

YOU ONLY NEED A SCALAR *ONLY*

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Abstract

We propose a compositional analysis for sentences of the kind “You only have to go to the North End to get good cheese”, referred to as the *Sufficiency Modal Construction* in the recent literature. We argue that the SMC is ambiguous depending on the kind of ordering induced by *only*. So is the exceptive construction – its cross-linguistic counterpart. *Only* is treated as inducing either a ‘comparative possibility’ scale or an ‘implication-based’ partial order on propositions. The properties of the ‘comparative possibility’ scale explain the absence of the prejacent presupposition that is usually associated with *only*. By integrating the scalarity into the semantics of the SMC, we explain the polarity facts observed in both variants of the construction. The sufficiency meaning component is argued to be due to a pragmatic inference.

1 Introduction

Adverbial *only* has been recently argued to require special treatment when occurring in sentences expressing sufficient condition. The following sentence, first discussed in (von Fintel and Iatridou 2005), proved to be problematic for the existing analyses of *only*:

- (1) To get good cheese you only have to go to the North End.

According to the observation in (Bech 1955/57), sentences like (1) are equivalent to:

- (2) To get good cheese it suffices to go to the North End.

This suggests that *only* can ‘reverse’ the relation of necessity, expressed by the embedded *have to*, giving rise to the sufficiency reading.

Another striking fact about (1) and others of its kin is that they do not entail the truth of the prejacent, the propositional complement of *only*. In other words, in uttering (1), we do not convey that the embedded anankastic conditional in (3) is true.

- (3) To get good cheese you have to go to the North End.

In other cases with *only* the prejacent is true, which is derived in one way or another from the meaning of the adverb. Interestingly, the absence of the prejacent presupposition in the sufficiency modal construction (SMC), as (von Fintel and Iatridou 2005) call (1), is limited to the positive cases, i.e. the negation of (1) does imply (3).

According to (von Fintel and Iatridou 2005)’s cross-linguistic survey of the morphosyntax of the SMC, a set of languages, like French, Modern Greek, etc., employs a negative adverb and an exceptive phrase instead of *only*:

- (4) Si tu veux du bon fromage, tu n’as qu’à aller à North End.
if you want of good cheese you NEG have except go to North End

The goal of this paper is to develop a compositional analysis for “only have to” sentences and their “neg+except” counterparts. We claim that the data in question can involve scalar uses of *only* and *except*, which enables us to account for the lack of the prejacent entailment/presupposition and derive the sufficiency meaning. In the literature on *only* the term

‘scalar’ is used to describe the fact that *only* triggers an ordering on the alternative propositions it operates on. This can be either an ordering based on logical implication, or one based on a contextually salient scale. We reserve the term ‘scalar’ for the cases that are not implication-based. We argue that both kinds of orderings can occur in the SMC as it is the case in simple sentences with *only*. *Except* and the scalar version of *only* appear to be polarity sensitive, which receives a pragmatic explanation in our approach.

Further, we show that the choice of the modal in the SMC depends on the ordering in question and on the properties of the modal itself. Thus, embedding an existential modal in the SMC gives meaningful results only if we use the implication-based ordering. The *can*-variant in (5) does not seem to have a scalar reading:

- (5) You can only take your wife to Italy to please her.

Finally, our analysis predicts that (2) is not equivalent to (1) and (4) but rather is a pragmatic inference from them.

The structure of the paper is the following: section 2 gives a brief overview of the existing analyses of the SMC and their problems; in section 3 we make a new proposal and give precise semantics and pragmatics for *only* and *except*; section 4 deals with the polarity issues and section 5 addresses the choice of modals in the SMC.

2 Problems with Previous Analyses

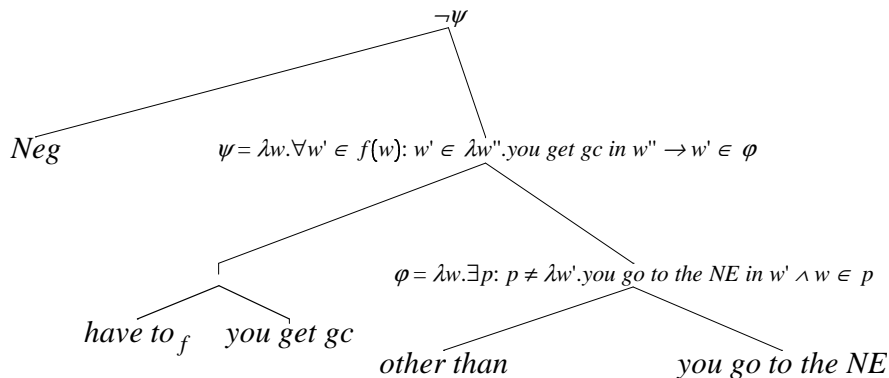
We will discuss two recent proposals for the analysis of the SMC – (von Fintel and Iatridou 2005) and (Huitink 2005) – and we will show what problems they run into while struggling to solve the “prejacent problem”.

To solve the “prejacent problem” (von Fintel and Iatridou 2005) pursue a lexical decomposition alternative, assuming that *only* splits into the negation and *except*, drawing on the parallel to the “ne que” construction in French. Moreover, they allow the modal to intervene between the two operators:

- (6) Splitting only hypothesis:
“only have to VP” = Neg > have to > other than VP

These assumptions would result in the LF in (7).

(7)



Thus, (von Fintel and Iatridou 2005) derive the following truth conditions for (1):

- (8) In some of the good cheese worlds you don't do anything other than going to the North End.

This truth condition combined with the presupposition in (9) does not entail the prejacent. (9) is an existential presupposition triggered by *only*, as assumed in (Horn 1996).

- (9) In all of the good cheese worlds you do something.

The SMC is thus predicted to express the possibility to achieve the goal expressed by the subordinate clause if the condition in the matrix clause is fulfilled. However, this semantics appears too weak to account for those sentences that involve sufficiency in the logical sense:

(10) For the bomb to explode, you only have to press the button.

The condition in (8) would wrongly predict that (10) is true in a world in which pressing the button does not trigger an explosion. (von Fintel and Iatridou 2005) are aware of this fact, but claim that this is the desired result.

There are another two aspects in their theory that we find problematic. The first one concerns the observation that the negated SMC sentence does imply its prejacent.

(11) You don't only have to go to the North End to get good cheese.

→ You have to go to the North End to get good cheese.

Adding a negation on top of the LF in (7) fails to explain (11).

Finally, by ignoring the scalarity of the construction, (von Fintel and Iatridou 2005) predict that (1) comes out true if you can get good cheese in the North End, regardless of the other possibilities for getting good cheese, i.e. even if there are easier ways.

Another proposal, due to (Huitink 2005), is to analyse *only* as a universal modal with reversed order of arguments and to use the notion of modal concord to dispense with the semantic contribution of *have to*. The truth condition she arrives at is:

(12) In all North End worlds you get good cheese.

which renders (1) equivalent to (2). This, similar to (von Fintel and Iatridou 2005)'s analysis, makes wrong predictions in case there are easier ways for obtaining good cheese than going to the North End. If you can as well get good cheese in the nearest shop, (1) is predicted true contrary to our intuitions. The general problem with the modal analysis is that it fails to capture the fact that the SMC does not only introduce a sufficient condition, but also ranks it as the easiest possible.

We can conclude that it is crucial to integrate the notion of 'scale' into the semantics of the SMC, which we will turn to in the next section.

3 Scalar Meaning of SMC

We saw that it is important to take into account the scalarity of the construction. It seems natural to assume that the presence of a scale is due to the semantics of *only*. Two major inferences associated with (1) are that:

- none of the ways of achieving the goal ranked higher on an effort scale than the one that appears in the sentence ($\llbracket ne \rrbracket$) are necessary
- none of the ways of achieving the goal ranked lower on an effort scale than $\llbracket ne \rrbracket$ are sufficient

Intuitively, the effort scale is constructed based on the comparative difficulty of actions described by different propositions. According to an observation of (von Fintel and Iatridou 2005), the scale consists not only of ways of achieving the goal, but may also include other propositions.

3.1 The Scale

The effort scale ranks propositions according to the degrees of difficulty they are assigned in the world of evaluation. To define the scale, we suggest that the degree of difficulty of a

proposition corresponds to its possibility in the actual world. Thus, we take the comparative possibility relation from (Lewis 1973) and use it for ranking:

(13) $\forall p, q, w$: p is at least as difficult as q in w iff

$$q \preceq_w p \text{ (i.e. } p \text{ is at most as possible as } q \text{ in } w)$$

In the degree talk:

(14) $\forall p, q, w$: p is at least as difficult as q in w iff $D(w)(p) \leq D(w)(q)$,

where $D(w)$ is a function from propositions to their possibility degrees in w .

We can also define the relations of sufficiency and necessity between a degree and a proposition based on the corresponding relations holding between propositions:

(15) $\forall q \in D_{st}, d \in D_d, w \in D_s$ (d is sufficient for q in w) \Leftrightarrow

$$(\exists p \in D_{st}: p \text{ is } d\text{-possible in } w \wedge \text{sufficient}_w(p, q))$$

(16) $\forall q \in D_{st}, d \in D_d, w \in D_s$ (d is necessary for q in w) \Leftrightarrow

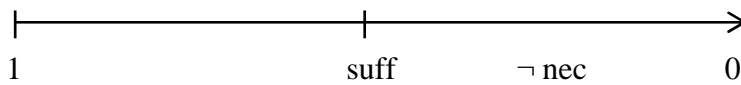
$$(\exists p \in D_{st}: p \text{ is } d\text{-possible in } w \wedge \text{necessary}_w(p, q))$$

Informally, for a degree d to be sufficient for a proposition q in a world w , there has to be another proposition p corresponding to d , which is sufficient for q in w . The same holds for necessity.

Further on, we assume that in the scalar context necessity and sufficiency are related in a certain intuitive way. We say that a degree d is sufficient for some proposition q in a world w iff any smaller degree d' is not necessary for q in w . This relation between sufficiency and necessity is formally defined in (17). It should be noted, that according to (14) greater degrees correspond to less effort on the scale, as can be seen on the diagram in (17). Here, the degree '1' corresponds to the propositions that are true in the world of evaluation, i.e. propositions that require zero effort to be fulfilled. The degree '0', on the other hand, corresponds to the propositions that are impossible in the world of evaluation, i.e. they cannot be fulfilled.

(17) $\forall q \in D_{st}, d \in D_d, w \in D_s$ (d is sufficient for q in w) \Leftrightarrow

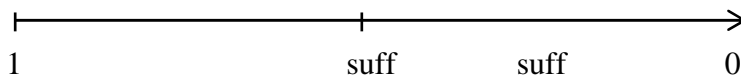
$$(\forall d': d' < d \rightarrow d' \text{ is not necessary for } q \text{ in } w)$$



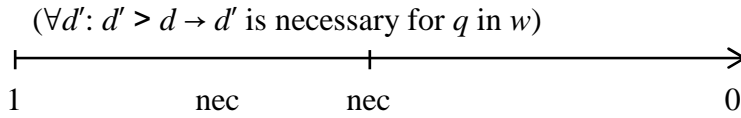
Using (17) we can derive the monotonicity properties of sufficiency and necessity, formalised in (18) and (19). (18) states that if a degree d is sufficient for a proposition q in a world w , then all smaller degrees are also sufficient for q in w , i.e. sufficiency is *monotone decreasing* in its degree argument. According to (19) if a degree d is necessary for a proposition q in a world w , then all greater degrees are also necessary for q in w , i.e. necessity is *monotone increasing* in its degree argument.

(18) $\forall q \in D_{st}, d \in D_d, w \in D_s$ (d is sufficient for q in w) \Rightarrow

$$(\forall d': d' < d \rightarrow d' \text{ is sufficient for } q \text{ in } w)$$



(19) $\forall q \in D_{st}, d \in D_d, w \in D_s (d \text{ is necessary for } q \text{ in } w) \Rightarrow$



Having defined the scale and formalised the behaviour of ‘sufficient’ and ‘necessary’ with respect to it, we can now turn to the meaning of *only* in the SMC.

3.2 The Meaning of Scalar *Only* in the SMC

We assume that *only* can operate on a proposition and a modal operator. It can additionally take as an argument a function D from worlds into functions from propositions to degrees, which is determined by the context and can change its range accordingly. In the case of the SMC, $D(w)$ will assign each proposition its probability degree in w and will thus have the range from 0 to 1. *Only*, applied to its arguments, asserts that the modal does not hold of any proposition for which $D(w)$ returns a smaller degree than the one it returns for the propositional argument. We follow (Horn 1996) in assuming a weak existential presupposition for *only*, i.e. that there is a proposition of which the modal holds. We, however, leave it open for now, whether the latter condition is strong enough to be empirically adequate.

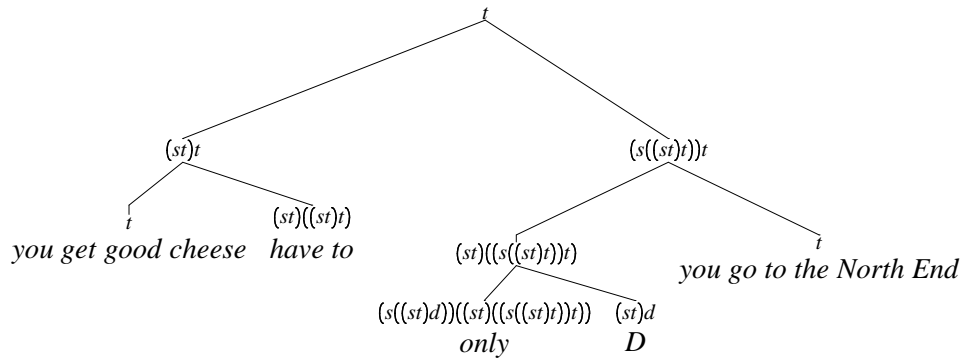
Formally, the meaning we propose for *only* is the following:

$$(20) \quad \llbracket \text{only} \rrbracket = \lambda w. \lambda D \in D_{s((st)d)}. \lambda p \in D_{st}. \lambda M \in D_{s((st)t)}: \exists r \in D_{st} [M(w)(r)].$$

$$\forall q \in D_{st} [D(w)(q) < D(w)(p) \Rightarrow \neg M(w)(q)]$$

The LF corresponding to (1) is the following:

$$(21) \quad ((\llbracket \text{only} \rrbracket (D))(\llbracket \text{ne} \rrbracket))(\llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket))$$



According to (20) we derive the following meaning:

- (22) A: You don’t have to do anything that is more difficult than going to the North End.
 P: There is something that you have to do to get good cheese.

Formally, this is represented as follows:

$$(23) \quad A: \lambda w. \forall q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{you go to the North End} \rrbracket)] \Rightarrow$$

$$\neg \llbracket \text{have to} \rrbracket (\llbracket \text{you get good cheese} \rrbracket)(w)(q)]$$

$$P: \lambda w. \exists r \in D_{st} [\llbracket \text{have to} \rrbracket (\llbracket \text{you get good cheese} \rrbracket)(w)(r)]$$

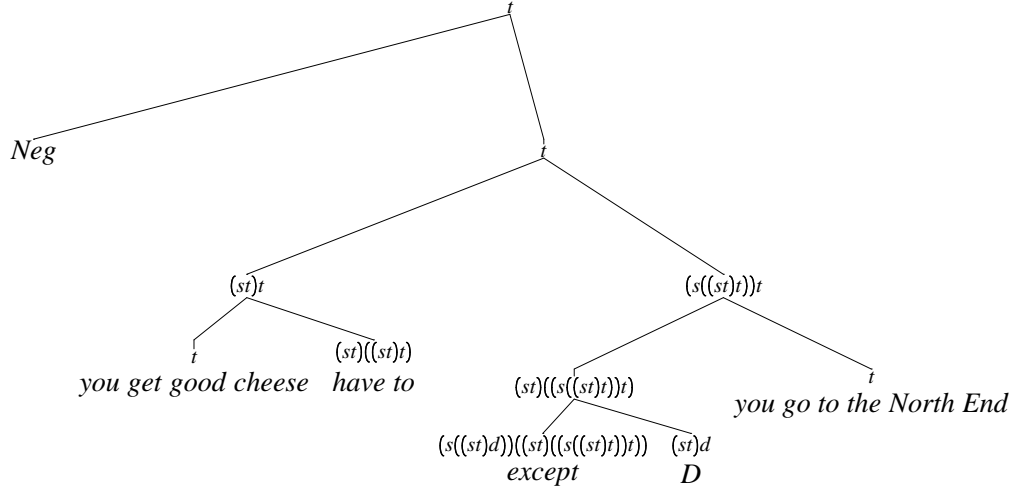
By analogy, we analyse the French *except* as a scalar operator with the meaning in (24):

$$(24) \quad \llbracket \text{except} \rrbracket = \lambda w. \lambda D \in D_{s((st)d)}. \lambda p \in D_{st}. \lambda M \in D_{s((st)t)}: \exists r \in D_{st} [M(w)(r)].$$

$$\exists q \in D_{st} [D(w)(q) < D(w)(p) \wedge M(w)(q)]$$

By putting *except* under negation, we will get the meaning for the French example in (4) that is equivalent to the meaning of its ‘only have to’ counterpart, cf. (22)/(23):

(25) Neg ((([except] (D)) ([ne])) ([have to] ([gc])))



As to the question, why we cannot use *except* without negation, we will try to give an answer to it in section 4.

3.3 Strengthening by Implicature

As we have observed in connection with the scalar inferences of the SMC, we have to make sure that sentences like (1) cannot be true or felicitous in scenarios in which there are easier alternatives for achieving the goal. To account for the non-sufficiency of easier alternatives, we need to strengthen the meaning by the requirement that any possibility degree greater than the one assigned to [ne] is necessary. In our set up, the strengthening can be derived as a scalar implicature.

Suppose that we have the following scenario: going to the nearest shop (ns) is easier than going to the North End (ne), which in turn is easier than going to Italy (it). The presence of ordered alternatives in the context allows us to build alternative assertions of the type ‘You only have to *x* to get good cheese.’ The alternative assertions are ordered according to their informational strength, as in (26). This ordering is the result of the monotonicity of *only*.

(26) $\lambda w. \forall q \in D_{st} [D(w)(q) < D(w)([ns]) \Rightarrow \neg [have\ to] ([gc])(w)(q)] \subseteq$
 $\lambda w. \forall q \in D_{st} [D(w)(q) < D(w)([ne]) \Rightarrow \neg [have\ to] ([gc])(w)(q)] \subseteq$
 $\lambda w. \forall q \in D_{st} [D(w)(q) < D(w)([it]) \Rightarrow \neg [have\ to] ([gc])(w)(q)]$

Following standard Gricean reasoning, we assume that all alternative assertions that are informationally stronger than the uttered one are believed to be false. Thus, we derive the following implicature:

(27) $\lambda w. \forall q \in D_{st} [D(w)(q) > D(w)([ne]) \Rightarrow$
 $\exists r \in D_{st} [D(w)(r) < D(w)(q) \wedge [have\ to] ([gc])(w)(r)]$

This implicature states that there exists a proposition, whose possibility degree is less than or equal to the degree of [ne] and is necessary for getting good cheese. According to (19), this means that all degrees greater than the one of [ne] are necessary.

Finally, we combine this implicature with the meaning of (1) and we derive the expected results: that the degree of going to the North End is sufficient for getting good cheese and that it is the lowest degree which is necessary for getting good cheese.

However, we still haven't derived the fact, that going to the North End itself is sufficient for getting good cheese. We assume that the sufficiency inference is also a result of pragmatic strengthening: if the speaker had known that going to the North End is not sufficient, he would have chosen another alternative with the same degree of possibility to make a relevant statement. So the sufficiency can be considered a conversational implicature – according to the maxim:

(28) *Be relevant!*

4 Polarity

In this section we are going to discuss two issues related to the polarity sensitivity of *only* and *except*: the ambiguity of the 'only have to' sentences and the restriction of scalar *only* and *except* to positive and negative contexts respectively.

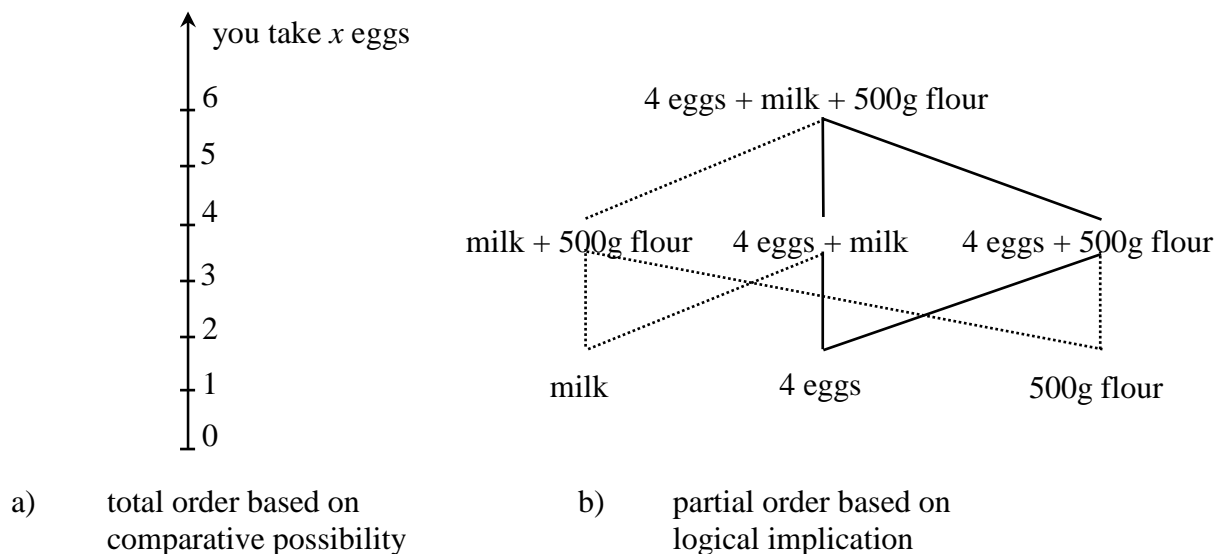
4.1 Ambiguity

If we look at different examples of 'only have to' sentences, we can find some that can be interpreted in different ways depending on what kind of alternatives they are associated with. Consider the following sentence:

(29) You only have to take four eggs in order to bake this cake.

On one of its readings (29) implies that you don't need more than four eggs to bake the cake. However, it can also mean – in a less natural scenario – that you can make the cake out of four eggs. In other words, in the first case the alternatives are of the form *you take x eggs* and therefore any two of them can be compared to each other. In the second case, we seem to build alternatives by taking various ingredients and combinations thereof: *you take a cup of milk, you take four eggs and 500g of flour, etc.* Here a total ordering of the alternatives is impossible. Schematically, we can represent these two cases in the following way:

(30) Possible orderings of alternatives:



In (30a) we have a situation, which can be dealt with using the semantics for *only* we presented above, i.e. it is more possible that you take three eggs than four eggs in a given state

of affairs. On the contrary, in (30b) it is not immediately clear how to derive the comparative possibility order, required by the ‘scalar’ *only* analysis.

The implication-based case is usually difficult to come up with. For our initial sentence (1) for example, we would need a scenario with the following alternatives:

- (31) you go to the North End and find the Italian shop;
 you go to the North End and call your Italian friend;
 you go to the North End, find the Italian shop and call your Italian friend

Another observation is that under negation we seem to always choose the implicature-based readings. Compare (32a) and (32b):

- (32) You don’t only have to take four eggs to bake this cake...
 a) ...you need to take four eggs and a cup of milk.
 b) #...you need to take five eggs.

This suggests that the ‘scalar’ *only* is polarity sensitive, akin to its counterpart *except*, with the difference that it requires a positive licensing environment.

4.2 Deriving Polarity

To account for the absence of the scalar reading of *only* under negation and the restriction that *except* can only occur in the scope of negation, we treat *only* and *except* as a PPI and an NPI respectively, drawing on (Condoravdi 2002)’s analysis of *until^P/erst*. We give a pragmatic explanation for their polarity sensitivity, in the spirit of (Krifka 1995)’s analysis of weak NPIs.

Let us consider the negated version of (1):

- (33) You don’t only have to go to the North End to get good cheese.

Applying our analysis to this sentence gives us the following truth conditions:

- (34) A: $\lambda w. \exists q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{you go to the North End} \rrbracket) \wedge$
 $\llbracket \text{have to} \rrbracket (\llbracket \text{you get good cheese} \rrbracket)(w)(q)]$
 P: $\lambda w. \exists r \in D_{st} [\llbracket \text{have to} \rrbracket (\llbracket \text{you get good cheese} \rrbracket)(w)(r)]$

This leads to a reversal of the informativeness order over alternative assertions:

- (35) $\lambda w. \exists q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{it} \rrbracket) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(q)] \subseteq$
 $\lambda w. \exists q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{ne} \rrbracket) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(q)] \subseteq$
 $\lambda w. \exists q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{ns} \rrbracket) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(q)]$

If we again follow the strategy of pragmatic strengthening, we will derive the following implicature:

- (36) $\lambda w. \forall q \in D_{st} [D(w)(q) > D(w)(\llbracket \text{ne} \rrbracket) \Rightarrow$
 $\nexists r \in D_{st} [D(w)(r) < D(w)(q) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(r)]]$

We can now prove that adding (36) to the assertion in (34) leads to a contradiction.

Assume that the truth conditions are satisfied in world w . Therefore, there is at least one proposition that is higher on the scale than $\llbracket \text{ne} \rrbracket$ and is necessary, say r :

- (37) $\exists r \in D_{st} [D(w)(r) < D(w)(\llbracket \text{you go to the North End} \rrbracket) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(r)]$

From the fact that we use a dense scale it follows that:

$$(38) \quad \forall p \in D_{st} [\exists q \in D_{st} [D(w)(p) < D(w)(q) < D(w)(\llbracket \text{you go to the North End} \rrbracket)]]$$

From (37) and (38) it follows that:

$$(39) \quad \exists p \in D_{st} [D(w)(p) < D(w)(\llbracket \text{you go to the North End} \rrbracket)] \wedge \\ \exists q \in D_{st} [D(w)(q) < D(w)(p) \wedge \llbracket \text{have to} \rrbracket (\llbracket \text{gc} \rrbracket)(w)(q)]$$

This, however, contradicts the implicature in (36). Therefore, it is impossible to satisfy both the truth conditions and the implicature.

To sum up, the scalar interpretation of *only* is limited to positive contexts because of the conflict that arises during the process of pragmatic strengthening of the negated sentences. The same holds for the positive sentences with *except*, rendering it an NPI.

5 Other Modals with *Only*

Our analysis predicts that *only* can take different modals as its arguments. However, only very few modals can participate in the SMC. With respect to the universal modals in particular, the paradigm for English looks as follows:

- (40) a) To get good cheese you only **need** to go to the North End.
 b) #To get good cheese you only **must** go to the North End.
 c) #To get good cheese you only **should** go to the North End.

(von Fintel and Iatridou 2005) offer a very neat generalisation for the pattern in (40): a universal modal can participate in SMC if it scopes under negation. Whatever is responsible for the behaviour of modals with respect to negation, if it is not based on purely structural considerations, then (von Fintel and Iatridou 2005)'s generalisation is compatible with our analysis of *only*, as the modal ends up in the scope of semantic negation.

As far as existential modals are concerned, an SMC with an embedded *can* is grammatical:

- (41) You can only take your wife to Italy to make her happy.

It seems that a scalar interpretation is not available here. (41) merely states that taking your wife to Italy is the only way to make her happy. This interpretation can be derived if we use the implication-based version of *only*, but we will not pursue this here. We restrict ourselves to explaining why *can* cannot be selected by the 'scalar' *only*.

Let us see what would happen if we embedded *can* under the 'scalar' *only*. We would have the following LF:

$$(42) \quad ((\llbracket \text{only} \rrbracket (D))(\llbracket \text{ne} \rrbracket))(\llbracket \text{can} \rrbracket (\llbracket \text{gc} \rrbracket))$$

If we adopt standard semantics for *can*, the LF in (42) will be interpreted as: "Any proposition *q* that is less possible than going to the North End in a world *w* is not compatible with getting good cheese in *w*." Formally:

$$(43) \quad \lambda w. \forall q \in D_{st} [D(w)(q) < D(w)(\llbracket \text{you go to the North End} \rrbracket)] \Rightarrow \\ \neg \llbracket \text{can} \rrbracket (\llbracket \text{you get good cheese} \rrbracket)(w)(q)]$$

Here we can again construct alternative assertions and, due to the monotonicity of the universal quantifier, order them according to their informational strength:

$$\begin{aligned}
(44) \quad & \lambda w. \forall q \in D_{st} [D(w)(q) < D(w)(\llbracket ns \rrbracket) \Rightarrow \neg \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)] \subseteq \\
& \lambda w. \forall q \in D_{st} [D(w)(q) < D(w)(\llbracket ne \rrbracket) \Rightarrow \neg \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)] \subseteq \\
& \lambda w. \forall q \in D_{st} [D(w)(q) < D(w)(\llbracket it \rrbracket) \Rightarrow \neg \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)]
\end{aligned}$$

If we proceed with standard pragmatic strengthening by negating the informationally stronger alternative assertions, we derive the following implicature:

$$\begin{aligned}
(45) \quad & \lambda w. \forall q \in D_{st} [D(w)(q) > D(w)(\llbracket ne \rrbracket) \Rightarrow \\
& \exists r \in D_{st} [D(w)(r) < D(w)(q) \wedge \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(r)]]
\end{aligned}$$

This, together with the assertion in (43), implies that going to the North End is compatible with getting good cheese, as the reader can verify, i.e.

$$(46) \quad \lambda w. \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(\llbracket ne \rrbracket)$$

We will assume that logically stronger propositions correspond to lower possibility degrees, as stated in (47):

$$(47) \quad \forall p, q, w [(p(w) \Rightarrow q(w)) \Rightarrow (D(w)(p) < D(w)(q))]$$

This assumption lets us derive (48) from (43):

$$\begin{aligned}
(48) \quad & \lambda w. \forall q \in D_{st} [(q(w) \Rightarrow \llbracket ne \rrbracket(w)) \Rightarrow \neg \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)] \Leftrightarrow \\
& \lambda w. \nexists q \in D_{st} [(q(w) \Rightarrow \llbracket ne \rrbracket(w)) \wedge \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)]
\end{aligned}$$

On the other hand, (46) is equivalent to:

$$(49) \quad \lambda w. \exists q \in D_{st} [(q(w) \Rightarrow \llbracket ne \rrbracket(w)) \wedge (q(w) \Rightarrow \llbracket gc \rrbracket(w))]$$

$$(50) \quad \lambda w. \exists q \in D_{st} [(q(w) \Rightarrow \llbracket ne \rrbracket(w)) \wedge \llbracket can \rrbracket (\llbracket gc \rrbracket)(w)(q)]$$

From (49) we derive (50), which obviously contradicts (48). Thus, we have shown that embedding *can* under ‘scalar’ *only* leads to a contradiction after the computation of the scalar implicature.

6 Conclusions

Under the scalar analysis of *only* in SMC, the Prejacent Problem does not arise as a consequence of the use of a weak presupposition. At the same time, by utilising the scalar behaviour of necessity and sufficiency relations, we can derive the desired sufficiency inference in the form of sufficiency between a degree and a proposition, strengthened by a conversational implicature.

The oddity of “only have to” sentences in scenarios with easier ways for achieving the goal is explained as a scalar implicature violation.

Scalarity is also responsible for the negative/positive polarity of *except* and *only*, respectively.

It remains an open issue how to explain the restrictions on the modals that can be embedded under *only*. So far we have shown that the use of *can* leads to inconsistency.

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