On the similarity between *unless* and *only-if-not*[1]

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Abstract. This paper discusses the semantics of *unless*-conditionals and compares them to *only-if-not*-conditionals. I propose that the meaning of *unless*-conditionals can be derived from the same ingredients as the meaning of *only-if-not*-conditionals: a negative conditional (where conditionals are understood as restrictors on quantifier domains as in the Kratzer-Lewis tradition) and an exhaustifier that, like *only*, negates all of the focus alternatives for a modal claim built by substitution of the element marked with focus with other elements of the same semantic type (but unlike *only* also asserts its prejacent). I propose that the two constructions are similar in the following sense. First, in both cases a negative conditional and the exhaustifier are separated syntactically. Secondly, focus alternatives are constructed in the same way: a set of focus alternatives for a proposition denoted by an *if*-clause (or a complement of *unless*) includes any other possible proposition. I suggest that this way of constructing alternatives resolves a long-standing puzzle about *only* with conditionals: it allows us to derive the right interpretation for *only* with conditionals in a compositional manner without making any special assumptions about the nature of the covert modal.

Keywords: *only*, conditionals, Conditional Excluded Middle, *unless*, exceptives

1. Introduction

In this paper I will discuss the semantics of *unless*-conditionals and compare them to *only-if-not*-conditionals (1).

(1) a. Unless it rains, the party will be outside.
b. Only if it does not rain, will the party be outside.

The analysis I propose is built on the idea that *unless* means (almost) the same thing as *only if not* (Clark and Clark, 1977: 457; Quirk, Greenbaum, Leech, and Svartvik, 1972: 746) or rather *if and only if not* (Comrie, 1986: 79). I will argue that there is an advantage in analyzing these two constructions in a similar way syntactically. I will suggest that the meaning of *unless*-conditionals can be derived from two ingredients: a negative conditional statement and an unpronounced exhaustifier that has a meaning similar to *only*.

The approach I suggest is a modified version of von Fintel's (1994) approach to *unless*-conditionals, according to which they are exceptive constructions in a modal domain: *unless* subtracts a set denoted by its complement from a domain of a modal operator (*unless* acts like *if not* in a Kratzer-Lewis system (Lewis, 1975; Kratzer, 1978, 1986), where conditionals restrict domains of modal operators) and states that subtraction of any alternative proposition makes the quantificational claim false.

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Building on the recent proposals made for *but*-exceptives (Gajewski, 2008, 2013; Hirsch, 2016), I suggest that domain subtraction and exhaustification should be separated syntactically. I will argue that this separation provides an explanation for weak NPI-licensing in *unless*-clauses. I suggest that *unless* marks its complement with focus and is obligatorily c-commanded by "O", which is identical to *only* except that it asserts its prejacent. "O" applies to an entire clause with a modal operator and negates all the alternatives for this clause that are built by substitution of the element marked with focus (the complement of *unless*) by its alternatives. The crucial aspect of the proposed analysis is that the set of alternatives for the complement of *unless* includes all possible propositions. I will show how this approach explains the known differences between *unless* and *if not*.

There is a long-standing puzzle about deriving the meaning of exhaustifiers like *only* with conditionals in a compositional manner (Barker, 1993; von Fintel, 1997; Herburger, 2015). Since "O", like *only*, involves negation of focus alternatives, the same puzzle arises for the proposed theory of *unless*-conditionals. There are two solutions to this puzzle proposed in the literature and both of them involve a special stipulation about the nature of the covert modal. According to the first one, bare conditionals obey the principle of Conditional Excluded Middle (Barker 1993; von Fintel 1997), and according to the second one, the covert modal obligatorily changes its modal force and becomes an existential quantifier under negative operators like *only* (Herburger, 2015).

I will show that it is possible to resolve the puzzle of *only* with conditionals without appealing to any special stipulation by extending my analysis of *unless*-conditionals to regular conditionals with *only*. I will argue that the right interpretation for those sentences follows naturally if we allow the set of possible alternatives for a proposition denoted by an *if*-clause to include not only the proposition itself and its negation (as it standardly assumed), but any possible proposition.

The discussion will go as follows. In Section 2 I will introduce the properties of *unless*-conditionals and von Fintel's analysis of them. I will propose my analysis for *unless*-conditionals. I will suggest separating domain subtraction and exhaustification syntactically. In Section 3 I will discuss the puzzle posed by combining *only* with conditionals and the Conditional Excluded Middle (CEM) as a solution to this problem. I will show that the analysis of *unless*-conditionals suggested here (as well as von Fintel's analysis of *unless*-conditionals) is not compatible with CEM. In Section 4 I will propose a novel solution to the problem of *only* with conditionals: I will extend the core idea of von Fintel's approach to *unless*-conditionals to *only-if*-conditionals and allow the set of alternatives for a proposition denoted by an *if*-clause to include any other possible proposition. In Section 5, I will discuss the consequences and predictions of the suggested approach. Section 6 concludes.

2. The semantics of *unless*-conditionals

2.1. *Unless* is not equivalent to *if not*.

Unless-conditionals express a negative condition and their meaning is close to *if not*. The similarity between *unless* and *if not* can be demonstrated by the following pair of sentences (2)a and (2)b.

(2) a. Unless it rains, the party will be outside.
b. If it does not rain, the party will be outside.

However, Geis (1973) in his classic paper provided several arguments against the idea that *unless* is equivalent to *if not*. The first argument given by Geis is that two *unless*-clauses cannot be coordinated (3). Two *if*-clauses – positive or negative – can be coordinated, as shown in (4).

(3) *Unless it rains and unless I am sick, the party will be at my house.

(4) If it does not rain and if I am not sick, the party will be at my house.

Geis also shows that *unless* does not combine with operators like *only*, *even*, and *except* ((5) and (6)), unlike negative *if*-clauses ((7) and (8)).

(5) *The party will be outside only unless it rains.

(6) *The party will be outside even/except unless the weather is good.

(7) The party will be outside only if it does not rain.

(8) The party will be outside even/except if the weather is not good.

Another difference between *if-not*- and *unless*-clauses noticed by Geis is their ability to host NPIs. Geis argued that NPIs are not licensed in *unless*-clauses at all. However, von Fintel (1994) showed that this is true only for strict NPIs like *yet* (9); weak NPIs like *anyone* can be licensed in *unless*-clauses (11).

(9) *Ivan will be upset **unless** Bill has come **yet**.

(10) Ivan will be upset **if** Bill has **not** come **yet**.

(11) **Unless anyone** objects, we must move on.

Another contrast between *if not* and *unless* is that *then* is not allowed in consequents of *unless*-conditionals (12) (Fretheim, 1977; von Fintel, 1994).

(12) Unless it rains, (*then) the party will be outside.

(13) If it does **not** rain, then the party will be outside.

Following Geis, we can conclude that *unless* is not equivalent to *if not*, and any semantic theory of *unless* should explain the differences between *unless* and *if not* that we observe here.

2.2. *Unless* as an exceptive construction

Von Fintel (1994) proposed that *unless* makes the following contribution to the meaning of a sentence (14).

(14) $[[\ [_S\ [_S \text{ unless } \alpha]\ [_S\ Q_{C1}\ \beta]]\ ]]^g = T$ iff $g(C_1)(w)–[[\alpha]]^g \subseteq [[\beta]]^g\ )\ \&$
$\forall Y(\ (g(C_1)(w)–Y \subseteq [[\beta]]^g) \rightarrow [[\alpha]]^g \subseteq Y)\}$
where $[[\alpha]]^g = \{w: [[\alpha]]^{g,w} = T\}$

In (14) Q_C stands for a universal modal operator.[2] Its index C is a covert domain restriction variable: it denotes a function that applies to a world and returns a set of worlds accessible from that world. α is a complement of *unless*; it is interpreted a set of possible worlds that is subtracted from the domain of the modal operator. β is the constituent that denotes a set of worlds that the modal takes as its second argument.

The first conjunct in (14) is a modal claim, where the denotation of α is subtracted from the domain of the modal quantifier. The second conjunct is the exhaustification or the leastness condition. It universally quantifies over possible propositions (sets of possible worlds) that can be subtracted from the domain of the modal operator instead of the proposition denoted by the original complement of *unless*. It states that if the resulting modal claim is true, then the original subtracted set is a subset of this set of possible worlds.

In other words, it negates all the resulting modal claims with exception of those that are already entailed by the original modal claim. The modal operator is assumed to be a universal quantifier. The structural position of the original restrictor R is in an upward entailing context (as it is under negation and in the restrictor of a universal quantifier). If R is substituted by its superset, the resulting modal claim will be entailed by the original modal claim, therefore its negation will contradict the original claim. This semantics predicts that two *unless*-clauses cannot be coordinated. The clause in (14) says that the set denoted by α is the unique minimal set subtraction of which from the domain of the modal operator makes the quantificational claim true. There cannot be two such unique sets.

2.3. Separating domain subtraction from exhaustification syntactically

One of the properties of *unless*-clauses is their ability to host weak NPIs (15).

(15) **Unless anyone** objects, we will move on.

This fact is not predicted by von Fintel's approach, where the domain subtraction and exhaustification are done in one step. The reason for this is the first conjunct of the formula in (14) that simply expresses the domain subtraction. The structural position of the constituent α

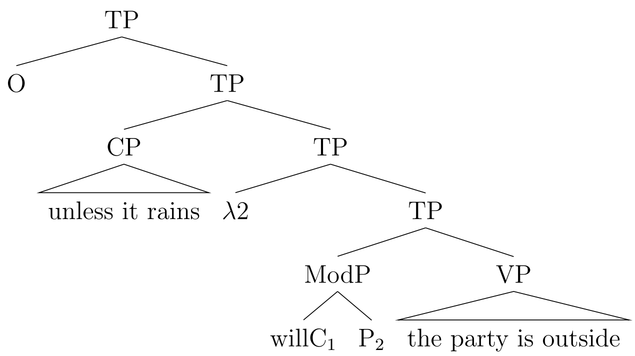
[2] *Unless*, due to its semantics, cannot apply to existential modals (von Fintel, 1994). The assumption is that in cases where an existential modal is overtly present in a sentence, *unless* operates on an unpronounced universal modal and an existential takes scope below it.

is not in a downward entailing context, because it is in the restrictor of the universal quantifier and under negation.

To account for the fact that weak NPIs are licensed in *unless*-clauses I propose that domain subtraction and exhaustification should be separated syntactically, as shown in (17). I will make the simplifying assumption that syntactically a modal forms a constituent with a variable of type <s,t>. The value of this variable is provided by the *unless*-clause via the mechanism of lambda abstraction.

(16) Unless it rains, the party will be outside.

(17)



Unless subtracts its complement (a proposition) from a domain of a modal operator (18) (thus an *unless*-clause is equivalent to a negative *if*-clause in the Kratzer-Lewis tradition (Lewis, 1975; Kratzer, 1978, 1986), where conditionals restrict domains of various operators).

(18) $[[\text{unless}\ \alpha]]^{w,g} = \{w_1 : w_1 \notin [[\alpha]]^g\}$

(19) For any sets of worlds P and Q, $[[\text{will}_{C1}]]^{w,g}(P)(Q) = T$ iff $g(C_1)(w) \cap P \subseteq Q$
(where C_1 is a variable standing for an accessibility function from worlds to sets of worlds).

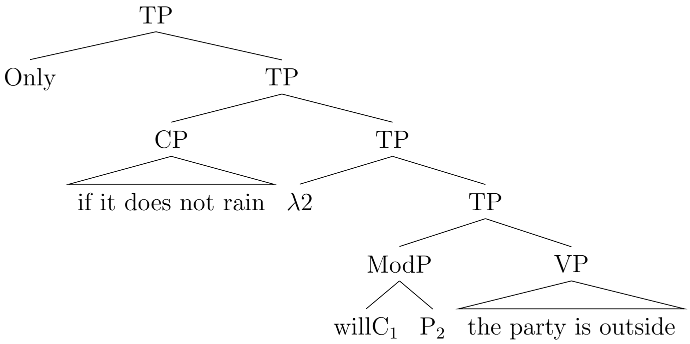
Unless marks its complement with focus and must be c-commanded at LF by "O".[3] The set of focus alternatives for a proposition p includes any other possible proposition. (The advantages of constructing alternatives in such a way will be shown in Section 4.) "O" c-commands the entire sentence containing an *unless*-clause. "O" has exactly the same semantics as *only* except that it asserts its prejacent (Chierchia, 2013) (20). It states that for each set of worlds such that it is a member of the set of focus alternatives of the original sentence and the world of evaluation is one of them, the set of worlds denoted by the original sentence is a subset of it. It essentially negates each of the focus alternatives except for the ones that are entailed by the original sentence. It also states that the evaluation world is a member of the set denoted by the original sentence; that is, it asserts its prejacent.

(20) **"O":** $[[O\ \alpha]]^{w,g} = T$ iff $\forall r\ [(r \in [[\alpha]]^g{}_f\ \&\ w \in r) \rightarrow [[\alpha]]^{w,g} \subseteq r]\ \&\ [[\alpha]]^{w,g}$

[3] The reasons why "O" is chosen as an exhaustifier and not the leastness operator are given in the Appendix.

Under the assumption that *only* also c-commands the entire sentence, *unless*-conditionals are structurally parallel to *only-if-not*-conditionals.

(21)



Because "O", unlike *only*, asserts its prejacent, *only-if-not*-conditionals are not predicted to be completely semantically equivalent to *unless*-conditionals. However one part of their meaning is predicted to be the same, namely the one that comes from negation of all alternatives that are formed by substitution of a conditional clause by its alternatives.

3. The problem of *only if*

In this section I will introduce the puzzle posed by applying of exhaustifiers like *only* (or "O") to conditionals.

3.1. The problem of *only* with bare conditionals

Deriving the meaning of *only* with conditionals in the absence of an overt modal operator (so-called bare conditionals) in a compositional manner is not an easy task. To see why, let us consider what *only* and *if* mean independently.

According to the standard assumptions about the semantics of *only*, it applies to a proposition (its prejacent) and negates all of the contextually relevant alternative propositions derived by substitution of the element marked with focus in the original sentence with elements of the same semantic type (Rooth, 1985). Thus the claim in (22) is true if and only if each of the claims in (23) is true.

(22) Only John came to the party.

(23) Bill did not come, Mary did not come, Jack did not come, etc.

Our goal is to derive the meaning of an *only if* claim, like the one in (24), by using the same ingredients: *only* and focus alternatives for its prejacent.

(24) Only if the queen is home, is the flag up.

The meaning of (24) can be roughly paraphrased as (25).

(25) In **all** worlds in which the queen is **not** home, the flag is **not** up.

Thus the result of applying *only* to a bare conditional seems to be a modal claim where the modal has the universal force, the restrictor is the negation of the original *if*-clause in (24) and the scope is the negation of the original scope.

There are two major problems with (24) that are extensively discussed in the literature. The first one is that (24) does not seem to presuppose that if the queen is home, the flag is up, even though normally *only* presupposes its prejacent (McCawley, 1974). The second problem is that it is not clear how to derive (24) from (25) given our standard assumptions about the semantics of conditionals and *only* (Barker, 1993; von Fintel, 1997; Herburger, 2015). I will set the first issue aside in this paper and focus on the second problem.

The prejacent of *only* in (26) taken by itself seems to be a universal modal assertion.

(26) If the queen is home, the flag is up.

The meaning of (26) (the prejacent) is something like (27), which I will represent as (28).[4]

(27) In **all** worlds where the queen is home, the flag is up.

(28) $[[(27)]]^{g,w}$ is T iff $P \subseteq Q$
where P = {w: the queen is home in w} and Q = {w_1: the flag is up in w_1}

Only negates all of the alternatives for its prejacent that are created by substitution of the focused element with other expressions of the same type. The focused element in this case is the *if*-clause (the meaning of which I represented with P). Since our goal is to get a modal claim with a restrictor that is the negation of the original restrictor, the alternative we are particularly interested in is the one given in (29). Under the assumption that the set of focus alternatives for a proposition only includes the proposition itself and its negation, this is the only alternative that can be negated without contradicting the original claim.

(29) $P' \subseteq Q$
(where P' stands for a complement of P, the original set)

Negation of this universal claim will result in an existential claim that can be paraphrased as (30). This is not the desired result, because (30) is too weak.

(30) In **some** worlds where the queen is **not** home, the flag is **not** up.

In what follows, I will review one of the existing solutions to this puzzle, according to which the covert modal operator obeys the principle of conditional excluded middle (CEM). I will show that the semantics for *unless*-conditionals developed here, as well as the semantics of *unless*-conditionals suggested by von Fintel, is not compatible with this principle. I will

[4] This semantics for conditionals completely ignores an accessibility relation. I omit the accessibility relation only for simplicity of exposition. (I make a simplifying assumption here that all worlds are accessible from all worlds.) In the Appendix, I show that my result holds in case we add an accessibility relation.

propose a novel solution to this puzzle that does not appeal to this principle and does not postulate any other special property of bare conditionals, but rather changes the way we construct the set of focus alternatives for a conditional clause.

3.2. Conditional excluded middle as a possible solution for the *only-if* puzzle

One of the existing solutions to this puzzle adopts the idea that bare conditionals obey the principle of conditional excluded middle (CEM) (Barker, 1993; von Fintel, 1994, 1997). In a theory-neutral way the principle of CEM can be expressed as follows: two claims "if p, q" and "if p, not q" cannot both be false.[5] The exact realization of this principle depends on the approach to the semantics of conditionals that one adopts. Von Fintel (1994) develops the idea that the covert universal modal operator that bare conditionals restrict – the generic operator – carries a homogeneity presupposition. A very simplified[6] semantics for GEN is given in (31).

(31) For any sets of worlds A and B, $[[GEN]]^{g,w}(A)(B)$ is defined only if $A \subseteq B \vee A \subseteq B'$.
If defined $[[GEN]]^{g,w}(A)(B)$ is T iff $A \subseteq B$.

Because of the homogeneity presupposition GEN is predicted to obey CEM (32). Essentially the higher scope negation over GEN is interpreted as the lower scope negation operating only on the proposition in scope of GEN.

(32) CEM for GEN: $\neg\ [[GEN]]^{g,w}(A)(B) \Leftrightarrow [[GEN]]^{g,w}(A)(\neg B)$

This solves the puzzle of *only* with bare conditionals in the following way. *Only* negates the only alternative given in (33). The homogeneity presupposition says that both (33) and (34) cannot be false, thus negation of (33) entails that (34) must be true.

(33) $P' \subseteq Q$

(34) $P' \subseteq Q'$

This is exactly the desired result, since (34) can be paraphrased as (35).

(35) In **all** worlds where the queen is **not** home, the flag is **not** up.

3.3. CEM as a problem for the analysis of *unless*-conditionals

The semantics for *unless*-conditionals developed in Section 2.3, as well as the semantics suggested by von Fintel (1994) introduced in Section 2.2, is not compatible with CEM. It essentially involves negation of all the alternatives built by substitution of the complement of *unless* with a different proposition. If we consider the claim in (36), then the set of negated

[5] For arguments against CEM see Leslie (1997).
[6] This semantics is simplified because it completely ignores the accessibility relation or the selection function that von Fintel uses to restrict the domain of GEN and account for the fact that GEN only makes a claim about relevant normal situations.

alternative modal claims will include things like the ones given in (37), because the list of the alternatives for a complement of *unless* includes any other possible proposition (that is not a superset of the original proposition).

(36) Unless it rains, the party will be outside.

(37) $\{\neg\ [g(C_1)(w_0) - \{w_1$: I call my mom in $w_1\} \subseteq \{w_1$: the party is outside in $w_1\}]$,
$\neg\ [g(C_1)(w_0) - \{w_1$: John is late in $w_1\} \subseteq \{w_1$: the party is outside in $w_1\}]$,
$\neg\ [g(C_1)(w_0) - \{w_1$: it snows in $w_1\} \subseteq \{w_1$: the party is outside in $w_1\}]$, etc.$\}$
(where C_1 stands for a contextually determined accessibility function)

If the high scope negation is interpreted as the low scope negation (because of CEM) we will end up with truth-conditions that involve a set of universal claims like the ones in (38). The claims listed in (38) are clearly not a part of what (36) means.

(38) In **all** worlds in which I don't call my mom, the party is **not** outside,
In **all** worlds in which John is not late, the party is **not** outside,
In **all** worlds in which it does not snow, the party is **not** outside, etc.

Moreover, the set of possible alternatives for the complement of *unless* includes all possible propositions, thus it will include not only the proposition denoted by *it snows*, but also the proposition denoted by its negation *it does not snow*. Putting those two propositions instead of the original complement of *unless* and negating the resulting modal claims by CEM is equivalent to saying that the party is not outside in all possible worlds (39). This contradicts the original modal claim that states that the party is outside in all worlds where it does not rain.

(39) In **all** worlds in which it does **not** snow, the party is **not** outside.
In **all** worlds in which it **snows**, the party is **not** outside.

This line of argumentation shows that the semantics for *unless*-conditionals suggested in this paper is not compatible with the principle of Conditional Excluded Middle that has been argued to be necessary to solve the problem of *only-if*-conditionals. In the next section I will show that CEM is not needed to solve the *only if* puzzle.

4. How to construct the alternatives for conditionals: *only if* without CEM

In this section I will show that we can derive the meaning of conditionals with exhaustifiers like *only* in a compositional manner if we drop the assumption that the set of focus alternatives for a proposition (denoted by an *if*-clause) includes only the proposition itself and its negation. I will show that if we allow this set to include any other possible proposition, the problem of *only if* can be solved without CEM or any special stipulations about the nature of the covert modal.

Let us go back to our example (24) (repeated as (40)). Its prejacent expresses the modal claim in (41).

(40) **Only if** the queen is home, is the flag up.

(41) $P \subseteq Q$
Where P = {w: the queen is home in w},
Q = {w_1: the flag is up in w_1}.

Only will negate all of the alternatives for this sentence that are created by substitution of the focused element with other expressions of the same type except for those that are entailed by the original sentence. The focused element in this case is the *if*-clause that I represented by R. Normally, *only* is represented as a quantifier over propositions or sets of worlds, as in (42). The contribution of *only* is to say that, for every proposition in the set of focus alternatives, if that alternative is true then it is entailed by the original sentence.[7]

(42) $[[\text{Only } \alpha]]^{w,g} = T \text{ iff } \forall r\ [(r \in [[\alpha]]^{g}{}_{f}\ \&\ w \in r) \rightarrow [[\alpha]]^{g} \subseteq r]$

In our case, whether a particular alternative is entailed by the original claim depends solely on the properties of its restrictor, because the alternatives differ from the original claim only with respect to their restrictor.

The universal quantifier is downward entailing on its first argument. Therefore the alternatives that are created by substitution of R by a subset of R are entailed by the original claim and cannot be negated by *only*. All other alternatives are negated.

Given this, we can represent the contribution of *only* by quantifying over alternative restrictors. We need to say that for every alternative restrictor, if it makes the quantification claim true, then this restrictor is a subset of the original restrictor. The formula in (43) says exactly the same thing as *only* applied to this particular modal construction.

It specifies the exact form of the alternatives (the antecedent of the material implication in (43)). It also specifies what it means for a resulting alternative quantificational claim to be entailed by the original one (the consequent of the material conditional in (43)): its restrictor is a subset of the original restrictor. This is because all and only quantificational claims with restrictors that are subsets of the original restrictor are entailed by the original quantificational claim.

(43) $\forall Y\ (Y \subseteq Q \rightarrow Y \subseteq P)$

Based on this way of representing the contribution of *only*, it can be shown that negation of all of the alternatives for (41) (with the exception of those that are entailed by the original sentence) entails that in all worlds in which the flag is not up, the queen is not home. The relevant proof is given in (44).

[7] In set talk: for any set of worlds if it is a member of the set of focus alternatives and the actual world is a member of this set, then the set of worlds denoted by the original sentence is its subset.

(44) a. $\forall Y\ (Y \subseteq Q \rightarrow Y \subseteq P) \Rightarrow$
b. $Q \subseteq P \Leftrightarrow$
c. $P' \subseteq Q'$
(where P' stands for the complement set of P and Q' stands for the complement set of Q, following the standard notation.)

The claim in (44)c can be paraphrased as (45).

(45) In **all** worlds where the queen is **not** home, the flag is **not** up.

The proof in (44) shows that if we take focus alternatives for a proposition denoted by an *if*-clause to be any possible proposition and negate all alternatives for an entire conditional (excluding the ones that are entailed by the original claim), we get the desired interpretation for *only* with bare conditionals.

5. The results of the suggested approach

In this section I will discuss the meaning of *unless*-conditionals and *only-if-not*-conditionals that is predicted by the approach suggested in this paper. I will also show that this approach explains the properties of *unless*-conditionals discussed in Section 2.

5.1. The predicted meaning of *unless*-conditionals and *only-if-not*-conditionals

The predicted meaning of (46) is given in (47). The first conjunct in (47) comes as a result of negating of all the alternatives for a modal claim. As was shown above, negation of all the alternatives in this case gives us the universal claim with the restrictor being the negation of the original restrictor and the scope being the negation of the original scope.[8] The second conjunct is the prejacent of "O" (and the *unless*-clause is interpreted as a negative *if*-clause).

(46) Unless it rains, the party will be outside.

(47) $[[(46)]]^{g,w0}$ = T iff $g(C_1)(w_0) \cap$ {w: it rains in w} $\subseteq$ {w: the party is outside in w}'
& $g(C_1)(w_0) \cap$ {w: it rains in w}' $\subseteq$ {w: the party is outside in w}

The predicted meaning of (48) is given in (49). This is the result of exhausting the alternatives. The semantics for *only if not* does not contain the second conjunct because *only* does not assert its prejacent.

(48) Only if it does not rain, will the party be outside.

(49) $[[(48)]]^{g,w0}$ = T iff $g(C_1)(w_0) \cap$ {w: it rains in w} $\subseteq$ {w: the party is outside in w}'

[8] Here I introduce the accessibility relation. The proof that was given in Section 4 ignored it. I demonstrate that adding the accessibility relation will give the same result in (47) in the Appendix.

The universal claim in (49) is the shared part of the meaning of the *unless*-conditional in (46) and *only-if-not*-conditional in (48). By making *only if not* and *unless* structurally and semantically similar this approach correctly predicts that (46) and (48) are very close in meaning. *Unless*-conditionals are predicted to be closer to *if-and-only-if*-conditionals, due to the fact that "O" asserts its prejacent and *only* does not.

5.2. Explaining the properties of *unless*-conditionals

5.2.1. Weak NPI licensing in *unless*-clauses

Weak NPIs are licensed in *unless*-clauses, as we saw before in (11) (repeated here as (50)).

(50) Unless **anyone** objects, we must move on.

Under the standard account NPIs like *any* and *ever* require downward entailing (DE) environments (Fauconnier, 1975, 1978; Ladusaw, 1979). To explain the ability of *unless*-clauses to host weak NPIs, I will adopt the environment-based approach to NPI licensing (Chierchia, 2004; Gajewski, 2005; Homer, 2011), according to which an NPI is licensed if there is a constituent containing that NPI which is the proper environment for that NPI.

For example, in (51) *any* is licensed, even though if we consider the entire sentence the position of *any* is not in DE context. Two DE operators – the lower clause negation and *no one* – make the environment of *any* upward entailing. However, there is a constituent in the sentence such that it is a proper environment for the NPI – the embedded negative sentence (this constituent is underlined in (51)).

(51) **No** one thinks that <u>John has **not** done any work</u>.

According to the account proposed in this paper the exhaustifier "O" and domain subtraction are separated syntactically. The constituent where *any* is licensed in (64) is the *unless*-clause itself, interpreted as *if not*. Thus the NPI licenser in this case is the negation or domain subtraction.

5.2.2. No licensing of strict NPIs: bi-clausal structure of *unless*-clauses

Strict NPIs, like *in years*, are not licensed in *unless*-clauses, see (52).

(52) * **Unless** John has visited Mary **in years**, I am happy. (Geis, 1974)

However, negation is known to license strict NPIs. To account for the strict NPI facts in *unless*-clauses, I suggest that *unless*-clauses have a more complex structure than they appear to have. I propose that *unless*-clauses consist of two clauses: they have a structure similar to "if it is **not** the case **that p**".

In years is not licensed if it is separated from negation by a finite clause boundary, as shown in (53). As (54) shows, this is not a problem for *any*. I propose that *in years* is not licensed in (52) for the same reason it is not licensed in (53): in both cases *in years* appears in a positive clause. Negation is too high to license the strict NPI. The schematic representation of the syntactic structure of an entire *unless*-conditional like (55) is given in (56). The *unless*-clause is marked in bold. This is the constituent in which weak NPIs are licensed.

(53) *It is **not** true **that** John has visited Mary **in years**.

(54) It is **not** true **that** John talked to **anyone**.

(55) Unless anyone objects, we will go on.

(56) [$_{TP}$ O [$_{CP}$ **[$_{CP}$ un [$_{PolP}$ less [$_{vP}$ ∅ [$_{CP}$ [∅$_{Com}$ anyone objects]]]]** [$_{TP}$ we will$_{C1}$ go on]]

The evidence in favor of this syntactic structure comes from the historical development of *unless*-conditionals. The *unless*-construction originates from *on lesse that, lesse than*, or *in*/*on*/*of lesse than* (one relevant example from Traugott (1997) is given in (57)).

(57) That thar sholde no Statut no Lawe be made, **oflasse than** they yeaf thereto their assent.
That no statute nor law should be made **unless** they gave their consent to it.
(1414 Parlt [HC] as cited by Traugott (1997) (her example (14c))

Thus at some point the domain subtraction was overtly separated from its complement by a finite clause boundary. I suggest that even though this clause boundary is not expressed overtly any longer in present-day English, native speakers are still sensitive to its presence.

5.2.3. *Unless* with *even* and *only*

I proposed that *unless* marks its complement with focus and is obligatorily c-commanded by a focus sensitive operator "O". This provides a natural explanation for the fact that *unless*-clauses cannot be associated with focus sensitive operators like *even* and *only*.

Elements that are already associated with one focus sensitive operator cannot be associated with another one (60). Thus the restriction observed in (58) is the same as the one observed in (59) and (60).

(58) *The party will be outside only unless it rains.

(59) *The party will be outside only only if it does not rain.

(60) *Bill gave flowers even only to Sue.

5.2.4. Coordination facts

The fact that two *unless*-clauses cannot be coordinated follows from the semantics proposed in this paper. Given this analysis, there predicted to be a conflict between the meaning of the first conjunct ("unless John leaves today I will leave") and the meaning of the second conjunct ("unless Joe leaves today I will leave") in (61).

(61) *Unless John leaves today and unless Joe leaves today, I will leave.

"O" negates all of the focus alternatives for the modal claim in the first conjunct. One of the alternatives for the complement of *unless* in the first conjunct is the proposition denoted by *Joe leaves today*. Thus the list the alternatives that "O" negates will include the modal claim in (62). "O" asserts its prejacent. The contribution of the prejacent of "O" in the second conjunct is given in (63). Negation of (62) directly contradicts (63). Conjunction of two *unless*-clauses will always result in a contradiction of this sort.

(62) $\neg$ [$g(C_1)(w_0) \cap$ {w: Joe leaves today in w}' $\subseteq$ {w: I leave in w}]

(63) [$g(C_1)(w_0) \cap$ {w: Joe leaves today w}' $\subseteq$ {w: I leave in w}]

5.2.5. *Then* in *unless*-clauses

Then is ungrammatical in both (64) and (65).

(64) ***Unless** it rains, then the party will be outside.

(65) ***Only** if it does not rain, then the party will be outside.

I will adopt the proposal by Iatridou (1994) and von Fintel (1994), according to which conditionals with *then* are examples of the left-dislocation construction. There are restrictions on what kind of items can be left-dislocated and those restrictions explain ungrammaticality of *then* in such conditionals.

An example of the left-dislocation construction is given in (66). In (66) a DP *the girls you invited* is left-dislocated. It is followed by a full clause, the subject position of which is occupied by the resumptive pronoun *they*. This pronoun picks up the same group of individuals as the left-dislocated DP (*the girls you invited*).

(66) The girls you invited, they are interesting.

Iatridou (1994) and von Fintel (1994) point out that focus sensitive operators like *only* and *even* cannot be associated with left-dislocated items ((67), (68)).

(67) ***Only** the girls you invited, they're interesting.

(68) ??**Even** the girls you invited, they're interesting.

Treating conditionals with *then* as examples of the left-dislocation construction allows us to reduce the restriction observed in (64)-(65) to the restriction observed in (67)-(68).

6. Conclusion

In this paper I offered an analysis of *unless*-conditionals, which is built on the observation going back to the work of Comrie (1986) that *unless*-conditionals mean the same thing as *if* *and only if not*. I suggested an approach that takes this idea literally and derives the meaning of *unless*-conditionals from a negative conditional, focus alternatives and an operator "O" that is exactly like *only* except that it asserts its prejacent.

I argued that there is a parallelism between *only-if-not-* and *unless*-conditionals. First of all, in both cases a negative condition (interpreted as a restrictor on a universal modal) and exhaustification are contributed by two items separated syntactically. This provides an explanation for weak NPI licensing in *unless*-clauses. Secondly, the list of alternatives for *unless*-conditionals and for *only-if-not*-conditionals that are negated by an exhaustifier is constructed in the same way. I suggested that a set of alternatives for a proposition denoted by an *if*-clause or by a complement of *unless* has to include all possible propositions. I showed that this way of constructing alternatives provides a natural solution to the problem of *only* with bare conditionals. In this way, this proposal derives the right interpretation for conditionals with *only* in a compositional manner without any stipulations about the nature of the covert operator that conditionals restrict.

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Appendix. The leastness condition vs "O".

In this appendix I would like to demonstrate two things. The first is that the result of using "O" is predicted to be slightly different than the result of using the leastness condition proposed by von Fintel (1994) (reviewed in Section 2.2). The second one is that if a modal has a complex restrictor that includes an accessibility relation, the result of negating alternatives for this modal claim formed by substitution of a proposition denoted by an *if* or *unless*-clause with any other possible proposition will give us the right interpretation for the sentence. I will demonstrate this using the example in (1).

(1) a. Unless it rains, the party will be outside.
b. LF: $[_{TP3}$ O $[_{TP2}$ $[_{CP}$ unless it rains] [λ1 $[_{TP1}$ the party [will$_{C2}$ P_1] be outside]]]]

We can represent the meaning of the prejacent of "O" in (1) (evaluated in the actual world) as in (2).

(2) $[[TP_2]]^{w0,g}$= T iff $R – Q \subseteq P$
R:={w: w is accessible from w_0}, Q:={w: it rains in w}, P:={w: the party is outside in w}

Von Fintel (1994) shows that the result of applying the leastness condition to the set Q in this modal claim (given in (3)a) is equivalent to (3)b.

(3) a. $\forall Y\,(R-Y \subseteq P \rightarrow Q \subseteq Y)$
b. $Q \subseteq P' \cap \mathbf{R}$
All the worlds where it rains are **the accessible worlds** where the party is **not** outside.

The problem with (3)b is that the accessibility relation appears on the wrong side. If the relevant accessibility relation is, for example, epistemic, then (3)a entails that every world where it rains is a world that is compatible with what is known. That is too strong. There might be worlds where it rains and the Earth is flat and those are not compatible with what is known.

The result of negating alternatives with "O" is given in (4), which is the desired result ("O" also asserts its prejacent, but right now we are focusing only on the result of negating alternatives).

(4) $Q \cap \mathbf{R} \subseteq P'$
All **accessible worlds** where it rains are the worlds where the party is **not** outside.

Here is the reason why "O" and "leastness" give different results. All modal claims that are formed by substitution of the original subtracted set R by its superset are indeed entailed by the original modal claim. However, they are not the only ones that are entailed. It can happen that subtracting a set of worlds will give us a modal claim with an empty set as the restrictor. This modal claim is entailed by the original one, but this subtracted set does not have to be a superset of R. We can demonstrate this scenario on the following model (5). A modal claim (6) is true in this model.

(5) $U:=\{a,b,c,d,e\}$, $R:=\{a,b,c\}$, $Q:=\{b,d\}$, $P:=\{a,c,e\}$

(6) $R-Q \subseteq P \Leftrightarrow \{a,c\} \subseteq \{a,c,e\}$

Let's consider an alternative modal claim where the subtracted set is {a,b,c} (7). This universal claim is true, because its restrictor is empty.

(7) $R-\{a,b,c\} \subseteq P$

The leastness condition tells us that if the resulting alternative is true, then the new subtracted set is a superset of the original one. Thus it should be the case that $\{b,d\} \subseteq \{a,b,c\}$, but it is not true. Therefore, some of the resulting modal claims are entailed by the original one, but the subtracted set is not a superset of the original one.

The actual result of negating all of the alternatives, except for the ones that are already entailed by the original modal claim (the result of applying "O" – again, ignoring the asserted prejacent) is given in (8).

(8) $\forall Y\,[((R-Y) \subseteq P) \rightarrow ((R-Y) \subseteq (R-Q))]$

The formula says that if the quantificational claim is true, then the entire new restrictor is a subset of the original restrictor (because the universal quantifier is downward entailing on its first argument). We can simplify this formula.

(9) Step 1: The left side inside the square brackets:
$R - Y \subseteq P = P' \subseteq (R - Y)'$ by contraposition
$= P' \subseteq (R' \cup Y)$ by DeMorgan's law
$= (P' \cap R) \subseteq Y$ by the following equivalence: for any A, B:
$A \subseteq (B \cup C) = A \cap B' \subseteq C$

(10) Step 2: The right side inside the square brackets:
$(R - Y) \subseteq (R - Q) = (R - Q)' \subseteq (R - Y)'$ by contraposition
$= (R' \cup Q) \subseteq (R' \cup Y)$ by DeMorgan's law
$= ((R' \cup Q) \cap R) \subseteq Y$ for any A, B: $A \subseteq (B \cup C) = A \cap B' \subseteq C$
$= ((R' \cap R) \cup (Q \cap R)) \subseteq Y$ by distributive laws

(11) Step 3: Putting the results together:
$\forall Y\ ((P' \cap R) \subseteq Y \rightarrow ((R' \cap R) \cup (Q \cap R)) \subseteq Y)$[9] =
$((R' \cap R) \cup (Q \cap R)) \subseteq (P' \cap R)$ $\Rightarrow$ because the universal quantifier is DE on its first argument
$(Q \cap R) \subseteq (P' \cap R)$ = All accessible worlds where it **rains** are worlds where the party is **not** outside.
This is the desired result.

The same result is predicted if *only* negates all of the alternatives for a negative conditional clause. Thus (12) is predicted to have the following truth-conditions.

(12) Only if it does not rain, will the party be outside.

(13) $[[(12)]]^{w0,g}$= T iff **$(Q \cap R) \subseteq (P' \cap R)$** where R:={w: is accessible from w_0}, Q:={w: it rains in w}, P:={w: the party is outside in w}

[9] The following equivalence is used here: for any sets A and B: $\forall Y\ (A \subseteq Y \rightarrow B \subseteq Y) = B \subseteq A$