Presupposition projection from *or* vs. *and* – an experimental comparison[1]

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Abstract. We present experimental evidence that conjunction and disjunction differ in terms of presupposition projection: 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. Disjunction on the other hand shows a radically different profile, which points to symmetric behavior: as long as there is one disjunct which carries information that can filter the presupposition, no projection occurs. This result strongly speaks against accounts that take all projection to be asymmetrically determined by linear order in a uniform way across connectives.

Keywords: presupposition projection, (a-)symmetry, disjunction, conjunction

1. Basics of projection

Certain lexical items are associated with presuppositions, requiring that some piece of information be established in the utterance context for their use to be felicitous (modulo global accommodation). For example, the verb *continue* is generally taken to presuppose that whatever state (or activity) is being described as continuing was indeed something that held (or was going on) before the referenced time:

(1) # John continues having research interests in Tolkien.

Uttering (1) in a context that supports no shared assumptions about John's past research interests in Tolkien seems to give rise to some amount of infelicity.[2] We say that 'continues having research interests' presupposes 'having had prior research interests'; the main new information that this contributes to an assertion is that of 'having current research interests.' The infelicity of (1), where the presupposition of 'continue' is not contextually supported, is then due 'presupposition failure'. Now contrast (1) with (2) below:

(2) I saw my old friend from college John the other day. We had done a research project on Tolkien together back then. To my surprise, he continues to have research interests in Tolkien.

In (2), the information that John had prior research interests in Tolkien is introduced explicitly before the sentence with *continue*, ensuring that the discourse context supports the presupposition; thus (2) is fully felicitous.

A key challenge in the literature on presupposition projection concerns the behavior of presuppositions in embedded contexts, e.g., in the scope of logical connectives. In some cases,

[1]Thanks to Anna Papafragou for useful feedback. Thanks also to the members of the Penn Semantics lab for useful comments at various stages of this project. All errors are our own.

[2]To varying extents, triggers allow global accommodation of the presupposed information, at least in certain cases; as this option is ruled out in our experimental designs through the use of so-called 'explicit ignorance contexts,' we do not dwell on this notion here.

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the presupposition of an embedded clause seems to become a presupposition of the complex sentence as a whole, whereas in others, it doesn't - this is the 'projection problem' for presuppositions (Karttunen, 1973). A central projection pattern is that presuppositions project from the scope of negation:

(3) #John does not continue having research interests in Tolkien.

Just as its non-negated counterpart, (3) is infelicitous if uttered in a context that leaves open whether or not John had prior research interests in Tolkien. This pattern tells us that presuppositions are a different aspect of meaning from the assertion, as only the latter is targeted by negation.

Consider now 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, (4b), the sentence as a whole seems felicitous, even in absence of a supporting (extra-sentential) discourse context, in contrast to (1), suggesting that the sentence as a whole does not carry the presupposition introduced by *continue*. However, when the first conjunct contains the trigger and the second conjunct introduces the information supporting the presupposition, then infelicity ensues, (4a).[3]

Recall that, intuitively, the presupposition trigger in (2) is felicitous because the presupposition is already entailed by the context, (Stalnaker (1974)). This intuition can easily be extended to the data in (4), as suggested by Stalnaker: As a hearer encounters (4b), they first parse the first conjunct followed by '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 commonly assumed by the discourse participants). Then, the second conjunct is parsed, and its presupposition is evaluated relative to an updated global context that integrates the information of the first conjunct. That context entails the presupposition of the second conjunct; hence the presupposition is supported and its use felicitous (the presupposition in the second conjunct gets 'filtered', in the terminology of Karttunen (1973)). In contrast, in (4a), the first conjunct gets parsed against the original global context. In order to be felicitous, the presupposition about John's prior research interests has to be entailed by that context as it gets evaluated. If that does not happen, then the presupposition projects, i.e., the conjunction as a whole carries the same presupposition. The second conjunct, which contains the presupposition, seems to 'come too late' to make a difference.

Note that on this general view on the projection problem, 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 define what counts as the local context is

[3]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.

complicated, and we'll turn to some detailed proposals shortly. However, assuming for the moment an intuitive characterisation of 'local context' as sketched above, the key generalization about presupposition projection can be stated as follows:

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

In (4a), the local context is simply the global context. However, in (4b) the local context is the initial global context plus the information contained in the first conjunct.

As the contrast between (4a) and (4b) 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. Stalnaker's account for conjunction crucially depends on the idea that the time-course of information becoming available - reflected in the linear order - has a central role to play: as parts of a sentence get parsed from 'left-to-right', information becomes available to a 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 more generally.

Turning to disjunction, we observe first that a presupposition in the second disjunct is filtered if *the negation of the first disjunct entails the presupposition*. No infelicity arises in (6):

(6) 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. (This was first observed in Partee's so-called 'bathroom sentences'.[4])

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

Leaving aside 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.

The experimental investigation of this apparent contrast and the theoretical question it gives rise to is the central concern of our paper. Before diving into the experimental approach, we first need to introduce more details of the most relevant previous accounts of presupposition projection and the different ways they handle (a-)symmetry effects. The first account is the Local Context account of Schlenker (2009), which makes room for both asymmetric and symmetric interpretations based on processing considerations. The second account is that of Hirsch and

[4]The prototypical 'bathroom sentences' are disjunctions like the following, hence the name:
(i) Either the bathroom is in a weird place or this house has no bathroom.

Hackl (2014), which brings in the mechanism of 'local accommodation' (introduced below) to account for apparent cases of symmetric filtering. Since both accounts are framed in terms of the Local Context theory of Schlenker (2009), we spell out its relevant details first.

2. Previous approaches

2.1. Schlenker (2009)

Defining 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 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 took the latter route; however, certain shortcomings in coverage (e.g., with regards to projection from quantifiers), led to the context change semantics of Heim (1983); this system was powerful enough to overcome the limitations of Stalnaker's approach, but faced criticism (whose first instances are attributed to Soames and Rooth) of lacking explanatory adequacy, as it baked the various filtering (a)-symmetries directly into the lexical entries of the connectives. 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 that ensures explanatory adequacy.

Following the standard Stalnakerian tradition, we will be thinking of contexts as sets of possible worlds, i.e. those worlds that are live options for being the actual one at a certain point in the 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 in which the truth value of the complex sentence overall is not already determined by other parts of the 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 and 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 settled 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 all C-worlds based on the information contained in a: one limits attention to worlds where the truth value of the entire sentence has not already been determined based on 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 compute the set of worlds where the truth value of the constituent under current consideration (here q) matters: the context worlds where the first conjunct is True, and only those, do matter, since these are the only worlds where the truth value of q affects the truth value of the conjunction. In worlds where the first conjunct is already False, the whole conjunction is False regardless of q. Thus, the local context for a second conjunct is the first conjunct, relativized to C. 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 modeled as asymmetric: p (relativized to C) matters for evaluating 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.

Turning to the local context of the initial disjunct, the asymmetric perspective 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 does not seem to be borne out. (8), repeated from (7) above, does not seem to give rise to any infelicity based on the presupposition in the first disjunct:

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

To handle such cases of symmetry, Schlenker defines 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 no longer quantifiying over all possible completions b', we now have access to the actual sentence completion b: the smallest subset of C one can restrict attention to in this case is based on what is contained in both a and b. Thus, the symmetric local context of p in (**p or q**)

will include worlds where the truth value of the disjunction is not yet determined. Since, we have access to the second disjunct, q, the symmetric local context of p is all the worlds in C where $\neg q$ is True.

While the introduction of symmetric local contexts accounts for the felicity of (8), it also immediately raises the question of how the two definitions of local contexts relate to one another. Maintaining that projection is fundamentally rooted in the incremental nature of parsing, Schlenker argues that the asymmetric definition is the default, and that the availability of the symmetric version is associated with additional processing cost, since the asymmetric default needs to be overcome.

This default-asymmetric conception makes two predictions: First, there should be measurable reflexes of the processing costs posited for the use of symmetric local contexts; in other words, (8) should be harder to process than its reverse counterpart in (6). Second the relative availability and any potential processing costs associated with the use of symmetric local contexts should be uniformly present across connectives: (costly) symmetry should be available for both conjunction and disjunction. We will explore these predictions in more detail later on. But before turning to the empirical side, we need to consider the second option for dealing with the felicity of (8) in a theory based on asymmetric local contexts.

2.2. Hirsch and Hackl (2014)

Hirsch and 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, they suggest an alternative way of deriving the absence of a global presupposition. Since they assume that filtering does follow parsing in proceeding from left-to-right, the presupposition in the first disjunct does project, at least initially. However, this interpretation ends up being discarded due to the application of local accommodation, which they argue is triggered on the basis of general pragmatic considerations associated with disjunctions.

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 (9):

(9) 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, i.e. the speaker must not think that only 'Sue went to the cinema' or only 'Sue went to the department store' is true. 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:

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

(11) 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, the sentence in (11) 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 as a presupposition to the local context, meaning that it will behave just like asserted content in terms of being affected by embedding operators. 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. Heim, 1983; Beaver and Krahmer, 2001), this level of detail suffices for our purposes. By providing a way to avoid projection, local accommodation comes to the rescue in bathroom disjunctions as it helps to avoid the clash with NO that would arise if the presupposition were accommodated globally; effectively, it results in an interpretation that can be paraphrased as follows:

(12) 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 and Bott, 2013; Romoli and 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 involves local accommodation to avoid the clash with NO. Under the assumption that local accommodation comes at a processing cost, the version with the trigger in the first disjunct is assumed to come 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 in this regard, which posits additional processing costs for symmetric filtering.[5]

[5]Note that Hirsch and Hackl (2014) report experimental data from binary preference tasks that indeed suggest that bathroom disjunctions with the trigger in the second disjunct are preferred. We do not review these details here; see Kalomoiros and Schwarz (2021) for more details.

2.3. Experimental background: Asymmetry in conjunction

We wish to investigate the (a)-symmetry of disjunction experimentally. To do so, we build on prior paradigms investigating related issues. In particular, we adapt 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 Schlenker's). The key target sentences are illustrated using the the emotive factive trigger *happy* (which presupposes its complement clause to be true):

(13) a. 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.

b. 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 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. This embedding is necessary in the case of conjunction, as parallel unembedded cases would not make it possible to tease apart acceptability due to global accommodation from acceptability due to right-to-left filtering. Embedding the conjunction in the antecedent of a conditionals - an environment from which presuppositions standardly project -, does differentiate these two cases: A globally accommodated presupposition would project. In contrast, if the presupposition were filtered (right-to-left) by the following conjunct, it should not have any impact on the global context. **(ii)** the presupposition-bearing conjunct asymmetrically entails the presupposition-less conjunct, to avoid a potential confound of redundancy (Rothschild, 2011).[6]

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), which explicitly asserts that the presupposed proposition was not settled by the context; and a support context (S), which explicitly supported the presupposition.

[6]The motivation for this 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.

(14) 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 the interpretation of **PsFirst** involves global accommodation of the presupposition, then it 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 presuppose that *p* in the following sentence. No such issue arises in the **Support** context. In contrast, if right-to-left filtering is an option, it should be acceptable. 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). If right-to-left and left-to-right filtering were equally available, these 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. 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:

(15) COND-PS[7] (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 COND-PS based on that. COND-PS also controls for potential (presumably limited) availability of local accommodation inside of the *if*-clause, as this is the only remedy for making this sentence acceptable in the Explicit Ignorance context (which should be equally available in PSFIRST).

Furthermore, to control for potential conjunct-order effects independent of the key presuppositional properties, non-presuppositional controls corresponding to either conjunct order were included as well:

(16) a. NO-PS-FIRST (A conjunction like the one in PS-FIRST, 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. NO-PS-SECOND (A conjunction like the one in PS-SECOND, 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.

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 PS-FIRST sentence is less acceptable than PSSECOND in an EI context. While there is a slight order effect in the non-presuppositional control conjunctions as well, it is much stronger in the presuppositional case (as reflected in 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).

[7]This is called SIMPLE-PS in Mandelkern et al. (2020), but we adjusted it to match our own condition names below.

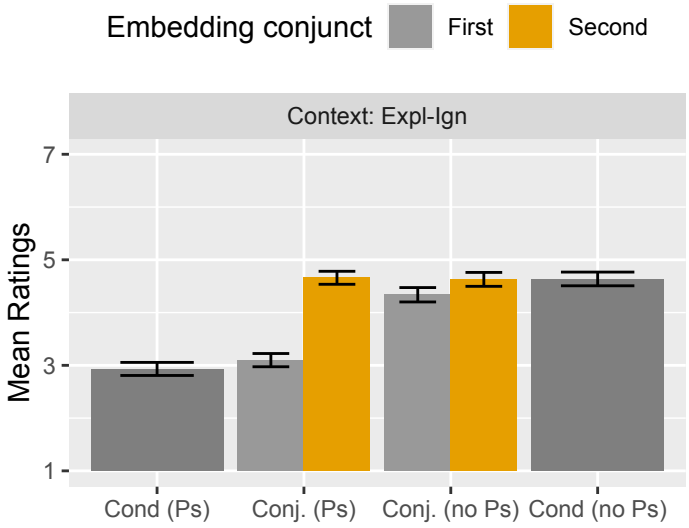

Figure 1: Mean acceptability for each condition in Mandelkern et al. (2020)

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, comprehenders would be expected to resort to it, even if it comes at a cost. But note that the acceptability of the PS-FIRST sentences in EI contexts is just as low as that of the COND-PS sentences, where the only mechanism that allows a COND-PS sentence to be acceptable in an EI context is local accommodation. Thus, the fact that the acceptability of PS-FIRST sentences parallels that of COND-PS sentences in EI contexts is evidence that right-to-left filtering is not available at all in PS-FIRST 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. Comparing *and* vs. *or*

3.1. Disjunction: Hypotheses

A fundamental question that comes out of the background we have laid is the following: Is there a difference between conjunction and disjunction in terms of presupposition projection? We reviewed the following possibilities above regarding symmetry phenomena: First, projection from disjunction might be entirely symmetric (cf. conjunction), without any associated costs. Alternatively, we reviewed two accounts that do posit some level of asymmetry at one level or another:

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

(18) **Hirsch and 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; local accommodation is assumed to come with its own processing cost (based on prior findings).

We present an experiments aimed at teasing these possibilities apart. Our results support the conclusion that conjunction and disjunction truly do differ in their projection behavior, with disjunction being symmetric and conjunction asymmetric.

3.2. Experiment

3.2.1. Design

Our experiment aims to provide a direct comparison between conjunction and disjunction by extending the Mandelkern et al. design for conjunction to disjunctions and combining he manipulations for the two connectives into a single experiment.

We created items using 6 triggers (*continue, again, aware, happy, stop, find out*), with parallel 6 condition variations implemented for each connective (CONJ vs. DISJ). To further maximize uniformity of stimuli while avoiding embedding of disjunctions in an *if*-clause[8], presupposition triggers appeared in the scope of the possibility modal *could*. This plays the same conceptual role for presupposition projection as the embedding in *if*-clauses in the Mandelkern et al. study, in that it allows us to dissociate filtering from global accommodation in conjunctions, and it also makes the disjunction stimuli entirely parallel to the conjunction stimuli.

Similarly to the PS-COND conditions in Mandelkern et al., we used simple (i.e., not coordinated) sentences with the presupposition trigger embedded in the scope of 'could', in Support (S) and Explicit Ignorance (EI) contexts as controls. These established baselines for presupposition projection and presuppositional support:

(19) ***Contexts:*** 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. I tried to figure out why that book was there.
   a. I know that John had research interests in Tolkien in the past, … (S)
   b. I don't know if he ever did have interests in Tolkien,… (EI)
   … so I thought:

(20) It could be the case that John continues having research interests in Tolkien, so that's why he's reading the book. (SIMPLE-PS)

The critical target sentences were conjunctions and disjunctions, embedded under 'could', with the presupposition introduced in either the first (PS-FIRST) or the second (PS-SECOND) disjunct or conjunct:

[8] See Kalomoiros and Schwarz (2021) on why this is an unsuitable embedding for disjunctions.

(21) **Disj:**

a. It could be the case that either John continues having research interests in Tolkien or he never used to have such interests, so I should ask him why he's reading this book. (PS-FIRST)

b. It could be the case that either John never used to have research interests in Tolkien or he continues having such interests, so I should ask him why he's reading this book. (PS-SECOND)

(22) **Conj:**

a. It could be the case that John continues having research interests in Tolkien and used to have research interests in Tolkien's fantasy writings, so he is reading the book for work. (PS-FIRST)

b. It could be the case that John used to have research interests in Tolkien's fantasy writings and continues having research interests in Tolkien, so he is reading the book for work. (PS-SECOND)

Following Mandelkern et al., for each presuppositional sentence, we include a non-presuppositional version ({CONJ/DISJ}-NO-PS-{FIRST/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 PS-FIRST relative to PS-SECOND that exceed any parallel decreases for the NO-PS variants.

(23) **DISJ:**

a. It could be the case that either John currently has research interests in Tolkien or he never used to have such interests, so I should ask him why he's reading this book. (NO-PS-FIRST)

b. It could be the case that either John never used to have research interests in Tolkien or he currently has such interests, so I should ask him why he's reading this book. (NO-PS-SECOND)

(24) **CONJ:**

a. It could be the case that John currently has research interests in Tolkien and used to have research interests in Tolkien's fantasy writings, so he is reading the book for work. (NO-PS-FIRST)

b. It could be the case that John used to have research interests in Tolkien's fantasy writings and currently has research interests in Tolkien, so he is reading the book for work. (NO-PS-SECOND)

Three types of fillers were included, illustrated in (25)-(27), with 6 items respectively for the FALSE-FILLER and COND types (3 Good and 3 Bad).

(25) a. ***Context:*** My friend Ava was planning to go on vacation in the Netherlands. One day, I stopped by her house and I saw that the lights were on. I did not know her itinerary exactly and I wasn't sure if she was gone, so I thought:

b. It could be false that Ava has gone on her vacation, so she might have time to have a cup of tea with me. (FALSE-FILLER)

(26) 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. (BAD-COND)

(27) 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. (GOOD-COND)

The FALSE-FILLER item were simple (i.e., non-coordinated) sentences embedded under 'It could be false'. There is nothing technically wrong with these sentences, but the presence of 'false' adds some complexity, which could lead to decreased acceptability. Their purpose was to counterbalance the fact that all the critical sentences were embedded under 'It could be the case'.

The GOOD/BAD-COND 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 GOOD-COND fillers, this requirement was fulfilled, while in BAD-COND fillers, it was not. By introducing another source of infelicity in the items that are presented, these pairs are aimed towards distracting the participants from picking up that we are testing the potential effects of projection in the critical items. Furthermore, as we rely on detecting acceptability effects based on fairly subtle interpretive properties of relatively complex and long sentences, we use these to provide an exclusion criterion in our data analysis (as detailed below): if a participant is not picking up on the (arguably less subtle) GOOD-COND vs. BAD-COND contrast, then this is an indication that their judgments are not calibrated at the right level of subtlety to be sensitive to our critical presupposition manipulations.

3.2.2. Predictions

Accounts that take projection to be uniformly asymmetric across connectives predict that PS-FIRST should be worse than PS-SECOND for both disjunctions and conjunctions, whereas no such difference should be found for the NO-PS conditions. If on the other hand projection properties differ by connective, with disjunction being symmetric and conjunction asymmetric, then we expect that there will be no advantage of DISJ-PS-SECOND over DISJ-PS-FIRST, but there should be a difference between CONJ-PS-FIRST and CONJ-PS-SECOND (as in Mandelkern et al). In a direct comparison of the connectives, this would also crucially predict an interaction between ORDER (FIRST vs SECOND) and CONNECTIVE (CONJ vs DISJ) in the PS conditions.

3.2.3. Participants and procedure

A total of 552 participants were recruited from Prolific and our university's subject pool.[9] After seeing informed consent, they saw a list of experimental items with one item per trigger and condition, counterbalanced in a Latin square design, with CONNECTIVE (DISJ vs. CONJ) as a between subjects factor, along with 12 fillers (18 items total). The full set of items was shown in randomized order. The task was to indicate on a 9-point scale how natural the sentence sounds in the given context.[10] A demonstration version of the experiment as well as the underlying code and the csv-files containing the full stimuli are accessible at `https://farm.pcibex.net/r/khsLsR/` (for conjunction) and `https://farm.pcibex.net/r/BpVBkN/` (for disjunction).

3.2.4. Results

Data Treatment Since the experiment included filler items, this allowed an independent assessment of participants' attentiveness and sensitivity to the general contextual considerations bearing on the task, namely GOODCOND (27), and BADCOND (26). Looking at all participants' data, there was a clear and significant difference between the two filler types, confirmed by a mixed effect linear regression model ($\beta = 4.1$, $SE = 0.82$, $t = 4.99$, $p < .01$). Based on this contrast, we decided to remove all participants with a mean difference between GOODCOND and BADCOND of less than 3. This affected 161 participants, leaving us with data from 391 participants' data. Since the differences in our critical presuppositional stimuli are quite fine-grained, we think that removing participants who are not sensitive to the clear contrast between GOODCOND and BADCOND fillers leads to a better measure of any potential presupposition-related differences.

CONJ vs. DISJ This brings us to our central concern, namely whether CONJ and DISJ differ in the way that linear order (introduction of the presupposition in the FIRST or SECOND conjunct) affects felicity in EI contexts. The overall descriptive pattern in mean ratings is illustrated in Figure 2. To test the apparent effect in opposite directions statistically, we fit a linear mixed effect model to the PS conditions, with ORDER and CONJ VS. DISJ as interacting fixed effects (using sum-coding), and random intercepts for participants and items, as well as a random slope for coordination type by Items (the maximal random effect structure for which the model would converge). There was a significant interaction ($\beta = .89$, $SE = .30$, $t = 2.95$, $p < .01$), as well as a significant main effect of coordination type with higher ratings for conjunction ($\beta = .1.36$, $SE = .30$, $t = 4.46$, $p < .01$).[11]

[9] After starting data collection on the latter, it quickly became clear that there was not sufficient supply of participants there at the time, and the subject pool ultimately only yielded 53 particpants; the remaining 499 participants were recruited on Prolific.

[10] We decided to use a 9-point scale, as the differences we are after are fairly subtle, in the hope of a more fine-grained scale providing more space for small differences to come out.

[11] p-values are calculated via the `lmerTest` package.

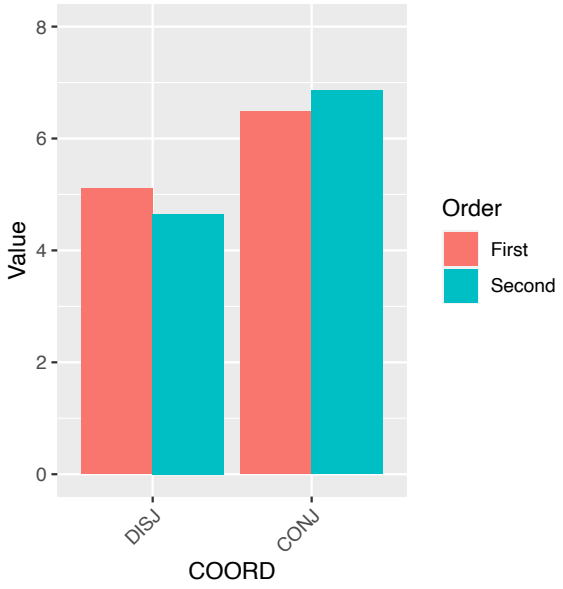

Figure 2: Mean acceptability by ORDER and Coordination type in PS conditions

In light of potential similar effects for the NO-PS condition, illustrated in Figure 3, we ran the same analyses on these. We find none of the relevant observed effects to be significant, i.e., no interaction ($\beta = .35$, $SE = .33$, $t = 1.04$, $p = 0.29$) and no simple effects of order (DISJ: ($\beta = .11$, $SE = .24$, $t = 0.45$, $p = 65$); CONJ: ($\beta = -.24$, $SE = .24$, $t = 1.02$, $p = .31$)), but only a main effect of coordination type, with conjunctions rated higher than disjunctions, as above ($\beta = .82$, $SE = .26$, $t = 3.17$, $p < .01$). Thus, the observed effects for CONJ-PS and DISJ-PS seem to be due to the relation of the presuppositions to the Explicit Ignorance context: in particular, the effect of ORDER in such contexts lacking support of the presupposition differs for conjunction and disjunction.

Thus, the results of our experiment support the conclusion that there is a genuine difference between conjunction and disjunction.

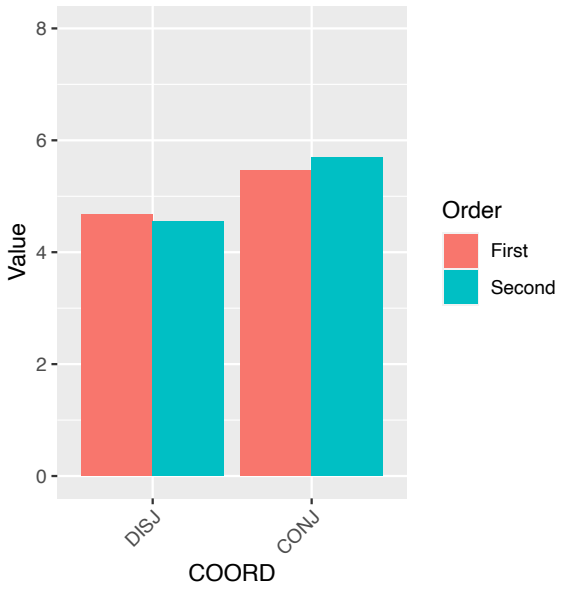

Figure 3: Mean acceptability by ORDER and Coordination type in NO-PS conditions

3.3. Discussion

Our results establish that disjunction and conjunction **differ** in terms of presupposition projection. PSFIRST conjunctions are worse than PSSECOND (cf. the asymmetry result of Mandelkern et al. (2020)), while the effect for disjunctions goes in the opposite direction: it is PSSECOND that is better than PSFIRST. This interaction between CONJTYPE and ORDER is enough to allow us to establish the difference between conjunction and disjunction.

However, one might wonder at the advantage that DISJ-PSFIRST shows compared to DISJ-PSSECOND (this is a statistically significant difference ($\beta = 0.46$, $SE = .22$, $t = 2.12$, $p < .05$)). We do not think that this contrast should directly inform our theoretical discussion of projection (e.g., to consider that we have projection from PS-SECOND, but not from PS-FIRST): first, there is no theory of projection that predicts such a difference between a PS-FIRST disjunction and a PS-SECOND disjunction: even on an account that posits symmetric filtering for disjunction, the prediction is that PS-FIRST and PS-SECOND should be equal. Thus, we are inclined to think that factors independent of presupposition are responsible for this difference. One possibility is that the presence of 'in the first place' contributed to decreasing felicity when appearing in the first disjunct. Compare these conditions for 'again':

(28) a. ***Context:*** My friend William researches the history of music and for the past few years he has been focusing on the history of woodwinds. One day, I stopped by his house and I saw a well-worn-out and heavily used book about the cello. I don't know if William ever had an interest in stringed instruments, so I thought:

b. It could be the case that either William is getting interested in the history of stringed instruments again or he never had such interests in the first place, so I should ask him why he's reading this book. (PS-FIRST)

c. It could be the case that either William never had interests in the history of stringed instruments in the first place or he is getting interested in the history of stringed instruments again, so I should ask him why he's reading this book. (PS-SECOND)

It seems that 'in the first place' is subject to a felicity constraint that demands some contrastive material to have been introduced in the preceding discourse. This happens in (28b), but not in (28c). Another (related) possibility is that disjunctions prefer to introduce what seems to be the default option in the first disjunct (see also Lassiter (2009)). In (28) above, the context creates a salient possibility that William has research interests in stringed instruments, and it might be preferable to address this positive possibility from the get-go in the first disjunct, rather than present its negation first. Future experimental forays into these issues should try to disentangle these possibilities.

Moreover, in the experiment reported in Kalomoiros and Schwarz (2021), which followed the same design, but looked only at (unembedded) disjunctions, the disjunction conditions presented a much 'flatter' picture, as can be seen in Figure 4: no significant difference exists between PSFIRST and PSSECOND (see Kalomoiros and Schwarz (2021) for details). This supports the idea that disjunction is infact symmetric in terms of projection, and crucially different from conjunction in this respect.

We now turn to a general discussion of the theoretical implications of our results.

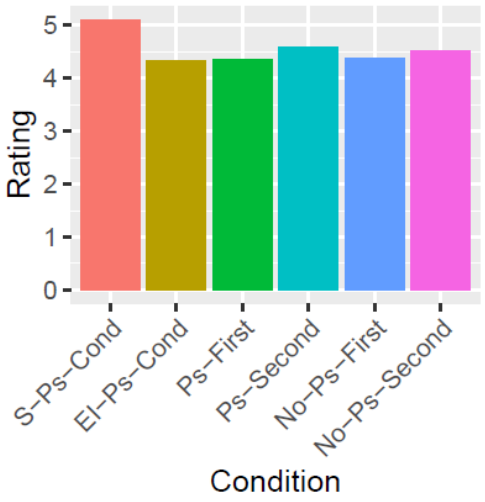

Figure 4: Mean acceptability across triggers, from Kalomoiros and Schwarz (2021)

4. General discussion

To frame our overall discussion of theoretical implications of our findings, we start by considering the space of options that remains open in light of them. First, embracing the notion that projection from disjunction is symmetric, we are left with two options.

Option 1 is that in the case of disjunction, symmetric filtering is available **without incurring any extra cost** (at least none that is measurable in our task). This would capture the absence of any left-to-right asymmetry between PS-FIRST and PS-SECOND. It also explains why the NO-PS conditions are no better than the PS conditions.

Option 2 is that genuine filtering is not at play in disjunction at all: Geurts (1999), for example, argues that presuppositions generally project from both disjuncts, yielding a different kind of symmetry. Absence of projection, e.g., in 'bathroom' disjunctions, then requires 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).

It is not clear that our data directly offer anything decisive for or against these two options. However, on a more general level that leaves the choice between these options open for now, it is important to note that neither option is compatible with a domain general projection mechanism that treats conjunction and disjunction **uniformly** w.r.t. effects of linear order: any successful theory of projection must be able to differentiate conjunction and disjunction in terms of projection (either by hard-wiring the difference into the lexical entries, or by exploiting some other difference between conjunction and disjunction, most plausibly their differing truth conditions). With regards to existing theories of projection, the issue extends to theories such as that in Schlenker (2009), which posits symmetric and asymmetric filtering mechanism to be available across the board. If there are two filtering mechanisms and they are both equally available, then we expect to see no difference between conjunction and disjunction. If, on the other hand, one of these mechanisms is taken as a default, with the other available at some processing cost, we expect either symmetry to be costly (if asymmetry is the default), or symmetry to be costless (if symmetry is the default); our results go against both of these set-ups.

One potential reaction might be to still postulate two filtering mechanisms, but tie their availability to the individual connectives, but that amounts to lexical specification of projection properties, with the corresponding loss of explanatory power. The other option is to postulate a new kind of projection mechanism that is uniform across connectives, but which derives their distinct projection properties from the way this mechanism interacts with other lexically specified properties, most plausibly their underlying truth conditions.

We will not delve deeper into these avenues here. However, we note that the approach that ends up lexicalizing these (a)-symmetries is deeply unsatisfacory and lacks explanatory adequacy. An attempt to provide a new pragmatic theory of projection that derives asymmetric conjunction, but symmetric disjunction has been recently pursued in Kalomoiros (Forth.) under the name *Limited Symmetry*. This approach tries to keep the spirit of Schlenker (2009), but aims to reconcile the goal of a predictive theory of projection with the empirical picture we presented in this paper. In *Limited Symmetry* linear order has still a crucial role to play but its effect is modulated by truth conditions, thus leading to symmetry in disjunction but not in conjunction, while simultaneously making various novel predictions (see Kalomoiros (Forth.) for the details)

5. Conclusion

In this paper we have been concerned with the effect of linear order on presupposition projection in conjunction and disjunction. We presented an experiment where we find empirical evidence 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. These findings have important theoretical implications, in that they place a constraint on viable theories of projection. In particular, they argue against theories that take linear order as the sole arbiter of projection and filtering (cf. Schlenker (2009), Hirsch and Hackl (2014)), in a way that has uniform effects across connectives.

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