HOW TO UNIFY RESTRICTIVE AND CONDITIONAL *IF*-CLAUSES

JANNEKE HUITINK

Department of Philosophy
Radboud University Nijmegen
janneke.huitink@gmail.com

This paper compares two unifying analyses of restrictive and conditional *if*-clauses. The first, going back to Lewis and Kratzer, denies that *if* has any meaning, and attributes seemingly conditional uses to covert operators. The second analysis is due to Belnap and assigns a partial semantics to conditionals. On this account, the difference between restrictive and conditional *if*-clauses reduces to a mundane scope ambiguity. I will present three reasons to prefer Belnap's analysis.[1]

1. Restrictive and conditional *if*-clauses

Pre-theoretically, there appear to be two kinds of *if*-clauses. The first kind of *if*-clause functions as a mere domain restrictor. Take (1) by von Fintel 1998:

(1) Few people like New York if they didn't grow up there.
$\approx$ Few people that didn't grow up in New York like it there.

It is natural to interpret the quantifier as ranging over individuals which satisfy the *if*-clause. Apart from this, the *if*-clause doesn't seem to make any contribution. Other conditionals, however, do seem to contribute a genuine conditional meaning. An example, taken from von Fintel and Iatridou 2002, is:[2]

(2) Many of the students will succeed if they work hard.
$\not\approx$ Many of the students who work hard succeed.

Sentence (2) isn't equivalent to its relative clause variant, i.e. quantification doesn't range over students who work hard. Rather, the sentence seems to ascribe many of the students a conditional property: λx.(x will succeed if x works hard).

The present paper asks how these two kinds of *if*-clauses can best be unified. In the next section, we will look at the theory which is currently most popular.

[1] A third Stalnakerian analysis proposed by von Fintel and Iatridou 2002, will, for reasons of space, be left out of the discussion. See Huitink 2007 for a critical discussion.
[2] The same holds for ordinary indicatives like 'If Oswald didn't shoot Kennedy, someone else did', but we focus on more difficult conditionals that, superficially, occur in the scope of determiner quantifiers.

2. The determiner-restrictor theory

Lewis 1975 observed that some *if*-clauses function as domain restriction devices. Since then, many linguists have come to believe that this is true of *if*-clauses *in general*, including conditional ones as in (2) that appear to stand on their own. For example, Kratzer 1991, 656 writes:

> The history of the conditional is the story of a syntactic mistake. There is no two-place *if* ...*then* connective in the logical forms of natural languages. *If*-clauses are devices for restricting the domains of various operators. Whenever there is no explicit operator, we have to posit one.

That is, *if* has no meaning, but marks an additional restriction on the domain of some higher quantifier. Accordingly, (3) receives the following logical form, in which *if*'s complement is part of the restrictor, while the main clause forms the nuclear scope:

(3) Few people like New York if they didn't grow up there.
(few x: x is a human $\wedge$ x didn't grow up in NY)(x likes it there)

This is true in a world w iff few values for x that satisfy the restrictive clause in w also satisfy the scope in w, i.e. iff few people that didn't grow up in New York like it there. Note that there is nothing in the representation that corresponds to *if*.

Given that *if* is semantically empty, how do we deal with sentences like (2) where the item seems to contribute a conditional meaning? As is clear from Kratzer's quote, whenever *if* appears to have meaning, this must be due to a covert operator, the domain of which is restricted by the *if*-clause. The covert operator is often an epistemic necessity modal. This leads to the following analysis:

(4) Many students will succeed if they work hard.
(many x: x is a student)((must: x works hard)(x succeeds)

This is true in a world w iff for many students x it holds that x succeeds in those accessible possible worlds in which x works hard, i.e. iff for many students the fact that he/she works hard licenses the conclusion that he/she will succeed.

3. Belnap's alternative

Many people seem to think that the only way to account for restrictive *if*-clauses is to allow that *if* is (at least in some cases) semantically empty.[3] But there is another way. Belnap 1970 proposed that a conditional $\phi \rightarrow \psi$ has the same truth value as ψ if ϕ is true, and lacks truth value otherwise:

(5) $[\![\phi \rightarrow \psi]\!]^w = [\![\psi]\!]^w$ if $[\![\phi]\!]^w = 1$; otherwise $[\![\phi \rightarrow \psi]\!]^w$ is undefined.

[3] A notable exception is Lewis himself, who was aware of Belnap's alternative, but dismissed it; see Lewis 1975, 11, fn 1. I aim to show that Lewis was too dismissive.

In a system like Belnap's, it seems natural to let quantifiers ignore individuals for which their scope is not defined. To see this, consider:

(6) Most tickets were sold at checker 4. (adapted from Eckardt 1999)
$\approx$ Most tickets *that were sold* were sold at checker 4.

Being sold is a prerequisite of being sold at checker 4. When interpreting (6), we seem to take this into account, which suggests the following semantics for *most*:

(7) $[\![(\text{most x: } \phi)(\psi)]\!]^g = 1$, iff $[\![\psi]\!]^{g[a/x]} = 1$ for most individuals a for which $[\![\phi]\!]^{g[a/x]} = 1$ and $[\![\psi]\!]^{g[a/x]} = 0/1$; 0 otherwise.

Notice that this definition is classical, i.e. not partial.[4] Inserting Belnap's conditional in the scope of a quantifier now leads to domain restriction with the *if*-clause:

(8) Most people don't like New York if they didn't grow up there.
(most x: x is human)(x didn't grow up in N.Y. → x doesn't like N.Y.)

This is true iff most values of x that satisfy the restrictor *and meet the definedness conditions* of the scope, satisfy the scope, that is, iff most people that didn't grow up in New York, don't like it there. Conclusion: it is possible to maintain that *if* has conditional meaning and still account for restrictive *if*-clauses.

What about conditional *if*-clauses? One could follow Kratzer's lead and assume that there is a covert modal embedded under the quantifier which is restricted by the *if*-clause. Indeed, von Fintel 2007 speculates that Belnap's conditional may perhaps never stand on its own. But why should we resort to covert material? The determiner-restrictor theory is forced to do this because it denies that *if* has conditional meaning, but on Belnap's analysis *if* does have meaning of its own. Given this semantics, conditional *if*-clauses can alternatively be analyzed as wide scope takers. This leads to the next representation for (9):

(9) Many of the students will succeed if they work hard.
(∃Y: Y is a set of students ∧
(Y works hard → (many x: x ∈ Y)(x will succeed))

I assume that *many of the students* presupposes a set of salient students, which is picked up by *they*. When defined, i.e. when the students referred to work hard, (9) is true iff many of them will succeed.

To sum up, there are two ways to unify restrictive and non-restrictive *if*-clauses. One is a classical approaches but comes at the cost of a rather baffling assumption: *if* is meaningless. It follows that seemingly conditional instances must be the work of covert operators. The other assigns a partial but not implausible semantics, and is able to attribute any observed conditional meaning to *if* itself. On this analysis, the difference between restrictive and conditional *if*-clauses reduces to an ordinary scope

[4] Nothing hinges on this; we could just as well say that (6) is undefined in case no tickets were sold.

ambiguity. One cannot help but feel that Belnap's account is far more elegant. For this reason alone, this semantics may be preferred. But there are further arguments.

4. Reasons to prefer Belnap's semantics

4.1. Conditionals in dialogue

The first argument comes from von Fintel 2007 who is concerned with conditionals in dialogue:

(10) A: If he didn't tell Harry, he told Tom.
B: Probably so.

The propositional anaphor *that* seems to refer back to the conditional in A's utterance. But B's utterance isn't interpreted as expected under the determiner-restrictor theory. If this analysis were correct, B's utterance would incorporate a modalized sentence under *probably*, yet the sentence is interpreted as if *probably* embeds a conditional with a restrictive *if*-clause.

One cannot maintain that the anaphor simply stands for the consequent of the conditional in A's utterance, while a covert anaphor (a part of *probably*) refers back to the antecedent, parallel to the next dialogue:

(11) A: Every student smokes.
B: Most (of them) do.

If implicit conditionalization were an option, the following utterance by B should be able to express that he told Tom in most worlds in which he didn't tell Harry, but this isn't borne out. It expresses that it is merely probable that he told Tom:

(12) A: If he didn't tell Harry, he told Tom.
B: He probably told Tom.

Belnap's conditional fits the interpersonal traffic of conditionals like a charm:

(13) A: If he didn't tell Harry, he told Tom.
he didn't tell Harry $\rightarrow$ he told Tom
'if the conditional is defined, i.e if he didn't tell Harry, he told Tom'

B: Probably so.
(probably:)(he didn't tell Harry $\rightarrow$ he told Tom)
'in most worlds where the embedded conditional is defined, i.e. where he didn't tell Harry, he told Tom'

Von Fintel concludes that Belnap's conditional is a better implementation of Kratzer's idea that it is the "life-goal" of *if*-clauses to restrict the domain of some operator or other. As argued above, however, this idea loses its motivation in Belnap's system, and we might explore his semantics as a genuine alternative.

4.2. Compositionality

My second argument is that Belnap's conditional allows for a more straightforward compositional semantics than the determiner-restrictor analysis does. The main problem for implementing the latter theory is that, at surface, *if*-clauses do not appear where they are interpreted. To solve this, von Stechow 2004 assumes that *if*-clauses are base generated as syntactic arguments of the operator whose domain they restrict. Overt word order is derived by movement. At LF, the *if*-clause reconstructs:

(14) $[_S[_{DP}$ few people if they didn't grow up in New York] $[_{VP}$ like it there]]

Compositional interpretation proceeds by constructing a complex restrictor out of the common noun and the *if*-clause, to which *few* is applied. The result is then applied to the rest of the sentence (due to lack of space, I must skip over the details). Another solution is proposed by von Fintel 1994, ch.3, who assumes that quantifiers take a free restrictor variable as their argument which may be bound by an *if*-clause:

(15) $[_S[_{DP}$few people i] $[_{VP}$ $[_{VP}$ like New York] $[_{CP}$if$_i$ they didn't grow up there]]]

Through this co-indexation, the *if*-clause poses restrictions on the value the assignment function might give to i.

With Belnap's semantics, there is no longer any mismatch between syntax and semantics. LFs correspond to surface structure:

(16) $[_S[_{DP}$few people] $[_{VP}$ $[_{VP}$ like New York] $[_{CP}$if they didn't grow up there]]]

We need not assume that the *if*-clause is a syntactic argument of the quantifier, nor that it binds some domain restriction variable.

4.3. Iterated conditionals

My final argument comes from conditionals with conditional consequents:

(17) If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.

This seems equivalent to 'if it rains or snows tomorrow *and* it doesn't rain, it will snow'. But on the determiner-restrictor analysis, (17) must be analyzed as a doubly modalized statement, which kills the equivalence:

(18) (must: it rains or snows)((must: it doesn't rain)(it snows))

I can believe that it rains or snows, but at the same believe that it is possible *relative to one of these live-possibilities* (where it rains or snows) that it neither rains nor snows.[5]

Belnap's semantics straightforwardly predicts the desired equivalence:

(19) (it rains or snows) $\rightarrow$ (it doesn't rain $\rightarrow$ it snows)

If (19) has a truth value, i.e. if it rains or snows, then it snows if the embedded conditional has a truth value, i.e. if it doesn't rain. That is, it snows if it rains or snows but doesn't rain.

5. Conclusion

We should drop the determiner-restrictor theory and opt for Belnap's system instead.

Bibliography

Belnap, N. D.: 1970, Conditional assertion and restricted quantification, *Noûs* 4(1), 1–12

von Fintel, K.: 1994, *Restrictions on quantifier domains*, Ph.D. thesis, University of Massachusetts at Amherst

von Fintel, K.: 1998, Quantifiers and 'if'-clauses, *The Philosophical Quarterly* 48(191), 209–214

von Fintel, K.: 2007, If*: the biggest little word*, Slides. Available at http://mit.edu/fintel/gurt-slides.pdf

von Fintel, K. and Iatridou, S.: 2002, *If and when* if*-clauses can restrict quantifiers*, Ms. MIT. Available at http://web.mit.edu/fintel/www/lpw.mich.pdf

Geurts, B. and Huitink, J.: 2006, Modal concord, in P. Dekker and H. Zeijlstra (eds.), *Proceedings of the ESSLLI 2006 Workshop Concord Phenomena at the Syntax-Semantics Interface*, University of Málaga

Huitink, J.: 2007, A unified account of restrictive and non-restrictive *if*-clauses, in M. Kluck and E. Smits (eds.), *Proceedings of the Fifth Semantics in the Netherlands Day*, pp 83–97, Groningen

Kratzer, A.: 1991, Modality/Conditionals, in A. von Stechow and D. Wunderlich (eds.), *Semantik: ein internationales Handbuch der zeitgenössischen Forschung*, pp 639–656, De Gruyter, Berlin

Lewis, D. K.: 1975, Adverbs of quantification, in E. Keenan (ed.), *Formal semantics of natural language*, Cambridge University Press

von Stechow, A.: 2004, *Modale und Konditionale*, Handout. Available at http://www2.sfs.uni-tuebingen.de/ arnim10/Handouts/Modalitaet.pdf

Zeijlstra, H.: 2007, *Modal concord is syntactic agreement*, Forthcoming in the Proceedings of SALT 17

[5] Proponents of the determiner-restrictor theory might try linking this to modal concord. Cf. 'Harry surely must stop talking soon': while containing two modal operators, this communicates just a single modality, see Geurts and Huitink 2006, Zeijlstra 2007. But it will be hard to make this compositional.