Filtering free choice*

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Abstract Sentences involving disjunctions under a possibility modal give rise to so-called 'free choice' inferences, i.e. inferences to the effect that each disjunct is possible. This note investigates the interaction between free choice and presupposition projection. We focus on sentences embedding both a disjunction in the scope of a possibility modal and a presupposition trigger, and we investigate how the free choice inference triggered by the former can contribute to filtering the presupposition of the latter. We consider three cases: conditionals, disjunctions and *unless* sentences. We observe that in all of these cases the presuppositions triggered from the consequent, second disjunct, or the scope of *unless* appear to be filtered by a free choice inference associated with the rest of the sentence. The case of the conditional can be accommodated by scalar accounts of free choice, but the disjunction and *unless* cases cause a substantial problem for all these accounts. After discarding a natural but unsuccessful attempt at a solution, we consider two more promising strategies. The first holds on to an implicature account of free choice and exploits an algorithm of free insertion of redundant material. The second exploits a semantic account of free choice. Each of these solutions comes with related problems. We conclude that the correct form of a theory of free choice remains open, though the data concerning the interaction between free choice and presupposition can significantly help sharpen our theoretical choices.

1 Introduction

Sentences involving disjunctions under a possibility modal give rise to so-called 'free choice' inferences, i.e. inferences to the effect that each disjunct is possible. For example, (1-a) suggests the inference in (1-b) (Kamp 1974).

(1) a. Maria can go study in Tokyo or Boston.
b. ⇝ *Maria can go study in Tokyo and she can go study in Boston*

One successful family of theories of free choice treats it as a kind of scalar implica-

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ture, broadly construed (Fox 2007, Alonso Ovalle 2005, Chemla 2010, Klinedinst 2007, Santorio & Romoli 2017, Franke 2011, Bar-Lev & Fox 2017 among others). The main argument for theories in this family is that free choice appears to be linked to polarity: free choice effects disappear in downward entailing contexts. Scalar accounts are very well placed to predict and explain this link.

This note raises a problem for all scalar accounts of free choice. We focus on the interaction between free choice phenomena and presupposition projection: in particular, we show that all scalar accounts have difficulties explaining patterns of presupposition projection and filtering in some complex sentences that involve free choice effects. For illustration, here is one of our sample sentences:

(2) Either Maria can't go study in Tokyo or Boston, or she is the first in our family who can go study in Japan.

The sentence in (2) as a whole appears to carry no suggestion that Maria can go study in Japan, despite the fact that the second disjunct contains a presupposition trigger, associated with that presupposition (*S is the first in our family to* C presupposes that *S* C-ed or is C-ing). This means that, in standard terminology, the presupposition that Maria can go study in Japan must be filtered.[1] But, for filtering to occur, the clause *Maria can't go study in Tokyo or Boston* needs to trigger a free choice reading when computing the presuppositions of the sentence. At the same time, that same clause needs to not trigger a free choice inference for its interpretation in the first disjunct. The problem, as we point out below, is that this double behavior cannot be predicted by standard scalar accounts.

After describing the problem, we sketch a quick map of the solution space. First, we briefly consider and discard a promising but unsuccessful attempt, based on the idea that implicatures can be calculated on presuppositions without also affecting the asserted content (Magri 2009, Spector & Sudo 2017, Gajewski & Sharvit 2012, Sudo & Romoli 2017, Marty 2017). We then turn to two more promising strategies. The first is based on a recent account of presupposition projection and anaphora by Rothschild 2017, which exploits free insertion of redundant material at LF. The second is based on recent semantic accounts of free choice (Aloni 2016, Starr 2016, Willer 2017 and Goldstein 2018). Both these strategies can account for our data, but

1 In principle, presuppositions can also not project by being 'locally accommodated' (cf. von Fintel 2008). This however would predict no difference between the sentence in (2) and (i): that is, the option of suspending the presupposition by local accommodation is equal in these sentences, yet intuitively from (i) we conclude much more that Mary can go study in Japan than in (2).

(i) Either Maria's brother could go study in Tokyo, or Maria is the first in our family who can go study in Japan.

have related problems. We conclude that the correct form of a theory of free choice remains open, though the data concerning the interaction between free choice and presupposition can significantly help sharpen our theoretical choices.

The rest of the paper is organized as follows. In §2, we provide some background about free choice and presupposition. We then illustrate the problem in §3. After sketching the unsuccessful strategy in §4, we discuss the two possible solutions, together with relevant problems, in §5. In §6, we discuss a further aspect of the truth-conditions of our main case predicted by both solutions.

2 Background

2.1 The implicature approach to free choice

One successful family of theories treats free choice as a kind of scalar implicature. We have already mentioned one argument for this general approach: free choice inferences tend to disappear in downward entailing environments, exactly like scalar implicatures. For illustration, notice that (3-a) does not have the reading in (3-b).

(3) a. It's not the case that Maria can go study in Tokyo or Boston
b. $\not\approx$ *It's not the case that: Maria can go study in Tokyo and Maria can go study in Boston*

Other arguments for this approach come from the well-known observation that free choice inferences are cancelable (cf. Simons 2005, Fox 2007), and from predicting free choice readings associated with universal quantifiers (Chemla 2009, Bar-Lev & Fox 2017), and nonmonotonic quantifiers (Bassi & Bar-Lev 2016, Gotzner et al. 2017). We refer the readers to the relevant sources for details.

All implicature theories of free choice start from semantic accounts of implicature, hence let us briefly survey the latter. A number of authors (Fox 2007, Chierchia et al. 2012, Chierchia 2013 among others) argue that scalar implicatures are derived via a covert exhaustivity operators, which following tradition we represent as 'EXH'. EXH takes a sentence and a set of its alternatives as arguments and returns the conjunction of the basic sentence with the negation of the 'excludable' subset of its alternatives. Informally, an alternative counts as excludable if negating it doesn't contradict the literal meaning of the sentence asserted, and doesn't force us to accept any other alternative in the set.[2]

2 Here are the lexical entries for EXH and the formal definition of excludability. (The notion below is not the final notion of excludability used by Fox; see Fox 2007 for the full story.)

(i) $[[\text{EXH } A]](w) = [[A]](w) \wedge \forall B \in \text{EXCL}(A, ALT(A))[\neg[[B]](w)]$

(ii) $\text{EXCL}(A, X) =$

Let us illustrate how this works in the case of a simple disjunction like (4) giving rise to the implicature that Maria didn't go to study in both places.

(4) Maria went to study in Tokyo or Boston.
$\rightsquigarrow$ *Maria didn't go study both in Tokyo and Boston*

The assumption is that the sentence in (4) is parsed as in (5) with a covert exhaustivity operator. In addition, we assume that the alternatives of (4), over which EXH quantifies, are those in (6).[3]

(5) EXH[Maria went to study in Tokyo or Boston]

(6)
$$\left\{ \begin{array}{ll} \text{Maria went to study in Tokyo or Boston} & \textbf{Tokyo} \vee \textbf{Boston} \\ \text{Maria went to study in Tokyo} & \textbf{Tokyo} \\ \text{Maria went to study in Boston} & \textbf{Boston} \\ \text{Maria went to study in Tokyo and Boston} & \textbf{Tokyo} \wedge \textbf{Boston} \end{array} \right\}$$

Given the alternatives in (6), only the conjunctive alternative (**Tokyo** $\wedge$ **Boston**) is excludable. This gives the intuitively correct prediction: excluding the conjunctive alternative yields the implicature in (4).

Free choice effects cannot be derived as simple implicatures, at least not by using the classical meanings of disjunction and possibility modals.[4] But they can be predicted on more sophisticated theories of implicature. One attempt, dating back to Fox 2007 (and building on an idea in Kratzer & Shimoyama 2002), derives the effect by postulating multiple occurrences of EXH in the relevant sentences. On this view, free choice is derived via a mechanism of recursive exhaustificaton. A more recent account (see Bar-Lev & Fox 2017) exploits a different meaning for the exhaustivity operator that allows one to directly conjoin the assertion with some of the alternatives.

For current purposes, it is not important exactly how free choice is derived, as long as the effect is based on one or more iterations of the exhaustivity operator. Both the problem we raise and the possible solutions are independent of the precise mechanism that derives free choice on scalar accounts. Hence we simply use 'EXH*' as a placeholder for whatever operator, or combination of operators, best suits the

$$\{B \in X : [\![A]\!] \nsubseteq [\![B]\!] \wedge \neg\exists C[C \in X \wedge ([\![A]\!] \wedge \neg[\![B]\!]) \subseteq [\![C]\!]]\}$$

3 An important issue for this account and for theories of implicatures in general is indeed how the alternatives used to compute exhaustified meanings are determined. This is a controversial issue in the literature but it is orthogonal to our problem, so we set it aside. For relevant discussion see Breheny et al. 2017 and references therein.

4 Though see Klinedinst 2007 and Santorio & Romoli 2017 for attempts at deriving free choice via EXH, in combination with more sophisticated semantics for modals.

purposes of scalar accounts. For example, we will assume that (7) is parsed as in (8).

(7) Maria can go to study in Boston or Tokyo.

(8) EXH*[Maria can go study in Boston or Tokyo]

This approach can account successfully for free choice inferences (or lack thereof) in the various linguistic environments mentioned above, including the DE contexts and embeddings of clauses like (7) under universal and nonmonotonic quantifiers.

2.2 Presupposition filtering and projection

A sentence like (9) gives rise to the inference that Maria went to study in Japan.

(9) Maria is the first in our family who went to study in Japan.
$\rightsquigarrow$ *Maria went to study in Japan*

This inference projects through embeddings in a way that is characteristic of presuppositions (Karttunen 1973, Heim 1982 and much subsequent work). For instance, when we embed (9) under negation, in the antecedent of a conditional, under a possibility modal, or we make a question out of it, the suggestion that Mary went to study in Japan remains robust. That is, the presupposition of (9) projects through embeddings in (10-a)-(10-d).

(10)
a. Maria is not the first in our family who went to study in Japan.
b. If Maria is the first in our family who went to study in Japan, her older brother must have gone to study in the States.
c. Perhaps Maria is the first in our family who went to study in Japan.
d. Is Maria the first in our family who went to study in Japan?
$\rightsquigarrow$ *Maria went to study in Japan*

In certain cases, however, presuppositions are filtered by embeddings. For instance, when we embed (9) in sentences like (11)-(13), repeated from above, we do not conclude from any of these sentences that Mary went to study in Japan.

(11) If Maria went to study in Tokyo, she is the first in our family who went to study in Japan.
$\not\rightsquigarrow$ *Maria went to study in Japan*

(12) Either Maria didn't go to study in Tokyo, or she is the first in our family who went to study in Japan.
$\not\rightsquigarrow$ *Maria went to study in Japan*

Sentence	Conditional ps	Unconditional ps	Filtering condition
If B, A_C	$\mathbf{B} \rightarrow \mathbf{C}$	$\mathbf{C}$	if **B** entails **C**
B or A_C	$\neg\mathbf{B} \rightarrow \mathbf{C}$	$\mathbf{C}$	if ¬**B** entails **C**
Unless B, A_C	$\neg\mathbf{B} \rightarrow \mathbf{C}$	$\mathbf{C}$	if ¬**B** entails **C**

Table 1 Presuppositions and associated filtering conditions predicted by the main approaches in the literature for the cases in question

(13) *unless* Maria didn't go to study in Tokyo, she is the first in our family who went to study in Japan.
$\not\rightsquigarrow$ *Maria went to study in Japan*

A theory of presupposition projection has to tell us when and how presuppositions project and when they do not. Informally, as we will see, to account for why presuppositions do not project in cases like (11)-(13), different theories capitalize in different way on the fact that the antecedent of the conditional, the negation of the first disjunct, and the negation of the restrictor of *Unless* entails the presupposition of the consequent, second disjunct, and nuclear scope of *Unless*, respectively.

The literature contains a large variety of approaches. For what is relevant here, we can divide the different approaches in two main groups, on the basis of the two main predictions they make for the cases above. The first type of accounts predicts the conditional presuppositions summarised below (e.g. Heim 1982, Gazdar 1979, Beaver 2001, Chierchia 1995, van der Sandt 1992, Geurts 1999; for more recent approaches, see Schlenker 2008a, 2009, Chemla 2010, Fox 2008, Rothschild 2011, George 2008, Mandelkern 2016a; see also Schlenker 2008b for discussion.). The second type of approaches (e.g., van der Sandt 1992, Geurts 1999, Mandelkern 2016a), on the other hand, predicts stronger presuppositions: i.e., they predict that the presupposition projects directly to the whole sentence.[5] What is most important for us is that both type of accounts derive the same filtering conditions for these cases: a presupposition triggered in the consequent of a conditional is filtered if entailed by the antecedent; a presupposition triggered in the second disjunct or scope of an *unless* sentence, is filtered if entailed by the negation of the first disjunct/the negation of the restrictor of the *unless* sentence. The two main type of predictions are summarised schematically in (13). We turn now to show that neither is correct for the cases at hand.

5 In addition, most of the account predicting the weaker presuppositions above are generally coupled with a theory of when these presuppositions can be strengthened to p to account for cases for which the weaker presuppositions appear inadequate. This falls under the name of the 'Proviso problem,' see Mandelkern 2016b and references therein for discussion.

3 The problem: filtering free choice

Consider the sentences (14)-(16).

(14) If Maria can go study in Tokyo or Boston, she is the first in our family who can go study in Japan (and the second one who can go study in the States).
$\not\rightsquigarrow$ *Maria can go study in Japan(/the States)*

(15) Either Maria can't go study in Tokyo or Boston, or she is the first in our family who can go study in Japan (and the second who can go study in the States).
$\not\rightsquigarrow$ *Maria can go study in Japan(/the States)*

(16) *unless* Maria can't go study in Boston or Tokyo, she is the first in our family who can go study in Japan (and the second who can go study in the States).
$\not\rightsquigarrow$ *Maria can go study in Japan(/the States)*

None of these sentences suggest that Maria can go to study in Japan (and that she can go to study in the States). That is, the strong unconditional presupposition predicted by some of the approaches above appears clearly wrong. We can still ask whether the weaker conditional presupposition predicted by the other approaches would be correct here. That is, we can ask whether the sentence suggests that Maria can go study in Japan, if she can go study in Boston.[6] But this also appears too strong: the sentence doesn't suggest anything about Maria being allowed to study in Japan, regardless of whether she can go study in Boston.[7]

Let us also point out that the intuition generalizes to all sorts of presupposition

6 The predicted conditional presupposition is actually *Maria can go study in Japan, if she can go study in Tokyo or Boston*, which we can simplify to *Maria can go study in Japan, if she can go study in Boston*.

7 An anonymous reviewer asks whether what is going on here is that we are accommodating some contextual 'free choice-like' assumptions according to which if Maria has any study permission, she has them both for Tokyo and Boston. While this may be plausible for some of the cases, we do not think this can be the whole story though. To see this, consider a context in which this assumption is explicitly denied as in (i).

(i) **Context**: My students applied to places in Japan and the States this year. These are very selective places and the competition is very high, so it's not obvious at all that if you get into one place you get into any of the others. I am not sure about the final results of the applications, but as for Maria:

a. If she can go study in Tokyo or Boston, she is the first in our school who can go study in Japan.
b. Either she can't go to Tokyo or Boston or she is the first in our school who can go study in Japan.
c. *Unless* she can't go to Tokyo or Boston, she is the first in our school who can go study in Japan.

triggers. While using the phrase *The first who can ...* is particular natural in this case, the issue can be reproduced with other presupposition triggers. None of the sentences below suggests that Maria can go study in Japan.

(17) a. If Maria can go study in Tokyo or Boston, she will be **happy** that she can go study in Japan.
b. Either Maria can't go study in Tokyo or Boston, or her dad will be **happy** that she can go study in Japan.
c. Unless Maria can't go study in Tokyo or Boston, her dad will be **happy** that she can go study in Japan.
$\not\rightsquigarrow$ *Maria can go study in Japan*

(18) a. If Maria can go study in Tokyo or Boston, her sister can go study in Japan **as well**
b. Either Maria can't go study in Tokyo or Boston, or her sister can go study in Japan **as well**
c. Unless Maria can't go study in Tokyo or Boston, her sister can go study in Japan **as well**
$\not\rightsquigarrow$ *Maria can go study in Japan*

(19) a. If Maria can go study in Tokyo or Boston, **it's not only** in Japan that she can go study.
b. Either Maria can't go study in Tokyo or Boston, or **it's not only** in Japan that she can go study.
c. Unless Maria can't go study in Tokyo or Boston, **it's not only** in Japan that she can go study.
$\not\rightsquigarrow$ *Maria can go study in Japan*

In summary: all these sentences seem to involve filtering of presuppositions. It is natural to assume that free choice is playing a role in this filtering.[8]

We still find that in this context there is nonetheless no presupposition that Maria can go study in Japan, if she can go study in Boston. Let alone that she can go study in Japan, period.

8 To better see the key intuition, let us compare the data in (14)–(16) to structurally similar examples. To this end, notice that disjunctions in the scope of plural existential determiners (as in (i)) also give rise to free choice inferences, while the corresponding singular ones (as in (ii)) do not (Klinedinst 2007).

(i) Some of our students are in Boston or Tokyo.
$\rightsquigarrow$ *Some of our students are in Boston and some of our students are in Tokyo*

(ii) Some of our students is in Boston or Tokyo.
$\not\rightsquigarrow$ *Some of our students is in Boston and some of our students is in Tokyo*

Now consider what happens when we embed (i) and (ii) in a disjunction like (iii) and (iv):

To illustrate the point, consider a schematic version of the sentences above in (20)-(22). (A^+ is a sentence asymmetrically entailing A; we ignore the second conjunct from now on for simplicity.)[9]

(20) If $\Diamond(\mathsf{A}^+ \vee \mathsf{B})$, $\mathsf{C}_{\Diamond \mathsf{A}}$

(21) Either $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}) \vee \mathsf{C}_{\Diamond \mathsf{A}}$

(22) Unless $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}), \mathsf{C}_{\Diamond \mathsf{A}}$

Consider the case of the conditional first: here the predicted projection is (23) (where '$\rightarrow$' stands for material implication).

(23) $\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \rightarrow \Diamond \mathsf{A}$

What is important here is that the literal meaning of $\Diamond(\mathsf{A}^+ \vee \mathsf{B})$ does not entail $\Diamond \mathsf{A}$, therefore the presupposition is incorrectly predicted not to be filtered.[10]

(iii) Either it's not true that some of our students are in Boston or Tokyo, or this is the first year that some of our students are in Japan.

(iv) ??Either it's not true that some of our students is in Boston or Tokyo, or this is the first year that some of our students is in Japan.

(iii) is intuitively felicitous and presuppositionless while (iv) is not. On the contrary, it suggests that, if one of our students is in Boston, then one of our students is in Japan. (This is a somewhat bizarre presupposition, which might explain why the sentence is somewhat awkward.)

Another way to refine the intuition is by comparing the cases above to the corresponding ones with simple disjunctions. Consider a variant of our case in (v) as compared to its corresponding simple disjunction in (vi) (here using the conditional case, but the same can be replicated with the disjunction and *unless* cases).

(v) If Maria can go study Tokyo or Boston, she is happy she can study in Japan.

(vi) ??If Maria went to study in Tokyo or Boston, she is happy she studied in Japan

While (v) is natural and carries no suggestion that Maria can study in Japan, (vi) sounds infelicitous. And, again, the infelicity of (vi) can be naturally connected to the odd presupposition it is predicted to carry (i.e., that Maria went to study in Japan, if she went to study in Boston; see discussion in section 3).

9 We use sans serif capital letters, $\mathsf{A}, \mathsf{B}, \mathsf{C} \ldots$, as sentence variables, and boldfaced capital letters, $\mathbf{A}, \mathbf{B}, \mathbf{C}$, for the propositions they express. We move freely from talking about presuppositions as propositions and as sentences.

10 Let us observe that appealing to Simplification of Disjunctive antecedent is of no help here. It is often observed that a conditional with disjunctive antecedents seems to entail the two conditionals with the individual disjuncts as antecedents (see Fine 1975).

(i) If Mary or Sue were at the party, the party would be fun.

a. $\rightsquigarrow$ If Mary was at the party, the party would be fun.

This case is not too difficult to accommodate once we have a theory of free choice that allows it to appear at embedded levels. This is in fact natural in semantic accounts of implicature, on which the EXH* operator can be merged at global or local level. In particular, we could parse the sentence above as (24).

(24) If $\text{EXH}^*(\Diamond(\mathsf{A}{+} \vee \mathsf{B}))$, $\mathsf{C}_{\Diamond \mathsf{A}}$

Given that now $\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B}))$ entails $\Diamond \mathsf{A}^+ \wedge \Diamond \mathsf{B}$ and therefore in turn entails $\Diamond \mathsf{A}$, the sentence above is correctly predicted not to have any presuppositions, as it projects the tautological presupposition in (25). Hence, as long as we allow for embedded free choice, we can account for the conditional case.[11]

(25) $(\Diamond \mathsf{A}^+ \wedge \Diamond \mathsf{B}) \rightarrow \Diamond \mathsf{A}$

But things are not as simple for disjunctive sentences and *unless*-sentences. Intuitively, the problem is this: we want to use the enriched, free choice meaning of the possibility clause for the purposes of computing the presupposition, exactly as we have done for the conditional. At the same time, we need the basic, non-free-choice meaning of the same clause to compute the meaning of the first disjunct. The problem is that we cannot have both at the same time.

For illustration, first consider that the predicted proposition that ends up being presupposed by the whole sentence is (21) and (20), which is (26), in both cases.

(26) $\neg\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}) \rightarrow \Diamond \mathsf{A} =$
$\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \rightarrow \Diamond \mathsf{A}$

The problem is again that $\Diamond(\mathsf{A}^+ \vee \mathsf{B})$ doesn't entail $\Diamond \mathsf{A}$ and therefore filtering is not predicted. But here, unlike in the conditional case, there is no clear way to strengthen the first disjunct to get free choice effect while obtaining a plausible overall meaning

b. ⇝ If Sue was at the party, the party would be fun.

There are a number of accounts of Simplification on the market, some pragmatic (Klinedinst 2007) and some semantic (Alonso-Ovalle 2004, Fine 2012, Santorio 2017, Ciardelli et al. 2018 among many). Here we want to notice that none of these accounts will help. Simplification is a global strengthening: a conditional entails two related conditionals. If anything this operation will add presuppositions to the sentence rather than taking them away (see Spector & Sudo 2017 and section §4 below). Conversely, the presuppositions of (14)–(16) seem to involve a strengthening that is local to the antecedent: i.e. they seem to presuppose $(\Diamond \mathsf{A}^+ \wedge \Diamond \mathsf{B}) \rightarrow \Diamond \mathsf{A}$.

11 One issue here is that we need to embed EXH* in the antecedent of a conditional, which is generally a dispreffered option (cf. Chierchia et al. 2012). In an implicature account of free choice, however, we seem to need that anyway for cases like (i) (Kamp 1978, Barker 2010.)

(i) If Mary can go study in Tokyo or Boston, she will choose Tokyo.

for the sentence. This is because we want free choice to arise on the negation of the first disjunct/restrictor of *unless*, without changing the meaning of the latter. To illustrate, consider the two options we have in either case: we could first exhaustify above negation within the first disjunct/restrictor of *Unless*. This however would not help, because exhaustifying above negation is vacuous. In other words, (27) is equivalent to $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B})$ and so its negation, cannot, in the same way, filter $\Diamond \mathsf{A}$ in the desired way.

(27) $\text{EXH}^*(\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}))$

We could try to insert the exhaustivity operator below negation as in (28) and here its negation $\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B}))$ would entail $\Diamond \mathsf{A}$ therefore correctly filtering the presupposition of the second disjunct/restrictor of *unless*.

(28) $\neg(\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B})).$

The problem, however, is that now the meaning of the first disjunct/restrictor of *unless* would be too weak and would correspond to the negation of free choice. In other words, the sentences above would have a reading that we could paraphrase as in (29) and (30) respectively. This reading, if it exists at all, is certainly not the reading we are after: under this reading, (15) and (16) would be true if Maria can go study in Tokyo and not in Boston (or vice-versa), while also being neither the first in the family who can go study in Japan nor the second who can go study in the States.

(29) Either it's not true that Maria can go study in Tokyo and can go study in Boston, or she is the first in our family who can go study in Japan (and the second who can go study in the States).

(30) *Unless* it's not true that Maria can go study in Tokyo and can go study in Boston, she is the first in our family who can go study in Japan (and the second who can go study in the States).

Let us summarize what we have done so far. After introducing both free choice and presupposition projection (in particular in conditionals, disjunction and *unless* sentences), we have considered the interaction of the two. We have found that there is a puzzle for all accounts that treat free choice as a kind of scalar effect. The puzzle is that sentences of the forms (20)–(22) appear to not have presuppositions, despite the fact that the rightmost clause contains a presupposition trigger. Hence the presuppositions of the rightmost clause must be filtered by the material in the rest of the sentence. This filtering is expected for conditionals (i.e. sentences of the form (20)), but not for the corresponding disjunctions or *unless*-sentences.

In the next sections, we turn to discussing possible solutions. We first focus on an apparently promising idea that, on close inspection, won't work. We then move on to two more promising suggestions.

4 A nonstarter: split exhaustification

Before laying out two potential solutions to the problem, let us dispatch a tempting but eventually fruitless response.[12] According to one recent line of theorizing (Magri 2009, Gajewski & Sharvit 2012, Spector & Sudo 2017, Sudo & Romoli 2017, Marty 2017), implicatures can be computed separately on the presuppositions and on the content of assertions. The motivation for this line of thought comes from cases like (31).

(31) Maria is unaware that some of the students passed the exam.

(31) has a reading (the dominant reading, in fact) that conveys that Maria doesn't believe that *any* of the students passed the exam, while at the same time presupposing that some *but not all* of the students passed the exam. To capture this reading, we seem to be forced to calculate implicatures on the presupposition, but not on the asserted content of the sentence. A number of theorists have proposed accounts that accomplish this (Magri 2009, Gajewski & Sharvit 2012, Spector & Sudo 2017, Sudo & Romoli 2017, Marty 2017). Here we sketch the simplest version of this idea, following the implementation in Sudo & Romoli 2017. The gist of the account is the assumption of an additional exhaustivity operators, which we will call EXH^*_2. This operator does the same of what EXH^* does, but at the presuppositional level. In other words, given a sentence Ap with presupposition p, we can now exhaustify in two different ways. First, we can use the regular EXH^* which is going to leave the presupposition untouched (it is going to let it project through; cf. Spector & Sudo 2017) and exhaustify the assertion part as in (32).[13]

(32) $[[\text{EXH}^*[\mathsf{A_p}]]] = \lambda w : p(w).[[\text{EXH}^*[\mathsf{A_p}]]](w)$

Second, we can make use of the new exhaustivity operator and leave the assertion component intact while exhaustifying the presuppositional aspect of the meaning of the sentence as in (33).[14]

(33) $[[\text{EXH}^*_2[\mathsf{A_p}]]] = \lambda w : [[\text{EXH}^*]](p)(w).\ [[\mathsf{A_p}]](w)$

12 Thanks to Clemens Mayr for discussion on this point.

13 We are using here the notation from Heim & Kratzer 1998, where a lambda expression $\lambda w : p(w).q(w)$ is a function from worlds into truth-values, which is only defined for worlds w when p is true at w and when defined is true if q is also true at that w.

14 The simple version we are sketching here raises the issue of what are the alternatives for EXH^*_2 given that presuppositions are propositions and not sentences and most theories of alternatives are linked to sentences. See Marty 2017 for discussion.

Now that we are equipped with this other exhaustivity operator, we can capture the relevant reading of (31) with the LF in (34).

(34) EXH_2^*[Maria is unaware that some of the students passed the exam]

This is because the assertion component in (34) is left untouched by EXH_2^*, therefore entailing that Maria doesn't believe that *any* of the students passed the exam, but the presupposition that some of the students passed the exam is now correctly strengthened to entail that *not all* of them did.

Now, our case might appear similar to (31) in all relevant ways. In particular, our problem involves a similar mismatch between the content and the presupposition of a sentence. Hence one might think that the novel exhaustivity operator above will also produce the right outcome in our case. This is a natural thought, but it is incorrect. There is a crucial difference between (34) and a case like (15), repeated below.

(15) Either Maria can't go study in Tokyo or Boston, or she is the first in our family who can go study in Japan.

In the case of (31), if we don't compute implicatures in any way, we predict a presupposition that is *weaker* than what the data suggest. So we need an operator that allows us to strengthen the presupposition by computing the implicature, without strengthening the content of the assertion. This is exactly what EXH_2^* above does. Conversely, in the case of (34), if we don't compute free choice we predict a presupposition that is *stronger* than what we data suggest. As we pointed out, the problem is that the presuppositions triggered by the second disjunct appear to be filtered, i.e. (34) is presuppositionless. Now, the problem is that no exhaustivity operator at the global level can produce the result of *weakening* the presupposition of a disjunction like (34).

Let us elaborate. Suppose we try to exhaustify the presupposition of (34) globally. Using again standard assumptions about presupposition, and embedding that presupposition under an exhaustivity operator EXH^*, as in (35), we get the presupposition in (36). Now, no matter what alternatives EXH_2^* uses, it will either be vacuous or it will strengthen the presupposition of (34) by conjoining the negation of some of these alternatives to it. Either way, it cannot *weaken* the presupposition to a tautology, which is what we need for filtering.

(35) EXH_2^*[Either Maria can't go study in Tokyo or Boston, or she is the first in our family who can go study in Japan].

(36) $\text{EXH}^*((\Diamond(\mathsf{A}^+ \vee \mathsf{B})) \rightarrow \Diamond \mathsf{A}))$

Conversely, if we try to exhaustify within the first disjunct, above or below negation, this will make no difference. The reason is that no presupposition is present; the presupposition comes from the second disjunct.[15]

(37) [Either EXH^*_2[Maria can't go study in Tokyo or Boston], or she is the first in our family who can go study in Japan].

(38) [Either not[EXH^*_2[Maria can go study in Tokyo or Boston]], or she is the first in our family who can go study in Japan].

In sum, no matter what meaning we assume for EXH^*_2 the alternatives it operates on, and where it is inserted, it cannot help with filtering. Exhaustivity operators are simply not in the business of weakening their prejacent, as we would need for filtering.

5 Two directions for a solution

We now turn to two more promising avenues towards a solution. The first holds on to an implicature account of free choice, and exploits a mechanism of free insertion of redundant material, building on an account of presupposition projection and anaphora recently proposed by Rothschild (2017). The second is based on abandoning the implicature approach altogether for a semantic account (Goldstein 2018, Willer 2017, Aloni 2016 and Starr 2016). Each of these options has problems, as we point out.

5.1 Free insertion of redundant material

5.1.1 Filtering free choice and free insertion

Rothschild (2017) proposes a trivalent approach to presupposition projection and anaphora. The crucial ingredient of his account for us is his mechanism of free insertion of redundant material, which builds on his previous proposal in Rothschild 2008 (see also Chierchia 2009, Kamp & Reyle 1993 and Geurts 1999). For illustration, consider a disjunction like (39).[16]

(39) There isn't a bathroom here, or it's under the stairs.

15 Notice also that invoking local exhaustification *at the presupposition level* won't do. To do that, we would need to assume that presuppositions somehow have actual separate LFs analogous to those of their associated sentence. In addition, we would have to assume that an exhaustivity operator can be inserted in these LFs at the embedded level, independently from the LF of the sentence. This conception of presupposition seems entirely at odds with all the major accounts in the literature, so we will not pursue it here.

16 Examples like (39) go back to Barbara Partee; see Partee 2004.

(39) has a coherent reading. This is hard to explain in the light of the fact that anaphora in natural language is highly constrained, and it's not clear how we can assign a suitable antecedent to the pronoun *it* in the second disjunct. In particular, notice that, in minimal variants of (39), anaphora is not felicitous.

(40) There isn't a bathroom here. ??It's under the stairs.

Rothschild (2017)'s account starts from the observation that (40) is equivalent to (41). Assuming that (40) can be analyzed as (41) allows us to get the anaphoric facts right: the underlined inserted part provides a suitable antecedent for the pronoun.

(41) There isn't a bathroom here, or <u>there is and</u> it's under the stairs.

In other words: we can say that sentences involve redundant conjunctions at the level of logical form. For instance, a sentence of the form $\ulcorner \mathsf{A} \vee \mathsf{B} \urcorner$ can be analyzed as having the logical form $\ulcorner \mathsf{A} \vee (\neg \mathsf{A} \wedge \mathsf{B}) \urcorner$. The more formal definition of this insertion mechanism is in (42) (adapted from Rothschild 2017):[17]

(42) **Adding Redundant Conjunctions (ARC)**: if a sentence A contains the clauses C and B, you may replace any instance of B with $\mathsf{C} \wedge \mathsf{B}$ if the resulting sentence is logically equivalent to **A**.

As Rothschild (2017) points out, this mechanism needs to be constrained not to overgenerate. The viability of his proposal ultimately depends on how principled these constraints are.

Let us show how free insertion can provide a solution to our problematic cases. Consider again the cases of disjunction and *unless*. Recall that there was no way to insert EXH* in the first disjunct/restrictor of *unless* that would give us the desired reading without also changing the meanings of the latter.

(43) Either $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}) \vee \mathsf{C}_{\Diamond \mathsf{A}}$

(44) Unless $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}), \mathsf{C}_{\Diamond \mathsf{A}}$

Notice, however, that (43) and (44) are classically equivalent to (45) and (46). We can, therefore, analyze (43) and (44) as having logical forms corresponding to (45) and (46), in accordance with (42).

(45) Either $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}) \vee (\underline{\Diamond (\mathsf{A}^+ \vee \mathsf{B}) \wedge} \, \mathsf{C}_{\Diamond \mathsf{A}})$

17 Where classical equivalence is defined as follows:

(i) **Definition of classical equivalence**: A and B are classically equivalent if for every interpretation $[[\,]]$ and world $w \in W$, $[[\mathsf{A}]]^w = 1$ iff $[[\mathsf{B}]]^w = 1$.

(46) Unless $\neg\Diamond(\mathsf{A}^+ \vee \mathsf{B}), (\underline{\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \wedge} \, \mathsf{C}_{\Diamond\mathsf{A}})$

In this way, we have a site where we can add EXH*. This allows us to obtain free choice, which in turn yields filtering of the presupposition. Hence we can exhaustify the inserted redundant material in the second disjunct/scope of *unless* as in (47) and (48).

(47) Either $\neg\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \vee (\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B})) \wedge \mathsf{C}_{\Diamond\mathsf{A}} =$
Either $\neg\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \vee (\Diamond\mathsf{A}^+ \wedge \Diamond\mathsf{B}) \wedge \mathsf{C}_{\Diamond\mathsf{A}}$

(48) *unless* $\neg\Diamond(\mathsf{A}^+ \vee \mathsf{B}), (\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B})) \wedge \mathsf{C}_{\Diamond\mathsf{A}} =$
unless $\neg\Diamond(\mathsf{A}^+ \vee \mathsf{B}), (\Diamond\mathsf{A}^+ \wedge \Diamond\mathsf{B}) \wedge \mathsf{C}_{\Diamond\mathsf{A}}$

With these ingredients in place, we predict the desired readings for (15) and (16). The reason is that the presupposition is filtered by the inserted material, once we strengthen the latter in a suitable way.[18] At the same time, since we have two distinct syntactic objects, we can apply our free choice operator EXH* to one, but not to the other. Hence we can still take $\Diamond(\mathsf{A}^+ \vee \mathsf{B})$ to contribute its basic meaning to truth conditions. This solves our problem, at least for the basic cases above.[19]

18 The predicted projection in a conjunction like $\mathsf{A} \wedge \mathsf{B}_\mathsf{C}$ is $\mathsf{A} \rightarrow \mathsf{C}$. Therefore in our cases the projection predicted in the second disjunction/scope of *unless* is (i), which is true in every context and therefore predicts correctly that *A* will not project.

(i) $\text{EXH}^*(\Diamond(\mathsf{A}^+ \vee \mathsf{B})) \rightarrow \Diamond\mathsf{A}$

19 An analogous argument involving anaphora and implicature approaches to the multiplicity inference of plural nouns, according to which the more than one suggestion of plural arises as an effect of exhaustification (Spector 2007 among others), comes from cases like (i):

(i) There are no students around or they are hiding.

In particular, for the plural pronoun to have a suitable plural antecedent, we could analyse (i) as (ii):

(ii) There are no students around or (<u>there are students around and</u> they are hiding)

And we can then add EXH* in the second disjunct as in (iii) and have the meaning which we could paraphrase as in (iv), which allows the pronoun to have a plural antecedent.

(iii) There are no students around or EXH*(there are students around) and they are hiding.

(iv) There are no students around or there are at least two students around and they are hiding.

5.1.2 Problems for the free insertion account

In this subsection, we show that Rothschild's theory runs into trouble with cases that are very similar to those we have used so far. To get the right predictions, the theory needs to be modified in a number of ways.

Can we exhaustify freely inserted material? The first worry is that, even on the more liberal understanding of **ARC**, the account runs into trouble with exhaustification. In particular, we need to exhaustify freely inserted material whose antecedent is not exhaustified. There is some evidence that this kind of exhaustification might not be available.

Consider the case in (49).

(49) Either Maria didn't visit Madrid or Barcelona [at all], or she regrets having visited only one of the two main cities in Spain.

(49) parallels our core example in (15). It is a disjunction with a presupposition that Maria only visited one of Madrid or Barcelona triggered in the second disjunct. This presupposition is not entailed by the literal meaning of the negation of the first disjunct, *Maria visited Madrid or Barcelona*. Now, our judgment about (49) is that it is not presuppositionless. On the contrary, it seems to presuppose that, if Maria visited Madrid or Barcelona, she visited Spain.

On the other hand, the free insertion account we are considering does predict that filtering is available. In particular, we are able to filter out the presupposition if we are allowed to use the following LF for (49):

(50) Either $\neg(\mathsf{A} \vee \mathsf{B}) \vee (\underline{\textsc{exh}(\mathsf{A} \vee \mathsf{B}) \wedge}\ \mathsf{C}_{(\mathsf{A}\wedge\neg\mathsf{B})\vee(\mathsf{B}\wedge\neg\mathsf{A})})$

Perhaps the proponent of free insertion can say something to explain why $\textsc{exh}^*$ is not available here; but they should give a preincipled story.

Trouble from the converse case. Another problem is generated by something like the converse case of our running example.[20] Consider (51). The first disjunct contains a positive sentence with a modal and disjunction, which we want to read with free choice. At the same time, despite the presence of a presupposition trigger in the second disjunct, the sentence doesn't presuppose that Maria cannot go study in Tokyo, i.e. the presupposition of the second disjunct appears filtered here as well. This filtering cannot be explained if we use the enriched, free-choice meaning of the first disjnct in the algorithm for presupposition projection.

20 Thanks to Shane Steinert-Threlkeld for suggesting this case to us.

(51) Either Maria can go study in Japan or the US or she is the first in our school who can't go study in Tokyo.
$\not\rightsquigarrow$ *Maria can't go study in Tokyo*

To appreciate the problem consider the schematic version of (51) in (52):

(52) Either $\Diamond(A \vee B) \vee C_{\neg\Diamond A^+}$

As a start, we know we want to read the first disjunct with free choice, so we have to eventually insert an EXH* in the first disjunct to derive that as in (53).

(53) Either EXH* $\Diamond(A \vee B) \vee C_{\neg\Diamond A^+} =$
Either$(\Diamond A \wedge \Diamond B) \vee C_{\neg\Diamond A^+}$

Once we do that, though, the predicted conditional presupposition for (53) is (54): Maria can't go study in Tokyo if she cannot go study in the States. This again appears too strong.[21]

(54) $\neg(\Diamond A \wedge \Diamond B) \rightarrow \neg\Diamond A^+ =$
$\neg\Diamond B \rightarrow \neg\Diamond A^+$

So far this is similar to our basic examples. What is interesting about this case, however, is that there is no obvious way to insert any clause from the sentence that would help generate the right prediction. That is, there is nothing in the first disjunct that could be inserted redundantly and would help filter the presupposition of the second one.

There is a natural move here, but it comes with a cost in terms of complicating the **ARC** further. We can allow ourselves to not only insert redundant parts of a sentence, but also their negations. In other words, we can tweak the definition of the **ARC** as in (55).

(55) **Adding Redundant Conjunctions (ARC)**: if a sentence A contains the clauses C and B, you may replace any instance of B with $C \wedge B$ or with $\neg C \wedge B$ if the resulting sentence is logically equivalent to **A**.

To see how (55) helps, consider again our case in (51): using (55) we can now take the first disjunct and insert its negation in the second one as in (56). The inserted material entails the presupposition of the second conjunct in the second disjunct and thus filters it, as desired.

(56) Either $\Diamond(A \vee B) \vee \neg\Diamond(A \vee B) \wedge C_{\neg\Diamond A^+}$

21 And obviously the unconditional presupposition that Maria can't go study in Tokyo period, would help even less here.

We can then insert EXH* as in (57) and obtain the correct reading with no presupposition: either Maria can choose between Japan and the States or she is the first in our school who cannot go to Tokyo.

(57) Either $\text{EXH}^*(\Diamond(A \vee B)) \vee \neg\Diamond(A \vee B) \wedge C_{\neg\Diamond A^+}$

In sum, a case like (51) is a challenge for the original version of the **ARC**. We can tweak the definition as in (55) and allow it to insert the negation of redundant parts of the sentence. This helps, but the move seems to have no independent motivation.

Contextual salience and contextual equivalence. Finally, consider the following sentence:[22]

(58) John said that Maria is not allowed to go study in Boston or Tokyo. Either he spoke truly, or she's the first person in our family who can go study in Japan.

Our intuition is that (58), similarly to our standard examples, carries no presupposition and hence gives rise to filtering. But this cannot be explained by the **ARC** as defined so far for two reasons. First, any plausible candidate for the material to be copied and inserted in (58) is outside sentence boundaries. This may be fixed by allowing ourselves to copy material from the clause that precedes the disjunction. For example, we might plausibly insert the following (and then exhaustify the underlined inserted part):

(59) John said that Maria is not allowed to go study in Boston or Tokyo. Either he spoke truly, or <u>Maria is allowed to study in Boston or Tokyo and</u> she's the first person in our family who can go study in Japan.

(59) is equivalent to (58): if John didn't speak truly, then it's not true that Mary is not allowed to study in Boston or Tokyo. That is, she is allowed to study in Boston or Tokyo. There is, however, also a second problem. The disjunctive sentence in (59) is not *logically* equivalent to the disjunctive sentence in (58), but only contextually equivalent to it. Hence the constraint on the material to be freely inserted should be relaxed. Freely inserted material needs to be not logically redundant, but only redundant given contextual information.

This discussion suggests replacing ARC in (42) with:[23]

22 Here we stick to disjunction, but the point can be replicated with conditionals and *unless*-sentences.
23 Where contextual equivalence is defined as follows:

(i) **Definition of contextual equivalence**: A and B are contextually equivalent in a context C if for every interpretation $[[\,]]$ and world $w \in C$, $[[A]]^w = 1$ iff $[[B]]^w = 1$.

(60) **Adding redundant conjunctions (ARC)**: if a sentence A contains the clause B you may replace any instance of B with $\mathsf{C} \wedge \mathsf{B}$ or $\neg\mathsf{C} \wedge \mathsf{B}$, where C is a *contextually salient* clause, if the resulting sentence is *contextually equivalent* to **A**.

Of course, it needs to be checked whether the new principle is too liberal, and causes overprediction elsewhere. This task goes beyond the goals of our note.

5.2 Semantic accounts of free choice

5.2.1 Filtering free choice and semantic accounts

Semantic accounts hardwire free choice in the meaning of possibility modals and/or disjunctions, rather than deriving it as a scalar inference. Classical accounts in this vein (see, among others, Simons 2005 and Zimmerman 2000) have been plagued by the problem of explaining the disappearance of free choice under negation and other DE operators. More recent semantic accounts are designed explicitly to deal with this problem (Aloni 2016, Starr 2016, Willer 2017, Goldstein 2018). Here we want to point out that semantic accounts of the new breed yield the correct predictions for our data.

For concreteness, we present informally a simplified version of the first system in (Goldstein 2018), referring the reader to Goldstein's paper for a full discussion. Goldstein's main idea is that free choice is the product of a kind of homogeneity (cf. Križ 2015). To accommodate homogeneity, he uses a trivalent semantics, on which all clauses are mapped to one of three truth values: true, false, and indeterminate (represented as '#'). The semantics derives free choice via two main assumptions. First, as on traditional alternative semantics, disjunctive clauses introduce sets of alternatives: hence e.g. $\mathsf{A} \vee \mathsf{B}$ denotes a set containing the two propositions $[[\mathsf{A}]]$ and $[[\mathsf{B}]]$. Second, the lexical meaning of possibility modals involves a requirement (which, for our purposes, we can model as a presupposition) to the effect that the alternatives denoted by the prejacent should be both evaluated in the same way.

These are Goldstein's lexical entries. Notice that '$\diamondsuit$' is the object language possibility modal, which is defined by appealing to a metalanguage modal '$\Diamond$'.

$$[[\mathsf{p}]] = \{\lambda w.\ p(w) = 1\}$$

$$[[\neg\mathsf{A}]] = W - \bigcup[[\mathsf{A}]]$$

$$[[\mathsf{A} \vee \mathsf{B}]] = [[\mathsf{A}]] \cup [[\mathsf{B}]]$$

$$[[\diamondsuit\mathsf{A}]] = \{\lambda w.\ \exists v \in \{0,1\}\ \forall \mathbf{A} \in \mathsf{A}, \Diamond\mathbf{A}(w) = v.\ \forall \mathbf{A} \in \mathsf{A}, \Diamond\mathbf{A}(w) = 1\}$$

Here is, schematically, how this system derives free choice. Take $\diamond(\mathsf{A} \vee \mathsf{B})$. $\mathsf{A} \vee \mathsf{B}$ denotes a set of two propositions, i.e. $\{\mathbf{A},\mathbf{B}\}$. Given the lexical meaning of $\diamond$, $\diamond(\mathsf{A} \vee \mathsf{B})$ presupposes that $\Diamond\mathbf{A}$ and $\Diamond\mathbf{B}$ have the same truth value, and asserts that they are both true. Once we place the whole clause under negation, via the homogeneity presupposition we get that, whenever the sentence is defined and true, both $\Diamond\mathbf{A}$ and $\Diamond\mathbf{B}$ have to be false. This is because the presupposition requires that they are either both true or both false and the sentence asserts that it's false that they are both true. As a result, the semantics correctly predicts the free choice reading of (61) and the sometimes called 'dual prohibition' reading of (62).

(61) a. Maria can go to Tokyo or Boston
b. $\rightsquigarrow$ *Maria can go to Tokyo and she can go to Boston*

(62) a. Maria can't go to Tokyo or Boston
b. $\rightsquigarrow$ *Maria cannot go to Tokyo and she cannot go to Boston*

The system also captures our problematic data. Consider again (63):

(63) Either Maria can't go study in Tokyo or Boston, or she is the first in our family who can go to study in Japan.

(64) Either $\neg \Diamond (\mathsf{A}^+ \vee \mathsf{B}^+) \vee \mathsf{C}_{\Diamond \mathsf{A}}$

On a system like Goldstein's, the clause $\Diamond(\mathsf{A}^+ \vee \mathsf{B}^+)$ appearing in the first disjunct does not give rise to free choice, since that clause appears under negation. In fact, it entails the expected dual prohibition reading that $\neg \Diamond \mathsf{A} \wedge \neg \Diamond \mathsf{B}$. At the same time, when we compute the presupposition of the sentence, $\Diamond(\mathsf{A}^+ \vee \mathsf{B}) \rightarrow \Diamond\mathsf{A}$, the same clause is interpreted with the free choice reading $\Diamond\mathsf{A}^+ \wedge \Diamond\mathsf{B}^+$. The presupposition of the whole sentence in (63) is, therefore, predicted to be equivalent to $(\Diamond\mathsf{A}^+ \wedge \Diamond\mathsf{B}) \rightarrow \Diamond\mathsf{A}$, hence not posing any requirements in the context (since it is a tautology). So we correctly predict filtering.

It's easy to see that Goldstein's system also has no problem with the converse of our main examples, which we repeat from above in (65).

(65) Either Maria can go study in Japan or the US, or she is the first in our family who can't go study in Tokyo.

In sum, a semantic account like Goldstein's (2018) can straightforwardly capture our problematic case. But it is still not immune to problems, as we point out in the next section.

5.2.2 A problem for the semantic accounts

The problem we raise links to the fact that semantic accounts have a general problem predicting free-choice-type effects in sentences involving conjunction.[24]

Start by noticing that a sentence like (66) also gives rise to a free-choice-type inference (see Fox 2007 for discussion and Chemla (2009) for experimental evidence for this inference):

(66) Maria is not required to go to Tokyo and Boston.
$\rightsquigarrow$ *Maria is allowed to not go to Tokyo and she's allowed to not go to Boston*

Notice, moreover, that a counterpart of (66) gives rise to a filtering phenomenon that is analogous to the one discussed above:

(67) Either Maria is required to go to Japan and the US, or she's the first in her family who is not required to go to Tokyo.

(68) Either $\Box(A \wedge B) \vee C_{\neg\Box A^{+}}$

Now, a semantic account like Goldstein's is unable to predict both the basic free-choice-type effect triggered by (66) and the filtering in (67). The reason is that in Goldstein's account conjunctions do not introduce alternatives (and it is not clear how to do it in a way that does not create problems elsewhere in the system) hence the basic algorithm for deriving free choice doesn't even get started. (66) is therefore an open problem for the semantic solution to our puzzle.

6 A note on the predicted truth conditions

Before closing, we want to go back to our main case repeated in (69) and briefly discuss the predictions of the accounts above with respect to its truth-conditions.[25]

(69) Either Maria can't go study in Tokyo or Boston, or she is the first one who can go study in Japan.

On both the solutions we considered, we can paraphrase the predicted truth conditions as follows:

(70) Either Maria can't go study in Tokyo and she can't go study in Boston or she has free choice between the two and is the first one who can go study in Japan.

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24 Thanks to Simon Goldstein for extensive and very helpful discussion about these points.

25 Thanks to an anonymous reviewer, Benjamin Spector, Paul Marty, Shane Steinert-Threlkeld and Simon Goldstein for discussion on this point.

In other words, the sentence is predicted to be *false* if Maria can only go to Tokyo, even if she is indeed the first one who can go study in Japan.

It's unclear that this prediction is right. Suppose that someone utters (69). And suppose that, after checking, we find out that Maria can only go study in Tokyo (and that she is indeed the first one who can go study in Japan). It seems to us that one can say that this person was right.

This said, we have to be careful that this way of judging an utterance as being true after learning more information might lead to more 'tolerant' intuitions than in the standard case. We cannot exclude that we might be more inclined to say that the speaker said something true *a posteriori*, after learning more information, than in the case in which we are judging whether she said something true against the information we already have at the time of utterance. Nonetheless, this is an important prediction of both of the strategies sketched above and it should be investigated further.

7 Conclusion

We have investigated the interaction between free choice and presuppositions. We have focused on sentences embedding both a disjunction in the scope of a possibility modal and a presupposition trigger, and we have looked at how the free choice effect triggered by the former can filter the presupposition of the latter. We have considered three cases: conditionals, disjunctions and *unless* sentences. We observed that in all of these cases the presuppositions triggered by the consequent, second disjunct, or the scope of *unless* appear to be filtered by a free choice inference associated with the rest of the sentence. The case of the conditional can be accommodated by scalar accounts of free choice, but the disjunction and *unless* cases cause a substantial problem for these accounts. After briefly considering a discarding an attempt at a solution, we have also sketched two more promising possible accounts. The first holds on to an implicature account and uses an algorithm that allows free insertion of redundant material. The second exploits a semantic semantic account of free choice. While our discussion is not conclusive, we think that the data we have presented in this squib provides an important case study for all theories of free choice.

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