A Scalar Implicature-based Approach to Neg-raising*

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Abstract In this paper, I give an analysis of neg-raising inferences as scalar implicatures. The main motivation for this account as opposed to a presupposition-based approach (Bartsch 1973 and Gajewski 2005, 2007) comes from the differences between presuppositions and neg-raising inferences, noticed by Gajewski (2005, 2007) and Homer (2012). In response to this issue, Gajewski (2007) argues that neg-raising predicates are soft presuppositional triggers and adopts the account of how their presuppositions arise by Abusch (2002, 2010). However, I argue that there is a difference between soft triggers and neg-raising predicates in their behavior in embeddings; a difference that is straightforwardly accounted for in the present approach. Furthermore, by adopting Abusch's (2010) account of soft triggers, Gajewski (2007) inherits the assumptions of a pragmatic principle of disjunctive closure and of a non-standard interaction between semantics and pragmatics - assumptions that are not needed by the present proposal, which is just based on a regular theory of scalar implicatures. I also show that the arguments that Gajewski (2007) presents in favor of the presuppositional account can be explained also by the scalar implicatures-based approach proposed here. Finally, while the main point of the paper is a comparison with the presuppositional account, I sketch a preliminary comparison with the revived syntactic approach by Collins & Postal (2012).

Keywords: Neg-raising, Presuppositions, Scalar implicatures, Alternatives

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1 Introduction

It is an old observation in the literature that certain sentence embedding predicates such as *think* and *want* interact with negation in a surprising way: when negated, these predicates are generally interpreted as if the negation was taking scope in the embedded clause. In brief, sentences like (1-a) and (2-a) are generally interpreted as (1-b) and (2-b), respectively.

(1) a. John doesn't think Bill left.
b. John thinks Bill didn't leave.

(2) a. John doesn't want Bill to leave.
b. John wants Bill not to leave.

The traditional name for this phenomenon is "neg-raising", and predicates like *think* and *want* are called "neg-raising predicates".[1] The fact that the sentence with wide scope negation appears to imply the one with narrow scope is not predicted by the standard semantics of such predicates.[2] Furthermore, other sentence-embedding predicates do not exhibit this property; compare (1-a) and (2-a) above with a sentence with a non-neg-raising predicate like *be certain* in (3-a): the latter does not imply at all the corresponding sentence with internal negation in (3-b).

(3) a. John isn't certain that Bill left.

1 Beyond *think* and *want*, there are many other neg-raising predicates, the following in (i) is a list from Horn 1989.

(i) a. *believe, suppose, imagine, expect, reckon, feel*
b. *seem, appear, look like, sound like, feel like*
c. *be probable, be likely, figure to*
d. *intend, choose, plan*
e. *be supposed to, ought, should, be desirable, advise, suggest*

See Horn 1978 for a general introduction to neg-raising and Homer 2012 for an extensive discussion of neg-raising modals.

2 The standard way to analyze such predicates, stemming from Hintikka (1969), is as universal quantifiers over possible worlds, restricted to some modal base. So for instance the semantics of *believe* is in (i), where M is a function from worlds and individuals to sets of worlds, in this case the set of worlds compatible with the beliefs of a in w.

(i) $[\![\text{believe}]\!](p)(a)(w) = \forall w' \in M(w,a)[p(w')]$

It is clear that negating (i) as in (ii-a) is not equivalent to (ii-b), where negation takes narrow scope.

(ii) a. $\neg[\forall w' \in M(w,a)[p(w')]]$
b. $\forall w' \in M(w,a)[\neg p(w')]$

b. John is certain that Bill didn't leave.

An influential account of neg-raising is the presupposition-based approach defended in Bartsch 1973 and Gajewski 2005, 2007. This approach, while successful in accounting for a variety of data relating to neg-raising, also faces the problem of explaining why the presupposition that it postulates does not behave like other presuppositions in embeddings other than negation. Gajewski (2007) tries to overcome this problem by connecting neg-raising predicates to "soft" presuppositional triggers, in the sense of Abusch (2002, 2010), a class of triggers whose presupposition is particularly weak and context-dependent. I argue that, nonetheless, the behavior of neg-raising predicates is different from that of this class of presuppositional triggers. Furthermore, as I discuss below, by adopting Abusch's (2010) account of soft triggers, Gajewski (2007) inherits some empirical issues and extra non-standard assumptions about the semantics-pragmatic interface associated with that view.[3]

This paper was conceived primarily as a contribution to semantic/pragmatic take to the phenomenon of Neg Raising. A very different view on that is the syntactic approach initiated by Fillmore 1963 among others. This approach, which also gave the name to the phenomenon, postulates that in a sentence like (1-a) above negation is actually generated in the embedded clause and interpreted there, but it then raises above the predicate and appears linearly before it. The syntactic approach has fallen under hard times since its initial launch (see Horn 1978, Gajewski 2005, 2007, and Homer 2012 for discussion). Upon finishing this paper, I was made aware of an unpublished book manuscript, Collins & Postal 2012, that revives the syntactic approach, addressing the challenges such an approach faces and offering a host of new data the authors claim favors it over its semantic competitor. I cannot possibly do justice to Collins and Postal's approach within the limits of the present attempt. However, I will, in the final section, show how some of the key generalizations they bring up as new evidence in favor of the syntactic approach actually derive in a principled manner from our present proposal. I will also raise some issues that strike me as being still quite problematic from a purely syntactic perspective (and are instead fully explainable on a more semantic take).

In this paper, following ideas in Chemla 2009a and Abusch (2002, 2010), I propose a scalar implicature-based account of the inferences associated with neg-raising predicates ("neg-raising inferences", henceforth). I discuss two main arguments which favor this approach over the presuppositional one: first, it can straightforwardly account for the differences between between neg-raising predicates and

3 An alternative pragmatic approach is an analysis in terms of a type of implicature (Horn 1978). Horn (1989) calls such implicatures "short-circuited implicatures", implicatures that would be in principle calculable but in fact are conventional properties of some constructions. I do not discuss this implicature based account here, for extensive discussion of its problems see Gajewski 2005.

presuppositional triggers. Second, it is based on an independently justified theory of scalar implicatures and it does not need to adopt the system in Abusch 2010, which, as I discuss below, has conceptual and empirical problems. Finally, I show that it can also account for those aspects of the behavior of neg-raising inferences that do appear presuppositional.

The paper is organized as follows: in section 2, I summarize the version of the presuppositional approach by Gajewski (2005, 2007) and the account of soft triggers by Abusch (2010) that he adopts. In section 3, I discuss the aspects of the behavior of neg-raising predicates that the presuppositional approach gets right and those that it gets wrong. The latter constitute the motivations for the scalar implicature-based analysis of neg-raising that I outline in section 4. In section 5, I discuss its predictions and in particular how the proposal accounts for the differences between neg-raising inferences and presuppositions. In section 6, I discuss the interaction between Neg-raising and polarity, and in section 7, I show how the present approach can also account for what the presuppositional account can explain with respect to the suspension of neg-raising inferences, the neg-raising inferences from the scope of negative quantifiers and negated universals, and the behavior of stacked neg-raising predicates. I summarise and conclude the comparison with the presuppositional approach in section 8. Finally, in section 9, I draw a preliminary comparison with the syntactic approach by Collins & Postal (2012).

2 The presuppositional approach

2.1 The excluded middle as a presupposition

Bartsch (1973) proposes a presuppositional account of neg-raising. The idea is that a sentence like (4-a), schematized as in (4-b), presupposes the so-called excluded middle proposition in (4-c), something that in the case of (4-a) we could paraphrase as "John has an opinion as to whether Bill is here".

(4) a. John believes that Bill is here.
b. $\textbf{believe}_j(p)$
c. $\textbf{believe}_j(p) \vee \textbf{believe}_j(\neg p)$

The positive case is not particularly interesting, because (4-c) is entailed by (4-b). However, when we negate (4-a) as in (5-a), under the assumption that presuppositions project through negation, we obtain the result in (5-d). This is obtained because (5-b) together with its presupposition in (5-c) entails (5-d) (if it's false that John believes that Bill is here and he has an opinion as to whether Bill is here or not, then he must believe that Bill is not here).

(5) a. John doesn't believe that Bill is here.
b. $\neg$**believe**(p)
c. **believe**$_j(p) \vee$ **believe**$_j(\neg p)$
d. **believe**$_j(\neg p)$

One problem that Bartsch's (1973) purely pragmatic approach faces is accounting for why certain predicates allow neg-raising and others do not (for instance why is *want* in English neg-raising, while *desire* is not?). Furthermore, neg-raising predicates also present cross-linguistic variation: for instance, *hope* is not neg-raising in English, while its counterpart in German, *hoffen*, is neg-raising (see Horn 1989 and Gajewski 2007). In other words, whether a predicate is neg-raising appears to be a matter of conventional properties of such predicate and is not based on general pragmatic assumptions.[4]

Gajewski (2005, 2007) adopts Bartsch's (1973) approach and improves on it in two respects. First, in response to the issue of conventionality just mentioned, he proposes that the excluded middle should be thought of as a semantic presupposition, lexically specified for certain predicates. As a lexically encoded property, it is then expected that it can be subject to cross linguistic variation. The semantics of a neg-raising predicate P is given schematically in (6).[5]

(6) $[\![P]\!] = \lambda p \lambda x : [\mathbf{P}(p)(x) \vee \mathbf{P}(\neg p)(x)] \,.\, \mathbf{P}(p)(x)$

While this move offers a way to accommodate the conventionality of neg-raising predicates, it also gives rise to the issue of why neg-raising inferences are context dependent. Indeed, we can easily create contexts which suspend them. For instance, in a context like (7-a), (7-b) does not imply (7-c) (from Bartsch (1973), reported in Gajewski (2007)).

(7) a. *Bill doesn't know who killed Caesar. Furthermore, Bill isn't sure whether or not Brutus and Caesar lived at the same time, so naturally*
b. Bill doesn't think Brutus killed Caesar.
c. Bill thinks Brutus didn't kill Caesar.

In response to this issue, Gajewski (2007) argues that neg-raising predicates are soft presuppositional triggers and that this would account for their context dependence. In the following section, I turn to the connection between neg-raising and soft triggers and I summarize Gajewski's (2007) proposal.

4 But see Homer 2012 for some suggestions on how to account for the source of neg-raising inferences in a purely pragmatic way.

5 I use Heim & Kratzer's (1998) notation, so that $\lambda\phi : \psi.\chi$ indicates the function from ϕ to χ only defined if ψ.

2.2 Connecting neg-raising and soft triggers

2.2.1 Soft triggers

Presupposition triggers can be divided into two groups, soft and hard, on the basis of whether the presuppositions they give rise to are easily defeasible (Abusch 2002, 2010, Romoli 2011). A paradigmatic example of a soft trigger is *win* whereas an example of a hard one is *it*-clefts: a sentence with *win* like (8-a), its negation in (8-b), and a conditional with (8-a) embedded in the antecedent like (8-c), give rise to the inference in (8-d). Analogously, (9-a)-(9-c) give rise to the inference in (9-d).

(8) a. Bill won the marathon.
b. Bill didn't win the marathon.
c. If Bill won the marathon, he will celebrate tonight.
d. Bill participated in the marathon.

(9) a. It was Mary who broke that computer.
b. It wasn't Mary who broke that computer.
c. If it was Mary who broke that computer, she should repair it.
d. Somebody broke that computer.

Another way to look at the pattern above is is by taking (8-d) and (9-d) as inferences of (8-a) and (9-a) respectively, and showing that they project regardless of whether they are embedded under negation or in the antecedent of a conditional. This projection behavior is what is generally taken to be the main characteristic of presuppositions.[6] Arguably, the best way to distinguish between soft and hard triggers is what Simons (2001) calls "the explicit ignorance test". The recipe is to create a context in which the speaker is manifestly ignorant about the presupposition; triggers that do not give rise to infelicity in such contexts are soft triggers. Consider the following two examples modeled on Abusch 2010 that show that according to this diagnostic *win* and *it*-clefts are indeed soft and hard triggers respectively.

(10) I don't know whether Bill ended up participating in the Marathon yesterday but if he won, he is certainly celebrating right now.

(11) I don't know whether anybody broke that computer
#but if it is Mary who did it, she should repair it.

Notice that the presupposition of a soft trigger can be suspended even if the speaker does not say explicitly that she is ignorant about it. However, it has to be evident from the context that she is. Consider the following example in (12) and assume it is

6 For an introduction to presuppositions see Chierchia & McConnell-Ginet 2000 and Beaver & Geurts To appear.

a conversation between two people who are meeting for the first time (from Geurts (1995) reported in Simons (2001)): the presupposition of *stop*, i.e. that the addressee used to smoke, is clearly not present.

(12) I noticed that you keep chewing on your pencil. Have you recently stopped smoking?

In sum, there is a class of presuppositions that can be suspend in a context that supplies the relevant information about the speaker's epistemic state. In the next subsection, I summarize Abusch's (2010) alternatives-based account of the presupposition of soft triggers, "soft presuppositions" henceforth, and some of the problems that it faces. Then I turn to Gajewski's (2007) account of neg-raising predicates as soft triggers.

2.2.2 Abusch 2010

Abusch (2002, 2010) proposes a pragmatic account of soft presuppositions based on lexical alternatives. The architecture of her proposal is as follows: the semantics of a soft trigger does not contribute a semantic presupposition but rather it provides a set of lexical alternatives; the pragmatic side is constituted by a principle that operates on these alternatives. The flexibility and defeasibility of soft presuppositions comes from the context sensitivity of the pragmatic principle. In slightly more detail, she assumes that the alternatives of soft triggers are intuitively contrastive terms, so that, for instance, *win* and *lose* are alternatives to each other. These lexical alternatives grow compositionally similarly to what is assumed in focus semantics, ultimately giving rise to sentential alternatives. For instance (13-a), schematized in (13-b), has the alternatives in (13-c)

(13) a. Bill won.
b. $\mathbf{won}(b)$
c. $\mathscr{A}lt(\text{13-b}) = \{\ \mathbf{won}(b), \mathbf{lost}(b)\ \}$

On the pragmatic side, Abusch (2010) assumes a pragmatic default principle, which requires the disjunction of the set of alternatives, indicated as $\vee\mathscr{A}lt$, to be true. Given the alternatives assumed, their disjunction entails what is generally assumed to be the soft presupposition. For instance, disjunctive closure applied to the alternative set in (13-c) gives rise to the entailment that Bill participated - that is (14-a) entails (14-b).

(14) a. $\vee\{\mathbf{won}(b), \mathbf{lost}(b)\} = (\mathbf{won}(b) \vee \mathbf{lost}(b))$
b. $\mathbf{participated}(b)$

The inferences of soft triggers in unembedded cases are derived by using lexical alternatives and a pragmatic principle of disjunctive closure operating on them. Assuming that they are generated in this way, however, raises the question of how such presuppositions should project. Indeed, one of the main challenges associated with soft triggers is explaining the fact that even if they are different from hard triggers with respect to defeasibility, they appear to project in very similar ways. In other words, a theory that can account for their defeasibility, still has to provide an explanation for the projection patterns. In relation to this Abusch (2010) assumes a dynamic framework along the lines of Heim 1983 and crucially formulates her pragmatic principle in such a way as to make reference to the local contexts created by the context change potentials of the dynamic meanings that make up the sentences. The definition of the principle is in (15).

(15) If a sentence ψ is uttered in a context with common ground c and ψ embeds a clause ϕ which contributes an alternative set $\mathscr{A}lt$, then typically c is such that the corresponding local context d for ϕ entails that some element of $\mathscr{A}lt$ is true.

The local contexts referred to in (15) are those information states created by the dynamic compositional semantics she assumes. I refer the reader to Abusch's (2010) paper for the details, but what is relevant for us is that this strategy effectively mimics the projection behavior of semantic presuppositions, by applying the pragmatic default globally, in a way that makes reference to the local context of the trigger. In other words, the principle in (15) applies to full sentences, at the global level, but makes reference to local contexts that are created during the composition of such sentences. Notice that this last assumption is at odds with standard assumptions about the semantics-pragmatics interface, whereby pragmatics only has access to the output of the semantics, generally thought to be a proposition (or a set of propositions). Here instead we would need a way to keep track of the history of the semantic composition in terms of context change potentials and then make this visible to pragmatics.

Beyond this conceptual point, there are two empirical problems connected to the way soft presuppositions project in Abusch's (2010) system: first, soft and hard presuppositions appear to pattern differently with respect to the projection behavior in quantificational sentences (Charlow 2009, Fox 2012; see also Chemla 2009b). In her system, the projection behavior of soft presuppositions exploits indirectly the one of hard presuppositions, so the former is predicted to be identical to the latter, and no difference is expected between them with respect to projection. Second, a further problem for this account was pointed out by Sauerland (2008), who observed that when a soft trigger is embedded under another, the disjunctive

closure of the combination of alternatives gives rise to an inference that is too weak. As he discusses, a sentence like (16-a), which contains the soft triggers *win* and *stop*, has intuitively the inference in (16-b). However, the disjunctive closure of the alternatives in (16-c) only gives rise to (16-d).[7]

(16) a. John stopped winning
b. John used to win
c. $\mathscr{A}lt$(16-a) = $\left\{ \begin{array}{l} \textbf{stop}(\textbf{win}(j)), \textbf{stop}(\textbf{lose}(j)) \\ \textbf{continue}(\textbf{win}(j)), \textbf{continue}(\textbf{lose}(j)) \end{array} \right\}$
d. John used to participate

Notice that in this case the inference in (16-b) is an entailment of (16-a) as shown by (17), so Abusch (2010) could appeal to this entailment to account for the intuition that (16-a) leads to the inference in (16-b).

(17) John stopped winning #but he didn't used to win.

However, this would not help her in the case of (18-a), which does not entail (18-b), but still has (18-b) as an inference.

(18) a. John didn't stop winning
b. John used to win

As Sauerland (2008) shows, the problem generalizes to all sentences which contain more than one soft presupposition.[8]

7 Abusch (2010) does not include anymore *stop* in the list of triggers that she discusses, contrary to Abusch (2002). The problem is however general and it applies to any case of a soft trigger embedded into another. Furthermore, if her theory is not meant to apply to aspectuals or factives, it is not anymore an account of soft triggers as identified by the explicit ignorance test above, but rather an account of a subset of them, for which, however, she does not specify a criterion of identification.

8 In response to this, Abusch (p.c. to Sauerland) suggests that the pragmatic principle should apply every time a soft trigger is encountered. This would ensure that there would never be a combination of the alternatives of soft triggers. However, given the assumption that the alternatives of soft triggers grow compositionally, the same problem would arise with other alternative bearers like scalar terms. For instance, in the case of (i-a) the predicted inference is only (i-b) and not the intuitively correct (i-c).

(i) a. (Now that he is retired), John didn't stop meeting all the students
b. John used to meet some of the students
c. John used to meet all of the students

2.2.3 Gajewski 2007

Following Abusch (2002, 2010), Gajewski (2007) proposes that neg-raising predicates are also soft triggers and stipulates that the alternatives of a neg-raising predicate are the corresponding predicates with internal negation; hence, a predicate like *believe* would have *doubt* (=*believe-not*) as its alternative, while a predicate like *want* would have *want-not*. As shown in (19-a)-(19-d), once we apply the principle of disjunctive closure proposed by Abusch (2010) over these alternatives we obtain as an inference the excluded middle proposition that Bartsch (1973) postulates directly as a presupposition. Once generated, this inference is predicted to project as a presupposition, in the way described above.

(19) a. John believes that Bill left.

b. $\textbf{believe}_j(p)$

c. $\mathscr{A}lt(\textbf{believe}_j(p)) = \left\{ \begin{array}{l} \textbf{believe}_j(p) \\ \textbf{believe}_j(\neg p) \end{array} \right\}$

d. $\vee\{\textbf{believe}_j(p), \textbf{believe}(\neg p)\} = (\textbf{believe}_j(p) \vee \textbf{believe}(\neg p))$

In sum, by adopting Abusch's (2010) account, Gajewski (2007) provides an analysis of neg-raising predicates as soft triggers. However, he inherits the extra assumptions of Abusch's (2010) system, the disjunctive closure and the non-standard semantics/pragmatics interface. Moreover, he also inherits Sauerland's problem in a case of a soft trigger embedding a neg-raising predicate, like (20). In the same way as above, the predicted inference for (20) is the weak on in (21-a) and not the intuitively correct one in (21-b).[9]

(20) John hasn't stopped believing that Obama deserved the Nobel Prize.

(21) a. John used to have an opinion as to whether Obama deserved the Nobel Prize.

b. John used to believe that Obama deserved the Nobel prize.

The fact that the approach that I propose below does not need these extra assumptions and does not have the above empirical problems constitutes an advantage over Gajewski's (2007) account.

9 Thanks to an anonymous reviewer for suggesting to add the discussion of this case.

3 Predictions

3.1 What the presuppositional approach gets right

The presuppositional approach can successfully account for three aspects of the behavior of neg-raising predicates. In the following, I summarize each of them and briefly show how they are predicted by the presuppositional account.[10]

The first aspect, observed by Gajewski (2005), regards the fact that the inference associated with a neg-raising predicate in the scope of negation is hard to suspend, in a way that resembles the markedness of presupposition cancellation in such environments. For instance, there is a contrast between (22-a) and (22-b)/(22-c), which shows that canceling neg-raising requires a special intonation, like stress on the auxiliary or on the predicate.

(22) a. John doesn't think that it is raining, #he is not sure.
b. John DOESN'T think that it is raining, he is not sure.
c. John doesn't THINK that it is raining, he is not sure.

The second aspect regards the inferences that neg-raising predicates give rise to when embedded in the scope of negative quantifiers and negated universals: from a sentence like (23-a) we typically draw the universal inference in (23-b), while in the case of a negated universal sentence like (24-a), the inference that we draw is (24-b).[11]

(23) a. No student thinks that Mary passed.
b. Every student thinks that Mary didn't pass.

(24) a. Not every student thinks that Mary passed.
b. There are some students who think that Mary didn't pass.

The third aspect regards the behavior of stacked neg-raising predicates. Fillmore (1963) originally observed that neg-raising operates cyclically. In other words, a sentence like (25-a), in which negation appears before a sequence of stacked neg-raising predicates, gives rise to the neg-raising inference in (25-b).

(25) a. I don't imagine Bill thinks Mary wants Fred to leave.
b. I imagine Bill thinks Mary wants Fred not to leave.

Horn (1971), however, observes that the cyclicity is only partial: the generalization

10 A further argument that Gajewski uses is the interaction with polarity. I discuss this in section 6.

11 Homer (2012) calls the inference in (24-b) "wide-scope existential quantification reading" and takes it as characteristic of neg-raising predicates, using it as a diagnostic of neg-raising in his investigation of modals.

appears to be that neg-raising belief predicates embedding neg-raising desire ones allow cyclicity, while desire predicates embedding belief ones do not.

(26) a. I don't believe Bill wanted Harry to die. $\rightsquigarrow$
b. I believe Bill wanted Harry not to die.

(27) a. I don't want Bill to believe Harry died $\not\rightsquigarrow$
b. I want Bill to believe Harry didn't die.

(28) a. I don't believe John wanted Harry to die until tomorrow.
b. *I don't want John to believe Harry died until yesterday.

In sum, there are three aspects of the behavior of neg-raising predicates, which, as I discuss below, can be accounted for if we treat them as presuppositional triggers: (a) the fact that neg-raising inferences are hard to cancel (b) the inferences they give rise to from the scope of negative quantifiers and negated universals, (c) the behavior of stacked neg-raising predicates. Gajewski (2007) shows that the presuppositional approach can account for these three aspects of the behavior of neg-raising predicates. Let us go briefly through each of them in the following.

First, the fact that presuppositions are hard to cancel under negation appears to be parallel to what happens with neg-raising inferences.[12] (29-b) appears parallel to the case of a presuppositional triggers like *discover*, as (30-a) and (30-b) show.

(29) a. John doesn't think that it is raining, #he is not sure.
b. John DOESN'T think that it is raining, he is not sure.

(30) a. John didn't discover that he was accepted, #he wasn't.
b. John DIDN'T discover that he was accepted, he wasn't.

Second, if we assume that presuppositions in the scope of negative quantifiers project universally (see Heim 1983 and Chemla 2009a for discussion), the prediction for the meaning of a sentence like (31-a) are (32-a) with the presupposition in (32-b). (32-a) and (32-b) together entail (32-c). In other words, Gajewski (2007) can derive the universal inference in (31-b) (=(32-c)).

(31) a. No student thinks that he was accepted.
b. Every student thinks that he wasn't accepted.

(32) a. $\neg\exists x[\textbf{student}(x) \wedge \textbf{thinks}_x(p)]$
b. $\forall x[\textbf{student}(x) \rightarrow (\textbf{thinks}_x(p) \vee \textbf{think}_x(\neg p))]$
c. $\forall x[\textbf{student}(x) \rightarrow \textbf{think}_x(\neg p)]$

12 Notice that this applies even if Gajewski (2007) argues that neg-raising predicates are soft triggers, since also these triggers, like *discover*, appear hard to suspend under negation.

The presuppositional account also makes the right predictions in the case of negated universal sentences: (33-a), schematized as in (34-a), together with the presupposition in (34-b), entails (34-c), which is the intuitively correct inference in (33-b).

(33) a. Not every student thinks that he was accepted.
b. Some student thinks that he wasn't accepted.

(34) a. $\neg\forall x[\textbf{student}(x) \rightarrow \textbf{thinks}_x(p)]$
b. $\forall x[\textbf{student}(x) \rightarrow (\textbf{thinks}_x(p) \vee \textbf{think}_x(\neg p))]$
c. $\exists x[\textbf{student}(x) \wedge \textbf{think}_x(\neg p)]$

Finally, Gajewski (2007) shows that the presuppositional account can also derive the behavior of partial cyclicity. The reason why it predicts it lies in the different way presuppositions project from belief versus from desire predicates. Consider embedding a sentence, like (35-a), which presupposes (35-b), into *think* and *want*, as in (36-a) and (36-b), respectively. The observation is that both (36-a) and (36-b) appear to presuppose (36-c) and crucially (36-b) does not presuppose (36-d) (see Heim 1992 and Beaver & Geurts To appear for discussion).

(35) a. Bill will sell his cello.
b. Bill has a cello.

(36) a. Bill thinks he will sell his cello.
b. Bill wants to sell his cello.
c. Bill thinks he has a cello.
d. Bill wants to have a cello.

This asymmetry in projection between *think* and *want* is what allows Gajewski (2007) to derive the pattern above (see Gajewski 2007 and Homer 2012 for detail).

In sum, the presuppositional account successfully accounts for the three aspects of the behavior of neg-raising predicates presented above. However, as I discuss now, the presuppositional account does not predict any difference between soft presuppositions and neg-raising inferences, contrary to what appears to be the case.

3.2 What the presuppositional approach gets wrong

The main problem for a presuppositional approach to neg-raising is the fact that there is very little evidence that the proposition assumed to give rise to neg-raising, the excluded middle proposition, has a presuppositional status. As Gajewski (2005: 68) says, "the evidence turns out to be mixed, tending towards suggesting that neg-raising predicates are not presuppositional." Recall that the standard test for presuppositionality is the projection behavior, that is the phenomenon exemplified by (37-a), which presupposes (37-b) in the same way as complex sentences embedding

(37-a) like (37-c)-(37-f) do.

(37) a. It was Mary who killed Bill.
b. Somebody killed Bill.
c. It wasn't Mary who killed Bill.
d. If it was Mary who killed Bill, she should confess.
e. Perhaps it was Mary who killed Bill.
f. Was it Mary who killed Bill?

Negation aside, however, the rest of the projection behavior of the excluded middle does not look presuppositional. Compare the cases in (37-d)-(37-f) above, with the ones in (38-d)-(38-f): it is unclear that we want the inference from the latter to (38-b).

(38) a. Bill thinks that Sue is here.
b. Bill has an opinion as to whether Sue is here
c. Bill doesn't think that Sue is here.
d. If Bill thinks that Sue is here, he will come.
e. Perhaps Bill thinks that Sue is here.
f. Does Bill think that Sue is here?

Again quoting from Gajewski (2005):

> There are certain environments linguists use to diagnose the presence of a presupposition. The most common are the antecedents of conditionals, yes/no questions, and epistemic modals. [...] If *think* introduces the presupposition that its subject is opinionated about the truth or falsity of its complement, then we expect each of the sentences to imply that Bill has an opinion as to whether Sue is here. This does not seem to be the case Gajewski (2005: p.69)

.

In response to this difference, that is not predicted by the presuppositional approach, Gajewski (2007) postulates that the excluded middle is a soft presupposition in the sense discussed above. In other words, (38-b) would not project out of embeddings like (38-d)-(38-f) because it can be suspended. I argue, however, that the suspension of soft presuppositions and the non-projection behavior of the excluded middle are different. The intuition is the following: consider (39-a) and (40-a): in an out of the blue context (39-a) appears to give rise to the inference in (39-b), unless we explicitly suspend it like in (39-c) or by making clear that the speaker is ignorant about (39-b). On the other hand, (40-a) appears neutral with respect to (40-b).

(39) a. If Mary stopped showing up late for class, Bill must be happy.
b. Mary used to show up late for class.
c. I don't know if Mary used to show up late for class, but If she stopped, Bill must be happy.

(40) a. If Mary thinks that Bill should be hired, she will say so at the next faculty meeting.
b. Mary has an opinion as to whether Bill should be hired.
c. I don't know whether Mary has an opinion, but If she thinks that Bill should be hired, she will say so at the next faculty meeting.

In other words, one can understand (40-a) and not draw the inference in (40-b), without the need for clear contextual information that the inference should be suspended like in (40-c).[13]

In sum, the suspension of soft presuppositions requires explicit information in the context that the speaker is ignorant about the presupposition, while this doesn't appear to be the case for the excluded middle inference; hence, if the excluded middle is a presupposition, it is a strange one: it does not project as a presupposition and its non-projection appears to be a different phenomenon from the suspension of suspendable presuppositions.

3.3 Summary

We saw that Gajewski's (2007) proposal can account for the conventionality of neg-raising inferences, the projection through negation, the inferences in the scope of negative quantifiers and negated universals and the partially cyclic behavior of stacked neg-raising predicates. Furthermore, by connecting to Abusch's (2010)

13 Gajewski (2005) discusses another characteristic that appear to distinguish neg-raising inferences from presuppositions. The observation is that if they behaved as regular presuppositions, we would expect to find (i) hard to judge if we know that Mary has no opinion, but, as Gajewski (2005: p.69) says, "most people [...] have no problem judging this sentence false in such a scenario".

(i) Mary thinks that John is in town.

It is fair to say, however, that while the case of judging (ii) seems clearly different from (i), as argued by von Fintel (2004) our judgements might not be reliable in the case of presupposition failure.

(ii) The present King of France is bald.

Furthermore, I am not sure we would not simply judge (iii) as false, in a context in which we know that John never showed up late for class.

(iii) John stopped showing up late for class.

account of soft triggers, it can also explain why they appear to be context dependent. However, we also saw that it has problems explaining the differences between soft triggers and neg-raising predicates in embeddings other than negation. Furthermore adopting Abusch's (2010) account brings in some empirical issues and extra assumptions about pragmatic principles and the semantics-pragmatic interface. In the next section, I propose a scalar implicature-based account of neg-raising inferences, which like Gajewski's (2007) localizes the source of neg-raising in a set of lexical alternatives. However, it does not require non-standard assumptions about the semantics-pragmatics interface in that it is only based on an independently motivated theory of scalar implicatures. Furthermore, it straightforwardly predicts the differences between neg-raising predicates and soft triggers.

4 A scalar implicature-based approach

From the data discussed above, the generalization appears to be as follows: when neg-raising predicates and soft triggers are embedded under negation, the inferences associated with them arise systematically. For instance (41-a) and (42-a) are typically read as implying (41-b) and (42-b), respectively.

(41) a. John didn't stop showing up late for class.
b. John used to show up late for class.

(42) a. John doesn't think that Fred left.
b. John thinks that Fred didn't leave.

In the presupposition approach, (42-b) arises from (42-a) and the excluded-middle inference in (43), so in turn we could assume that (42-a) gives rise systematically to (43).

(43) John has an opinion as to whether Fred left.

However, while a soft presupposition like (41-b) is also systematically drawn in the case of other embeddings, like the antecedents of conditionals, the corresponding excluded middle inference in (43) is not. For instance, in the antecedent of a conditional like (44-a), the inference in (44-b) is systematic unless explicitly suspended, but the corresponding excluded middle presupposition in (45-b) isn't there when we utter (45-a).

(44) a. If John stopped showing up late for class, Bill will be happy.
b. John used to show up late for class.

(45) a. If John thinks that Fred left, he will be upset.
b. John has an opinion as to whether Fred left.

Notice that scalar implicatures exhibit the very same pattern. For instance, consider the scalar implicature coming from a scalar term like *every*.[14]

(46) a. Not every student came.
b. Some student came.

The inference from (46-a) to (46-b) can be accounted for as a scalar implicature, by postulating that *every* and *some* are alternatives to each other. As Chemla (2008) observes, we can also describe the inference in (45-b) as behaving like a presupposition with respect to negation. In other words, one could describe the inference in (46-b) as projecting through negation, as both (46-a) and its negation in (47) give rise to the inference that some student came, (46-b), the former as an entailment (or entailment and presupposition), the latter as a scalar implicature.

(47) Every student came.

Given this perspective, one might wonder whether this inference can "project" out of other embeddings such as the antecedent of a conditional, in parallel to what presuppositions do. In other words, one might wonder whether (48-a) can lead to the inference in (48-b).

(48) a. If every student came, the party was a success
b. Some student came

In fact, (48-b) is not predicted to be an inference of (48-a) by standard theories of scalar implicatures and, indeed, there is a difference between the pair (44-a) and (44-b) and (48-a) and (48-b): assuming that we can infer (48-b) from (48-a) at all we certainly do not need the explicit suspension like in (49) in order not to draw it.

(49) I don't know whether any of the students came, but if everyone did, the party was a success.

From the data above, It appears that the behavior of neg-raising inferences in embeddings resembles scalar implicatures more than soft presuppositions. In the following, I show how we can derive this pattern: scalar implicatures and neg-raising inferences are drawn systematically when (strong) scalar terms and neg-raising predicates are embedded under negation, but not in other embeddings, like the antecedent of conditionals. Before going to the prediction, let me briefly discuss the theory of scalar implicatures that I adopt.

14 Chemla (2009c) calls scalar implicatures coming from strong scalar terms in downward entailing contexts, like the one in (46-b), "negative implicatures". Chierchia (2004) calls them "indirect scalar implicatures."

4.1 A Theory of Scalar Implicatures

For concreteness, I adopt a theory of scalar implicatures as entailments of exhaustified sentences (Chierchia et al. To appear, Fox 2007 and Magri 2010 among others). This theory is admittedly controversial. At the same time, it is fully worked out formally and it delivers in a computationally explicit way the full range of scalar and free choice implicatures and their interactions. In this theory an exhaustivity operator EXH, similar to *only*, applies to propositions and their associated alternatives and it affirms the proposition while negating a subset of its alternatives.

(50) $\text{EXH}(\mathscr{A}lt(p))(p)(w) = p(w) \wedge \forall q \in \mathscr{E}xcl(p, \mathscr{A}lt(p))[\neg q(w)]$

I assume that the alternatives that end up being negated, sometimes called the "excludable alternatives", are all the ones that can be consistently negated without contradicting the assertion as in (51).[15]

(51) $\mathscr{E}xcl(p, \mathscr{A}lt(p)) = \{q \in \mathscr{A}lt(p) : \lambda w[\neg q(w)] \cap p \neq \emptyset\}$

Exhaustification of a sentence with respect to the relevant alternatives gives rise to scalar implicatures.[16]

15 This is a simplification that I adopt for convenience. The actual notion of excludable alternatives need to be more sophisticated. This is because the notion of excludable alternatives as defined classically give rise to some well-known problems (see Fox (2007) and Magri (2010: pp.32-33)). One way of overcoming these problems is the notion of 'innocent exclusion' (Fox 2007; see also Gazdar 1979 and Sauerland 2004). The innocently excludable alternatives are the alternatives that are in all maximal consistently excludable subsets of the alternatives.

(i) $\mathscr{E}xcl_{ie}(\phi, \mathscr{A}lt(\phi))$ is the intersection of all maximal consistently excludable subsets of $\mathscr{A}lt(\phi)$

The intuition behind this notion is as follows: we want to exclude as many consistently excludable alternatives as possible but we do not want to decide among them in an arbitrary way. In the following, I keep on using the simpler notion of excludability of non-weaker alternatives, while mentioning where the notion of innocent exclusion or equivalent ways of constraining the exclusion of non-weaker alternatives are actually needed.

16 It has been noted in the scalar implicature literature that the definition of excludable alternatives employed overgenerates in certain cases with multiple scalar items (Fox 2007: fn.35, Magri 2010: pp. 35-36 and Chemla in preparation: p.56). The problem arises because differently from the standard definition, the one used above considers non-weaker alternatives rather than strictly stronger ones. Fox (2007: fn.35) proposes a constraint on multiple replacements that blocks the generation of some problematic implicatures. The problem is relevant here because the procedure is incompatible with the way to obtain universal projection under "no" to which I turn below. For lack of space I cannot discuss the issue here, but in Author to appear I show that we can make a minimal amendment to Fox's procedure and make it compatible with the present proposal.

As for alternatives, I assume that certain items, like *every*, are associated with a set of lexical alternatives, which then grow to become alternatives of more complex expressions containing them. For concreteness, I make use the formulation of alternatives' growth in (52) and (53), adapted from Chierchia 2004.

(52) **Basic Clause**: For any lexical entry α, $\mathscr{A}lt(\alpha)$[17] =
  a. $\{[\![\alpha]\!]\}$ if α is lexical and does not belong to a scale (where a 'scale' is a set of expressions partially ordered by generalized entailment.)
  b. $\{[\![\alpha_1]\!]$ ... $[\![\alpha_n]\!]\}$ if α is lexical and part of a scale $\langle[\![\alpha_1]\!]...[\![\alpha_n]\!]\rangle$

(53) **Recursive Clause** (pointwise functional application)
  a. $\mathscr{A}lt(\beta(\alpha)) = \{b(a) : b \in \mathscr{A}lt(\beta)$ and $a \in \mathscr{A}lt(\alpha)\}$

To illustrate, consider a scalar item like *every*, which is standardly assumed to be associated with the set of lexical alternatives in (54).[18]

(54) $\mathscr{A}lt$(every) = {**every**, **some**}

Given the definition above, we are now in a position to compute the alternatives of any complex sentence containing *every*. For instance, the alternatives of (55-a) are predicted to be those in (55-b), while the alternatives of (56-a), those in (56-b).

(55) a. Every student came.
  b. {**every(student)(came), some(student)(came)**}

(56) a. Not every student came.
  b. {¬**[every(student)(came)]**, ¬**[some(student)(came)]**}

By way of illustration, we can now go back to the case in (57-a) repeated from above and see how we can derive the inference in (57-b), when (57-a) is exhaustified as in (58-a).

17 Where $\mathscr{A}lt$ is a function from expressions to a set of interpretations

18 An alternative formulation based on Logical Forms rather than interpretations is proposed in Klinedinst 2007 and is summarized in (i-a) and (i-b).

(i) For any expression α, the set of alternatives to α, indicated as $\mathscr{A}lt(\alpha)$ is:
  a. $\{\alpha_1...\alpha_n\}$ if α is lexical and part of a scale $\langle\alpha_1...\alpha_n\rangle$
  $\{\alpha\}$ if α is lexical and not part of a scale
  b. $\{[\beta'\gamma'] : \beta \in \mathscr{A}lt(\beta) \wedge \gamma' \in \mathscr{A}lt(\gamma)\}$, if $\alpha = [\beta\gamma]$

What (i) says is that the alternatives to a complex structure is the set of all possible combinations of replacements of alternatives to lexical items contained in that structure.

(57) a. Not every student came
b. Some student came

(58) EXH[not every student came]

Notice, first, that (58) is exhaustified with respect to the alternatives in (59). Notice, also, that the alternative ¬**some(student)(came)** is not weaker than the assertion (i.e., ¬**every(student)(came)**), in fact it is stronger. Exhaustification amounts, therefore, to the negation of ¬**some(student)(came)**, which is the inference in (57-b).

(59) $\mathscr{A}lt = \{$ ¬**every(student)(came)**, ¬**some(student)(came)** $\}$

(60) EXH(¬**every(student)(came)**) =
¬**every(student)(came)** ∧ ¬¬**some(student)(came)** =
¬**every(student)(came)** ∧ **some(student)(came)**

In sum, I am assuming that alternatives are lexically encoded for some expressions, they then grow compositionally into sentential alternatives and these alternatives are exhaustified. As we will see below, context can modulate these alternatives and consequently the inferences arising from them. This all is independently needed for scalar implicatures. The only addition specific to neg-raising that I will add has to do with the alternatives that I assume for neg-raising predicates. I turn to this now.

4.2 The alternatives of neg-raising predicates

Expressions corresponding to universal quantifiers in natural language are standardly assumed to have their existential counterpart as alternatives. For instance, *every* and *necessary* are associated with the alternatives in (61) and (62), respectively.

(61) $\mathscr{A}lt(\textbf{every})(A)(B) = \left\{ \begin{array}{l} \textbf{every})(A)(B) \\ \textbf{some})(A)(B) \end{array} \right\} = \left\{ \begin{array}{l} \forall x[Ax \rightarrow Bx] \\ \exists x[Ax \wedge Bx] \end{array} \right\}$

(62) $\mathscr{A}lt(\textbf{necessary}(p)) = \left\{ \begin{array}{l} \textbf{necessary}(p) \\ \textbf{possible}(p) \end{array} \right\} = \left\{ \begin{array}{l} \Box(p) \\ \Diamond(p) \end{array} \right\}$

As we have seen above, these alternatives allow us to obtain scalar implicatures like (63) and (64).

(63) I didn't meet every student.
⇝ I met some student.

(64) It is not necessary to attend the lessons.
⇝ It is possible to attend the lessons.

Attitude predicates are also universal quantifiers, therefore, a straightforward extension of the assumption above is to have them associated with their existential counterparts as in (65) and (66).[19]

(65) $\mathscr{A}lt(\textbf{be certain}(p)(x)) = \left\{ \begin{array}{l} \textbf{be certain}(p)(x)) \\ \textbf{be possible for}(p)(x)) \end{array} \right\} = \left\{ \begin{array}{l} \Box_x p \\ \Diamond_x p \end{array} \right\}$

(66) $\mathscr{A}lt(\textbf{desire}(p)(x)) = \left\{ \begin{array}{l} \textbf{desire}(p)(x) \\ \textbf{be okay for}(p)(x) \end{array} \right\} = \left\{ \begin{array}{l} \Box_x p \\ \Diamond_x p \end{array} \right\}$

These alternatives predict the inferences in (67) and (68), inferences that are intuitively attested: when I say that John isn't certain that Mary was here, I am suggesting that he considers it possible (i.e., excluding that he is certain that she wasn't here, although this is compatible with the literal meaning). Analogously for (68).[20]

(67) John isn't certain that Mary was here.
$\rightsquigarrow$ It is possible for John that Mary was here.

(68) John doesn't desire to help me.
$\rightsquigarrow$ It is okay for John to help me.

This much a straightforward extension of the treatment of universal quantifiers (like *every* and *necessary*). My proposal is that a class of attitude verbs (i.e. a particular set of universal modals) comes with a different alternative, namely an excluded middle one. In other words, the alternatives for neg-raising attitude predicates like *think* or *want* are in (69) and (70).

(69) $\mathscr{A}lt(\textbf{think}(p)(x)) =$
$\left\{ \begin{array}{l} \textbf{think}(p)(x) \\ \textbf{have an opinion as to whether}(p)(x) \end{array} \right\} = \left\{ \begin{array}{l} \Box_x p \\ \Box_x p \vee \Box_x \neg p \end{array} \right\}$

(70) $\mathscr{A}lt(\textbf{want}(p)(x)) =$
$\left\{ \begin{array}{l} \textbf{want}(p)(x) \\ \textbf{have a desire as to whether}(p)(x) \end{array} \right\} = \left\{ \begin{array}{l} \Box_x p \\ \Box_x p \vee \Box_x \neg p \end{array} \right\}$

19 Notice that while I am glossing the alternatives with a paraphrase, it does not matter in the perspective on alternatives as semantic objects that I am taking, whether the alternative is lexicalized as a single word or a more complex locution (see Abusch (2010) for a similar point).

20 This extends to all non-neg-raising predicates. So for instance, with (i) we are typically suggesting that is compatible with what John said that Mary was here, that is we are excluding that he said that Mary wasn't here.

(i) John didn't say that Mary was here.

As I will show below, these alternatives are responsible for the neg-raising inferences in (71-a) and (71-b).

(71) a. John doesn't think that he was accepted.
⇝ John thinks that he wasn't accepted.
b. John doesn't want you to leave.
⇝ John wants you not to leave.

Analogously, this account can be extended to the case of definite plurals.[21] The problem with definite plurals is that they are interpreted as universal quantifier in a positive case, that is (72-a) seems equivalent to (72-b). However, the negation of (72-a), in (73-a), does not appear to be equivalent to the negation of (72-b), in (73-b). Rather it is interpreted as in (74).

(72) a. I met the boys.
b. I met each of the boys.

(73) a. I didn't meet the boys.
b. I didn't meet each of the boys.

(74) I didn't meet any of the boys.

I assume that definite plurals like (75) are associated to alternatives of the form in (76).[22]

21 Thanks to an anonymous reviewer for suggesting to add the case of definite plurals. I will not discuss it in details in this paper, but will point to how the approach to neg-raising could be extended to them. For an alternative perspective based on recursive scalar implicatures see Magri (2013).

22 To be precise, I actually assume that the excluded middle alternative is associated with a distributive operator, responsible for the distributive readings of definite plurals. I am assuming that this operator applies to the predicate that then applies to a plural individual. In other words, a sentence like (i) should be analysed as (ii) (Winter 2000 among many others).

(i) The boys left.

(ii) [the boys] DIST[left]

DIST is a distributive operator with the meaning in (iii) and the alternatives in (iv).

(iii) $\text{DIST} = \lambda P \lambda x \forall y \in x[P(y)]$

(iv) $\mathscr{A}lt = \left\{ \begin{array}{l} \lambda P \lambda x \forall y \in x[P(y)] \\ \lambda P \lambda x [\forall y \in x[P(y)] \vee \forall y \in x[\neg P(y)]] \end{array} \right\}$

This makes it so that the resulting meaning of (i) is (v), while the meaning of its negation in (vi) is (vii) and not (viii).

(v) $\forall y \in \textbf{boys}[\textbf{left}(y)]$

(75) $\mathbf{the}_{pl}(A)(B) = \forall x[Ax \rightarrow Bx]$

(76) $\mathscr{A}lt = \left\{ \begin{array}{l} \forall x[Ax \rightarrow Bx] \\ \forall x[Ax \rightarrow Bx] \vee \forall x[Ax \rightarrow \neg Bx] \end{array} \right\}$

In an analogous fashion to the case of neg-raising inferences, these alternatives are responsible for the homogeneity inferences in (77).

(77) I didn't meet the boys.
$\rightsquigarrow$ I didn't meet any of the boys.

Notice that the two types of alternatives of universal quantifiers give opposite results: compare the case of *every* versus *the* in (78) and (79), and those of *being certain* and *think* in (80) and (81).

(78) I didn't meet every student.
$\rightsquigarrow$ I met some of the students.

(79) I didn't meet the students.
$\rightsquigarrow$ I met none of the students.

(80) John isn't certain that Mary was here.
$\rightsquigarrow$ It's compatible with John's belief that Mary was here.

(81) John doesn't think that Mary was here.
$\rightsquigarrow$ It's **in**compatible with what John believes that Mary was here.

I argue that these two alternatives, the existential and the excluded middle alternative, are in complementary distribution and each universal quantifier in natural language either have one or the other. In particular, I propose that while *every*, *necessary*, *be certain*, *desire* and similar non-neg-raising predicates have the existential alternative, the_{pl}, *think*, *want* and the other neg-raising predicates have the excluded middle one.

In sum, the semantics of a neg-raising predicate P is non-presuppositional and it is given schematically in (82), while its alternatives are in (83).[23]

(82) $[\![\mathrm{P}]\!] = \lambda p \lambda x.\Box_x[p]$

(vi) The boys didn't leave.

(vii) $\forall y \in \mathbf{boys}[\neg \mathbf{left}(y)]$

(viii) $\neg \forall y \in \mathbf{boys}[\mathbf{left}(y)]$

23 An anonymous reviewer suggests a different route, which makes use of the alternatives proposed by Gajewski (2007) in (ii).

(i) $[\![\mathrm{P}]\!] = \lambda p \lambda x.\Box_x[p]$

(83) $\mathscr{A}lt(\text{P}) = \left\{ \begin{array}{l} \lambda p \lambda x.\Box_x[p] \\ \lambda p \lambda x.[\Box_x[p] \vee \Box_x[\neg p]] \end{array} \right\}$

Given the definition of alternatives' growth above a sentence like (85-a) winds up having the alternatives in (85-c).

(84) a. John believes that Bill left
b. $\textbf{believe}_j(p)$
c. $\mathscr{A}lt(\textbf{believe}_j(p)) = \left\{ \begin{array}{l} \textbf{believe}_j(p) \\ \textbf{believe}_j(p) \vee \textbf{believe}_j(\neg p) \end{array} \right\}$

Compare to non-neg-raising predicates Q, which instead have their existential counterparts as alternatives.

(85) $[\![\text{Q}]\!] = \lambda p \lambda x.\Box_x(p)$

(86) $\mathscr{A}lt(\text{Q}) = \left\{ \begin{array}{l} \lambda p \lambda x.\Box_x(p) \\ \lambda p \lambda x.\Diamond_x(p) \end{array} \right\}$

A sentence like (87-a) with a non-neg-raising predicate like *be certain* has the alternatives in (87-c).

(87) a. John is certain that Bill left
b. $\textbf{is-certain}_j(p)$
c. $\mathscr{A}lt(\textbf{is-certain}_j(p)) = \left\{ \begin{array}{l} \textbf{is-certain}_j(p) \\ \textbf{is-possible-for}_j(p) \end{array} \right\}$

A question at this point is of course where these alternatives of neg-raising predicates come from. I don't offer more than Gajewski (2007) and Abusch (2010) in this respect: instead of assuming that $\textbf{believe}(p)$ has $\textbf{believe}(\neg p)$ as an alternative, as Gajewski (2007) does, I am encoding the excluded middle, that is $[\textbf{believe}(p) \vee \textbf{believe}(\neg p)]$, directly as one of the alternatives. This might seem just a technical variant of Abusch-Gajewski's approach, but as we will see in the next section, it now becomes possible to obtain neg-raising inferences via the alternatives above and just

(ii) $\mathscr{A}lt(\text{P}) = \left\{ \begin{array}{l} \lambda p \lambda x.\Box_x[p] \\ \lambda p \lambda x.\Box_x[\neg p] \end{array} \right\}$

In the general case this would make the same prediction of the alternatives that I propose. However, in cases like (iii), it predicts the intuitively not attested inference in (iv). I leave a more in deep exploration of this alternative approach for future research.

(iii) It's possible that John thinks that Mary is away.

(iv) It's impossible that John thinks that Mary isn't away.

an independently established theory of scalar implicatures.

5 Predictions

5.1 The basic case and negation

In the unembedded case, exhaustification is vacuous as the excluded middle alternative is entailed by the assertion. For instance, in the case of a neg-raising predicate like *believe* in (88-a), if John believes that it is raining, then he has an opinion as to whether it is raining, so none of the alternatives in (88-c) is excludable.

(88) a. John believes that it is raining.
b. $\textbf{believe}_j(p)$
c. $\mathscr{A}lt(\textbf{believe}_j p) = \left\{ \begin{array}{l} \textbf{believe}_j p \\ \textbf{believe}_j p \vee \textbf{believe}_j \neg p \end{array} \right\}$

However, when a sentence like (88-a) is embedded under negation as in (89-a), we predict the excluded middle to project out as if it was a presupposition: the alternative of (89-a), schematized in (89-b), becomes (90).

(89) a. John doesn't believe that it is raining.
b. $\neg\textbf{believe}_j p$

(90) $\mathscr{A}lt(\neg\textbf{believe}_j p) = \left\{ \begin{array}{l} \neg\textbf{believe}_j p \\ \neg[\textbf{believe}_j p \vee \textbf{believe}_j \neg p] \end{array} \right\}$

The negation of the excluded middle proposition is not entailed by (89-b), hence when we exhaustify we wind up negating the negation of the excluded middle, thus obtaining the excluded middle again.

(91) $[\![\text{EXH}]\!](\neg\textbf{believe}_j p) = \neg\textbf{believe}_j p \wedge \neg\neg[\textbf{believe}_j p \vee \textbf{believe}_j \neg p] =$
$\neg\textbf{believe}_j p \wedge [\textbf{believe}_j p \vee \textbf{believe}_j \neg p]$

As we know from above, (91) entails (92), hence we derive the neg-raising inference. Indeed, the claim that John has an opinion about p together with the assertion that it's not true that John believes that p allows us to conclude that he believes that not-p.

(92) $\textbf{believe}_j \neg p$

5.2 Other embeddings and non-projection

5.2.1 Non projection

As we just saw, in the case of negation, exhaustifying a sentence like (93-a) gives rise to the excluded middle inference in (93-b), from which we can conclude the neg-raising inference in (93-c).

(93) a. John doesn't think that Fred left
b. John has an opinion as to whether Fred left.
c. John thinks that Fred didn't leave.

What about the case of other embeddings? It is easy to show that the present proposal does not predict that neg-raising inferences should project out of embeddings in the same way as presuppositions. In other words, we make the same prediction for *think* and *every* in cases like (94-a)-(94-c) and (95-a)-(95-c): exhaustification of these cases does not give rise to the inferences in (94-d) and (95-d), respectively.

(94) a. If John thinks that Fred left, he will be upset
b. Perhaps John thinks that Fred left
c. Does John think that Fred left?
d. $\not\rightsquigarrow$ John has an opinion as to whether Fred left

(95) a. If Frank met every student, he will come to our department.
b. Perhaps Frank met every student.
c. Did Frank meet every student?
d. $\not\rightsquigarrow$ Frank met some student

For instance in the case of (94-b), schematized in (96-a), the alternatives that we have are in (96-b). It is easy to see that none of the alternatives is excludable, thus no inference is predicted from exhaustification in this case.

(96) a. $\Diamond[\mathbf{think}_j(p)]$
b. $\mathcal{A}lt(\Diamond[\mathbf{think}_j(p)]) = \left\{ \begin{array}{l} \Diamond[\mathbf{think}_j(p)] \\ \Diamond[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)] \end{array} \right\}$

So blocking of 'projective' behavior under upward entailing operators like $\Diamond$ is rather straightforward. In such cases the alternative is entailed and there simply is no presupposition-like behavior. The way in which alternatives play out in downward entailing (or non-upward entailing) contexts also makes the right predictions, but requires closer scrutiny. I turn to this now.

5.2.2 Novel inferences

Consider again the case of the conditional in (94-a) repeated in (97-a), schematized as in (97-b), where I adopt for concreteness a strict conditional semantics for conditionals (von Fintel 1997 among many others). The alternatives wind up being (98-a) and the exhaustification of (97-a) with respect to such alternatives is in (98-b).

(97) a. If John thinks that Fred left, he will be upset
b. $\Box[\textbf{believe}(p) \rightarrow q]$

(98) a. $\mathscr{A}lt = \left\{ \begin{array}{l} \Box[\textbf{believe}(p) \rightarrow q] \\ \Box[(\textbf{believe}(p) \vee \textbf{believe}(\neg p)) \rightarrow q] \end{array} \right\}$
b. $[\![\text{EXH}]\!](\Box[\textbf{believe}(p) \rightarrow q]) =$
$\Box[\textbf{believe}(p) \rightarrow q] \wedge \neg\Box[(\textbf{believe}(p) \vee \textbf{believe}(\neg p)) \rightarrow q] =$
$\Box[\textbf{believe}(p) \rightarrow q] \wedge \Diamond[(\textbf{believe}(p) \vee \textbf{believe}(\neg p)) \wedge \neg q]$

(98-b) claims that it's possible that John has an opinion as to whether Fred left and that he won't be upset. Together with the first conjunct that asserts that if he believes that Fred left he will be upset, the whole conjunction is equivalent to (99): if he believes that Fred left, he will be upset and it is possible that he believes that Fred didn't leave and he won't be upset.

(99) $\Box[\textbf{believe}(p) \rightarrow q] \wedge \Diamond[\textbf{believe}(\neg p) \wedge \neg q]$

In this case, however, it is not easy to argue for this inference, because it is entailed by the so-called "conditional perfection" inference, which conditionals have independently from the presence of neg-raising predicates (see von Fintel 2001 and references therein).[24] Let us turn, then, to another non-UE environment like the restrictor of a universal quantifier, as in (100-a). In this case, if we exhaustify (100-a), we obtain the inference in (100-b) as shown in (101-b).

(100) a. Every student who believed that she was accepted came to the party.
b. Some student who believed that she wasn't accepted didn't come to the party.

(101) a. $\forall x[\textbf{believe}_x p \rightarrow Qx]$
b. $[\![\text{EXH}]\!](\forall x[\textbf{believe}_x p \rightarrow Qx]) =$
$(\forall x[\textbf{believe}_x p \rightarrow Qx]) \wedge \neg\forall x[(\textbf{believe}_x p \vee \textbf{believe}_x \neg p) \rightarrow Qx] =$
$(\forall x[\textbf{believe}_x p \rightarrow Qx]) \wedge \exists x[(\textbf{believe}_x p \vee \textbf{believe}_x \neg p) \wedge \neg Qx]$

24 In this case the inference is that if it's not the case that John believes that Fred left, he won't be upset. This entails that if John believes that Fred didn't leave then he will not be upset.

(101-b) claims that every student who believes that she was accepted came to the party and there is a student who either believes that she was accepted or believes that she wasn't and didn't come to the party. The two conjuncts are equivalent to (102): every student who believes that she was accepted, came to the party and there is a student who believes that she wasn't and didn't come to the party.

(102) $\forall x[\textbf{believe}_x p \rightarrow Qx] \wedge \exists x[\textbf{believe}_x \neg p \wedge \neg Qx]$

Given that the presuppositional account does not predict this inference, if we can argue for its existence we would have an argument for the present proposal.[25]

An argument for the inference above can be constructed on the basis of the so-called "Hurford's constraint". The condition is that in (103) (Hurford 1974; see also Chierchia et al. To appear and Singh 2008).

(103) **Hurford's constraint**:
A sentence that contains a disjunctive phrase of the form S or S' is infelicitous if S entails S' or S' entails S.

(103) can immediately account for the infelicity of sentences like (104).

(104) #John is in Italy or in Milan.

Hurford (1974) and Gazdar (1979), however, observed that (103) appears to be violated by cases like (105), as the second disjunct is stronger than the first one, but nonetheless (105) is felicitous.

(105) Either John solved some of the problems or he solved them all.

Chierchia et al. (To appear) argue that (105) is not a violation of the Hurford's constraint because we should analyze it with an embedded exhaustivity operator in the first disjunct as in (106-a), so that it becomes equivalent to (106-b), and hence the second disjunct does not entail the first one.

(106) a. Either [EXH[John solved some of the problems]] or he solved them all.

25 To see that the presuppositional account does not predict it, notice that what we can conclude from (i-a) depends on our assumptions about the projection of presuppositions from the restrictors of universal quantifiers. Suppose, for the sake of the argument, that we assume a theory that predicts universal projection from the restrictor of universal quantifiers, what we can conclude from (i-a) is (i-b).

(i) a. Every student who believes that she was accepted will come to the party.
b. Every student has an opinion on the matter.

b. Either John solved some but not all of the problems or he solved them all.

Chierchia et al. (To appear) use the Hurford's constraint as a diagnostic for (embedded) scalar implicatures. In the following, I use it here to test the status of the inference above. For instance, the present proposal predicts that from (107-a) we can have the inference in (107-b)

(107) a. Every student who thinks I am right will support me.
b. Some student who think that I am not right will not support me.

We can then construct the disjunction in (108) to check whether (107-b) is an inference of (107-a). Notice that given the downward entailingness of the restrictor of *every* the second disjunct in (108) entails the first one, unless the first one is analyzed as in (109). (109), given the present proposal, gives rise to the inference in (107-b), which disrupts the entailment relation.

(108) Either every student who thinks I am right will support me or every student who has an opinion on the matter (at all) will.

(109) EXH[every student who thinks that I am right will support me]

To the extent that (108) is felicitous we have an argument for the inference in (102). The same argument can be reproduced for the inference from (110-a) to (110-b), given the disjunction in (111).[26]

26 One might object that the felicity of the disjunction above should be subsumed by whatever explained the felicity of disjunctions like (i) with no neg-raising predicate and in which the second disjunct entails the first.

(i) We will either test everyone who smokes Marlboro or we will test everyone who smokes (at all).

If (i) is felicitous, there must be another inference disrupting the entailment relation between disjuncts. Katzir (2007) argues that the restrictor of a universal has its syntactic simplification as alternatives. So in this case the alternative of (ii-a) would be (ii-b). Exhaustification would give then rise to the inference in (iii), which, in turn, would disrupt the entailment relation between the disjuncts of (i).

(ii) a. We wil test everyone who smokes Marlboro.
b. We will test everyone who smokes.

(iii) ¬[we will test everyone who smokes]

However, this alternative explanation of the felicity of this type of disjunction is not available for cases in which the entailing disjunct is more complex than the entailed one, like in (iv). In this case it is not straightforward to see what alternative obtained by syntactically simplify the first disjunct could disrupt the entailment relation between the second disjunct and the first one.

(110) a. No student who thinks that I am wrong will support me.
b. Some student who thinks that I am right will support me.

(111) Either no student who thinks that I am wrong will support me or no student who has an opinion on the matter will.

5.2.3 Summary

I proposed that neg-raising predicates have their corresponding excluded middle propositions as alternatives and that neg-raising inferences arise as a scalar implicature via exhaustification of sentences containing such predicates. As we saw, the differences between neg-raising inferences and (soft) presuppositions are accounted for straightforwardly in the present approach. Finally, notice that the present proposal, like Gajewski's (2007), can accommodate the fact that neg-raising inferences are characteristics of certain predicates and not others. What distinguishes neg-raising and non-neg-raising predicates is their alternatives: the former has the excluded middle as an alternative but the latter do not. In the following section, I turn to a discussion of the interaction between polarity and neg-raising.

6 Interaction with polarity

6.1 Neg-raising, strong NPIs, and Anti-additivity

It has been noticed since Lakoff 1969 that a subset of NPIs, so-called "strict" or "strong" NPIs, show a difference between neg-raising and non-neg-raising predicates: they are licensed when embedded under a negated neg-raising predicate, like in (112-a), but they are not when in the scope of a non-neg-raising one, like in (112-b).

(112) a. John doesn't think that Mary will arrive until tomorrow.
b. *John isn't certain that Mary will arrive until tomorrow.

Zwarts (1998) proposes that the characteristic property of strong NPIs is that they are licensed in anti-additive contexts. An anti-additive contexts is the scope of an anti-additive function, defined in (113).

(113) A function f is anti-additive iff for any a, b in the domain of f, $f(a) \wedge f(b) \subseteq f(a \vee b)$

(iv) Either every student who wants to invite Philippe will come to the meeting or every student who has a desire on the matter will come.

As shown by the validity of the inference from (114-a) to (114-b), negation is an anti-additive function.

(114) a. It didn't rain and it didn't snow.
b. It didn't rain or snow.

Gajewski (2007) shows that the presuppositional approach predicts that cases like (112-a) are anti-additive environments, thus the fact that strong NPIs are licensed in these cases is accounted for.[27]

In the same way, the present proposal predicts that negated neg-raising predicates create anti-additive environments, thus it accounts for the licensing of strong NPIs like *until* in sentences like (115).

(115) John didn't think that Bill would leave until tomorrow

The entailment in (116), for any neg-raising predicate P, propositional arguments p, q and individual x, is predicted by the semantics proposed here.[28]

27 As Gajewski (2007: p.304) discuss, consider the meaning of a neg-raising predicate P as in (i) (where $\Box$ has to be understood to range over the modal base of the neg-raising predicate P, see fn.3 above).

(i) $[\![\text{not } P]\!](p)(x) =$
a. *presupposes* : $[\Box p \vee \Box \neg p]$
b. *asserts* : $\neg \Box p$
c. together (i-a) and (i-b) entail: $\Box \neg p$

(ii) $[\![\text{not } P]\!](q)(x) =$
a. *presupposes* : $[\Box q \vee \Box \neg q]$
b. *asserts* : $\neg \Box q$
c. together (ii-a) and (ii-b) entail: $\Box \neg q$

(iii) $[\![\text{not } P]\!](p \vee q)(x) =$
a. *presupposes* : $[\Box(p \vee q) \vee \Box \neg (p \vee q)]$
b. *asserts* : $\neg \Box (p \vee q)$
c. together (iii-a) and (iii-b) entail: $\Box \neg (p \vee q)$

(i) and (ii) entails that no world is a $(p \vee q)$-world, hence the presupposition of (iii) is satisfied and (iii) must be true. The presuppositional account, then, predicts that negated neg-raising predicates create anti-additive contexts.

28 Let us go through this in brief: first, consider the meaning of a neg-raising predicate P to have the form in (i-a) (see fn.2 and 13 above), with the alternatives in (i-b), and that the exhaustification of (i-a) with respect to the alternatives in (i-b), brings about the neg-raising inference as in (i-c).

(i) a. $[\![\text{not } P]\!](\text{p})(\text{x}) = \neg \Box p$
b. $\mathscr{A}lt = \left\{ \begin{array}{l} \neg \Box p \\ \neg [\Box p \vee \Box \neg p] \end{array} \right\}$

(116) $[\![\text{EXH}[\text{not } P]]\!](p)(x) \wedge [\![\text{EXH}[\text{not } P]]\!](q)(x) \Rightarrow [\![\text{EXH}[\text{not } P]]\!](p \vee q)(x)$

In sum, for arbitrary p, q the present semantics validates the inference in (116), thus predicting that negated neg-raising predicates create anti-additive contexts. This would be the end of our section on polarity, if it wasn't for the fact that recently Gajewski (2009) himself and Chierchia (in preparation) have argued that anti-additivity is actually neither sufficient nor necessary for the licensing of strong NPIs, thus undermining the above argument that strong NPI licensing is predicted.

In the following I briefly sketch some problems for anti-additivity and then I outline the alternative approach by Gajewski and Chierchia and how this applies to neg-raising. Finally, I show how this accounts for the case of truth-predicates, which are highly problematic for an anti-additive account.

6.1.1 The problems for anti-additivity

Anti-additivity is successful in explaining a variety of contexts that license strong NPIs. However, as Chierchia (in preparation) and Gajewski (2011) discuss, it leaves open at least three problems: first, certain anti-additive contexts like the restrictor of *every* and *no* do not license strong NPIs, as (117-a) and (117-b) show, from Chierchia in preparation.[29]

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c. $[\![\text{EXH}[\text{not } P]]\!](p)(x) = \neg\Box p \wedge \neg\neg[\Box p \vee \Box\neg p] = \Box\neg(p)$

Analogously, the exhaustification of (ii-a) with respect to (ii-b) brings about the inference in (ii-c).

(ii) a. $[\![\text{not } P]\!](p \vee q)(x) = \neg\Box(p \vee q)$

b. $\mathscr{A}lt = \left\{ \begin{array}{l} \neg[\Box(p \vee q)] \\ \neg[\Box(p \vee q) \vee \Box\neg(p \vee q)] \end{array} \right\}$

c. $[\![\text{EXH}[\text{not } P]]\!](p \vee q)(x) = \neg\Box(p \vee q) \wedge \neg\neg[\Box(p \vee q) \vee \Box\neg(p \vee q)] = \Box\neg(p \vee q)$

It is easy to show, then, that (iii-a) and (iii-b) together entail (iii-c): if there are no worlds in which p is true and there are no worlds in which q is true, there are no worlds in which $p \vee q$ is true.

(iii) a. $[\![\text{EXH}[\text{not } P]]\!](p)(x) = \Box\neg(p)$

b. $[\![\text{EXH}[\text{not } P]]\!](q)(x) = \Box\neg(q)$

c. $[\![\text{EXH}[\text{not } P]]\!](p \vee q)(x) = \Box\neg(p \vee q)$

29 The anti-additivity of the restrictors of *ever* and *no* is shown by the equivalences in (i) e (ii).

(i) a. Every red or black book is on the table.

b. Every red book is on the table and every black book is on the table

(ii) a. No red or black book is on the table.

b. No red book is on the table and no black book is on the table

(117) a. *Every student who left until his birthday missed many classes.
b. *No student who has seen Mary in weeks is upset with her.

Second, von Fintel (1999) has shown that we should ignore presuppositions for the purpose of licensing weak NPIs. As I will discuss below, he defines a notion of entailment, Strawson-entailment, that makes it possible to define a notion of downward monotonicity that, in turn, explain the distribution of weak NPIs in the scope of presuppositional triggers. However, presuppositional triggers do not appear to license strong NPIs, despite the fact that when we define anti-additivity in terms of Strawson-entailment, we have many contexts, in particular all Strawson-downward entailing contexts, that are Strawson anti-additive and yet do not license strong NPIs (Gajewski 2011). Finally, anti-additivity is a descriptive generalization, and an approach like Gajewski (2011) and Chierchia (in preparation) wants instead to predict why such contexts should license strong NPIs and not others.

6.2 A different approach to strong NPI licensing

Gajewski (2011) and Chierchia (in preparation) propose a new theory based on the idea that strong NPIs are sensitive to non-truth conditional meanings. Informally, the idea is that while presuppositions and scalar implicatures do not matter for the licensing of weak NPIs, they do matter for strong NPIs. To illustrate, consider the contrast between (118) and (119), which shows that a strong NPI like *until thursday* can appear in the scope of negation like in (118), but cannot appear felicitously in downward entailing contexts like the restrictor of a universal quantifier as shown by (119).

(118) Mary didn't leave **until Thursday**.

(119) *Every student who left **until Thursday**, missed the class on presuppositions.

The gist of the idea is that the relevant difference between (119) and (118) is that the former, but not the latter, has a presupposition (i.e., that the domain of quantification, indicated as D, and the restrictor have a non-empty intersection). The two components of the meaning of (119) can be schematized as (120-a) and (120-b).

(120) a. **presupposition**: $\exists x \in \text{D}[[\![\text{left until thursday}]\!](x)]$
b. **assertion**: $\forall x \in \text{D}[[\![\text{left until thursday}]\!](x) \rightarrow Q(x)]$

Gajewski (2011) and Chierchia (in preparation) argue that in evaluating downward entailingness for the purpose of licensing strong NPIs, we should look at the conjunction of assertion, scalar implicatures, and presuppositions. Indeed, if we do this

in the case of (120-a) and (120-b), we do not have a downward entailing environment anymore. In other words, (121) does not entail (122), for any predicate P.

(121) $\exists x \in \text{D}[[\![\text{left until thursday}]\!](x)] \wedge$
$\forall x \in \text{D}[[\![\text{left until thursday}]\!](x) \rightarrow Q(x)]$

(122) $\exists x \in \text{D}[([\![\text{left until thursday}]\!](x) \wedge P(x))] \wedge$
$\forall x \in \text{D}[([\![\text{left until thursday}]\!](x) \wedge P(x)) \rightarrow Q(x)]$

In sum, the Gajewski-Chierchia approach predicts that presuppositions and scalar implicatures may interfere with the licensing of strong NPIs. Let us turn now to the case of neg-raising.[30]

6.2.1 The case of neg-raising

Going back to the contrast in (123), repeated from above. Given Gajewski-Chierchia's approach, it is not anti-additivity that distinguishes between (123-a) and (123-b), but rather some differences pertaining to scalar implicatures or presuppositions. Let us go through this in detail.

(123) a. John doesn't think that Mary will arrive until tomorrow.
b. *John isn't certain that Mary will arrive until tomorrow.

Recall that I am proposing that universal quantifiers in natural language can either take as alternative the corresponding existential quantifier or their corresponding excluded middle proposition. As we saw, this in turn means that for a sentence like (124-a), we predict the inference in (124-b), while for that in (125-a) we predict the inference in (125-b)

(124) a. John isn't certain that Mary was here.
b. $\rightsquigarrow$ it's possible for John that Mary was here.

(125) a. John doesn't think that Mary was here.
b. $\rightsquigarrow$ it's impossible for John that Mary was here.

In the perspective of Gajewski-Chierchia's theory of Strong NPIs, we have to consider whether (124) and (125) are downward entailing environments. Or more precisely, whether (124) and (125), as enriched with their scalar implicatures or presuppositions, are downward entailing environments. It is easy to see, that the scalar implicature of (124) disrupts the DEness of the environment, while that of (125) does not. Abstractly, in the latter case we have something like (126). While for

30 In Appendix B, I discuss the case of neg-raising desire predicates, which gives rise to a problem for Gajewski-Chierchia's account of strong NPIs and propose a solution.

(124) we have a combination of presupposition and assertive meaning as in (127). Therefore, the contrast between the two cases is predicted.

(126) $\Box_j[\neg p_{\textbf{strong NPI}}]$

(127) $\neg\Box_j[p_{\textbf{strong NPI}}] \wedge \Diamond_j[p_{\textbf{strong NPI}}]$

In sum, in the approach by Gajewski and Chierchia anti-additivity does not play a role anymore. The criterion for Strong NPI licensing is simply whether the environment in which it appears is downward entailing, once we consider presuppositions and scalar implicatures. In this perspective, strong NPI licensing under an attitude predicate does not follow directly from that predicate giving rise or not to neg-raising inferences. What happens, instead, is that in the case of neg-raising versus non-neg-raising predicates the difference is due to the difference in the inferences that they give rise to. In particular, while the neg-raising inference of neg-raising predicates leaves the downward entailingness of the environment intact, the existential inference of non-neg-raising predicates disrupts it, thus disallowing strong NPIs in their complements.

6.2.2 Bonus: truth predicates

In addition to not having the problems for the anti-additivity account pointed out above, Gajewski-Chierchia's approach also has another advantage over the anti-additivity approach in the case of truth-predicates.[31]

The problem with truth-predicates can be described as follows. First, it seems hard to deny that the meaning of predicates like *it is true that* is the identity function on the proposition that it takes as complement. So in other words, *it is true that it is raining* would just mean *it is raining*, and *it isn't true that it's raining* would be equivalent to *it's not raining*. Once we admit this, however, we immediately predict that a sentence of the form *it's not true that p* is an anti-additive context. Given an anti-additive account, therefore, we expect these sentences to license strong NPIs. This is, however, not the case: while in a sentence like (128) the NPI *until six o' clock* is licensed, it is not in the equivalent (129).

(128) Robin won't be here until six o' clock.

(129) *It's not true that Robin will be here until six o' clock.

Moreover, truth predicates also block licensing of Strong NPIs, when in the scope of neg-raising predicates. Compare (130) to (131).

31 This section is based on a comment made by an anonymous reviewer, who I thank for raising the issue and providing the examples.

(130) Leslie doesn't believe that Robin will be here until six o' clock.

(131) *Leslie doesn't believe that it's true that Robin will be here until six o' clock.

In sum, truth-predicates constitute a problem for an anti-additivity-based theory of strong NPI licensing. If we adopt Gajewski-Chierchia's approach, however, the problem disappears. This is because we have a way to distinguish between (131) and (130), in a way that allows us to understand why truth predicates don't license strong NPIs.

The gist of the point is that truth predicates appears to be presuppositional and their presupposition disrupts the downward entailingness that would license the strong NPI. As Moltmann (2012) discusses, 'in general, in order for such entities to act as the arguments of the predicates *right* and *correct* they need to have been introduced in the previous discourse context.' To bring out this intuition, imagine a context in which a professor enters in the class and out of the blue says either (132) or (133). In the former case, but not in the latter, if it wasn't in question, even implicitly, whether the alarm will go off, the sentence is odd.

(132) It's true that the alarm will go off.

(133) The alarm will go off.

In other words, a sentence like (132) is odd out of the blue or seems to force accommodation that the proposition under the truth predicate was in question, while cases like (133) or (134) do not appear to have these felicity conditions.

(134) It is possible that the alarm will go off.

Notice also that this effect projects under embeddings in the typical way in which presuppositions do, as shown by (135-a)-(135-c).

(135) a. It's not true that the alarm will go off.
b. If it's true that the alarm will go off, we should be prepared.
c. Is it true that the alarm will go off?

I propose to capture the data above through a presupposition. The idea is that while the meaning of *it is true that* is indeed the identity function, it also introduces a presupposition, which accounts for the anaphoric effect pointed out by Moltmann (2012). For our purposes, we can formulate the presupposition as in (136).[32,33]

32 This probably needs to be refined, but the exact formulation of the presupposition is not important for our purposes - what only matters for us is its role in disrupting DEness.

33 Chris Collins (p.c.) pointed out to me the case in (i), where it is not clear whether a presupposition of

(136) $[\![\text{IT IS TRUE THAT P}]\!]^{C,w}$
is only defined in C if $[\![\text{P}]\!]$ was (explicitly or implicitly) in question in C before
when defined, it is equivalent to $[\![\text{P}]\!]^{C,w}$

This means that (137) is now equivalent to (138), where the first conjunct is not a DE context, hence the licensing is disrupted, given Gajewski/Chierchia's approach.[34]

(137) It's not true that Robin will come until Thursday.

(138) Robin will come until Thursday was in question in C and it's not true that Robin will come until Thursday

In sum, truth-predicates constitute a problem for any account of neg-raising coupled with an anti-additivity-based approach to strong NPI licensing. Once we adopt Gajewski-Chierchia's account of strong NPIs, however, the problem disappears and this constitute another advantage of this approach.

7 Explaining what the presuppositional approach can explain

I turn now to the three aspects of the behavior of neg-raising predicates discussed in section 2.3.1, which are taken as motivations for the presuppositional approach, and I show how the present proposal can account for them too.

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this sort is accommodated. What seems to be relevant in these cases is the interaction between the presupposition of *also* and that of *it is true*. I leave a more thorough investigation of this use of truth predicates for further research.

(i) While John was late, it is also true that he brought the coffee, so let's forgive him.

34 An anonymous reviewer suggests that we should treat the truth-predicate itself as being neg-raising, thus, he/she notices, in my account this would mean that it should have the excluded middle alternative. The argument for treating truth-predicates as neg-raising predicates would come from the equivalence of (i) and (ii) and this would be a signature property of NR predicates in general.

(i) It's not true that it's raining.

(ii) It's not raining.

I disagree: if we treat *it is true that* as the identity function, then the equivalence between (i) and (ii) just comes from the meaning of the truth predicate, with no need of any neg-raising mechanism at all. Therefore I see no reason why '*be true/the case* must be taken to be an NR predicate.

(iii) $[\![\text{IT IS NOT TRUE THAT IT'S RAINING}]\!]^{C,w} = \neg(\text{ID}(\textbf{raining})(w)) = \neg\textbf{raining}(w)$
where $\text{ID} = \lambda p.p$

7.1 Suspension of neg-raising inferences

The context dependence of neg-raising predicates can be accounted for in the present proposal by any mechanism that accounts for the context dependence of scalar implicatures. In particular, I assume that the generation of scalar implicatures depends on relevance: only relevant alternatives will give rise to scalar implicatures. In the following, I will sketch how an implementation in terms of questions under discussion, could be adopted in the present account.

As discussed Merin (1999), van Rooij (2002), Fox & Katzir (2011), Zondervan (2009), Magri (2010), we can model relevance using questions under discussion. The idea is that all assertions can be thought of as answers to (implicit or explicit) questions under discussion (see Roberts 2004, Beaver & Clark 2009 among others). Further, assume that a question is associated with a partition of the common ground (i.e., a set of pair-wise disjoint propositions whose union is the common ground).[35] The notion of relevance is then (139), where Q is the partition associated with the question (Heim 2011).

(139) **Relevance** A proposition p is relevant to a question Q iff p is (contextually equivalent with) the union of some subset of Q.

What (139) says is that a proposition is relevant if it does not distinguish among the cells of the (partition associated with) the question. By way of illustration consider the question under discussion to be (140-a), which corresponds to the partition Q in (140-b).

(140) a. Is it raining?
b. $Q = \{c_1 = \textbf{rain}, c_2 = \neg\textbf{rain}\}$

Given the notion of relevance in (139), we predict that (141-a) is relevant given the question in (140-a), while (141-b) is not. This is because the former corresponds to one cell of the partition, while the latter does not correspond to any cell (i.e., both in c_1 and c_2 there are worlds in which John will come and worlds in which John will not come).

(141) a. It's not raining.
b. John will come.

In the theory above, sensitivity to relevance can be modeled by defining a subset of the alternatives, the set of "relevant alternatives", based on the notion of relevance above. The set of relevant alternatives is the set of alternatives the interpretations of

35 This can be the semantics of questions itself or derivable from it (see Heim 1994). For a discussion of the semantics of questions see Hagstrom 2003.

which is a union of some subset of (partition of the) question under discussion.

(142) Given the partition Q of the question under discussion,
$\mathscr{A}lt_{\mathscr{R}}(p) = \{q \in \mathscr{A}lt(p) : q \text{ is a cell or a union of cells of } Q\}$

At this point, we can simply have exhaustification taking relevant alternatives as in (143) and, correspondingly the set of excludable alternatives as in (144).[36]

(143) $[\![\text{EXH}_{\mathscr{A}lt_{\mathscr{R}}}]\!](p)(w) = p(w) \wedge \forall q \in \mathscr{E}xcl(p)[\neg q(w)]$

(144) $\mathscr{E}xcl(p) = \{q \in \mathscr{A}lt_{\mathscr{R}}(p) : \lambda w[\neg q_w] \cap p \neq \emptyset\}$

This notion of relevance can account for the fact that typically we draw the inference to the negation of (145-d) from (145-c) when the question under discussion is (145-a) and not when it is (145-b).

(145) a. How many chairs do you have?
b. We need two chairs for the faculty meeting. Who has two chairs?
c. I have two chairs.
d. I have three chairs.

By way of illustration, (145-a) gives rise to the partition of the common ground in (146) in which each line represents a cell of the partition and **exactly n** stands for *I have exactly n chairs* (suppose the maximum number of chairs you can have is four).

(146) $Q_1 = \left\{ \begin{array}{l} c_1 = \textbf{zero} \\ c_2 = \textbf{exactly one} \\ c_3 = \textbf{exactly two} \\ c_4 = \textbf{exactly three} \\ c_5 = \textbf{exactly four} \end{array} \right\}$

We can now see that (145-d) is relevant given Q_1 because it is the union of some of its cells (i.e, $c_4 \cup c_5$). Given that it is relevant, it is going to be negated by EXH, so we expect the implicature that I have two but not three chairs.

On the other hand, the question in (146-b) gives rise to the partition in (147), where **me** and **john** stand for *John has two (or more) chairs* and *I have two (or more) chairs*, respectively (suppose the only individuals in the context are me and John).

36 From now on, I assume that the alternatives are relevant alternatives and omit the subscript whenever no confusion could arise.

(147) $$Q_2 = \left\{ \begin{array}{l} c_1 = \neg\textbf{me} \wedge \neg\textbf{john} \\ c_2 = \textbf{me} \wedge \neg\textbf{john} \\ c_3 = \neg\textbf{me} \wedge \textbf{john} \\ c_4 = \textbf{me} \wedge \textbf{john} \end{array} \right\}$$

Here (145-d) is not relevant because it is not the union of any cells of Q_2, rather it distinguishes within c_2, providing irrelevant information. In sum, we can account for the pattern in (145), because the alternative (145-d) is relevant when (145-a) is the question under discussion but not when (145-b) is.

I discussed how the exhaustification-based theory can account for the context dependence of scalar implicatures. I show now that we can adopt the same mechanism for the case of neg-raising inferences. To illustrate, let us start from the case, where the neg-raising inference is not suspended. I argue that in cases (148-a), the most natural question under discussion is (149-a).

(148) a. Bill doesn't think that Fred left.
b. Bill thinks that Fred didn't leave.

(149) a. What does Bill think about whether Fred left?

(149) in turn gives rise to the partition in (151-b) (or refinements thereof), where the cells are worlds in which Bill thinks that Fred left, the ones in which Bill thinks that Fred didn't leave and the ones in which Bill has no opinion on the matter.

(150) $$Q = \left\{ \begin{array}{l} c_1 = \textbf{think}_b p \\ c_2 = \textbf{think}_b \neg p \\ c_3 = \neg[\textbf{think}_b(p) \vee \textbf{think}_b(\neg p)] \end{array} \right\}$$

Recall that we are assuming a notion of relevance such that a proposition is relevant if and only if it is a cell or a union of cells in the (partition of) the question under discussion. The alternatives of (148-a) as schematized in (151-a) are represented in (151-b).

(151) a. $\neg\textbf{think}_b(p)$
b. $\mathscr{A}lt = \left\{ \begin{array}{l} \neg\textbf{think}_b(p) \\ \neg[\textbf{think}_b(p) \vee \textbf{think}_b(\neg p)] \end{array} \right\}$

We can now see that they are all relevant: they are either a cell or a union of cells of (150).[37] Hence, when we exhaustify as in (152), we obtain the inference in (148-b), in the way indicated above.

(152) EXH[not[Bil thinks that Fred left]]]

37 $\neg\textbf{think}_b(p) = c_2 \cup c_3$ and $\neg[\textbf{think}_b(p) \vee \textbf{think}_b(\neg p)] = c_3$.

Let us consider now the case of suspension in (153), repeated from above.

(153) John DOESN'T think that it is raining. He isn't sure.

The focus on the auxiliary suggests that the question under discussion is (154). (154) is a polar question, which creates the partition in (155). Given Q, among the alternatives of (153) in (156) only the one corresponding to the assertion, $\neg\mathbf{think}_j(p)$, is relevant.[38,39]

(154) Does John think that it is raining?

(155) $Q = \left\{ \begin{array}{l} c_1 = \mathbf{think}_j p \\ c_2 = \neg\mathbf{think}_j p \end{array} \right\}$

(156) $\mathscr{A}lt = \left\{ \begin{array}{l} \neg\mathbf{think}_j(p) \\ \neg[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)] \end{array} \right\}$

In this case, then, no alternative other than the assertion is relevant thus we predict the suspension of the neg-raising inference in (153). This can account for the observation by Gajewski (2005) that stress on the negation suspends the neg-raising inference, as shown by (157-a) versus (157-b), repeated from above.

(157) a. John doesn't think that Fred left. #He isn't sure.
b. John DOESN'T think that Fred left. He isn't sure.

Notice that indeed the same pattern arises with other scalar terms like *some* in (158-a) and (158-b).

(158) a. John didn't correct some of the papers, #he corrected them all.
b. John DIDN'T correct some of the papers, he corrected them all.

Summing up, the suspension of neg-raising inferences is accounted for by simply adopting the mechanism for suspension of scalar implicature. Furthermore, this accounts for the fact that stress on negation suspends neg-raising inferences.[40]

38 $\neg[\mathbf{think}_j(p) \vee \mathbf{think}_j(\neg p)]$ is irrelevant because it distinguishes within the c_2.

39 When we have an explicit question-answer like in (i-a)-(i-b), we can understand (i-b) as implicating that John thinks that it's not raining. In the case in which we draw the neg-raising inference we are accommodating a different question, namely (149-a).

(i) a. Does John think that it is raining?
b. John doesn't think that it is raining.

40 As Gajewski (2005) observes we can also suspend neg-raising inferences via stress on the predicate.

(i) John doesn't THINK that it is raining, he is not sure.

7.2 Negative quantifiers and negated universals

Turning to the case of negative quantifiers, recall that we want to account for the fact that (159-a) gives rise the inference in (159-b) and that strict NPIs are licensed in the scope of negative quantifiers as (160) shows.

(159) a. No student thinks that Mary passed.
b. Every student thinks that Mary didn't pass.

(160) No student thought that Mary would leave until tomorrow.

Furthermore, as Homer (2012) discusses, we also want to account for the inference from a negated universal quantifier like (161-a) to (161-b).

(161) a. Not every student think that Mary passed
b. Some student thinks that Mary didn't pass

As we saw above, the presuppositional approach can account for these inferences, assuming the projection behavior of presuppositions across negative quantifiers and negated universals. Let me show now that the present account also has no problem accounting for these facts, if we assume that a sentence with *no* like (162-a) has the corresponding sentence with *not every* in (162-b) as an alternative.

Scalar implicatures seem to pattern again in the same way as neg-raising inferences here, as (ii) shows.

(ii) John didn't correct ALL of the papers, he corrected none.

How do we account for the suspension of (i) and (ii)? I argue that the focus on the predicate suggests that the question under discussion should be (iii-a) and the corresponding partition (iii-b): we are asking what is the relation is that John does not bear to the propositional complement.

(iii) a. What is the R such that John doesn't bear R with respect to whether it is raining?
b. $\{\neg\textbf{think}_j p, \neg\textbf{think}_j \neg p, \neg\textbf{think}_j p \wedge \neg\textbf{think}_j \neg p, \neg\textbf{hope}_j p, \ldots\}$

In this case, the alternative that John does not have an opinion as to whether it is raining is relevant. Therefore, if the sentence is exhaustified globally, it would lead to the neg-raising inference in (iv), which is in contradiction with the second sentence in (ii). We are then allowed to exhaustify locally and suspend the inference.

(iv) $\neg$EXH[John thinks that it is raining], he is not sure.

The same *mutatis mutandis* applies to the case of *all*. Notice that it is not clear that focus on a soft trigger like *discover* obtain the same effect of suspension. Beaver (2008) argues, indeed, that the intonational pattern in (v) favors the projection of the soft presupposition, rather than its suspension.

(v) John didn't DISCOVER that he was accepted, (?)he wasn't.

(162) a. No student came.
b. Not every student came.

This assumption is motivated independently on the following grounds: first, notice that it is generally assumed that sentences with negative quantifiers like (163-a) and negated universals like (163-b) are alternatives of one another (Horn (1972), Levinson (2000)). Indeed as seen above, this can predict the inference from (163-a) to (163-c) as the negation of the stronger alternative in (163-b).

(163) a. Not every student came.
b. No student came.
c. Some student came.

Second, there are various independent arguments for decomposing negative quantifiers into negation plus an indefinite (see Sauerland 2000, Penka 2007, Iatridou & Sichel 2008 among many others). Assuming the decomposition of *no* as *not some*, given any standard definition of how alternatives grow (Sauerland 2004) and the assumption that *every* and *some* are scale-mates, we straightforwardly predict that a sentence with *no (=not some)* should have the corresponding sentence with *not every* as an alternative.

Given this assumption, a sentence like (164-a) will have (164-b) among its alternatives and so we obtain the universal neg-raising inference in (164-c) as shown by the derivation in (165).

(164) a. No student thinks that Mary passed.
b. Not every student thinks that Mary passed.
c. Every student thinks that Mary didn't pass.

(165) a. $\neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)]$

b. $\mathscr{A}lt = \left\{ \begin{array}{l} \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \\ \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{think}_m(p)] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \end{array} \right\}$

c. $\mathscr{E}xcl = \left\{ \begin{array}{l} \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))] \end{array} \right\}$

d. $[\![\text{EXH}]\!](\neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)]) =$
$\neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \wedge \forall x[\mathbf{stud}(x) \rightarrow (\mathbf{think}_m(p) \vee \mathbf{think}_m(\neg p))]$
$= \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{think}_m(p)] \wedge \forall x[\mathbf{stud}(x) \rightarrow \mathbf{think}_m(\neg p)]$

In sum, the present account correctly predicts a universal neg-raising inference in the scope of negative quantifiers like *no*. I argue for the existence of this inference in the

case of scalar implicatures in general; for instance, that (166-b) can be an inference of (166-a).

(166) a. None of these ten professors failed all of their students.
b. $\rightsquigarrow$ All of these ten professors failed some of their students.

As for the licensing of strict NPIs, notice that we also predict that neg-raising predicates in the scope of negative quantifiers create an anti-additive environment. This is because if no one thinks that p and no one thinks that q the entailment that no one thinks that p or q is predicted. If every person's belief worlds are worlds in which p is not true and every person's belief worlds are worlds in which q is not true than every person's belief worlds are worlds in which p or q is not true. This can account for the licensing of strict-NPIs in sentences like (167).

(167) No student thought that Bill would leave until tomorrow

Turning now to negated universals, it is easy to see that also in this case the present proposal makes the correct prediction. In other words, it predicts (168-b) to be an inference of (168-a), as shown by the derivation in (169).

(168) a. Not every students wants to help me (Homer 2012)
b. There is some student who wants not to help me

(169) a. $\neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{want}_m(p)]$

b. $\mathscr{A}lt = \left\{ \begin{array}{l} \neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{want}_m(p)] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{want}_m(p) \vee \mathbf{want}_m(\neg p))] \\ \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{want}_m(p)] \\ \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{want}_m(p) \vee \mathbf{want}_m(\neg p))] \end{array} \right\}$

c. $\mathscr{E}xcl = \left\{ \begin{array}{l} \neg\exists x[\mathbf{stud}(x) \wedge \mathbf{want}_m(p)] \\ \neg\exists x[\mathbf{stud}(x) \wedge (\mathbf{want}_m(p) \vee \mathbf{want}_m(\neg p))] \\ \neg\forall x[\mathbf{stud}(x) \rightarrow (\mathbf{want}_m(p) \vee \mathbf{want}_m(\neg p))] \end{array} \right\}$

d. $[\![\text{EXH}]\!](\neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{want}_m(p)]) =$
$\neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{want}_m(p)] \wedge \exists x[\mathbf{stud}(x) \wedge \mathbf{want}_m(p)] \wedge \forall x[\mathbf{stud}(x) \rightarrow$
$(\mathbf{want}_m(p) \vee \mathbf{want}_m(\neg p))] = \neg\forall x[\mathbf{stud}(x) \rightarrow \mathbf{want}_m(p)] \wedge \exists x[\mathbf{stud}(x) \wedge$
$\mathbf{want}_m(p)] \wedge \exists x[\mathbf{stud}(x) \wedge \mathbf{want}_m(\neg p)]$

Summing up, we do not need the presuppositional approach to account for the universal inference of neg-raising predicates embedded in the scope of negative quantifiers and the wide scope existential readings of negated universals, nor do we need it to account for the licensing of strict-NPIs in such environments. Let me now turn to the last putative presuppositional behavior of neg-raising predicates, that is

their behavior when stacked one into another.

7.3 Partial cyclicity

As discussed above, a negated neg-raising belief predicate embedding a neg-raising desire one like in (170-a) allows a reading as if negation was taking scope at the lowest level like in (170-b), while a desire-predicate embedding a belief one like (171-a) does not.

(170) a. I don't believe Bill wanted Harry to die. $\rightsquigarrow$
b. I believe Bill wanted Harry not to die.

(171) a. I don't want Bill to believe Harry died. $\not\rightsquigarrow$
b. I want Bill to believe Harry didn't die.

As we saw, the presuppositional approach can explain this pattern quite elegantly. I show that the present proposal can account for it, given a condition that regulates the interaction between presuppositions and exhaustification. Let us first go through what happens if we exhaustify (170-a) or (170-a).

7.3.1 Symmetric predictions

As it stands, the present system overgenerates, in that it predicts that both the negation of *believe(want)* and that of *want(believe*) should lead to the reading as if negation was taking the lowest scope below both predicates. To illustrate, consider the sentence in (172-a), schematized in (172-b) and with the alternatives in (172-c).

(172) a. Mary doesn't believe that John wants Fred to leave
b. $[\![\text{EXH}]\!][\neg[\mathbf{bel}_m[\mathbf{want}_j(p)]]]$
c. $\left\{ \begin{array}{l} \neg[\mathbf{bel}_m[\mathbf{want}_j(p)]] \\ \neg[\mathbf{bel}_m[\mathbf{want}_j(p) \vee \mathbf{want}_j(\neg p)]] \\ \neg[\mathbf{bel}_m[\mathbf{want}_j(p)] \vee \mathbf{bel}_m[\neg[\mathbf{want}_j(p)]]] \\ \neg[\mathbf{bel}_m[\mathbf{want}_j(p) \vee \mathbf{want}_j(\neg p)] \vee \mathbf{bel}_m[\neg[\mathbf{want}_j(p) \vee \mathbf{want}_j(\neg p)]]] \end{array} \right\}$

Once we exhaustify and negate all the alternatives that are not entailed by the assertion we obtain the conjunction of (173-a), (173-b), and (173-c).

(173) a. $\neg\mathbf{believe}_m(\mathbf{want}_j(p))$
b. $\mathbf{believe}_m(\mathbf{want}_j(p)) \vee \mathbf{believe}_m\neg(\mathbf{want}_j(p))$
c. $\mathbf{believe}_m(\mathbf{want}_j(p) \vee \mathbf{want}_j(\neg p))$

It is easy to see that from (173-a) and (173-b) we can conclude (174-a) and from (174-a) and (173-c) we can infer (174-b).

(174) a. $\textbf{believe}_m\neg(\textbf{want}_j(p))$
b. $\textbf{believe}_m(\textbf{want}_j(\neg p))$

So we rightly predict that (172-a) can lead to the inference in (175).

(175) Mary believes that John wants that Fred didn't leave

The predictions, however, are the same also for *want* embedding *believe*, as they only depend on the combination of alternatives. We have of course various ways to suspend this inference (non-activation of alternatives and local exhaustification) but the question is why the inference appears to be always suspended, in a way that differs from the one coming from *believe(want)*. In response to this issue, I propose that there is a condition on EXH, which requires that EXH should not tinker with the presupposition of its prejacent. As I show below, this blocks exhaustification in the case of *want* embedding *believe*, but not in the case of *believe* embedding *want*.

7.3.2 A condition on EXH

The idea in informal terms is that the exhaustification of a sentence should leave untouched the presupposition of its prejacent. As I show below, if we were to exhaustify a sentence like (176) we would end up strengthening its presuppositions and thus we cannot do it.

(176) I don't want Bill to believe Harry died.

Before formulating the condition, let us make some explicit assumptions about what happens when EXH applies to a presuppositional prejacent. First, we need to adopt the notion of strawson-entailment, as defined in (177) (Gajewski 2011, von Fintel 1999).

(177) **Strawson entailment**
a. For p, q of type t,
$p \subseteq_s q$ iff $p \rightarrow q$
b. For f, g of type $\langle\sigma, \tau\rangle$,
$f \subseteq_s g$ iff for all a of type σ such that $g(a)$ is defined then $f(a) \subseteq_s g(a)$

The notion of Strawson entailment allows us to look at entailment relations by ignoring presuppositions. We can, hence, define EXH as in (178).[41]

41 We can define the notion of innocent exclusion on the basis of Strawson entailment. I just use the simpler notion here for the sake of presentation.

(178) a. $[\![\text{EXH}]\!](\phi)(w) = \forall \psi \in \mathscr{E}xcl(\phi)[\neg \psi_w]$
b. $\mathscr{E}xcl(\phi) = \{\psi \in \mathscr{A}lt(\phi) : \phi \not\subseteq_s \psi\}$

The presuppositions of an exhaustified sentence are, hence, going to be those of the prejacent and those of the negated alternatives. We can now formulate the condition in (179), which requires EXH to leave the presuppositions of its prejacent untouched. In other words, the exhaustivity operator should be just a "hole" in Karttunen's (1973) sense and not add anything to the presuppositions of the prejacent. The condition is formulated as a presupposition of EXH as in (179).

(179) $\text{EXH}[\phi]$ is defined only if $\pi(\phi) = \pi(\text{EXH}[\phi])$
(where for any α, $\pi(\alpha)$ indicates the presuppositions of α)

I show now that (179) blocks exhaustification in the case of *want* embedding *believe*.

Back to partial cyclicity I am remaining neutral on the meaning of *want*, but crucially I am assuming that it comes with the presuppositions that the complement of *want* is not settled in the attitude holder's mind (von Fintel (1999), following Heim (1992)). In other words, a sentence like (180) would presuppose (181).[42]

(180) a. Mary wants Fred to come.
b. It's possible for Mary that Fred come and it's possible that he doesn't.

Let us now go back to the case of *want* embedding *believe* like in (181).

(181) Mary doesn't want John to believe that Fred left.

I show now that if we were to exhaustify (182) we would strengthen the presuppositions in (182-b) (where $\Diamond_m[p]$ indicates that p is possible according to Mary's beliefs.)

(182) a. $\neg \textbf{want}_m(\textbf{bel}_j(p)$

42 Notice that this has to be further refined to accommodate examples such as (i) from Heim (1992), where the attitude holder does not appear to have doubts about where he will be tonight.

(i) (John hired a baby-sitter) because he wants to go to the movies tonight.

Heim (1992: p.199) proposes that what (i) teaches us is that "when we assess someone's intention [...] we don't take into account all his beliefs, but just those that he has about matters unaffected by his own future actions". In other words, in the semantic adopted here, we should not consider simply the set of doxastically accessible worlds, but rather the set of worlds compatible with what α believes to be the case no matter how he or she chooses to act. For our purposes, this modification is immaterial, so I will just ignore it.

b. $\Diamond_m[\mathbf{bel}_j(p)] \wedge \Diamond_m[\neg\mathbf{bel}_j(p)]$

Consider now what would happen if we were to exhaustify (181) as in (183) with respect to its alternatives in (184).

(183) EXH[Mary doesn't want John to believe that Fred left]

(184) $\left\{ \begin{array}{l} \neg[\mathbf{want}_m[\mathbf{bel}_j(p)]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p)] \vee \mathbf{want}_m[\neg[\mathbf{bel}_j(p)]]] \\ \neg[\mathbf{want}_m[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)] \vee \mathbf{want}_m[\neg[\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p)]]] \end{array} \right\}$

The result of exhaustification is the conjunction of (185-a), (185-b), and (185-c).

(185) a. $\neg\mathbf{want}_m(\mathbf{bel}_j(p))$
b. $\mathbf{want}_m(\mathbf{bel}_j(p)) \vee \mathbf{want}_m\neg(\mathbf{bel}_j(p))$
c. $\mathbf{want}_m(\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p))$

As for the assertion part, in parallel to the case of *believe* embedding *want*, from (186-a) and (186-b) we could conclude (186-c) and from (187-a) and (187-b) we could conclude (187-c). In other words, we would obtain the reading equivalent to negation taking scope below both neg-raising predicates.

(186) a. $\neg\mathbf{want}_m(\mathbf{bel}_j(p))$
b. $\mathbf{want}_m(\mathbf{bel}_j(p)) \vee \mathbf{want}_m\neg(\mathbf{bel}_j(p))$
c. $\mathbf{want}_m(\neg(\mathbf{bel}_j(p))$

(187) a. $\mathbf{want}_m(\neg\mathbf{bel}_j(p))$
b. $\mathbf{want}_m(\mathbf{bel}_j(p) \vee \mathbf{bel}_j(\neg p))$
c. $\mathbf{want}_m(\mathbf{bel}_j(\neg p))$

However, I show now that the presupposition of the exhaustified sentence is stronger than that of the prejacent, thus exhaustification is blocked by the condition in (179). To see this, let us go through the presupposition of each conjunct of the exhaustified assertion. The first conjunct in (185-a) is simply the prejacent so its presupposition in (188-a) is just that of the prejacent. The presupposition of the second conjunct in (185-b) is the same as the one in (188-a) as shown in (188-b).[43] Finally, that of the third conjunct (185-c) is the one in (188-c).

(188) a. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg\mathbf{bel}_j p]$
b. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg\mathbf{bel}_j p]$

43 Notice that this is the case regardless of the assumptions about the projection of presuppositions in disjunctive sentences.

c. $\Diamond_m[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p] \wedge \Diamond_m[\neg[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p]]$

The presupposition of the exhaustified assertion would, hence, be (189-a), that is the conjunction of the presuppositions in (188-a), (188-b) and (188-c).

(189) a. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg[\mathbf{bel}_j p \vee \mathbf{bel}_j \neg p]]$
b. $\Diamond_m[\mathbf{bel}_j p] \wedge \Diamond_m[\neg \mathbf{bel}_j p]$

It is easy to see that (189-a) is stronger than the presupposition of the prejacent repeated in (189-b), thus exhaustification is blocked by the condition in (179) above.

Notice that the case of unembedded *want* is not blocked by (179). To see this consider the exhaustification of a sentence like (190-a), which gives rise to the meaning in (190-b): the presuppositions is that in (191), which is identical to that of the prejacent.

(190) a. EXH[John doesn't want that p]
b. $\neg \mathbf{want}_j p \wedge \mathbf{want}_j p \vee \mathbf{want}_j \neg p =$
$\mathbf{want}_j \neg p$

(191) $\Diamond_j p \wedge \Diamond_j \neg p$

Furthermore, the case of *believe* embedding *want* like (192-a) repeated from above is also allowed by (179) because *believe* is non-presuppositional, so we predict that EXH can apply and thus gives rise to the inference in (192-b).

(192) a. Mary doesn't believe that John wants that Fred left.
b. Mary believes that John wants that Fred didn't leave.

Given (179) we correctly predict that, contrary to (192-a), (193-a) cannot be exhaustified and thus cannot give rise to the inference in (193-b).

(193) a. I don't want Bill to believe Harry died $\not\rightsquigarrow$
b. I want Bill to believe Harry didn't die.

Finally, notice that by blocking EXH in (194-a) we not only predict that negation cannot take scope below *think*, but we also seem to incorrectly predict that it should not even take scope below *want*. In other words, we do not predict the inference from (194-a) to (194-b)

(194) a. John doesn't want that Mary think that p
b. John wants that it's not true that Mary think that p

However, we have a way to predict the inference from (194-a) to (194-b), through the LF in (195). This is because the most embedded EXH is vacuous, as *think* is the

strongest among its alternatives, however it "eats" the alternatives of *think*. Hence, at the global level we are free to exhaustify again only over the alternatives of *want* in (196), thereby getting the reading that we want, as shown in (197). This reduces to the case of *want* not embedding other scalar terms above, which is allowed by (179).

(195) $\text{EXH}[\neg[\textbf{wants}_j[\text{EXH}[\textbf{think}_m(p)]]]]$

(196) $\left\{ \begin{array}{l} \neg[\textbf{want}_m[\textbf{think}_m p]] \\ \neg[\textbf{want}_m[\textbf{think}_m p] \vee \textbf{want}_m[\neg[\textbf{think}_m p]] \end{array} \right\}$

(197) $\textbf{want}_j \neg[\textbf{think}_m p]$

In sum, also the last putative argument for the presuppositional status of neg-raising predicates can be accounted for in the scalar implicature-based proposal here.

8 Conclusions

I proposed a scalar implicatures-based approach to neg-raising inferences, which accounts for the conventionality and the context dependence of neg-raising inferences. The proposal presents three advantages over Gajewski's (2007) presuppositional account. First, it accounts for the non-presuppositional aspect of the behavior of neg-raising inferences, that is their projecting through negation but not through other embeddings. Second it predicts novel inferences when neg-raising predicates are embedded in non-upward entailing contexts that the presuppositional account does not predict. Third, it is based on an independently justified theory of scalar implicatures and it does not need to adopt the system by Abusch (2010), which, as discussed above, has conceptual and empirical problems. Furthermore, it can explain the suspension of neg-raising inferences, the interaction with the licensing of strict NPIs, the behavior of neg-raising predicates in the scope of negative quantifiers and negated universals and when they are stacked one into the other.

9 Addendum: a preliminary comparison with Collins and Postal 2012

9.1 The syntactic revival of neg-raising

The syntactic approach to neg-raising, first proposed in Fillmore (1963), takes a very different perspective on the phenomenon than the one defended in this paper. As mentioned above, the gist of this approach is that in sentences like (198) a negation is actually present at LF in the embedded clause and it is interpreted there. However, it also raises in the matrix clause where it appears at surface structure. In other words, (198) is to be analysed as in (199), where the lowest copy of negation is interpreted and the highest is pronounced.

(198) John doesn't believe that it is raining

(199) John NEG_1 believes that [it is $<\text{NEG}_1>$ raining]]

The syntactic account of neg-raising has fallen on hard times since the first initial proposal. Recently, however, Collins & Postal (2012) has revived it by discussing new (and old) challenging data for any non-syntactic account. That is to say for any account, like the one defended in this paper, in which in a sentence like (198), no negation is assumed to ever be present at LF in the embedded clause. Collins & Postal 2012 constitutes an interesting challenge to the semantic/pragmatic approach to neg-raising and I will not be able to do full justice to all of their data. Nonetheless, I want to draw a preliminary comparison by discussing their main arguments and outline how to approach them from the present account.

In particular, there are two arguments in their proposal. I am going to deal with the the first one, which is based on putative sensitivity to islands of neg-raising. The gist of the argument is that if negation really moves out of the embedded clause in cases like (198), we expect it to be constrained by standard constraints on movement.

Their second argument involves cases in which a phrase is fronted in the embedded clause of a neg-raising predicate with consequent subject auxiliary inversion, like in (200) from Horn (1975). The puzzling feature of these data is that a phrase like *ever* does not appear to be frontable in general, as shown in (201-a) and (201-b), although these are contexts in which *ever* is licensed without inversion. Moreover, it cannot be fronted in the embedded clause of a non-neg-raising predicate like in (202).

(200) I don't believe that ever have the media played such a major role in a kidnapping.

(201) a. *If you think that ever would John leave, let me know.
b. *Do you think that ever would John leave?

(202) *I am not sure that ever have the media played such a major role in a kidnapping.

In the syntactic approach, this can be accounted for if we assume that the fronted phrase actually contains a negation at LF, which allows the phrase to be fronted. Then, while interpreted in the embedded clause, this negation raises to the matrix clause via neg-raising and is pronounced there. In other words, the syntactic approach, informally, derives (203-b) from (203-a).[44]

44 More in detail, the assumption is that negation originates in a constituent [NEG ever before] (Postal 2005) and is then extracted to the initial position of the embedded clause. Then it either remains in situ, and we get (203-a) or it moves via neg-raising and we get (203-b).

(203) a. I think that **never** before have the media played such a major role in a kidnapping.
b. I do**n't** think that **ever** before have the media played such a major role in a kidnapping.

In the following, I will tackle the first argument based on Island sensitivity in some detail and outline how one can respond from the present approach. As for the second one, instead, I recognise it as a challenge for the present account and have to leave a response for future research. In the final section, I will briefly discuss four critical points that I see in the syntactic approach.

9.2 The argument from Islands effects

9.2.1 The argument

Collins & Postal (2012) present three types of data supporting the prediction of their account that neg-raising should be sensitive to islands. The first is about cases in which negation, in their account, should have moved out of a subject or a topic position, two positions that are assumed to be islands for movement. The second regards complex noun phrases and wh-islands. The third is related to configuration of extraction across a topicalised phrase. Let us discuss them in turn.

Subject and Topics are typically taken to be islands for movement. In a syntactic approach to neg-raising, therefore, we expect that extracting negation out of a topic or a subject should be disallowed. Collins & Postal (2012) argue that the data in (204-a)-(204-c) support this prediction: while (204-a) have the usual neg-raising reading, that it's incompatible with John's believe that Mary was here, they claim that (204-b) and (204-c) do not.[45]

(i) a. I believe that the media have played such a major role [NEG_1 ever before]
$\rightarrow$ (negative fronting)
b. I believe that [[NEG_1 ever before]$_2$ have the media such a major role t_2]
$\rightarrow$ (neg moves to take scope on the embedded clause)
c. I believe that [NEG_1 [t_1 ever before]$_2$ have the media such a major role t_2]
$\rightarrow$ (neg raising)
d. I NEG_1 believe that [t_1 [t_1 ever before]$_2$ have the media such a major role t_2]

45 Notice, in passing, that topicalisation and passives don't follow straightforwardly from islandhood. As they admit, in the case of topicalisation or passives, islandhood would only block one possible analysis of the sentences, namely one in which negation is extracted from the topicalised clause (or the subject clause in passive). However, nothing blocks an alternative analysis of the sentence in which negation would raise out of the complement clause's base position.

(i) Wanda believes that Kevin will not breathe a word about it until Friday $\rightarrow$ Neg-raising
Wanda does not believe that Kevin will breathe a word about it until Friday $\rightarrow$ Topicalization

(204) a. John doesn't believe that Mary was here.
b. That Mary was here, John doesn't believe.
c. That Mary was here is not believed by John.

They back up the intuition above with data from strong NPIs licensing: (205-a) is felicitous as expected, but (205-b) and (205-c) are not.

(205) a. Laura did not believe that Sheila had prayed **in years**.
b. *That Sheila had prayed **in years**, Laura did not believe.
c. *That Sheila had prayed **in years** was not believed by Laura.

Similar contrasts are found for other clauses in subject position like (206-a) versus (206-b).

(206) a. It is not likely that Sheila have prayed in years.
b. *That Sheila have prayed in years it is not likely.

The second type of data that they discuss involve complex NP and wh-islands. The complex NP cases are cases like (207), where *believe* takes a nominal argument with a clausal complement. (207-a) cannot be understood as (207-b) and licensing of strong NPIs is impossible, (208). Given that this complex nominals are islands, as shown by (209), the matrix negation of (207) could not have been extracted out of the clausal complement of the nominal argument and, therefore, the syntactic approach rightly predicts the absence of neg-raising and strong NPI licensing.

(207) a. I do not hold the belief that the moon will vanish.
b. I hold the belief that the moon will not vanish.

(208) *I do not hold the belief that the moon will vanish until Tuesday.

(209) *When do you hold the belief that the moon will vanish?

Analogously, the prediction that negation cannot be extracted out of wh-arguments is confirmed, they argue, by the cases in (210-a)-(210-c): while *plan* gives rise to neg-raising inferences when it takes a propositional complement, (210-a), it does not when it combines with an interrogative complement, (210-b). Moreover, it does not license strong NPIs in that case, (210-c).

(210) a. I don't plan to leave early.

That Kevin will breathe a word about it until Friday, Wanda does not believe → Topicalization

In order to block the analysis above they have to assume the following ad hoc constraint in (ii).

(ii) If NEG raises out of a clause C, then C cannot itself be raised.

$\rightsquigarrow$ I plan not to leave early.

b. I don't plan what to eat eat on a long trip.
$\not\rightsquigarrow$ I plan what not to eat on a long trip.

c. *I don't plan who to say a fucking thing to.

Finally, the third type of cases that they discuss involve the ban of extracting across a topicalised phrase, as shown by the contrast between (211-a) and (211-b). An island effect that they take to be responsible for the infelicity of (212-b).

(211) a. When does Leslie believe that Jim should call Irene?
b. *When does Leslie believe that Irene, Jim should call?

(212) a. Leslie doesn't believe that Jim should call Irene until tomorrow
b. *Leslie doesn't believe that Irene, Jim should call until tomorrow

In sum, they present three type of cases in support of the prediction of their account that neg-raising is sensitive to islands. I respond to each of them in the following.

9.2.2 How island effects follow on the semantic approach

I believe that the approach in this paper can be extended to account for the data above. In brief, I propose that the case of subject and topic islands can be accounted for by an independently needed condition on (strong) NPIs licensing. The case of complex noun phrase and Wh-islands, instead, follows straightforwardly from the fact that the argument of the neg-raising predicates cannot be negated and hence the excluded middle alternative cannot be constructed. Finally, the case of extraction across topics follows from Gajewski-Chierchia's approach to Strong NPI licensing, adopted above. Let us look at each of these cases in detail.

Starting from subject and topic islands. I have to say that I am not convinced by their judgements that neg-raising inferences are not possible with topicalization and passives, repeated in (213-b) and (213-c), along with the regular case in (213-a). In my intuitions, (213-b) and (213-c) can be understood as in (214-a) and (214-b).

(213) a. John doesn't believe that Mary was here.
b. That Mary was here, John doesn't believe.
c. That Mary was here is not believed by John.

(214) a. That Mary wasn't here, John believes.
b. That Mary wasn't here is believed by John.

What about their NPI licensing data, though, repeated in (215-a)-(215-c)?

(215) a. Laura did not believe that Sheila had prayed **in years**.

b. *That Sheila had prayed **in years**, Laura did not believe.
c. *That Sheila had prayed **in years** was not believed by Laura.

Collins & Postal (2012) themselves discuss a potential alternative explanation for the contrast between (215-a) on the one hand and (215-b) and (215-c) on the other. It is well known that NPIs in English resist reconstruction (Heycock & Kroch 2002 among many others). One classical case is (216), where *anyone* is not licensed, but it should be if it was able to reconstruct below negation. The sentence would just mean that none came.[46]

(216) *Anyone didn't come.

(217) [NEG anyone came]

Similarly, Reeve (2012) discusses cases of reconstruction of the pivot phrase of it-clefts: in (218-a) the pronoun can be bound by the quantifier, in (218-b) *he* cannot refer to Fred and (218-c) allows an interpretation in which *every dog* takes scope over *a chicken*.

(218) a. It is his$_1$ final, that no student$_1$ would redo.
b. It is Fred that he dislikes.
c. It is a chicken that every dog ate.

However, even if the pivot appears to be able to reconstruct in it-cleft sentences, if it contains an NPI (weak or strong) it does not, as (219) and (220) show.

(219) *It is any student that no professors like.

(220) *It is until midnight that no guest will arrive.

46 Notice that in the case of weak NPIs, the sentence becomes felicitous if NPI is contained in a larger phrase. So for instance, Heycock & Kroch (2002) discuss the case in (i) and propose that the relevant condition is not anti-reconstruction per se but rather a ban on the NPI c-commanding the licensor at PF.

(i) A doctor with any knowledge of biology wasn't available.

Heycock & Kroch (2002) observation seems to hold in the case of weak NPIs. For strong NPIs, however, the relevant examples do not seem to improve even if the strong NPI does not c-command the licensor.

(ii) *It's staying until midnight that no student will do.

(iii) *It's having seen Mary in years that none of us has done.

I assume, therefore, that the condition on Strong NPIs has to be extended to the entire phrase containing the Strong NPI. (thanks to Chris Collins (p.c.) for discussion on this).

Finally, Collins & Postal (2012) also have cases in which a strong NPI appears to be licensed only if it does not c-commanded its licensor at PF.

(221) a. Kevin under no imaginable circumstances will leave **until midnight**.
b. *Kevin will leave **until midnight** under no imaginable circumstances.

Given the data above, there must be a condition on strong NPIs in English which requires that they not reconstruct. I will not try to formulate it here in details: it can be done in terms of reconstruction or linear order. What is relevant for us is that this independently motivated condition is enough to account for their data related to topic and subjects. This is because in the cases in (222-a), (222-b), and (222-c), repeated from above, the clause containing the strong NPI cannot reconstruct below its licenser and thus it cannot be licensed.

(222) a. *That Sheila had prayed **in years**, Laura did not believe.
b. *That Sheila had prayed **in years** was not believed by Laura.
c. *That Sheila have prayed in years it is not likely.

In sum, I disagree with their judgements that neg-raising inferences are not possible with passives and topics. As for the non-licesing of strong NPIs, this is accounted for by an independently needed condition on anti-reconstruction effects of phrases containing (strong) NPIs. Let us turn to Wh- and complex NPs Islands.

Consider again the case of complex NPs in (223). Here, there is no doubt that (223) can never be understood as (224). Moreover, as we saw, strong NPIs cannot be licensed in the clausal complement, (225).

(223) John doesn't believe the rumour that Mary will come.

(224) John believes the rumour that Mary will not come.

(225) *John doesn't believe the rumour that the moon will vanish until Tuesday.

Starting from the absence of neg-raising inferences, notice that the complement of the neg-raising predicate is not a proposition in this case, so the semantics of *believe* has to be adapted for taking a nominal complement. For our purposes, I will simply assume that *believe* has a version taking individuals as complements (Moulton 2009, Kratzer 2006 for discussion). If the nominal argument denotes an individual, something of type *e*, it is clear that negation cannot combine with it, as shown by (226). In other words, if we were to attempt to construct the excluded middle alternative, the second conjunct could not be constructed.

(226) *John believes not the rumour that Mary will come

When the second disjunct cannot be constructed the alternative reduces to the first

disjunct or is not constructed at all. Schematically, when we have a configuration like (227), the second disjunct of the excluded middle alternative cannot be constructed, hence the alternative collapses into the first disjunct.

(227) $\mathbf{bel}_j(x_e)$

(228) $\mathbf{bel}_j(x_e) \vee \mathbf{bel}_j * \neg(x_e)$

What about the non-licensing of NPIs? I argue that the presupposition of the nominal, *the rumour* in this case, disrupts the downward entailingness of the context, thus anti-licensing the strong NPIs. In other words the sentence in (229), has a presupposition along the lines of that in (230) and this makes it so that no strong NPI can be licensed in the clausal complement.[47]

(229) John doesn't believe the rumour that Mary will come.

(230) John believes that there is a rumour that Mary will come.

A similar argument can be given in the case of wh-arguments of neg-raising predicates. As discussed above, the pattern is the same: (231-a) cannot be understood as (231-b) and (232) is not acceptable.

(231) a. I don't plan what to eat on the trip.
b. I plan what not to eat on the trip.

(232) *I don't plan who to say a fucking thing.

The arguments of *plan* in this case appears to be embedded questions. I remain neutral on which theory of questions to adopt (e.g., a set of propositions, a partition - see Hagstrom 2003 for discussion), for what is relevant here, in no case can negation be applied in a sensible way to the question. So again the excluded middle alternative reduces to the first disjunct.[48]

47 The presupposition might even be the stronger in (i) (see Heim 1992 and Geurts 1998 for discussion). For our purposes, this is immaterial.

(i) There is a unique and salient rumour that Mary will come.

48 One might think that negation could be defined to be applied pointwise to the set of propositions of the question. In general, however, trying to negate questions in this way would not give sensible results. And, indeed, negation never appears to take wide scope over a question. To illustrate the issue, consider a Hamblin/Karttunen's style semantics for questions, so that (i) would mean (ii).

(i) What to eat on the trip.

(ii) $\lambda p \exists x[\mathbf{thing}(x) \wedge p = \lambda w[\mathbf{eat\text{-}on\text{-}the\text{-}trip}_w(I,x)]]$

(233) $\mathbf{plan}_j(X) \vee \mathbf{plan}_j * \neg(X)$
$\mathbf{plan}_j(X)$

As for the non-licensing of strong NPIs in sentences like (234), I am assuming that in this case it is the presupposition of the embedded question, that one of the answers is true (Dayal 1996 among many others), that disrupts the downward entailingness of the context and anti-licenses the strong NPI.

(234) *I don't plan who to say a fucking thing.

Finally, what accounts for the cases of extraction across topics like that in (235), repeated from above? Notice that here the condition on no reconstruction of strong NPIs discussed above is not violated. Moreover no problem in the construction of the alternatives arises.

(235) *Leslie doesn't believe that Irene, Jim should call until tomorrow

Here again Gajewski-Chierchia's theory allows a way out. This is because a sentence with topicalisation can be analysed as being presuppositional (e.g., von Fintel 1995). Again the exact formulation of the presupposition is not relevant for our purposes, so I will just assume that a sentence like (236) appears to have an existential presupposition over the topicalised phrase, as in (237).

(236) Irene, Jim should call tomorrow.

(237) There is somebody that Jim should call tomorrow.

In the same way as above, this presupposition can account for the non-licensing of the strong NPI in the case in (238-b), repeated from above.[49]

If we define negation to apply pointwise to (ii) we would obtain the meaning in (iii), roughly the set of propositions such that there is nothing that I bring on the trip. It is not even clear what the question would be in this case.

(iii) $\lambda p \neg \exists x[\mathbf{thing}(x) \wedge p = \lambda w[\mathbf{eat\text{-}on\text{-}the\text{-}trip}_w(I,x)]]$

Compare (iii) to the proper negative question embedded in (231-b) which has the meaning in (v): the set of propositions such that there is something that I don't bring on the trip, i.e., what I do not bring on the trip.

(iv) $\lambda p \exists x[\mathbf{thing}(x) \wedge p = \lambda w[\neg\mathbf{eat\text{-}on\text{-}the\text{-}trip}_w(I,x)]]$

49 Collins & Postal (2012) do not discuss explicitly whether neg-raising inferences would arise from cases like (i-a). Again, in my intuitions, I don't find a difference in terms of neg-raising inferences from (i) and (ii): both can be understood as conveying that I think that Jim doesn't love Irene.

(i) I don't think that Irene, Jim loves.

(238) a. Leslie doesn't believe that Jim should call Irene until tomorrow
b. *Leslie doesn't believe that Irene, Jim should call until tomorrow

In sum, we have seen three types of data that Collins & Postal (2012) take to be evidence for an island sensitivity of neg-raising and I proposed to account for them based on three ingredients: first, a no reconstruction condition on (strong) NPIs, to which Collins & Postal (2012) themselves bring supporting evidence. Second, Gajewski-Chierchia's proposal on strong NPI licensing, which can account for the non-licensing of strong NPIs in all cases non covered by the first condition. Finally, the fact that negation cannot apply to individual arguments or embedded questions.

9.3 Some critical points for the syntactic approach

In the present section I am going to briefly point out some issues that appear to be problematic for the revived syntactic approach, while receiving an arguably principled explanation on the present account. The first is related to the syntactic approach to Strong NPI licensing that they adopt. The second has to do with their response to the problem of neg-raising with negative quantifiers, the third concerns partial cyclicity, and the fourth is about the non-scope interaction of negation in the embedded clause of a neg-raising predicate. Let us discuss each in turn.

9.3.1 Syntactic approach to Strong NPI licensing

Contrary to what I have assumed above, Collins & Postal (2012) make use of a theory of Strong NPIs as requiring a local licensor (Linebarger 1987 among others). They do not consider, however, Gajewski's (2007) arguments against this approach, showing that local licensing is neither sufficient nor necessary. That it is not sufficient is shown by cases like (239-a), which contrary to that in (239-b), are not felicitous. (240-a) and (240-b) is an analogous contrast.

(239) a. *Not every student arrived until 5 o' clock.
b. Not a single student arrived until 5 o' clock.

(240) a. *Not every student has visited Bill in (at least two) years.
b. Not a single student has visited Bill in (at least two) years.

Moreover, local licensing is not necessary, as shown by the felicity of (241), which is felicitous despite the non-locality of the licensing.

(241) An applicant is not allowed to have left the country in at least 2 years.

(ii) I don't think that Jim loves Irene.

Gajewski notices a defendant of the syntactic account could claim that non-finite clauses do not count as boundary for the local licensing condition. However, this wrongly predicts that replacing the existential modals with universal ones should lead to grammatical sentences.[50]

(242) *An applicant is not required to have left the country in at least 2 years.

In sum, Collins & Postal (2012) adopt a controversial analysis of strong NPI licensing and I think it is crucial for them to defend it against arguments like the above.[51]

9.3.2 Negative quantifiers and neg-deletion

The classical problem for a syntactic account of neg-raising are cases involving a negative quantifier in the matrix clause like (243), which can be read as (244).

(243) No student believes that she was accepted.

(244) Every student believes that she wasn't accepted.

The problem is that interpreting a negation in the embedded clause (or in the matrix clause) does not give rise to the right meaning in (244). More precisely, assuming that the meaning of negative quantifiers are as the negation of an existential, as discussed above in section 7.2, then there is no way we can obtain the right meaning in (244), if we also have a covert negation to interpret in the embedded or matrix clause.[52]

50 The data in (i) and (ii) are another case

(i) An applicant can't have left the country in at least 2 years.

(ii) *An applicant doesn't have to have left the country in at least 2 years.

51 As far as I can see, they could adopt an anti-additivity based account of Strong NPI licensing. They would, however, inherit the problems pointed out above for anti-additivity (truth-predicates, restrictors of universal quantifiers etc).

52 Generally, what is assumed that the syntactic account has to do is to decompose negative quantifiers like *no* as universal quantifier and negation in the embedded clause and then assume that neg-raising of the negation below somehow incorporates into the universal quantifier giving rise to a spell out of "no".

(i) Every linguist expected that she would *NEG* arrive until Tuesday.
neg-raising
Every NEG linguist expected that she would *NEG* arrive until Tuesday
some lexical composition of every and NEG
No linguist expected that she would arrive until Tuesday

Collins & Postal (2012) propose that in the case of negative quantifiers the negation in the embedded clauses are not one but two. Moreover, they argue that there is an operation of negation deletion, which under a set of restricted conditions makes it so that a negation is cancelled at PF but not at LF. The derivation they propose for deriving (244) from (243) is in (245).

(245) No student thinks that NEG_2 NEG_1 was accepted.
neg-deletion of NEG_1 *by* NEG_2
No student NEG_2 thinks that NEG_1 was accepted.
neg-raising
No student NEG_2 thinks that NEG_1 was accepted.
neg-deletion of NEG_2 *by no*

While deleted at PF both negation are interpreted so that the meaning that we get for (244) is the correct one in (246), something we might paraphrase as for no student it is not true that she believes that she wasn't accepted, which is equivalent to saying that every student believes that she wasn't accepted.

(246) $\neg\exists x[\textbf{student}(x) \wedge \neg\Box_x[\neg\textbf{was-accepted}(x)]] =$
$\forall x[\textbf{student}(x) \rightarrow \Box[\neg\textbf{was-accepted}(x)]]$

In sum the meaning that we obtain is correct and no unconventional decomposition of negative quantifiers has to be assumed. However, as Collins & Postal (2012) themselves recognise, it is crucial for their account to show that this neg-deletion operation is not an ad hoc mechanism adopted just for the purposes of neg-raising with negative quantifiers. They argue that some first independent evidence come from expletive negation and complements of adjectival phrases modified by *too*. Let us briefly see them in turn.

Expletive negation in English appears marginally in cases like (247-a), which is understood as (247-b). They argue that it should be analysed as (248), with another negation deleted at PF in the embedded clause. As they say, this analysis is 'equally plausible' as another one, which posits a null meaning of negation for these cases. While the meaning obtained is the right one, I find the argument per se to not be very strong, unless one is able to argue against the other 'equally plausible' account of expletive negation.[53]

(247) a. I wouldn't be surprised if it didn't rain.

As Collins & Postal (2012) discuss, this analysis is not only implausible, but also clashes with the above mentioned arguments in the literature arguing for a decomposition of negative quantifiers as negation + existential and not universal + negation.

53 Some initial arguments in favour of a non-negative approach comes from Donati (2000) for expletive negation in Italian and French.

b. I wouldn't be surprised if it did rain.

(248) I wouldn't be surprised if it did [NEG_1[NEG_2] rain]

A second independent evidence for neg-deletion would come from complements of adjectival phrases modified by *too*. They observe that cases like (249-a) can be paraphrased as in (249-b) and hence 'curiously from a standard point of view, although the complement of (249-a) contains an overt NEG, it is understood positively' (Collins & Postal 2012: p.42).

(249) a. Rachel is too nice not to help people in need.
b. Rachel is so nice that she won't fail to help people in need.

Given this, they propose the analysis in (250), where COMP is a silent complementiser which licenses the deletion of NEG_2.

(250) Rachel is too nice [COMP [NEG_2 to [NEG_1 help people in need]]]

I have to say I do not understand how (250) provides the right meaning for (249-a). To illustrate, let us adopt the meaning of *too* proposed in Meier (2003), following Heim (2000). Given this analysis, (249) would roughly wind up meaning (251).

(251) The maximal degree to which Rachel is nice is greater than the degree d' such that if Rachel was d'-nice she would help people in need.

Intuitively, however, (251) is not the meaning of (249-a), but rather it seems to represent that of (252). The correct meaning of (249-a), I argue, is (253).

(252) Rachel is too nice to help people in need.

(253) The maximal degree to which Rachel is nice is greater than the degree d' such that if Rachel was d'-nice she would **not** help people in need

To see that these are different meanings, imagine a context in which Rachel has seen Bill cheating on the exam and we are considering whether she would go to tell the professor or not. Imagine that here we want to convey that the degree to which she is nice is greater than the degree to which if she were that degree nice she would go to tell the professor about it. In other words, we are saying that she will not go because she is nicer than how nice she would be if she were to do that. Here we would use (255) and not (254).

(254) Rachel is too nice not to tell the teacher about it.

(255) Rachel is too nice to tell the teacher about it.

In sum, I do not see how positing a deleted embedded negation in cases like (249-a) (and like (252)) can give rise to the right meaning.

Furthermore, they claim that another evidence for negation in the embedded clause comes from the licensing of NPIs in clauses like (256).[54] It is not clear to me again how they can get the right meaning for (256) given their analysis in (257), with a covert negation in the embedded clause, (which then moves via neg-raising in a position close to the silent COMP in order to get deleted).

(256) Dana is too cynical to believe/think that Mary would lift a finger to help Kyle.

(257) [Dana is too cynical [COMP [to think that Mary would [*NEG* lift a finger] to help Kyle]]

They do not say explicitly whether they are assuming that negation is interpreted below or above *think* but either way I don't see how they can get the meaning right. Given the assumption above about the meaning of *too*, a sentence like (256) would roughly mean (258), if negation is interpreted above *think* or (259), if it is interpreted below.

(258) The degree to which Dana is cynical is greater than the degree d' such that if Dana were d'-cynical she would **not** think that Mary would lift a finger to help Kyle.

(259) The degree to which Dana is cynical is greater than the degree d' such that if Dana were d'-cynical she would think that Mary would **not** lift a finger to help Kyle.

If we posit no negation, instead, we obtain the intuitively correct meaning in (260).

(260) The degree to which Dana is cynical is greater than the degree d' such that if Dana were d'-cynical she could think that Mary would lift a finger to help Kyle.

In sum, if we posit a covert negation in the adjectival phrases modified by *too*, we do not appear to be getting the right meaning for these sentences.[55]

54 This is of course an evidence given their assumption about strong NPI licensing requiring a local licenser, an assumption that I argued above is problematic. It is true, however, that here it has to be explained why NPIs are licensed. From the perspective I am taking, this is accounted for by the fact that these complements are downward entailing environments, given Heim (2000) or Meier (2003) analysis (thanks to Irene Heim for discussion on this point).

55 Chris Collins (p.c.) suggests that we could change the meaning of *too* so that it would mean simply *so* but it would force a negation to be present in the embedded clause. This, however, leaves open why we could not have an analysis for (i) as in (ii), where two negations have been inserted and

In conclusion, while I find their solution to the negative quantifier problem ingenious, I think that in order to be any better than an analysis which posits a decomposition of negative quantifiers as universal plus negation, an analysis that they rightly criticise, they need independent evidence for the operation of neg-deletion that they adopt. Of the two preliminary evidence that they provide, I find one very weak and I think the other is problematic.

9.3.3 Partial Cyclicity

As discussed above, while neg-raising appears to be cyclic in cases like (261), which could be treated by the syntactic approach as having a negation in the most embedded clause moving cyclicly through the complement clause of *want* and then to the matrix clause, it is not cyclic in cases like (262).

(261) John doesn't believe that Mary wants Fred to leave.

(262) John doesn't want Mary to believe that Fred left.

Collins & Postal (2012) do not mention the partial cyclicity data, which remains, therefore a limitation of the syntactic approach.

9.3.4 No scope interactions in the embedded clause

As Collins & Postal (2012) discuss, it was noted since Seuren (1974) the negation of neg-raising cannot interact scopally with other operator in the embedded clause. For instance, he noticed that (263) can only have the reading corresponding to (264-a) and not that in (264-b).

(263) I don't suppose Fred always falls asleep during meetings.

(264) a. I suppose that Fred doesn't always fall asleep during meetings.
b. I suppose that Fred always doesn't fall asleep during meetings.

Similarly, (265) can only mean (266-a) and not (266-b) (from Collins & Postal 2012).

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they are both deleted via neg-deletion (one by the other negation and the other negation by the silent complementiser). Given the new analysis of *too*, (ii) would give the wrong meaning again.

(i) Dana is too cynical to think that Mary would lift a finger to help Kyle.

(ii) [Dana is too cynical [COMP [to think that NEG_3 Mary would [NEG_1 lift a finger] to help Kyle]]

(265) I don't think that Carol saw many people.

(266) a. I think that Carol saw few people.
b. I think that many people, Carol didn't see.

From the perspective of semantic/pragmatic accounts of neg-raising like the one presented in this paper, these data are not problematic at all. Such accounts do not postulate any negation in the embedded clause at any point in the derivation, so it is not surprising that this non-existent negation cannot interact scopally with other operators in the sentence. On the other hand, from the point of view of the syntactic account there is no reason why we shouldn't expect that the negation, which is present at LF in the embedded clause, could not take scope below other operators. Therefore, Collins & Postal (2012), following Seuren (1974), are forced to assume the ad hoc constraint in (267) in order to block this possibility.

(267) If a NEG raises from clause B to clause A, and NEG originates in W = [NEG X] then W is the highest operator in B.

The fact that semantic approaches like the present one do not need a constraint like (267) is an advantage over the syntactic account.

9.4 Summary

In this section, I briefly discussed the revived syntactic approach by Collins & Postal (2012) and I sketched a preliminary comparison with the one of the present paper. In particular, I described how one of their two main arguments can be accounted for given an independently needed condition on NPI licensing, the way alternatives are constructed with non propositional complements and Gajewski/Chierchia's theory of Strong NPI licensing. For the other of their arguments, I have acknowledged that it remains a limitation of the present account and I left a response for future research. Finally, I pointed to four critical issues of their approach having to do with their syntactic approach to Strong NPI licensing, their response to the problem of negative quantifiers, their non-account of partial cyclicity, and the non-scope interactions of negation in the embedded clause of a neg-raising predicate.

10 Appendix A: an open issue for the condition on EXH

I discussed above that exhaustification of a sentence like (268-a) is not blocked by the condition above in (179), so that we correctly obtain the neg-raising inference in (268-b).

(268) a. EXH[John doesn't want Mary to come]

b. John wants Mary not to come.

However, if the sentential complement of *want* contains a strong scalar term like *every* as in (269) a problem arises.

(269) Mary doesn't want every student to come to the party.

To see the problem, notice that (269) can be read as implying (270-a) and furthermore at the same time it can also give rise to the scalar implicature in (270-b).

(270) a. Mary wants not every student to come to the party.
b. Mary wants some of the students to come to the party.

If we combine the alternatives of *every* and *want*, we obtain both the neg-raising inference in (270-a) and the scalar implicature in (270-b): schematically the alternatives that we obtain are those in (271) and it is easy to show that when we exhaustify (269) with respect to them we obtain (272).

(271) $$\left\{ \begin{array}{l} \neg[\textbf{want}_m[\textbf{all}]] \\ \neg[\textbf{want}_m[\textbf{some}]] \\ \neg[\textbf{want}_m[\textbf{all}] \vee \textbf{want}_m[\neg[\textbf{all}]] \\ \neg[\textbf{want}_m[\textbf{some}] \vee \textbf{want}_m[\neg[\textbf{some}]] \end{array} \right\}$$

(272) $\textsc{exh}[\neg[\textbf{want}_j\textbf{all}]] = \textbf{want}_j\neg\textbf{all} \wedge \textbf{want}_j\textbf{some}$

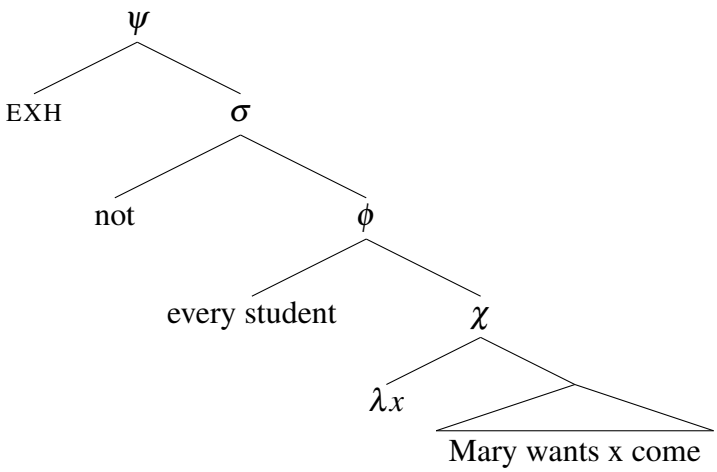
The predictions would, therefore, be correct. However, we are in the same as we were in in the case of *want* embedding *believe* above: the presuppositions of the exhaustified sentence are stronger than those of the prejacent: the presuppositions of the prejacent are in (273-a) and those after exhaustification are in (273-b).

(273) a. $\Diamond_j\textbf{all} \wedge \Diamond_j[\neg[\textbf{all}]]$
b. $\Diamond_j\textbf{all} \wedge \Diamond_j[\neg[\textbf{some}]]$

In sum, the condition in (179) here appears too restrictive.

A possible solution for this problem is assuming that the reading above is associated with an LF like in (274), in which *every student* is moved out of the scope of *want*.

(274)



As one can show, in this case the presupposition of the exhaustified prejacent is identical to the one of the prejacent and it is that in (275).[56]

(275) $\forall x[\textbf{stud}(x) \rightarrow (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))]$

The presupposition of the exhaustified assertion is, therefore, not stronger that that of its prejacent and exhaustification is not blocked by the condition in (179). In sum, this approach constitutes a solution for the case of *every*, I leave open for now whether it can be extended to other strong scalar terms.

11 Appendix B: A problem with neg-raising desire predicates and Strong NPIs and its solution

The problem arises when we look at the case of neg-raising predicates like *want* or *intend*. Recall that we assumed that **want** has the presupposition in (276).

(276) $\textbf{want}_j p$ is only defined iff $\Diamond_j p \wedge \Diamond_j \neg p$

Notice now that in the case of (277) the licensing of the strong NPI *until Thursday* is not expected.

56 In order to see this, compare the presuppositions of the prejacent in (i) and the one of the exhaustified sentence in (ii).

(i) $\sigma : \forall x[\textbf{stud}(x) \rightarrow (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))]$

(ii) ψ: $\forall x[\textbf{stud}(x) \rightarrow (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))] \wedge \exists x[\textbf{stud}(x) \wedge (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))] \wedge \forall x[\textbf{stud}(x) \rightarrow (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))] =$
$\forall x[\textbf{stud}(x) \rightarrow (\Diamond_m(\textbf{come}(x)) \wedge \Diamond_m(\neg\textbf{come}(x))]$

(277) John doesn't want Mary to leave **until Thursday**.

This is because once we consider the conjunction of assertion and presupposition the context in which *until Thursday* is in is not downward entailing anymore, as schematically shown in (278), where ϕ = "Mary leave until Thursday".

(278) $\Diamond_j \phi \wedge \Diamond_j \neg \phi \wedge \neg \mathbf{want}_j(\phi)$

In essence, what (278) says is that it's possible for John that Mary leave until thursday and it's possible for John that Mary doesn't leave until thursday and John doesn't want that Mary leaves until thursday. So the presupposition creates a positive context that disrupts the downward monotonicity, hence we predict that (277) should be infelicitous.[57]

As a solution to this problem, I propose to weaken the presupposition of *want* adopted above, repeated in (279).

(279) $\mathbf{want}_j p$ is only defined iff $\Diamond_j p \wedge \Diamond_j \neg p$

I propose now that we should weaken it to that in (280), which only requires that if j thinks that p is possible, then j thinks that also $\neg p$ is.

(280) $\mathbf{want}_j p$ is only defined iff $\Diamond_j p \rightarrow \Diamond_j \neg p$

Notice that both occurrences of p are now in a downward entailing environment, hence no intervention is predicted when p contains a strong NPI. There remains the issue that a sentence like (281) in the semantics adopted here would be false, instead of a presupposition failure, if Mary believes that p is not possible.

(281) Mary wants that p

As von Fintel (2004) among others discusses, it is unclear that our intuitions about the difference between presuppositions failure and falsity are reliable, so this new prediction appears defensible.

57 Notice that it is irrelevant for the problem whether or not, given an account of neg-raising, we also conclude (i), schematized in (ii), from (277), as the presupposition part remains the same.

(i) John wants Mary not to leave **until Thursday**.

(ii) $\Diamond_j \phi \wedge \Diamond_j \neg \phi \wedge \mathbf{want}_j \neg(\phi)$

References

Abusch, Dorit. 2002. Lexical alternatives as a source of pragmatic presupposition. In Brendan Jackson (ed.), *Semantics and Linguistic Theory (SALT) 12*, 1–19.

Abusch, Dorit. 2010. Presupposition triggering from alternatives. *Journal of Semantics* 27(1). 1–44.

Bartsch, Renate. 1973. "negative transportation" gibt es nicht. *Linguistische Berichte* 27.

Beaver, David. 2008. Have you noticed that your belly button lint colour is related to the colour of your clothing? *to appear. In E. Zimmerman (ed.), Presupposition: Papers in Honor of Hans Kamp.* .

Beaver, David & Brady Z. Clark. 2009. *Sense and sensitivity. how focus determines meaning.* Oxford: Oxford University Press.

Beaver, David & Bart Geurts. To appear. Presuppositions. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning volume 3*, Berlin: Mouton de Gruyter.

Charlow, Simon. 2009. "strong" predicative presuppositional objects. *Proceedings of ESSLLI 2009* .

Chemla, Emmanuel. 2008. An anti-introduction to presuppositions. In Paul Egré & Giorgio Magri (eds.), *Presuppositions and Implicatures: Proceedings of MIT-France Workshop on Scalar Implicature and Presupposition*, vol. 60, MIT Working Papers in Linguistics.

Chemla, Emmanuel. 2009a. Presuppositions of quantified sentences: experimental data. Previous version availabe at http://www.emmanuel.chemla.free.fr.

Chemla, Emmanuel. 2009b. Presuppositions of quantified sentences: Experimental data. *Natural Language Semantics* 17(4). 299–340.

Chemla, Emmanuel. 2009c. Universal implicatures and free choice effects: Experimental data. *Semantics and Pragmatics* 2.

Chemla, Emmanuel. in preparation. Similarity: towards a unified account of scalar implicatures, free choice permission and presupposition projection. Unpublished manuscript.

Chierchia, Gennaro. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In Adriana Belletti (ed.), *Structures and Beyond: The Cartography of Syntactic Structures*, vol. 3, 39–103. Oxford: Oxford University Press.

Chierchia, Gennaro. in preparation. Recursive pragmatics. Ms Harvard University.

Chierchia, Gennaro, Danny Fox & Benjamin Spector. To appear. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An international handbook of natural language meaning volume 3*,

Berlin: Mouton de Gruyter.
Chierchia, Gennaro & Sally McConnell-Ginet. 2000. *Meaning and Grammar: An Introduction to Semantics, 2nd edition*. Cambridge: MIT Press.
Collins, Chris & Paul Postal. 2012. Classical NEG-raising. MS NYU.
Dayal, Veneeta. 1996. *Locality in Wh-quantification: Questions and relative clauses in Hindi*. Dordrecht: Kluwer Academic Press.
Donati, Caterina. 2000. A note on negation in comparison. *Quaderni del Dipartimento di Linguistica* 10. 55–68.
Fillmore, Charles. 1963. The position of embedding transformations in grammar. *Word* 19. 208–231.
von Fintel, Kai. 1995. The formal semantics of grammaticalization. In Jill Beckman (ed.), *North east linguistic society*, 175–190. University of Pennsylvania: Graduate Linguistic Student Association.
von Fintel, Kai. 1997. Bare plurals, bare conditionals and only. *Journal of Semantics* 14(1). 1–56.
Fox, Danny. 2007. Free choice and the theory of scalar implicatures. In Uli Sauerland & Penka Stateva (eds.), *Presupposition and Implicature in Compositional Semantics*, 71–120. Palgrave.
Fox, Danny. 2012. Presupposition projection from quantificational sentences: trivalence, local accommodation, and presupposition strengthening. MS the Hebrew University of Jerusalem.
Fox, Danny & Roni Katzir. 2011. On the characterization of alternatives. *Natural Language Semantics* 19(1). 87–107.
Gajewski, Jon. 2005. *Neg-raising: Polarity and presupposition*: MIT dissertation.
Gajewski, Jon. 2007. Neg-raising and polarity. *Linguistics and Philosophy* .
Gajewski, Jon. 2009. L-triviality and grammar. Ms UConn.
Gajewski, Jon. 2011. Licensing strong npis. *Natural Language Semantics* 19(2). 109–148.
Gazdar, Gerald. 1979. *Pragmatics: Implicature, Presupposition, and Logical Form*. New York: Academic Press.
Geurts, Bart. 1995. *Presupposing*: University of Stuttgart dissertation.
Geurts, Bart. 1998. Presuppositions and anaphors in attitude contexts. *Linguistic and Philosophy* .
Hagstrom, Paul. 2003. What questions mean. *GLOT International* 7. 188–201.
Heim, Irene. 1983. On the projection problem for presuppositions. In Daniel P. Flickinger (ed.), *Proceedings of WCCFL 2*, 114–125. Stanford University, Stanford, California: CSLI Publications.
Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9. 183–221.
Heim, Irene. 1994. Puzzling reflexive pronouns in *de se* reports. Unpublished

Handout.
Heim, Irene. 2000. Degree operators and scope. In Brendan Jackson & Tanya Matthews (eds.), *Proceedings of SALT X*, 40–64. Cornell University, Ithaca, NY: CLC Publications.
Heim, Irene. 2011. Lecture notes. Pragmatics Class, MIT.
Heim, Irene & Angelika Kratzer. 1998. *Semantics in Generative Grammar*. Malden, MA: Blackwell.
Heycock, Caroline & Anthony Kroch. 2002. Topic, focus, and syntactic representation. In *Proceedings of WCCFL 21*, 141–165.
Hintikka, Jaako. 1969. Semantics for propositional attitudes. In J. W. Davis, Hockney & Wilson (eds.), *Philosophical logic*, 21–45. Reidel.
Homer, Vincent. 2012. Neg-raising and positive polarity: The view from modals. Ms Ecole Normal Superieure.
Horn, Laurence. 1971. Negative transportation: Unsafe at any speed? In *Proceedings of Chicago Linguistics Society 7*, 120–133.
Horn, Laurence. 1975. Neg-raising predicates: toward an explanation. In L. James San Robin E. Grossman & Timothy J. Vance (eds.), *In papers from the eleventh regional meeting of the chicago linguistic society*, Chicago: University of Chicago Press.
Horn, Laurence. 1978. Remarks on neg-raising. In Peter Cole (ed.), *Syntax and semantics 9: Pragmatics*, Academic Press.
Horn, Lawrence. 1972. *On the semantic properties of logical operators in English*: UCLA dissertation.
Horn, Lawrence. 1989. *A natural history of negation*. Chicago: University of Chicago Press.
Hurford, James R. 1974. Exclusive or inclusive disjunction. *Foundations of Language* 11. 409–411.
Iatridou, Sabine & Ivy Sichel. 2008. Negative DPs and scope diminishment: Some basic patterns. In *Proceedings of NELS 38*, .
Karttunen, Lauri. 1973. Presupposition of compound sentences. *Linguistic Inquiry* 4(3). 169–193.
Katzir, Roni. 2007. Structurally-defined alternatives. *Linguistic and Philosophy* .
Klinedinst, Nathan. 2007. *Plurality and possibility*: UCLA dissertation.
Kratzer, Angelika. 2006. Decomposing attitude verbs. Talk given at The Hebrew University of Jerusalem.
Lakoff, George. 1969. A syntactic argument for negative transportation. In *Chicago linguistics society 5*, 149–157.
Levinson, Stephen. 2000. *Presumptive meanings*. MIT Press.
Magri, Giorgio. 2010. *A theory of individual-level predicates based on blind mandatory scalar implicatures*: Massachusetts Institute of Technology dissertation.

Magri, Giorgio. 2013. An account for the homogeneity effects triggered by plural definites and conjunction based on double strengthening. Ms ENS, Paris.

Meier, Cécile. 2003. The meaning of *too*, *enough*, and *so...that*. *Natural Language Semantics* 11(1). 69–107.

Merin, Arthur. 1999. Information, relevance and social decisionmaking. ome principles and results of decision-theoretic semantics. *Logic, Language and Computation vol.2* .

Moltmann, Friederike. 2012. Truth predicates in natural language. In Dora Achourioti, Henri Galinon & José Martinez (eds.), *Volume on truth*, Springer. T.

Moulton, Keir. 2009. Clausal complementation and the wager-class. In A. Schardl & M. Walkow (eds.), *In proceedings of NELS 38*, GLSA.

Penka, Doris. 2007. *Negative indefinites*: Universität Tübingen dissertation.

Postal, Paul. 2005. Suppose (if only for an hour) that negative polarity items are negation-containing phrases. MS NYU.

Reeve, Matthew. 2012. *Clefts and their relatives*. Amsterdam: John Benjamins.

Roberts, Ian. 2004. The C-system in Brythonic Celtic languges, V2, and the EPP. In Luigi Rizzi (ed.), *The structure of CP and IP*, 297–328. Oxford: Oxford University Press.

Romoli, Jacopo. 2011. The presuppositions of soft triggers aren't presuppositions. In Neil Ashton, Anca Chereches & David Lut (eds.), *Semantic and linguistic theory (salt) 21*, Rutgers University.

Sauerland, Uli. 2000. No 'no': on the crosslinguistic absence of a determiner 'no'. In *Proceedings of the tsukuba workshop on determiners and quantification*, Tsukuba University, Tsukuba, Japan.

Sauerland, Uli. 2004. Scalar implicatures in complex sentences. *Linguistics and Philosophy* 27(3). 367–391.

Sauerland, Uli. 2008. Implicated presuppositions. In Anita Steube (ed.), *Sentence and context: Language, context and cognition.*, Berlin and new York: Mouton de Gruyter.

Seuren, Pieter. 1974. Autonomous versus semantic syntax. In *Semantic syntax*, Oxford University Press.

Simons, Mandy. 2001. On the conversational basis of some presuppositions. In Rachel Hastings, Brendan Jackson & Zsofia Zvolenszky (eds.), *Semantics and Linguistic Theory (SALT) 11*, 431–448.

Singh, Raj. 2008. On the interpretation of disjunction: asymmetric, incremental, and eager for inconsistency. *Linguistics and Philosophy* .

van Rooij, Robert. 2002. Relevance implicatures. MS, ILLC, Amsterdam.

von Fintel, Kai. 1999. Counterfactuals in dynamic contexts. In Uli Sauerland & Orin Percus (eds.), *The Interpretive Tract*, 123–152. MIT Working Papers in Linguistics.

von Fintel, Kai. 2001. Conditional strengthening: a case study in implicature. Unpublished manuscript.

von Fintel, Kai. 2004. 'would you believe it? the king of france is back! presuppositions and truth-value intuitions". *In Descriptions and Beyond, edited by Marga Reimer and Anne Bezuidenhout. Oxford University Press.* .

Winter, Yoad. 2000. Distributivity and dependency. *Natural Language Semantics* 8(1). 27–69.

Zondervan, Arjen. 2009. Experiments on qud and focus as a contextual constraint on scalar implicature calculation. In Uli Sauerland & Kazuko Yatsushiro (eds.), *From experiment to theory, presuppositions, negation and scalar implicatures*, Palgrave.

Zwarts, Frans. 1998. Three types of polarity. In E. Hinrichs F. Hamm (ed.), *Plural quantification*, 177–238. Dordrecht, Kluwer.