in a different condition. One of the main reasons to include fillers generally is to distract from experimental items. As we only presented a very small number of items, we decided that they were not necessary, and instead prioritized keeping the length of the experiment as a whole minimal.

3.1.2 *Predictions* Let us recap the main theoretically salient options of patterns for projection from disjunction, specifically in bathroom sentences: One possibility is that projection from disjunction is entirely symmetric (in contrast to conjunction), without any costs associated for right-to-left filtering. Alternatively, we reviewed two accounts that do posit some level of asymmetry at one level or another:

(25) **Schlenker (2009):** Symmetric filtering is possible in a 'bathroom disjunction', but associated with a processing cost, due to a processing preference for asymmetric projection.

(26) **Hirsch & Hackl (2014):** Presuppositions in the first disjunct of a 'bathroom disjunction' *do* project (maintaining that projection from disjunction is strictly asymmetric), but subsequently get locally accommodated to avoid a clash with NO; local accommodation is assumed to come with its own processing cost (based on prior independent evidence).

Both accounts thus posit an asymmetry of one sort or another between PSFIRST and PSSECOND, which is associated with a processing cost that, on standard assumptions, should be reflected in a decrease in ratings in an acceptability judgment task. Note that both Schlenker's symmetric filtering cost, and the Hirsch & Hackl local accommodation cost are presupposition-specific and therefore should play no role in the NOPSFIRST/SECOND conditions. Thus, both accounts predict that PSFIRST and PSSECOND should differ in acceptability to a greater extent than NOPSFIRST and

NoPsSecond. In other words, both views predict an interaction between Order and PsType.[11]

There is furthermore a prediction specific to the local accommodation view. The PsFirst and SimplePs sentences in EI contexts are parallel on this approach, in that they are both acceptable precisely to the extent that local accommodation is available. So, at least on this dimension, they should be equally acceptable relative to controls (there could, of course, be other differences in acceptability reflecting, e.g., their difference in complexity). At the same time, the PsSecond and SimplePs sentences in Support contexts are parallel in that preceding material (either in the local context, in the case of PsSecond, or in the global context, in the case of SimplePs sentences in Support contexts) ensures that the presupposition is entailed in the respective local contexts. So both the SimplePs sentences in Support contexts and the PsSecond sentences should be fully acceptable with regards to evaluating the presupposition. Taking these two parallels together, this means that the local accommodation account predicts that there should be no interaction between the conditions posited to involve local accommodation (EI-SimplePs and PsFirst), and the conditions where the presupposition is supported in its local context (S-SimplePs and PsSecond).

3.1.3 *Participants & Procedure* 251 participants were recruited via Prolific, and after seeing informed consent, each was shown 6 items, one per trigger and condition, in a Latin square design. The SimplePs controls were shown first to establish baselines (either in an EI or S context, in random order), followed by the disjunction conditions (in random order). Participants indicated on a 7-point scale how natural the sentence sounds in the given context. A demonstration version as well as the underlying code and csv-files required

11 Note that a non-trivial difference between the account of Schlenker (2009) and Hirsch & Hackl (2014) is what they predict in the case of disjunctions where one of the disjuncts **strictly entails** the presuppositions of the other disjunct, as in (i) below:

(i) ***Context:*** We find a full pack of Marlboro cigarettes in the dustbin of Mary's office. We have no idea if she has ever smoked, so we think:

a. Either Mary stopped smoking or she never used to smoke Marlboros.
b. Either Mary never used to smoke Marlboros or she stopped smoking.

A theory like the symmetric Local Contexts of Schlenker (2009) predicts filtering in both cases in (i), as the negation of 'Mary never used to smoke Marlboros' entails that 'Mary used to smoke'. However, on the Local Accommodation approach of Hirsch & Hackl (2014), (i-a) and (i-b) are not on par. For (i-b), Hirsch & Hackl predict filtering (as in this case the asymmetric version of Local Contexts predicts filtering). But, for (i-a), their prediction is one of projection, without repair from Local Accommodation. The reason is that adding the presupposition that Mary used to smoke to the context does not commit the comprehender to the assumption that the second disjunct must be false: it's perfectly possible for someone to have been a smoker without ever having smoked Marlboros. So, the NO constraint is not violated, and Local Accommodation is not triggered. Thus, in an Explicit Ignorance context, (i-a) should lead to infelicity, in a way that (i-b) doesn't. Our own design aims to probe the role of local accommodation by including the SimplePs conditions. However, future experimental forays into these issues should look into examples like those in (i) in an effort to find convergent evidence with our results. We thank an anonymous reviewer for helpful comments on this, as well as Benjamin Spector, who discussed this issue with us.

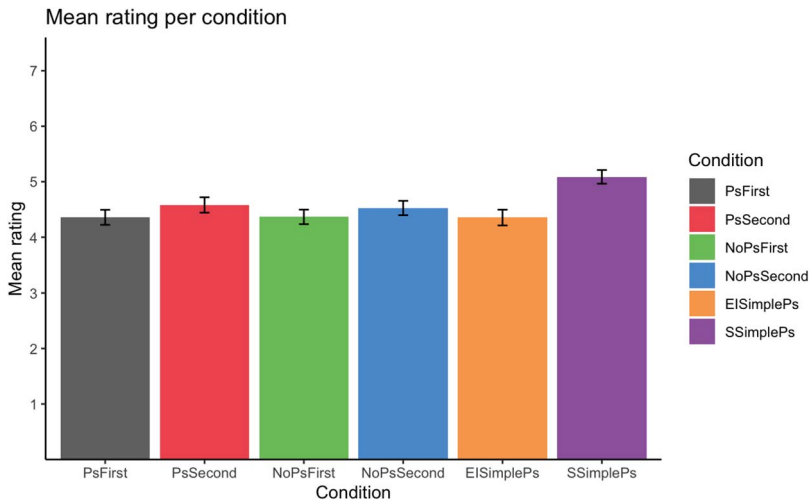

Figure 2 Mean acceptability by condition in Experiment 1. Error bars represent standard error.

to recreate the experiment are accessible at https://farm.pcibex.net/r/bMqAbG/.[12] The full stimuli, together with the R scripts required for the statistical analysis of the following section, are accessible at the OSF page for this paper, at https://osf.io/3p68r/

3.1.4 *Results* The overall descriptive pattern of the results is simple, as illustrated in Fig. 2: The S-SimplePs condition appears to have higher ratings, whereas all the others seem to be roughly similar.

We conducted statistical analyses from various perspectives to assess the theoretically relevant hypotheses. First, we fit a mixed effect ordinal regression model with a 2×2 interaction for the disjunction conditions. The factors PsType and Order were sum-coded, and the model included random intercepts for both participants and items as well as a random effect slope for PsType by items.[13] There were no significant effects, as detailed in Table 1.

While the lack of effects in the interaction analysis is already telling, we also carried out planned comparisons to test for potential effects of Order separately for the Ps and NoPs conditions, using the *emmeans* package with Bonferroni-corrected p-values. Order had no significant effect on ratings for either Ps ($\beta = -0.133, z = -0.808, p = 0.8382$) or NoPs ($\beta = -0.243, z = -1.507, p = 0.2635$). In sum, we find no support for the Order × PsType

12 Click on 'Click here to edit a copy in the PCIbex Farm.' in the top bar to access code and stimuli directly (no account or sign-in needed) on the PCIbex Farm (Schwarz & Zehr 2021).

13 Since participants only saw two items per factor level, by-participant random effect slopes could not sensibly be included. The maximal model included a by-item random effect slope for the interaction of Order and PsType; but this did not significantly improved model fit, as confirmed by a likelihood ratio test via model comparison ($p = 0.7278$), and hence was left out of the final model. Including a by-item random slope for Order did not significantly improve model fit either ($p = 0.8713$), and was again left out of the final model. Including the random slope for PsType significantly improved overall model-fit ($p < .001$), and was included in the final model.

Table 1 PsType × Order Mixed-effects model summary

	Coeff.	SE	*z*	*p*
PsType	-0.02878	0.34660	-0.083	0.934
Order	0.18847	0.11562	1.630	0.103
PsType × Order	0.10994	0.23088	0.476	0.634

interaction predicted by asymmetric accounts, nor any effects of order for either the Ps or No-Ps conditions.

The frequentist statistical analyses above fail to reject the null hypothesis, but it would be theoretically relevant, and even more informative, to be able to directly support the absence of an interaction for disjunction in particular. To that end, we also calculated Bayes factor BF_{10} for a parallel Bayesian model with the interaction included, and one without the interaction. These models were fitted using the `brms` package in R (Bürkner 2017, 2018). Since the overall experimental setup is at least reasonably parallel to that of the prior experiment on conjunction by Mandelkern *et al.* (2020), we use the parameter expectations calculated by a Bayesian ordinal mixed-effects model for that experiment as empirical priors. To calculate Bayes factor, we followed Nicenboim *et al.* (2022) and used bridge-sampling with the function *bayes_factor* provided in `brms`. We computed the Bayes factor in favor of the model with the interaction, and found a value of BF_{10} =.0009, indicating that the model without the interaction should actually be preferred. Based on the Bayes factor scale from Jeffreys (1939), this constitutes extreme evidence in favor of the simpler model, thus supporting the null hypothesis with regards to the interaction term. In sum, in contrast to the findings by Mandelkern *et al.* (2020) for conjunction which supported the relevant interaction, our data provide evidence that no such interaction is present for disjunction.

In a second perspective on our data, we fit an ordinal mixed effects regression model with a 2×2 interaction for the four Ps conditions to test for the interaction that is theoretically relevant for the local accommodation-based account of Hirsch & Hackl, as well as for the effectiveness of our context manipulation in the conditional control condition. For this purpose, a new factor SupType (Support Type) was set up, with the EI-SimplePs and PsFirst conditions coded as NoPriorSupport, and S-SimplePs and Ps-Second as PriorSupport (since the latter two both involve support of the presupposition in the preceding context, assuming standard left-to-right filtering). The second factor was CompType (Complexity Type), with the levels Cond and Disj. Both factors were sum-coded, and an ordinal model including random intercepts for both participants and items as well as a by-item randon slope for CompType was fitted in R.[14] As shown in Table 2, there was a significant interaction, as well as a significant effect of SupType (dominated by the interaction, as detailed below).

To further investigate the nature of the interaction, we conducted planned comparisons to separately test for effects of SupType at the Cond and Disj levels of the CompType factor,

14 Again, since participants only saw two items per factor level, by-participant random effect slopes could not sensibly be included. Based on model comparisons using likelihood-ratio tests, including a random effect slope for the interaction did not significantly improve model fit ($p = 0.6585$). Neither did including a random slope for SupType ($p = 0.7516$).

Table 2 SupType × CompType Mixed-effects model summary

	Coeff.	SE	z	p
CompType	0.2244	0.3385	0.663	0.507419
SupType	-0.3940	0.1150	-3.427	<.001
CompType * SupType	-0.4917	0.2296	-2.141	<0.05

using the *emmeans* package with Bonferroni-corrected p-values. SupType had a significant effect on ratings for Cond ($\beta = 0.640$, $z = 3.905$, $p < .001$), but - in line with the same comparison in the PsType×Order analysis above - not for Disj ($\beta = 0.148$, $z = 0.919$, $p = 0.7158$). The main effect of SupType thus seems to be entirely driven by the Cond condition.

In sum, while local-accommodation based asymmetry accounts endorse the null hypothesis of there being no interaction between SupType and CompType - as both EI-SimplePs and PsFirst face the same predicament of no preceding support, leaving local accommodation as the only remedy to reconcile the target sentence with the explicit ignorance context - our statistical analysis allows us to refute that null hypothesis, in that we do find a significant interaction. Furthermore, the significant effect of SupType provides crucial evidence for the validity, sensitivity, and power of our experiment, in that we are able to find effects of missing presuppositional support in the linguistic context for an embedded occurrence of a presupposition trigger in SimplePs. In that light, the absence of any effects of Order in the presuppositional disjunctions indeed suggests that both left-to-right and right-to-left filtering seem to be on par in disjunctions.

3.1.5 *Discussion* Both the Schlenker (2009) and the Hirsch & Hackl (2014) views posit that something extra, beyond the default and easily available projection mechanism, is at play in PsFirst disjunctions (costly right-to-left filtering for the former, local accommodation for the latter). Thus, the lack of an interaction between PsType and Order (which contrasts with the findings in Mandelkern *et al.* for conjunction using the same paradigm) - and any effects of order in the Ps conditions - is unexpected under such asymmetric approaches. Moreover, the additional prediction of the local accommodation account, i.e. that SupType should have parallel effects in the SimplePs and the Disj conditions, meaning there should be no interaction between SupType and CompType, is directly refuted by our results, as we do find such an interaction.

The picture that emerges from our data is that PsFirst and PsSecond do not significantly differ in acceptability, and furthermore exhibit no presupposition-based decreases in acceptability, given that they are not found to differ from the NoPs controls. In this respect, our results stand in stark contrast to the findings for conjunction in Mandelkern *et al.* (2020), where their conjunctive PsFirst was found to be significantly less acceptable than the PsSecond counterpart and NoPs controls.[15] Given the parallel paradigms in

15 While we are not able to go into any detailed comparison with other related prior experimental work using different tasks, it's worth noting that our findings align rather well with those for disjunction in Chemla & Schlenker (2012). At the same time, they do contrast somewhat with those in the experiments reported by Hirsch & Hackl (2014), as their task requiring a forced choice between the

our experiment and that of Mandelkern *et al.*, this provides initial evidence that conjunction and disjunction indeed are different in terms of their projection behavior. The apparent symmetry between PsFirst and PsSecond for disjunction in our data suggests that any mechanism that is postulated to account for presupposition projection must be sensitive to the differences between a first conjunct and a first disjunct, and not treat them on par.

We will turn to more detailed considerations of the theoretical implications of these findings in section 4. However, there are a number of potential criticisms or concerns about the specifics of Experiment 1 that warrant further empirical evidence to solidify the basis for theoretical discussion. First, as laid out in detail above, there are numerous changes from the Mandelkern *et al.* paradigm in our experiment, which one could use to question how comparable the results are. Second, as an anonymous reviewer points out, Experiment 1 lacks low-acceptability fillers or controls that could be used to ensure that participants are not just being very agreeable (whether out of general charity or because of the relative complexity of our sentences, or any other reason); this could be masking a levelling-out effect of differences that might otherwise be detected (Though we note that at least to some extent, the contrast in SimplePs and the significant interaction in the analysis testing for local accommodation in PsFirst speaks against this possibility). Finally, and expanding on the first point, it would be desirable to have a direct comparison between conjunction and disjuncction with a design and stimuli that are maximally similar. Experiment 2 aims to provide just that.

3.2 *Experiment 2: A direct comparison of 'and' vs. 'or'*

3.2.1 *Design* Experiment 2 combines the Mandelkern *et al.* design for conjunction and our own design for disjunction into a single experiment. We created a total of 24 items using 3 triggers (*continue*, *again*, *stop*), with 8 items per trigger.[16] Given that we wanted to explicitly contrast disjunctions with conjunctions, and that conjunctions require embedding to differentiate global accommodation and right-to-left filtering (see initial discussion of Mandelkern *et al.* design above), we decided on a uniform design embedding both conjunctions and disjunctions in the antecedent of a conditional, and ventured to come up with carefully constructed stimuli that are reasonably natural and understandable despite

two disjunct orders in bathroom sentences does indicate some level of asymmetry. However, this need not directly contradict our interpretation of the findings presented here. First, their asymmetry could directly result from the particular task, which requires explicit comparison between the two variants. Secondly, our findings are not in principle incompatible with some amount of processing advantages of left-to-right processing, which our task may not pick up on.

16 The main reason for excluding factive triggers in this experiment was that with conjunctions and disjunction embedded in the antecedent of a conditional, factives create potentially problematic ambiguities:

(i) If Mary either found out that John is cheating on her or John is not cheating on her, then . . .

The second disjunct, *John is not cheating on her*, could be interpreted as scoping under *find out*, undermining the functioning of our design. We thus limited ourselves to the three mentioned triggers, which do not suffer from this issue.

the complexity of embedding the connectives. Thus, our critical items were PsFirst/Second conjunctions and disjunctions presented in EI contexts, illustrated below.[17]

(27) Conj

a. ***Context:*** I used to raise Apis bees: these sting a lot, and also die when they sting you, which reduces honey production. But a recently discovered genetic mutation can produce bees which have no sting. Cynthia is interested in honey production, but she has reservations about bees dying. It thus surprised me when I discovered that she had not heard about the genetically modified bees. I don't know if she has ever raised any bees, so I thought:

b. If Cynthia has stopped raising bees, and used to raise Apis bees, then it makes sense that she hasn't heard about this. (PsFirst)

c. If Cynthia used to raise Apis bees, and has stopped raising bees,then it makes sense that she hasn't heard about this. (PsSecond)

(28) Disj

a. ***Context:*** I used to raise Apis bees: these sting a lot, and die when they sting you, which reduces honey production. But a recently discovered genetic mutation can produce bees which have no sting. Cynthia is interested in honey production, but she has reservations about bees dying. It thus surprised me when I discovered that she had not heard about the genetically modified bees. I don't know if she has ever raised any bees, so I thought:

b. If Cynthia either has stopped raising bees or has never raised any bees, then it makes sense that she hasn't heard about this. (PsFirst)

17 As pointed out to us by Ashwini Deo and David Beaver (p.c.), our conjunction stimuli included two items where the non-presuppositional conjunct involved the lexical item "only". An example is presented below:

(i) a. If Kat has stopped doing spelunking and has only done spelunking in easy caves, then this trip is not for her. (PsFirst)

b. If Kat has only done spelunking in easy caves and has stopped doing spelunking, then this trip is not for her. (PsSecond)

Here, the conjunct containing "stop" is the presuppositional one, whereas the other conjunct contains information that entails the presupposition of the presuppositional conjunct (in this case that "Kat used to do spelunking"). The issue here is that if we take "only" to presuppose the truth of its prejacent, then these conjunctions involve two presuppositional conjuncts. In that case, what we are calling Ps-Second in fact is akin to a PsFirst type of stimulus. This is potentially problematic as the PsFirst vs PsSecond contrast we are after is potentially obliterated in these items. Two points are in order here: 1) the potentially problematic items involved only *two* out of *twenty four* conjunction stimuli. So, there should be enough stimuli to counterbalance any problems that these two stimuli might be creating. 2) This sense is confirmed by the fact that when we remove the problematic conjunction items (removing also the corresponding items for disjunction) the statistical picture remains unchanged: the same three-way interaction between Connective, Order and PsType that we report in section 3.2.4 comes out equally strongly (see the stats script on the *OSF* page for the paper). Thus, we do not believe that the presence of "only" in the two conjunction items represents significant cause for concern.

c. If Cynthia either has never raised any bees or has stopped raising bees, then it makes sense that she hasn't heard about this. (PsSecond)

As before, for each presuppositional sentence, we include a non-presuppositional version (Conj/Disj-NoPsFirst/Second) as well, to control for any potential order-related effects unrelated to presupposition. The crucial presupposition-based effects can then be isolated via decreases in acceptability of PsFirst relative to PsSecond that exceed any (potential) parallel decreases for the NoPs variants.

(29) Conj

a. If Cynthia frowns upon raising bees and used to raise Apis bees, then it makes sense that she hasn't heard about this. (NoPsFirst)
b. If Cynthia used to raise Apis bees and frowns upon raising bees, then it makes sense that she hasn't heard about this. (NoPsSecond)

(30) Disj

a. If Cynthia either frowns upon raising bees or has never raised any bees, then it makes sense that she hasn't heard about this. (NoPsFirst)
b. If Cynthia either has never raised any bees or frowns upon raising bees, then it makes sense that she hasn't heard about this. (NoPsSecond)

As these examples show, the conjunction stimuli are identical to the disjunction stimuli up to choice of connective and the non-presuppositional conjunct (apart from the presence of 'Either'; see footnote 9): the latter still asymetrically entails the presuppositions of the presuppositional conjunct in conjunctions, but not in disjunctions. Moreover, minor variations in the contexts for conjunctions vs disjunction were sometimes necessary to accommodate the impact of their different meanings. Note also that the disjunctions do not include the extra conjunct they carried in Experiment 1.

Parallel to Experiment 1, we used simple (i.e., not coordinated) sentences with the presupposition trigger embedded in the antecedent of conditionals, in Support (S) and Explicit Ignorance (EI) contexts, as controls to establish baselines for local accommodation and presuppositional support:

(31) a. ***EI Context:*** I used to raise Apis bees: these sting a lot, and die when they sting you, which reduces honey production. But a recently discovered genetic mutation can produce bees which have no sting. Cynthia is interested in honey production, so it surprised me when I discovered that she had not heard about the genetically modified bees. I don't know if she has ever raised any bees, so I thought:

b. ***S Context:*** I used to raise Apis bees: these sting a lot, and die when they sting you, which reduces honey production. But a recently discovered genetic mutation can produce bees which have no sting. Cynthia is interested in honey production, so it surprised me when I discovered that she had not heard about the genetically modified bees. I know that she used to raise bees, but I don't know if she still does. So, I thought:

c. If Cynthia has stopped raising bees, then it makes sense that she hasn't heard about this. (SimplePs)

Additionally, 24 fillers of two types were included, illustrated in (32)-(33) (12 of each type).

(32) a. ***Context:*** The Louvre has a new exhibition of medieval art. Melanie is an art critic and is in Paris to review the new exhibition. So I thought:
b. If Melanie isn't in Paris then something must have happened on her trip. (BadCond)

(33) a. ***Context:*** My friend Saul is a philosopher and has been working on a new theory for the past year. However, he has been very secretive about it. Yesterday he told me that he was almost done with the work, but given how secretive he has been I'm not sure whether he will publish it. So, I thought:
b. If Saul publishes his new theory, then that will make the other philosophers very excited. (GoodCond)

The Good/BadCond fillers were designed to implement the following manipulation (present also in the fillers of Mandelkern *et al.*): generally, for a conditional to be felicitous, the antecedent must not be excluded as a possibility in the context. In GoodCond fillers, this requirement was fulfilled, while in BadCond fillers, it was not, allowing for an independent assessment of sensitivity to pragmatic infelicity of broadly comparable severity in the task. Introducing another source of infelicity in the items that are presented also served to distract participants from our critical manipulation.

3.2.2 *Predictions* Accounts that take projection to display an asymmetry uniformly across connectives predict that PsFirst should be worse than PsSecond for both disjunctions and conjunctions, whereas no such difference should be found for the NoPs conditions. Thus, for both connectives the Order the conjuncts appear in should have parallel effects on acceptability based on the PsType of a sentence. Conversely, if filtering is asymmetric in conjunctions but symmetric in disjunctions, then we predict that PsFirst should be worse than PsSecond for conjunctions. For disjunction, this predicts that PsFirst should be equally acceptable to PsSecond. In both cases, these patterns should hold relative to any potential independent order-based differences in the NoPs conditions. In other words the effects of Order on acceptability should vary based on the PsType of a sentence for conjunctions, but not for disjunctions, so a three-way interaction is predicted between Connective, Order and PsType status, driven by a 2×2 Order-PsType-interaction for conjunction, parallel to Mandelkern *et al.*'s, that is not present for disjunction.

3.2.3 *Participants & Procedure* The Connective and PsType factors were between-subjects, following the approach in Mandelkern *et al.* Accordingly, the items were divided into 4 lists (2 choices for Connective and 2 choices for Ps status), and each participant saw items for either conjunction or disjunction, and consistently with one kind of PsType. Thus one of the conjunction lists contained all the PsFirst/Second conjunctions together with the EI-SimplePs items, plus all the fillers. The other conjunction list contained all the NoPsFirst/Second conjunctions together with the S-SimplePs items, plus all the fillers. Similarly for the two disjunction lists. Each list was counterbalanced with a Latin square design. 203 native English speakers were recruited from the University of Pennsylvania subject pool, and after seeing informed consent, each participant was shown one of the aforementioned four lists of items. The items were presented in random order, with every participant seeing 48 items (24 critical and 24 fillers). Participants were asked to indicate on

a 9-point scale how natural each sentence sounded in the given context.[18] A demonstration version as well as the underlying code and csv-files required to recreate the experiment are accessible at https://farm.pcibex.net/r/bMqAbG/. Again, the full stimuli, together with the R scripts required for the statistical analysis of the following section, are accessible at the OSF page for this paper, at https://osf.io/3p68r/

3.2.4 *Results* Figure 3 shows the pattern of results for conjunction and disjunction. Starting from the the SIMPLE-Ps conditions we see differences between S-SIMPLEPs and EI-SIMPLEPs in both the conjunction and the disjunction data. We fit ordinal mixed-effects models to subsets of the data containing only the SIMPLEPs conditions, predicting Rating from condition (levels: S-SIMPLEPs and EI-SIMPLEPs) for each connective. The models included by-participant and by-item random intercepts, as well as a by-item random slope for condition.[19] Both the models for conjunction and for disjunction revealed a statistically significant difference between S-SIMPLEPs and EI-SIMPLEPs (CONJ: $\beta = 2.95$, $SE = 0.35$, $z = 8.33$, $p < 0.001$, DISJ: $\beta = 1.72$, $SE = 0.34$, $z = 5.06$, $p < 0.001$). This confirms that our design can indeed detect acceptability differences due to presupposition projection.[20]

We move on to the crucial three-way interaction between CONNECTIVE, ORDER, and PSTYPE in the conditions with connectives. A visual inspection of the plots suggests a clear difference in acceptability between PSFIRST and PSSECOND for conjunction, but not for disjunction. Importantly, in both conjunction and disjunction the NOPS conditions are parallel to one another, suggesting that no substantial presupposition-independent order effects are at play.

To assess the corresponding 3-way interaction statistically, we combined the data from the four lists. The following two-level factors were set up: CONNECTIVE (CONJ vs DISJ), PSTYPE (PS vs NOPS) and ORDER (FIRST vs SECOND), all sum-coded. We then fit an ordinal mixed effects model predicting Rating from CONNECTIVE, PSTYPE status, ORDER and their (2- and 3-way) interactions. The model also included a by-participant random slope for

18 The increase to 9 points was an attempt to improve chances to detect subtle contrasts. As pointed out by an anonymous reviewer, though, increasing the points on a Likert scale beyond 7 is non-standard and may not be the best way to try to achieve greater sensitivity in one's response variable. In light of our solid set of findings below, we do not see any concern that issues based on that interfered with the effect of our manipulations.

19 As every participant saw only one kind of SIMPLEPS sentence, by-participant random slopes for condition could not sensibly be included in the model.

20 The reader may wonder what the results for the filler conditions looked like. There was a large difference between GOODCOND vs BADCOND: the mean acceptability of GOODCOND was 7.47, while that of BADCOND was 2.55. This difference confirms that our participants were indeed generally sensitive to pragmatic violations, which was part of the point of including this kind of filler (see the discussion in section 3.2.1). However, it's worth noting that numerically this is a much larger difference than the difference between EISIMPLEPS vs SSIMPLEPS. Since the latter difference represents the baseline for what simple presupposition failure looks like in our design, the fact that the fillers behave differently points to the conclusion that when the antecedent of a conditional is not a live possibility in the context, this leads to a more severe violation than the type of presupposition failure that our presuppositional items are probing. While in principle interesting, this contrast falls outside the scope of the current paper, and its investigation is left for future research.

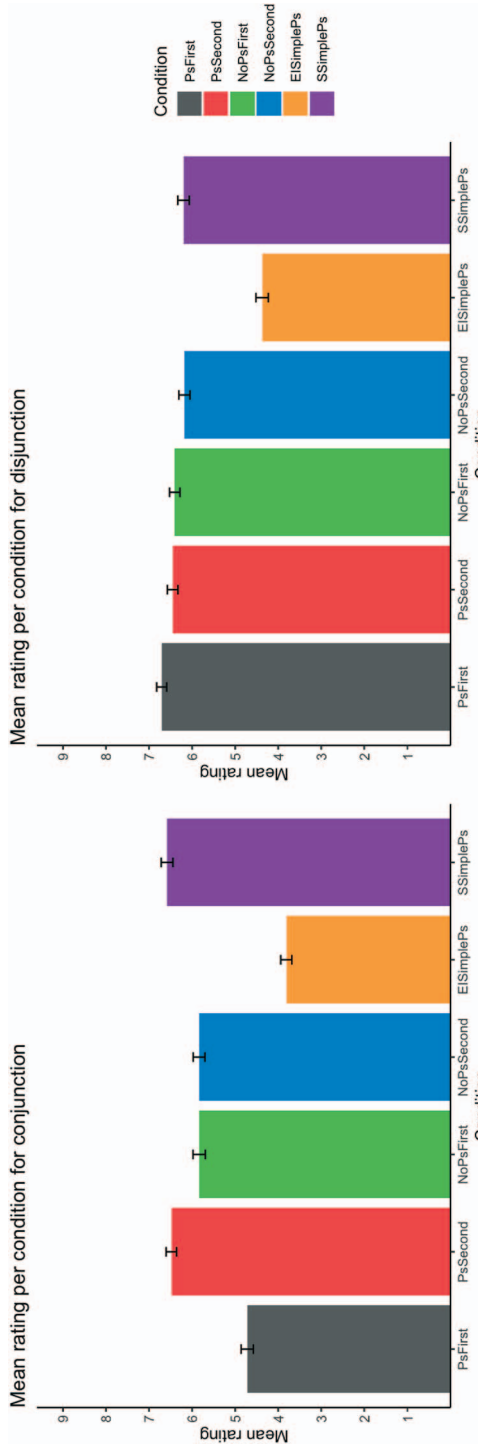

Figure 3 Mean Acceptability rating per condition by connective in Experiment 2. Error bars indicate standard error.

Table 3 Connective × PsType × Order Mixed-effects model summary

	Coeff.	SE	z	p
ConnectiveCONJ	-0.48025	0.15355	-3.128	< .01
PsTypePs	0.01624	0.25108	0.065	0.948419
OrderFirst	-0.37058	0.08072	-4.591	< .001
ConnectiveCONJ × PsTypePs	0.22331	0.19155	1.166	0.243687
ConnectiveCONJ × OrderFirst	-0.49636	0.08078	-6.145	< .001
PsTypePs × OrderFirst	0.42043	0.11357	3.702	< .001
ConnectiveCONJ × PsTypePs × OrderFirst	0.42050	0.11346	3.706	< .001

Order, and by-item random slopes for PsType and Connective.[21] The output of the model is summarized in Table 3:

There is a highly significant three-way interaction between Connective, PsType and Order. There also are overall 2-way interactions between Connective and Order and PSType and Order, as well as a main effect of Order, but these are all dominated by the 3-way interaction. To assess the nature of the latter in more detail, we also carried out planned comparisons of the PsType × Order interactions for each Connective separately, using the *emmeans* package with Bonferroni-corrected p-values. For disjunction, there is no significant PsType × Order interaction effect ($\beta = 0.000142$, $z = 0$, $p = 0.9996$). But for conjunction, we do get a significant PsType × Order interaction ($\beta = -1.681845$, $z = -5.157$, $p < .0001$). This confirms that our three-way interaction is driven by the presence of a significant PsType × Order interaction for conjunction, which is absent for disjunction.

As was the case with Experiment 1, it is of theoretical interest to assess the evidence in favor of the null hypothesis with respect to the 2-way interaction term for disjunction. We again turn to Bayesian analyses and a calculation of Bayes factor BF_{10}, as for Experiment 1, for versions of the model for the disjunction data with and without the interaction. Since the best point of comparison (in terms of comparability of conditions and materials) is the conjunction data from Experiment 2, we use the parameter expectations from a Bayesian analysis of these as priors for the disjunction models.[22] The calculation of Bayes factor in favor of the model with the interaction term included yields $BF_{10} = 0.00117$, indicating that the model without the interaction (i.e., the equivalent of assuming that the interaction parameter equals zero) should actually be preferred. Parallel to what we found for Experiment 1, this constitutes extreme evidence in favor of the simpler model

21 As each participant only saw items with one Connective and PsType, by-participant random slopes for these factors could not sensibly be included in the model. The maximal model that converged included by-item and by-participant random intercepts. It also included a by-participant random slope for Order, and by-item random slopes for PsType, Order and Connective, and their interaction. Including the by-participant random slope for the interactions of PsType, Order and Connective did not significantly improve model-fit, ($p = 0.95$). Neither did the inclusion of the by-participant random slope for Order ($p = 0.79$). Therefore, our final model left these out.

22 Note that these were relatively close to those for the original (Mandelkern *et al.* 2020) data, so this choice did not amount to all that much of a material difference.

Table 4 CompType × SupType Mixed-effects model summary

	Coeff.	SE	z	p
CompTypeComplex	0.58328	0.16719	3.489	< .0001
SupTypeNoS	-0.39525	0.09656	-4.093	< .0001
CompTypeComplex × SupTypeNoS	0.52599	0.09804	5.365	< .0001

(Jeffreys 1939), thus supporting the null hypothesis with regards to the interaction term. In sum, while our new conjunction data replicate the crucial interaction of Mandelkern *et al.* (2020), the Experiment 2 disjunction data provide further evidence, in addition to what we already found for Experiment 1, that no such interaction is present for disjunction.

Parallel to our test of the predictions of Hirsch & Hackl (2014) for Experiment 1, the other theoretically-relevant question to ask (of the disjunction part of our data) is whether the presence of material capable of supporting a presupposition in one of the disjuncts has a significant effect on acceptability, compared to cases where no such support exists. As above, we set up a two-level CompType factor that tagged PsFirst/Second disjunctions as Complex, while EI/S-SimplePs conditionals were tagged as Simple. Another two-level factor, SupType, tagged the relevant sentences by the kind of prior support that existed for the presuppositions in them: EI-SimplePs and PsFirst sentences were tagged as NoS (i.e. 'No prior support'), while S-SimplePs and Ps-Second sentences were tagged as S (i.e., 'Prior Support'). The factors were sum-coded. We then fit an ordinal mixed-effects model predicting Rating from CompType, SupType and their interaction. The model also included by-participant and by-item random intercepts, as well as by-item random slopes for CompType, SupType and their interaction, as well as by-participant random slopes for CompType.[23] The results of this model are summarized in the following table:

As Table 4 shows, there is a highly significant interaction between CompType and SupType. To assess the nature of this in more detail, we also carried out planned comparisons of the differences between the Simple and Complex levels of the CompType factor separately for each level of the SupType factor, using the *emmeans* package with Bonferroni-corrected p-values. We found that while the difference between Simple and Complex is not significant in the S case of the SupType factor ($\beta = 0.115$, $z = 0.283$, $p = 0.7770$), there is a very significant difference between the two in the NoS case ($\beta = 2.219$, $z = 5.998$, $p < .0001$). This replicates Experiment 1 in this respect, again countering the prediction of a Hirsch & Hackl (2014)-style account assuming local accommodation as the source of preventing projection from an initial presuppositional disjunct in bathroom sentences.

23 Since not every participant saw both kinds of SupType sentences (some only saw SSimplePs), a by-participant random slope for SupType could not sensibly be included. Thus, the maximal model we could fit predicted Rating from CompType, SupType and their interaction, and included by-participant and by-item random intercepts, as well as by-item random slopes for CompType, SupType and their interaction, and a by-participant random slopes for CompType. Model comparison revealed that including the by-item random slope for the interaction of CompType and SupType significantly improved model fit ($p = 0.01614$). So did including the by-participant random slope for CompType ($p < .001$).

3.2.5 *Discussion* Experiment 2 clearly and directly establishes that **conjunction and disjunction are not the same** in terms of the effect of linear order on their projection properties. As in Mandelkern *et al.* conjunctions exhibit a PsFirst/Second contrast with an advantage for the latter, where the presupposition is supported by the *preceding* context, reflected in the two-way interaction between Order and PsType. Crucially, the effect of linear order on projection from disjunction significantly differs from that of conjunction in comparison to controls, as reflected in the three-way interaction between Connective, PsType and Order. The calculation of Bayes factor for models of the disjunction data including vs. not including the two-way interaction between Order and PsType furthermore provides direct evidence that this interaction is absent for disjunction altogether. Additionally, we replicate the interaction between CompType and SupType that we found in Experiment 1, suggesting that local accommodation is not operative in PsFirst disjunctions, as we do find a decrease in acceptability for local accommodation in simple conditionals, but not in PsFirst disjunctions.

4 THEORETICAL IMPLICATIONS

4.1 *Constraints on a Theory of Projection*

Our findings suggest that filtering in disjunctions is crucially different from filtering conjunctions, with the former appearing symmetric. Let's consider theoretical options in light of this. The obvious option (call this Option 1) is that in the case of disjunction, right-to-left filtering is available **without incurring any extra cost** (at least none that is measurable in our task). This would capture the three-way interaction found in Experiment 2, and it would also explain the fact that this interaction is driven by a significant interaction between PsType and Order in the case of conjunction, which is absent for disjunction.

The only other option we see that one could in principle consider is that genuine filtering is not at play in disjunction at all (call this Option 2): Geurts (1999), for example, argues that presuppositions generally project from both disjuncts, yielding across the board symmetric projection rather than filtering. Absence of projection, e.g., in 'bathroom' disjunctions, then requires invoking a different mechanism, and local accommodation fits the bill (parallel to the Hirsch & Hackl proposal for presuppositions in the first disjunct of a bathroom sentence, but generalized to both orders), with no obvious alternatives. A potential conceptual counterargument against an explanation of this type is that it appears stipulative: filtering is available for other connectives, but not for disjunction. At the same time, this approach can be made more explanatory if we subsume it under a Local Contexts-style account as follows: we can assume that disjunctions are interpreted systematically exclusively (recall from fn 8 that in exclusive disjunctions the local context for both the first and second disjunct is the global context). This could be done either by taking disjunctions to have a structure of the form *Exh*[*A or B*] or assuming that Local-contexts computations apply after implicature strengthening (although again see fn 8 for a discussion on this).

But in purely empirical terms, this type of approach crucially predicts, parallel to the Hirsch & Hackl proposal, that the local accommodation of presuppositions in bathroom disjunctions incurs a penalty due to processing difficulties. More specifically, under the assumption - unchallenged in the literature, as far as we're aware - that the cost of local accommodation does not vary across environments, this penalty should be comparable to the one found in our SimplePs conditions, where a presupposition is locally accommodated in the antecedent of a conditional. But then we can compare whether the difference between

the SimplePs conditions parallels any differences between PsFirst vs NoPsFirst on the one hand, and any differences between PsSecond vs NoPsSecond on the other: on a theory with symmetric local accommodation for PsFirst/Second, all these differences should parallel one another, predicting the absence of an interaction. Perhaps unsurprisingly given the overall results pattern, corresponding statistical analyses reveal decreases in acceptability based on local accommodation for SimplePs, but no parallel effects for either disjunction order.[24] Note, furthermore, that all disjunction versions are rated higher than EI-SimplePs. Finally, recall that our previous analyses of the disjunction conditions in Experiment 2 revealed no main effect of PsType, again in line with there not being any penalty for either PsFirst or PsSecond relative to NoPs. All of this speaks against an analysis based on symmetric local accommodation for both disjunct orders, and seems to leave Option 1 (i.e., symmetric filtering without a cost) as the only game in town.

On a more general level, it is important to note that neither option above is compatible with a domain general projection mechanism that posits **uniform** effects of linear order on conjunction and disjunction. With regards to existing theories of projection, the issue most relevantly extends to Schlenker (2009), which posits both a symmetric and an asymmetric filtering mechanism to be available across the board. If there are two such filtering mechanisms and they are both equally available across connectives, then we expect to see no difference between conjunction and disjunction in projection (a-)symmetries. If, on the other hand, one of these mechanisms is taken as a default, with the other available at some processing cost, then we have the following possibilities:

- Asymmetry is the default, Symmetry is costly: this predicts the existence of symmetric conjunction at a cost, plus a default-based asymmetry for disjunction. Our data, together with the results from Mandelkern *et al.* show that neither of these predictions is borne out.
- One could in principle also conceive of an alternative conceptual setup of the two mechanisms, such that (ii) Asymmetry is costly, and Symmetry is the default. But this predicts symmetry (without any cost!) for conjunction and thus is incompatible with the Mandelkern *et al.* results, as well as our parallel order effects for conjunction.

Therefore, we are left in a situation where the differences in projection properties of conjunction and disjunction cannot be captured by positing two filtering mechanisms that are uniformly available across connectives. One potential further reaction to maintain this perspective might be to still postulate two filtering mechanisms, but have their availability

24 To evaluate this we set up the following factors: LocAcc (levels: LocAcc vs NoLocAcc), which tagged the disjunction data as either involving Local Accommodation on the Geurts (1999) theory or not. The other factor was CompType (levels: COND, DISJ1, DISJ2), which tagged the data depending on whether they were a conditional, a (No)PsFirst disjunction, or a (No)PsSecond disjunction. We then fitted an ordinal mixed effects model predicting Rating from these two factors and their interaction. The model also included by-participant and by-item random intercepts, as well as a by-participant random slope for CompType, and by-item random slopes for CompType and LocAcc. Using the *emmeans* package we carried out planned comparisons of the difference between the LocAcc levels for each level of CompType. This revealed a significant difference between LocAcc and NoLocAcc only in the case when CompType = *COND*, i.e. only for the SimplePs sentences ($\beta = -1.81, z = -5.172, p < .0001$). When CompType = *DSIJ1* or CompType = *DSIJ2*, no significant difference exists between LocAcc and NoLocAcc. This contradicts the predictions of the Geurts (1999) approach, as there should be a meaningful difference between LocAcc and NoLocAcc for all levels of the CompType factor.

vary across individual connectives. That, however, amounts to lexical specification of projection properties, with the corresponding loss of explanatory power and undermining the basic motivation that this type of account started out with. This leaves us with the option of exploring other formulations of projection mechanisms that apply uniformly across connectives but with varying effects. Distinct projection properties should then derive from the way such mechanisms interact with other lexically specified properties, most plausibly the connectives' underlying truth conditions. In the remainder of this section, we discuss how different theoretical approaches relate to this space of options.

4.2 *Dynamic Semantics*

Dynamic semantics (Heim 1983, and much subsequent work) owes the central role it has played in presupposition theory to its powerful capacity for specifying context change potentials (CCPs) to model desirable projection properties of embedding expressions, connectives, and quantifiers. On the flip-side, this very power also has led to criticism based on the explanatory challenge we've already discussed in detail. And yet, despite being so powerful, coming up with a proper dynamic treatment corresponding to Option 1 in the previous section (i.e., implementing symmetric filtering for disunction) is in fact problematic.

In dynamic semantics, the meaning of a sentence S is viewed as function that takes a context (most simply construed as a set of worlds C) and returns a new context C' that is (on this simple construal) the intersection of C and the proposition p corresponding to the traditional meaning of S. In the case of a conjunction, this gives us the following update rule:

(34) $C[\alpha \textit{ and } \beta] = (C[\alpha])[\beta] = (C \cap [\![\alpha]\!]) \cap [\![\beta]\!]$

This rule re-writes the CCP for a conjunction in terms of the individual CCPs of the conjuncts: the CCP of a conjunction is that function that first applies the CCP of the first conjunct α to the context C, and then applies the CCP of β to $C[\alpha]$ (the *result* of applying α to C). This has the effect of ridding C of any worlds where (the underlying propositions of) α and β are false, which captures the classical truth-conditional meaning of conjunction.

What about the definedness conditions of $C[\alpha \textit{ and } \beta]$? Dynamic semantics assumes that for a complex CCP to be defined, every simple CCP application involved in rewriting it must be defined (this corresponds to the so-called Weak Kleene recipe for dealing with combinations of undefinedness, cf. Rothschild 2011). Thus $C[\alpha \textit{ and } \beta]$ is defined iff $(C[\alpha])[\beta]$ is defined; this, in turn, is defined iff applying α to C is defined, and applying β to $C[\alpha]$ is defined. If α carries a presupposition, then C must entail it, otherwise $C[\alpha]$ will be undefined. And if β carries a presupposition, then $C[\alpha]$ must entail it, in order to avoid undefinedness. This amounts to asymmetric filtering conditions for conjunction, as β is interpreted relative to a context resulting from applying α to the original C.

The explanatory challenge for dynamic semantics is that there are several CCPs one can define for a given connective that are truth-conditionally equivalent, but vary in terms of definedness conditions (Heim 1990; Schlenker 2008; Soames 1982). In particular, we could just as well specify the following rule for conjunction:

(35) $C[\alpha \textit{ and } \beta] = (C[\beta])[\alpha]$

Set-theoretically, $(C[\beta])[\alpha] = (C[\alpha])[\beta]$, if defined. However, for $(C[\beta])[\alpha]$ to be defined, on this rendering, β must be defined in every C-world, and α must be defined in every β-world in C (so a presupposition in α is filtered if it is entailed by β). In other words, we get reverse-filtering conjunction, yielding a right-to-left asymmetry - which does not seem to be attested in natural languages.

Can we specify a symmetric filtering version of disjunction, in line with Option 1 in the previous section, in dynamic semantics? It turns out, that there is no single dynamic rule that can make disjunction symmetric (as first observed in Rothschild 2011). To see why, consider the filtering requirements imposed on us by 'bathroom disjunctions': the first disjunct must be evaluated in a context where we have already incorporated the negation of the second disjunct. At the same time, simple disjunctions tell us that the second disjunct must be evaluated against a context where the negation of the first disjunct has been incorporated. Trying to state these requirements in a dynamic rule, one might propose the following:

(36) $C[\alpha \textit{ or } \beta] = C[\neg\beta][\alpha] \cup C[\neg\alpha][\beta]$

But recall that for a complex CCP to be defined, **every** simple CCP-application step in which it is re-written must be defined. This means that $C[\neg\beta][\alpha]$ must be defined, and $C[\neg\alpha][\beta]$ must be defined; for these to be defined, $C[\alpha]$ and $C[\beta]$ must be defined respectively (as $C[\neg\alpha] = C - C[\alpha]$). But then a disjunction will always be undefined if either of its disjuncts carries a presupposition that is not entailed by C, irrespective of the entailments of the other disjunct. In other words, we wind up with the equivalent of Option 2 above, with no filtering in disjunction at all.

To get symmetric disjunction one needs to postulate access to two distinct CCPs to encode Left-to-Right and Right-to-Left filtering respectively:[25]

(37) a. $C[\alpha \textit{ or } \beta] = C[\alpha] \cup C[\neg\alpha][\beta]$

- (defined iff all worlds in C satisfy the presupposition of α and all worlds in C where α is False satisfy the presuppositions of β)

b. $C[\alpha \textit{ or } \beta] = C[\beta] \cup C[\neg\beta][\alpha]$

- (defined iff all worlds in C satisfy the presupposition of β and all worlds in C where β is False satisfy the presuppositions of α)

This is precisely the position adopted by Rothschild (2011), whose dynamic system provides access to these two rules by taking all possible re-write rules for complex CCPs to be in principle available (thus avoiding the explanatory challenge). However, this setup also allows access to both (34) and (35) for conjunction, thus predicting the in-principle availability of symmetry for conjunction as well (much like Schlenker's two mechanisms proposal). One can again introduce a general source for asymmetry to try to fix this, e.g., by adding an order-constraint on possible re-write rules to the effect that either exclusively or preferably makes (34) and (37-a) available for conjunction and disjunction (see

25 One can also consider getting out of this by changing the recipe by which definedness is calculated in dynamic semantics to the Strong Kleene recipe; but this is of no general help, as it would just shift the difference between conjunction and disjunction to how definedness has to be calculated for them.

Rothschild 2011, for details). However, this in turn produces asymmetry uniformly across connectives, thus failing to capture the difference in projection properties between conjunction and disjunction in our experimental results.

Therefore, dynamic semantics is not suited to giving us a symmetric lexical entry for disjunction and an asymmetric one for conjunction at the same time in a non-stipulative way. In fact, the only direct option for symmetric disjunction in just one lexical entry corresponds to (the already discarded) Option 2 above, positing the symmetric *absence* of filtering in disjunction. Finally, whichever route is taken here, the explanatory challenge remains, for even if one can capture the empirical patterns (at least to a great extent), stipulative choices about the context change potentials or projection machinery in play for the different connectives have to be made.

4.3 *Trivalent Semantics*

Trivalent theories assume three truth values: *True*, *False* and # (undefined). # is used to capture presupposition failure. Presupposition projection is modeled by the way the # value does or does not percolate in complex sentences. Projection properties of connectives are then determined by the distribution of # in their trivalent truth tables (see Beaver 2001, for an overview of trivalent semantics in the context of presupposition). The truth tables for conjunction and disjunction that encode the projection properties we are trying to capture based on our results are as follows:

(38)

p \ q	T	F	#
T	T	F	#
F	F	F	F
#	#	#	#

Asymmetric trivalent conjunction

(39)

p \ q	T	F	#
T	T	T	T
F	T	F	#
#	T	#	#

Symmetric trivalent disjunction

In conjunctions, if the first conjunct is #, then the entire conjunction is always #, regardless of the truth value of the second conjunct. This corresponds to a presupposition in the first conjunct always projecting, regardless of the status of the second conjunct. Presuppositions in the second conjunct, however, need not lead to a presupposition of the entire sentence: if the first conjunct is false, the entire sentence is automatically false. This setup yields the equivalent of asymmetric filtering: if p entails the presupposition of q and p is true, then

q cannot be undefined; if p entails the presupposition of q and p is false, then the entire sentence is false.[26]

In contrast, in the truth table specified here for disjunction, if one disjunct is #, this percolates to the whole disjunction just in case the other disjunct is F or #. If the second disjunct is T, then the whole disjunction is T. Given this, consider a 'bathroom disjunction' of the form p *or* q, where p carries a presupposition p', and $\neg q \models p'$. In all worlds w where p' is false, q will be true (by modus tollens). By the truth table above, the whole disjunction will be true, then; and such a disjunction will never be #, which means that no projection occurs in these types of sentences - we get symmetric filtering.[27] Thus, trivalent semantics is capable of delivering asymmetric filtering for conjunction but symmetric filtering for disjunction.

We need to consider the explanatory challenge raised for dynamic semantics for this type of approach, too, however. Why are these entries chosen, and not others? It may seem like this inevitably requires lexical stipulation. However, as George (2008) remarkably shows, these tables can be derived via one general algorithm, stated below as Algorithm 1 (we are simplifying here; see George 2008, for full details).

With Algorithm 1 in mind, take a conjunction where the first conjunct has the # value. There is no way that the second conjunct can have a value that will make the entire conjunction True on the classical table. Thus, the entire conjunction is assigned #. Disjunction is different. If the first disjunct has the # value, all is not lost. If the second disjunct is True, then we can assign True to the entire disjunction by the classical table. If it is False, the classical truth table gives us no information, so we assign # to the entire disjunction. This yields the trivalent truth tables above.

Thus George's trivalent account with the linear-order driven algorithm succeeds in capturing the varying impact of linear order on projection from conjunction and disjunction.

Does the variation in projection (a-)symmetry across connectives require a trivalent setup, or are there alternative ways of modelling this? We now turn to a new proposal capturing the pattern in a bivalent system.

26 As noted by an anonymous reviewer, a consequence of modelling presupposition projection in conjunction using the table in (38) is that if the first conjunct is false, the whole conjunction is false, regardless of the second conjunct. In particular, this means that the second conjunct could suffer presupposition failure, but as long as we are in a context where the first conjunct is false in all worlds, no presupposition failure should arise. One can debate the extent to which this leads to correct empirical results. For example, the reviewer considers a case like the following:

(i) a. ***Context:*** We find a cigarette butt in Bill's room, but we know it doesn't belong to him. At the same time, we're trying to find out if Bill currently smokes, and we don't know if he has ever been a smoker. So, I say: I don't know if Bill ever smoked or not, but
b. It's not the case that that cigarette butt belongs to him and he continues to smoke.

The reviewer judges (i-b) to suffer from presupposition failure, despite the fact that in this context, table (38) above predicts that (i-b) is false rather than undefined. We find the judgment less clear. At the same time, this falls outside the scope of the current paper, and is be left for future research.

27 Note that when the presupposition of one disjunct is unrelated to the other disjunct, this trivalent approach and, say, a dynamic semantics variant with both CCPs in (37-a) and (37-b) differ from one another, in that the former predicts no impact of a presupposition of one disjunct as long as the other is true; whereas both of the dynamic entries predict undefinedness in such a case. We won't pursue this difference here further, as the current focus is on capturing symmetric filtering from disjunction.

Given ($\alpha * \beta$) (where $*$ is a binary connective), consider first α
if *on the basis of the truth value of* α *and the classical semantics of the* $*$ *connective, you can assign a truth value to the whole sentence*, **then**
  do so;
else
  if *there exists a possible truth value for* β *that can make the sentence True on the classical truth table*, **then**
    check the value of β:
      if *the classical truth table assigns a value to sentence on the basis of the value of* α *and* β **then**
        Assign that value to the whole sentence;
      else
        assign # to the whole sentence;
      end
  else
    assign # to the whole sentence;
  end
end

Algorithm 1: The algorithm of George (2008)

4.4 *Limited Symmetry*

Kalomoiros (2022) introduced the idea of a novel projection system, *Limited Symmetry*. This system is inspired by Schlenker (2008, 2009), but also takes into account the insight of George (2008), namely that the impact of incremental interpretation can be modulated by interfacing with the truth conditions unique to each connective. The core aim is to derive asymmetric conjunction but symmetric disjunction through a single filtering mechanism, in line with the empirical data reported above. The following gives a brief and basic introduction, leaving a more detailed and full-fledged discussion and evaluation for another occasion (see also Kalomoiros 2023b; Kalomoiros 2023a).[28]

4.4.1 *The general idea* First, some notation: following Schlenker, $p'p$ indicates a proposition with a presuppositional component p' and a non-presuppositional component p. The meaning of $p'p$ is the conjunction of p' and p in a classical, bivalent semantics. What is the impact of p' when a comprehender encounters $p'p$ as a simple sentence? At the core is the fundamental intuition, going back at least to Stalnaker's seminal work, that presuppositions should be non-informative - they are already taken for granted. Crucially, this non-informativity should be assessed independently of the assertive component p: at least for some triggers, it has been proposed that their assertive component entails the presupposition, and this shouldn't trivially count as non-informativity, Schlenker (2007).[29] We can assess the non-informativity of p' independently of p by substituting the latter with an arbitrary D, and then proceeding to check that $p'D$ and D are equivalent in context C: this

28 The presentation here diverges from Kalomoiros (2022) to avoid some issues and increase concision and accessibility.

29 Thanks to two anonymous reviewers, our editor Yasu Sudo, as well as Philippe Schlenker for helpful feedback and discussion on this point that led to some substantial re-framing in the formulation of the analysis.

requires that all worlds in C where $p'D$ is true are worlds where D is true; and all worlds in C where $p'D$ is false are worlds where D is false. This holds iff every world in C is a p'-world - the core of our Non-Informativity constraint.[30]

What about cases where $p'p$ occurs in a complex sentence, such as ($p'p$ *and* q)? Extending the above, we require that ($p'D$ *and* q) and (D *and* q) have to be contextually equivalent. This can be broken down into checking that for all D and for all worlds in the context C:

- All the C-worlds where ($p'D$ *and* q) is true are worlds where (D *and* q) is true.
- All the C-worlds where ($p'D$ *and* q) is false are worlds where (D *and* q) is false.[31]

But moreover, integrating the idea of incremental presupposition evaluation in Asymmetric Local Contexts, we require that this equivalence hold (**so far as it can be determined**) for every partial sub-string from the moment of encountering $p'p$.

For example, in the case of ($p'p$ *and* q), soon after encountering $p'p$, we have access to the partial string (p′p and. The requirement is that in all worlds where we can determine (p′D and to be true no matter the continuation, (D and also needs to be true no matter the continuation (for all D). Similarly, in all worlds where we can determine (p′D and to be false no matter the continuation, (D and also needs to be false no matter the continuation (for all D).

At parsing point (p′D and, we know that the sentence is already false (for all D) in all worlds where $p'D$ is false. Similarly, (D and is already false (for all D) in worlds where D is false.

So, we can check whether all these worlds where $p'D$ is false are worlds where D is false. We will see below that this holds just in case p' is true in all worlds in C.

Crucially, due to the different truth conditions in play for disjunctions, no such determination is possible at the equivalent parsing point (p′p or, effectively leading to consideration of the second disjunct in evaluating a presupposition in the first disjunct. We demonstrate this with a more formal illustration of the constraints and their application.

4.4.2 *Definitions* The core of *Limited Symmetry* is an incrementally applicable Non-Informativity constraint for sentences containing presuppositional statements of the form $p'p$ in a given context C:

(40) **Non-Informativity Constraint:** A presuppositional component p' of a sentence S beginning with a string of the form $\alpha\ p'p$ has to be non-informative in context C, in the following sense: for every t such that $\alpha\ p'p\ t$ is a sub-string of S:

a. *T*-**Non-Informativity:** For all sentences D,
$\{w \in C \mid \text{for all } \beta:\ w \models \alpha\ [p'D]\ t\ \beta\} \subseteq \{w \in C \mid \text{for all } \beta:\ w \models \alpha\ D\ t\ \beta\}$[32]

b. *F*-**Non-Informativity:** For all sentences D,
$\{w \in C \mid \text{for all } \beta:\ w \models \neg(\alpha\ [p'D]\ t\ \beta)\} \subseteq \{w \in C \mid \text{for all } \beta:\ w \models \neg(\alpha\ D\ t\ \beta)\}$

30 This Non-Informativity constraint also underlies Phillipe Schlenker's *Transparency* constraint, from which *Limited Symmetry* is heavily inspired. Since *Transparency* theory is equivalent to Local context (Schlenker 2009), it faces the same problem of not being able to derive symmetry for disjunction but asymmetry from conjunction from a **single** mechanism. For reasons of space then, we eschew a presentation of *Transparency* theory here; see Kalomoiros (2023b) for more details.

31 This is simply the contrapositive of "All the worlds where (D *and* q) is true are worlds where ($p'D$ *and* q) is true".

32 The brackets around [$p'D$] are meant for exposition only, and should not be taken as part of the string.

These two constraints formalize the earlier intuitive characterization of non-informativity in terms of contextual equivalence independent of p and for all parsing points $\alpha\ p'p\ t$ after the parser encounters $p'p$ in S. They can be checked at every relevant parsing point $\alpha\ p'p\ t$, meaning that violations can be detected incrementally as the sentence is parsed from left to right. For example, in parsing $(p'p\ and\ q)$, comprehenders can try checking for violations at parsing points (p′p, (p′p and, and (p′p and q.

We now apply this kind of reasoning to the three cases most relevant for current purposes: $(p'p\ and\ q)$, $(q\ and\ p'p)$, and $(p'p\ or\ q)$.

4.4.3 $(p'p\ and\ q)$ For $(p'p\ and\ q)$, the constraint becomes operative at parsing point (p′p, where $t = \epsilon$, and we can start checking whether non-informativity holds at this and following parsing points:[33]

$t = \epsilon$. For (p′p, the sets on the left of both T-**N**(on)-**Inf**(ormativity) and F-**N**(on)-**Inf**(ormativity) yield the empty set: these are the sets of worlds where, for all D, $([p'D]\ \beta$ and $\neg([p'D]\ \beta)$, respectively, are true for all β; but since β could be anything, including both and $\bot$) and or $\top$), no such worlds exist.[34] Since the empty set is a subset of any set, both constraints are vacuously satisfied.

$t = and$. For (p′p and, we focus on the F-Non-Informativity constraint, which becomes:[35]

(41) For all D: $\{w \in C \mid \text{for all } \beta:\ w \models \neg(([p'D]\ and\ \beta)\} \subseteq \{w \in C \mid \text{for all } \beta:\ w \models \neg((D\ and\ \beta)\}$

33 Note that our Non-Informativity constraints operate on *bracketed* strings, an assumption shared with Schlenker (2007) and Schlenker (2009). As pointed out by an anonymous reviewer, and our editor Yasu Sudo, this raises the question about what level of representation incremental approaches like *Limited Symmetry* and Local Contexts work on: is it pure linearized strings, or is there also some structure involved? And if there is structure involved, how does the parser know how much structure to attribute to a partial string, since in hearing $p'p$, there could be multiple possible parses, i.e. $p'p$, $(p'p$, $((p'p$ etc. Here, we make the assumption that as parsers are processing a linearized string from left-to-right, at every parsing point they follow a heuristic of attributing the *minimal* amount of structure that is consistent with the parse at that point. For example, in hearing $p'p$, they will posit only one opening parenthesis. If no binary connective follows $p'p$, then they will simply close the parenthesis and get $(p'p)$. Otherwise, if $p'p$ is followed by some binary connective $*$, they will continue working under the assumption that this is the highest connective, in which case they know that they should be expecting the final form of the sentence to be $(p'p*\delta)$. If afterwards they get information that makes them realise that this initial assumption was wrong (e.g. if it turns out that actually they are dealing with a sentence like $((p'p*q)*r)$), we assume that they will backtrack and restart the parsing process, positing more structure at the beginning, i.e. starting with assuming $((p'p$.

34 More explicitly: Suppose the set of worlds such that $([p'D]\ \beta$ is true for all β is non-empty. Then it contains a world $w \in C$ such that for any β, $([p'D]\ \beta$ is true. But consider the case where β is of the form and $\bot$), where $\bot$ is a contradiction. The resulting sentence is not true in any world, hence it's not true in w. But this contradicts our assumption that w is a world where for all β, $([p'D]\ \beta$ is true. Hence $\{w \in C \mid \text{for all } \beta:\ w \models ([p'D]\ \beta)\}$ must be empty. Parallel reasoning holds for $\{w \in C \mid \text{for all } \beta:\ w \models \neg([p'D]\ \beta)\}$, only this time take β to be or $\top$), where $\top$ is a tautology.

35 The T-Non-Informativity constraint holds trivially, as there are no worlds in C where for any β, (p′p and β, and (p and β are already true. See also fn. (34).

Since β can be anything, including $\top$), the left set consists of worlds where $p'D$ is false. The right set consists of worlds where D is false. So the constraint amounts to requiring that:

(42) For all D: $\{w \in C \mid p' = 0 \textit{ or } D = 0\} \subseteq \{w \in C \mid D = 0\}$

(42) holds iff $C \models p'$: suppose first that (42) holds. Then, since it holds for all D, it must hold for the case where D is a tautology $\top$, in which case the right set in (42) becomes the empty set. But then, (42) holds just in case $\{w \in C \mid p' = 0\}$ is empty, i.e. just in case $C \models p'$. For the converse, suppose that $C \models p'$. Then, the constraint in (42) can be re-written as the trivial:

(43) For all D: $\{w \in C \mid D = 0\} \subseteq \{w \in C \mid D = 0\}$

So ($p'p$ *and* q) violates the constraints unless p' is true in the context. In other words, it presupposes p' **no matter the second conjunct**, i.e. we always get projection and there's no right-to-left filtering.

4.4.4 (q *and* $p'p$) For (q *and* $p'p$), the constraints require that at the point (q and p′p it hold that:

(44) For all D:
T-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models (q \textit{ and } [p'D]\ \beta\} \subseteq \{w \in C \mid \text{for all } \beta : w \models (q \textit{ and } D\ \beta)\}$
F-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models \neg((q \textit{ and } [p'D]\ \beta)\} \subseteq \{w \in C \mid \text{for all } \beta : w \models \neg((q \textit{ and } D\ \beta)\}$

The only possible β is ') ', and (q *and* $[p'D]$) is true in worlds where p', D, and q are true. It's false in worlds where at least one of them is false. So, the constraints become:

(45) For all D:
T-**N-Inf**: $\{w \in C \mid p' = 1 \textit{ and } D = 1 \textit{ and } q = 1\} \subseteq \{w \in C \mid D = 1 \textit{ and } q = 1\}$
F-**N-Inf**: $\{w \in C \mid p' = 0 \textit{ or } D = 0 \textit{ or } q = 0\} \subseteq \{w \in C \mid D = 0 \textit{ or } q = 0\}$

T-Non-Informativity necessarily holds since the left set is more restrictive. F-Non-Informativity holds iff $C \models q \rightarrow p'$: if F-Non-Informativity holds, then it holds for the case of $D = \bot$, with the constraint becoming:

(46) $\{w \in C \mid p' = 0 \textit{ or } q = 0\} \subseteq \{w \in C \mid q = 0\}$

This holds just in case all $\neg p'$-worlds in C are also $\neg q$-worlds, which in turn is equivalent to $C \models q \rightarrow p'$. Conversely, if $C \models q \rightarrow p'$, then (47) holds (as there are no worlds where $p' = 0$ and $q = 1$), and F-Non-Informativity can be re-written as the trivial (48).

(47) for all D: $\{w \in C \mid p' = 0 \textit{ or } D = 0 \textit{ or } q = 0\} = \{w \in C \mid D = 0 \textit{ or } q = 0\}$

(48) for all D: $\{w \in C \mid D = 0 \textit{ or } q = 0\} \subseteq \{w \in C \mid D = 0 \textit{ or } q = 0\}$

Hence, a presupposition in the second conjunct places no constraints on the context as long as it is entailed by the first conjunct. We derive asymmetric filtering for conjunction.

4.4.5 ($p'p$ *or* q) For $S = (p'p \textit{ or } q)$, the parser encounters the presupposition at the point (p′p. Recall that the constraints must hold for all t such that ($p'p$ t is a sub-string of S. For

this initial parse where $t = \epsilon$, the situation is exactly parallel to conjunction in 4.4.3 and the constraints hold vacuously.

$t = or$**.** For (p′p or, the constraints become:

(49) For all D:
T-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models ([p'D] \textit{ or } \beta\} \subseteq \{w \in C \mid \text{for all } \beta : w \models (D \textit{ or } \beta\}$
F-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models \neg(([p'D] \textit{ or } \beta)\} \subseteq \{w \in C \mid \text{for all } \beta : w \models \neg((D \textit{ or } \beta)\}$

Starting with the latter, the set of worlds where $([p'D]$ *or* β is false for all β is empty (since β can be $\top$), and F-Non-Informativity holds trivially (as the empty set is a subset of every set). For T-Non-Informativity, the left set of worlds consists of those where p' and D are true, and the constraint amounts to the straightforwardly true (50); thus, both constraints hold.

(50) For all D: $\{w \in C \mid p' = 1 \textit{ and } D = 1\} \subseteq \{w \in C \mid D = 1\}$

$t = or\ q$**.** For the final relevant value of t, i.e,. the parse (p′p or q, we get:

(51) For all D:
T-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models ([p'D] \textit{ or } q\ \beta\} \subseteq \{w \in C \mid \text{for all } \beta : w \models (D \textit{ or } q\ \beta\}$
F-**N-Inf**: $\{w \in C \mid \text{for all } \beta : w \models \neg(([p'D] \textit{ or } q\ \beta)\} \subseteq \{w \in C \mid \text{for all } \beta : w \models \neg((D \textit{ or } q\ \beta)\}$

The only possible β is '$)$'. $([p'D]$ *or* $q)$ is true in worlds where p' and D are true or where q is true (or all three), and T-Non-Informativity straightforwardly holds (as $\{w \in C \mid (p' = 1 \textit{ and } D = 1) \textit{ or } q = 1\} \subseteq \{w \in C \mid D = 1 \textit{ or } q = 1\}$). $([p'D]$ *or* $q)$ is false in worlds where it both holds that either p' or D is false and q is false. It's useful to re-write this last set using the distributive law, with the F-Non-Informativity constraint becoming:

(52) For all D: $\{w \in C \mid (p' = 0 \textit{ and } q = 0) \textit{ or } (q = 0 \textit{ and } D = 0)\} \subseteq \{w \in C \mid q = 0 \textit{ and } D = 0\}$

This holds iff $C \models \neg q \rightarrow p'$: suppose first that (52) holds. Then it must hold for $D = \top$, in which case the right set becomes the empty set ($\top \neq 0$ in all w).

But then the constraint can only hold if the left set is also empty, i.e., it must hold that $C \models \neg(\neg p' \textit{ and } \neg q)$, which is equivalent to $C \models \neg q \rightarrow p'$. Conversely, if $C \models \neg q \rightarrow p'$, then $\{w \in C \mid p' = 0 \textit{ and } q = 0\}$ is the empty set (there are no worlds where $\neg q = 1$ and $p' = 0$), and we can re-write (52) as (53), with subsethood trivially holding due to identity:

(53) For all D: $\{w \in C \mid q = 0 \textit{ and } D = 0\} \subseteq \{w \in C \mid q = 0 \textit{ and } D = 0\}$

Thus, we derived that a disjunction of the form $(p'p \textit{ or } q)$ requires that $C \models \neg q \rightarrow p'$, exactly the condition satisfied by 'bathroom' disjunctions. For a disjunction of the form $(q \textit{ or } p'p)$, parallel reasoning derives the same condition, yielding symmetric filtering for presuppositions in disjunctions.

In sum, while we have to leave details of this theory and a more extensive discussion and evaluation for another occasion, we have shown that *Limited Symmetry* offers a Schlenker-inspired theory of projection where a single mechanism derives **asymmetric**

conjunction and **symmetric** disjunction, on par with George's account but without a trivalent semantics.

5 CONCLUSION

In this paper we have been concerned with the effect of linear order on presupposition projection in conjunctions and disjunctions. In two experimental studies, we find empirical evidence supporting the conclusion that they differ in this regard: whereas conjunction exhibits an asymmetry in projection, only allowing left-to-right filtering, disjunction was found to be symmetric, allowing filtering in either direction (without any cost for right-to-left filtering). These findings constrain theories of projection. In particular, they argue against theories that posit uniform effects of linear order on projection across connectives (cf. Schlenker 2009; Hirsch & Hackl 2014). Furthermore, theories like dynamic semantics, despite being powerful in allowing a lot (and arguably too much) freedom in the way projection rules are stated, cannot easily capture our data, as no single context change potential for disjunction derives symmetric filtering, and positing multiple CCP order variants just recreates versions of the explanatory challenge in light of the observed contrast between conjunction and disjunction. Trivalent accounts like that by George (2008), with a general linear-order based algorithm for determining the distribution of undefinedness in truth-tables for connectives, capture the pattern successfully, but do require a commitment to a departure from classical bivalent semantics. Finally, the new *Limited Symmetry* account, first proposed in Kalomoiros (2021, 2022), which follows Schlenker's proposal in its general approach, manages to combine a general and explanatory pragmatic account with an implementation that lets the projection mechanism interact with the truth conditions of a given connective, similar to George's account, thereby deriving varying impacts of linear order on projection for different connectives, in line with our experimental data. We see this as a fruitful new avenue for modeling projection, with many new questions and predictions to be explored in future work.

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