Partial Semantics for Iterated *if*-Clauses

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Abstract

This paper argues in favor of a partial semantics for indicative conditionals, along the lines of a proposal made by Belnap in the seventies: conditionals only have a truth value if their antecedent is true, and in this case, their truth value equals the truth value of their consequent. I argue that this semantics offers a way out of the impasse following Gibbard's (1981) famous proof that if $\varphi \rightarrow (\psi \rightarrow \chi)$ and $(\varphi \wedge \psi) \rightarrow \chi$ are equivalent, $\rightarrow$ cannot be stronger than material implication.

1 Introduction

The present paper concerns the meaning of *if* in indicative conditionals. An example of such a conditional is (1):

(1) If it is snowing, it is cold.

I am going to explore a proposal made by Belnap (1970, 1973) which says that *if* corresponds to a two-place connective $\rightarrow$, with a partial semantics, informally as follows:

(2) $\varphi \rightarrow \psi$ only has a truth value if φ is true and if $\varphi \rightarrow \psi$ has a truth value, this is the truth value of ψ.

The structure of the paper is as follows. Section 2 introduces one of the problems that Belnap's partial semantics helps to solve: the problem of iterated *if*-clauses.[1] After that, section 3 discusses existing solutions and their problems. Then, in section 4 Belnap's semantics is introduced and I will explain how it deals with iterated *if*-clauses.

Of course, once we adopt a partial semantics, we are bound to alter the predictions that classical approaches make about the logic of conditionals. But I will argue in section 5 that we shouldn't be too worried about this. Finally, in 6 I will conclude the

[1] I actually believe that there are further reasons to adopt the partial semantics that I am championing here: (i) it offers a neat account of the interpretation of conditionals in the scope of quantifiers, and (ii) the interpersonal traffic of conditionals in dialogue seems to require a two-place connective just like the one I am advocating here. See Huitink (2008, chapter 5) for discussion.

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paper by some remarks on how the partiality that I propose to write into the semantics of *if* relates to the partiality that is often employed in theories of presupposition projection.

2 The problem: iterated *if*-clauses

2.1 Material implication and its paradoxes

In order to see what is problematic about iterated *if*-clauses, we must consider a traditional proposal about the meaning of *if*. Material implication goes back to Philo of Megara, but was championed by logicians like Frege and Russell. The idea is that an indicative conditional excludes the possibility that its antecedent is true while its consequent is false:

(3)

φ	ψ	$\varphi \supset \psi$
1	1	1
1	0	0
0	1	1
0	0	1

If you believe that *if* is truth functional, material implication is really the only reasonable option (in a classical system, that is). To see this, consider (4):

(4) If Mary and John are both in Paris, then Mary is in Paris.

This conditional is true, come what may. It is thus true when its components are (true, true), (false, true), or (false, false). Now, if conditionals are indeed truth-functional, it follows that they are *always* true in these cases, cf. Edgington (1995, 242).[2]

Nevertheless, material implication seems plain wrong as an analysis of indicative conditionals. In fact, associating the semantics of 'ordinary' indicative conditionals with $\rightarrow$ leads to counterintuitive predictions, known as *paradoxes of material implication* (see Bennett (2003) for an overview). These paradoxes have two sources:

1. Whenever the antecedent is false, the conditional is true.
2. Whenever the consequent is true, the conditional is true.

The first paradox is that the material implication analysis predicts that the falsity of the antecedent is sufficient to affirm the truth of a conditional. However, this doesn't seem to be borne out. We would not reason as follows: I am convinced that the Chinese will stay out of the conflict, therefore I am convinced that (5) is true (example from Stalnaker (1968)):

(5) If the Chinese enter into the Vietnam conflict, the United States will use nuclear weapons.

[2]Obviously, the components of (4) are such that it cannot happen that the antecedent is true while the consequent is false. Hence, (4) does not establish that conditionals should be false in this case. However, no one doubts that conditionals are false in this situation.

The second paradox is that, given an analysis of indicative conditionals as material implications, the truth of the consequent is predicted to be sufficient to affirm the truth of a conditional. This, too, seems unwarranted. If you believe that the US will use nuclear weapons, simply because of their arrogance, the low intelligence of their president or whatever, but have no opinions about the future actions of the Chinese, you wouldn't utter (5), which seems to state that there is some *connection* between the US warfare and Chinese politics. In sum, the problem with analyzing indicative conditionals as material implication is that this makes it far too easy for such conditionals to be true.

Several solutions have been proposed. Some have opted for a pragmatic defense, saying that conditionals with false antecedents (true consequents) are true, but infelicitous, e.g. David Lewis (1976), but it has convincingly been argued by Bennett (2003, 38-42) that such stories don't hold water. In short, the problem is that disbelief in its antecedent does not automatically mean that one shouldn't utter a conditional. Others have proposed stronger, modal truth conditions, i.e. strict implication by C.I. Lewis (1912, 1918). Conditionals do not just exclude that the antecedent is true while the consequent is false, but they claim that this is impossible. Such an analysis still gives rise to some paradoxes. For instance, if the antecedent is contradictory, the conditional is automatically true. Lewis thought that these paradoxes were less severe than those of material implication, but not everyone agreed (relevant logicians did not (Mares, 2008)).

2.2 Iterated *if*-clauses

We are now ready to state the problem about iterated *if*-clauses. The problem is that the following two sentences are equivalent. In fact, both are trivial (Edgington, 1995):

(6) a. If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.
 b. If it rains or snows tomorrow and it doesn't rain (tomorrow), it will snow.

Why is this problematic? This: Gibbard (1981) famously proved that it follows from this equivalence that indicative conditionals cannot have stronger truth conditions than material implication.

Let $\rightarrow$ stand for the indicative conditional, without prejudging its semantics, and suppose we adopt the following principles:

(i) $\varphi \rightarrow (\psi \rightarrow \chi) \equiv (\varphi \wedge \psi) \rightarrow \chi$
(ii) $\varphi \rightarrow \psi \models \varphi \supset \psi$
(iii) If $\varphi \models \psi$, then $\models \varphi \rightarrow \psi$

These principles appear unremarkable. The first of these is just the equivalence we want to account for. Principle (ii) says that whatever truth conditions we assign to $\rightarrow$, they should be such that our conditional entails material implication. It seems agreed upon in the literature that we want this. Note that the modal analysis just alluded to (i.e. strict implication) makes it true. Finally, principle (iii) says that if one sentence entails another, it implies this sentence. For example, 'Mary and John are both in Paris' entails 'Mary is in Paris', and 'If Mary and John are both in Paris, then Mary is in Paris' is indeed tautological.

Yet given these principles, we can proof that indicative conditionals cannot be stronger than material implication. The proof proceeds by showing that (7) is a tautology and that it entails (8):

(7) $(\varphi \supset \psi) \rightarrow (\varphi \rightarrow \psi)$

(8) $(\varphi \supset \psi) \supset (\varphi \rightarrow \psi)$.

To see that (7) is a tautology, note that it is by (i) equivalent to $((\varphi \supset \psi) \wedge \varphi) \rightarrow \psi$. This, in turn, is equivalent to $(\varphi \wedge \psi) \rightarrow \psi$ (by proposition logic). By (iii), this formula is true in any world. Now, given that $\rightarrow$ entails $\supset$ (principle (ii)) (7) entails (8). Now, as (8) is entailed by a tautology, (8) must itself be a tautology, and this must be because its antecedent entails its consequent. It follows that $\rightarrow$ cannot have stronger truth conditions than $\supset$.

3 Previous solutions

3.1 Kratzer's solution

Let's now discuss some solutions in the literature. First, Kratzer (1991) argues that Gibbard's proof shows that we were mistaken to assume that such things as conditional connectives exist. She wrote that:

> 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. (Kratzer, 1991, 656)

Take (9), in which a conditional occurs in the scope of a modal:

(9) If it is snowing, it must be cold.

Intuitively, the *if*-clause provides the restrictor of the modal, i.e. quantification ranges over worlds in which it is snowing. This follows if the modal and the *if*-clause are interpreted as a single quantifier-restrictor complex.

(10) (must if it is snowing) (it is cold)
"in all accessible worlds where it is snowing, it is cold"

Of course, not all conditionals occur embedded under an overt quantificational operator, but Kratzer assumes that in these cases, we must postulate a covert operator, which is usually an epistemic necessity modal like *must*. So (11) is analyzed as equivalent to (9), which seems right:

(11) If it is snowing, it is cold.
$\approx$ If it is snowing, it must be cold
"in all accessible worlds where it is snowing, it is cold"

We can now see how Krater would analyze iterated *if*-clauses. She proposes to treat such *if*-clauses as stacked relative clauses, which results in successive restriction of the domain:

(12) If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.
“in all worlds in which it rains or snows tomorrow and in which it doesn't rain tomorrow, it will snow”

Though this gets the predictions right, it requires to drastically rearrange various parts of the sentence (at surface, the *if*-clause occurs sentence-initially, far away from the covert operator that it is supposed to restrict).

Particularly problematic is the position of *then*. Intuitively, this word is some anaphoric element which picks up the *if*-clause (in von Fintel's (1994, chapter 3) version of the analysis, *then* is a phonetic realization of the modal's restrictor variable). However, then it occurs in the wrong place. Compare:

(13) a. If it rains or snows tomorrow, *then* if it doesn't rain tomorrow, it will snow.
b. If it rains or snows tomorrow, if it doesn't rain tomorrow, *then* it will snow.

We want to account for the meaning of (13a), but on Kratzer's analysis one would expect that this meaning could only be expressed by (13b).

3.2 Schlenker's solution

To solve the syntax-semantics mismatch associated with Kratzer's analysis, Schlenker (2004) proposes that *if*-clauses are plural definite descriptions of possible worlds. He would analyze our sentence as follows:

(14) If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.
[ιW: it rains or snows tomorrow (W)][ιW′: $W' \subseteq W$ and it doesn't rain tomorrow (W′)][all w: $w \in W'$] (it will snow (w))

Thus, Schlenker takes over Kratzer's assumption that the sentence contains a covert quantifier over possible worlds, but the relevant domain is now determined in a different way. The first *if*-clause denotes all and only those worlds in which it rains or snows. The second *if*-clause narrows this further down to just those worlds in which it rains or snows but doesn't rain. It is asserted that in all of the remaining worlds it snows.[3] Crucially, the (covert) modal in (14) is interpreted *in situ*. Hence, this representation is more natural than Kratzer's analysis from a syntactic point of view. However, the analysis makes different predictions than Kratzer does. For instance, it is now expected

[3] This analysis goes back to Schein (2003), who proposed it to solve a puzzle raised by Barker (1997): if pronouns go proxy for definite descriptions (as the E-type approach has it), how to account for sentences like (i)?

(i) If a theory is classical, then if it is inconsistent, it is usually trivial.

Here, the second occurrence of *it* is to be analyzed as ‘the classical inconsistent theory’, but this interpretation cannot be derived if *usually* is restricted by the coordination of the *if*-clauses.

that modals can also collectively quantify over the worlds supplied by the *if*-clause. But, as far as I know, such cases have not been attested.

4 Belnap's partial semantics

4.1 Conditional assertion

Belnap (1970, 1973) presents his conditional semantics as a formalization of the idea that conditionals make *conditional assertions*. He traces this idea back to Quine:

> Now under what circumstances is a conditional true? Even to raise this question is to depart from everyday attitudes. An affirmation of the form 'if *p* then *q*' is commonly felt less as an affirmation of a conditional than as a conditional affirmation of the consequent. [At this point, Quine credits Dr. Philip Rhinelander in a footnote - JH] If, after we have made such an affirmation, the antecedent turns out true, then we consider ourselves committed to the consequent, and are ready to acknowledge error if it proves false. If on the other hand the antecedent turns out to have been false, our conditional affirmation is as if it had never been made. (Quine, 1950, 12)

To see the point, consider (15), which is taken from McDermott (1996) and concerns the result of the next roll of an ordinary, six-sided dice:

(15) If it is even, it will be a six.

Suppose that you had bet on (15). It seems clear that the bet is won when the result of the next roll is six, and lost when the result is four. But what if it is five? McDermott reports that most people assume that the bet is called off in this case.

Belnap wanted to give a semantic version of conditional assertion. He originally proposed the following in Belnap (1970) (still somewhat vague; to be made precise below):

(16) If φ is true in w, then what $\varphi \rightarrow \psi$ asserts in w is what ψ asserts in w. If φ is false or nonassertive in w, then $\varphi \rightarrow \psi$ is nonassertive in w.

But this doesn't allow for iterating *if*-clauses. Therefore in Belnap (1973) he added the restriction that the scope should be assertive:

(17) If φ is true in w and ψ is assertive in w, then what $\varphi \rightarrow \psi$ asserts in w is what ψ asserts in w. If φ is false or nonassertive in w or if ψ is nonassertive in w, then $\varphi \rightarrow \psi$ is nonassertive in w.

Now, the phrase 'what $\varphi \rightarrow \psi$ asserts in w is what ψ asserts in w' can be understood in two ways. It could be that $\varphi \rightarrow \psi$ has the truth value of its consequent, or it could be that it expresses the same proposition. Then w is a part of the context rather than an index of evaluation. Belnap chose this second option. He reckoned the first option was rather boring, writing that what $\varphi \rightarrow \psi$ asserts in w is identical to what ψ asserts in w "does not boringly mean an identity of truth-values but an identity of propositional content" (Belnap, 1970, 4).

However, I think that the interesting semantics is not at all what we want for conditionals. To see the problem, consider the following example by Edgington (1995, 289):

(18) If you press that switch, there will be an explosion.

Clearly, my saying (18) might well save your life, especially when the antecedent is false. But how is this possible if (18) fails to assert a proposition? How can (18) ever be used to persuade you to not press that switch, if my utterance of it fails to communicate something for you to grasp?[4]

So I define conditional assertion as follows:

(19) $\varphi \rightarrow \psi$ is defined in a world w if φ is true in w and ψ is defined in w
If defined, the truth value of $\varphi \rightarrow \psi$ in w is the same as the truth value of ψ in w

Notice incidentally that (18) also suggests that we should change the norm for assertion. Classically, one should only assert something if one knows/beliefs (depending on your favorite theory of assertion) that it is true. But then (18) couldn't felicitously be asserted, as it probably has no truth value. In our partial system, however, the norm for asserting a proposition should be the knowledge/belief that it is true, given that it has a truth value, cf. McDermott (1996).

Belnap championed this semantics because he wanted to give a uniform analysis of *every crow* and *some crow* as 'for every x, if x is a crow' and 'for some x, if x is a crow', respectively. (Recall that classically, the domain of a universal quantifier is restricted by a conditional, but for existential quantifiers a conjunction is used.)

(20) a. Every crow is black.
for every x, if x is a crow, x is black
b. Some crow is black.
for some x, if x is a crow, x is black

If quantifiers care only about cases for which their scope is defined, this works: "for some x for which 'if x is a crow, x is black' is defined, i.e. for some x which is a crow, it is true that x is black". However, for ordinary restricted quantification, as supplied by common nouns, this is unattractive. First, no one believes that quantifiers are unary operators. Second, this involves postulating an inaudible *if*. Although I don't think Belnap's semantics should be employed in a uniform analysis of (20a) and (20b), I do believe that it provides a solution to the problem of iterated *if*-clauses, which I will argue for next.

[4]Note that the last statement of Quine's quote is thus plain false.

4.2 Solving Gibbard's problem

We can now analyze our sentence as follows:

(21) If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.
(it rains or snows tomorrow) $\rightarrow$ (it doesn't rain tomorrow $\rightarrow$ it will snow)

If (21) has a truth value, i.e. if it rains or snows, and if the embedded conditional has a truth value, i.e. if it doesn't rain, it snows. That is, it snows if it rains or snows but doesn't rain. So (21) comes out equivalent to (22):

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

Note that on this theory, there is no mismatch between syntax and semantics, as this representation mirrors the surface form of (21). Of course, on this semantics, neither of these sentences comes out as trivial, because they may be undefined (the antecedent may not be true). However, they do come out trivial on the assumption that the sentences have a truth value. Clearly, if they have a truth value, this value is most definitely true. Below in section 5, I will argue that our every-day judgments of validity and triviality are guided by the assumption that the statements involved are defined. That is, I will propose to combine Belnap's semantics with what is known as Strawson-entailment (von Fintel, 1999).

Summing up, there is another way to avoid the conclusion that if we want to have the equivalence between (6a) and (6b), material implication is the only candidate for indicative conditionals. We can assign partial truth conditions to indicative conditionals. This suggests that Gibbard's proof only holds in a classical, two-valued system. Indeed, in a partial system, it is plain that Gibbard's principles do not straightforwardly hold. The problem is his third principle, repeated here:

(iii) If $\varphi \models \psi$, then $\models \varphi \rightarrow \psi$

Given Belnap's semantics, this is simply not true. If all worlds that make φ true are worlds that make ψ true, it doesn't follow that all worlds make $\varphi \rightarrow \psi$ true, for some worlds are $\neg\varphi$-worlds and in these worlds, $\varphi \rightarrow \psi$ has no truth value.

5 Logical implications

By adopting a partial semantics for *if*, we loose the validity of certain laws which "warm the cockles of a logician's heart", as (Belnap, 1973, 51) nicely puts it. Indeed, Lycan (2006) sees this this as the main objection against conditional assertion theories. In Belnap's semantics, the following do no longer hold:[5]

[5] It is very likely that even more laws do no longer hold. We restrict attention to Contraposition and Or-to-if-inference, because the invalidity of these particular two is often used as an argument against conditional assertion theories, see for instance Lycan (2006).

(23) a. Contraposition:
$\varphi \rightarrow \psi \equiv \neg\psi \rightarrow \neg\varphi$
b. Or-to-if-inference:
$\varphi \vee \psi \models \neg\varphi \rightarrow \psi$

Any world in which $\varphi \rightarrow \psi$ is true, is a world in which ψ is true, and therefore a world in which $\neg\psi \rightarrow \neg\varphi$ lacks a truth value. It is easy to see that the reverse direction doesn't hold either. Contraposition is thus ruled out. As for Or-to-if-inference, some worlds in which $\varphi \vee \psi$ is true will make φ is true. These worlds will clearly not make $\neg\varphi \rightarrow \psi$ true.[6][7]

This is a problem, for Contraposition and Or-to-if-inference do seem to hold for natural language indicative conditionals, as (24) and (25) respectively show:

(24) If it is raining, we won't play.
Therefore, if we play, it isn't raining.

(25) Either Oswald killed Kennedy, or someone else did.
Therefore, if Oswald didn't kill Kennedy, someone else did.

But if Contraposition and Or-to-if-inference are not valid, then why are (24) and (25) such compelling arguments? I submit that our judgments about the validity of (24) and (25) come about by the tacit assumption that the premise and conclusion have a truth value.

Strawson (1952) considers ways to make the inference from the Aristotelean A-form to the Aristotelean I-form valid:

(26) Every crow is black.
Therefore, some crows are black.

Traditionally, the inference in (26) is not justified, for its premise is true in models in which there are no crows, yet its conclusion is clearly false in such a model. However, most English speakers find (26) valid.

Strawson sought to solve this puzzle by (i) abandoning the assumption that all sentences necessarily have a truth value, and (ii) redefining the notion of entailment. He assumes that A-forms are neither true nor false in case their subject term is empty. In addition, Strawson assumes that cases in which the subject term is empty are irrelevant as far as entailment is concerned:

> The rule that A entails I states that, *if corresponding statements of these forms have truth values*, then if the statement of the A form is true, the statement of the I form must be true; and so on. (Strawson, 1952, 177)

[6]The reverse direction 'If-to-or-inference' of course does come out: any world in which $\neg\varphi \rightarrow \psi$ is true, is a world in which $\varphi \vee \psi$ is true in all worlds.

[7]All I am presuming here about the meaning of $\neg$ and $\vee$ is that $\neg\psi$ is not true if ψ is, and that $\varphi \vee \psi$ is true if φ is. I consider this uncontroversial. Yet the reader may wonder about the semantics of connectives other than $\rightarrow$, now that we are working in a partial system. The semantics that Belnap assumes comes down to strong Kleene, except of course his definitions for $\rightarrow$.

Let $\models_S$ be the kind of entailment that Strawson had in mind. This can be defined as follows:

> $\varphi \models_S \psi$ iff
> $\varphi, \chi \models \psi$ (i.e. φ, χ classically entails ψ)
> where χ is a premise stating that the definedness conditions of all statements involved are satisfied

It is easy to see that (26) is Strawson-valid. The premise presupposes that there are crows. Strawson thought of this as a precondition for the premise to have a truth value: only if there are crows, can 'Every crow is black' be true or false. It follows that provided that the premise of (26) has a truth value, we are justified to conclude that some crows are black.

Belnap (1973) himself refers to this notion of entailment as a useful one for conditional assertion. Indeed, both Or-to-if-inference and Contraposition turn out to be Strawson-valid:

(27) a. Contraposition:
$\varphi \rightarrow \psi \equiv_S \neg\psi \rightarrow \neg\varphi$
b. Or-to-if-inference:
$\varphi \vee \psi \models_S \neg\varphi \rightarrow \psi$

Contraposition follows, i.e. $\varphi \rightarrow \psi, \neg\psi \models \neg\psi \rightarrow \neg\varphi$ because there is no world which makes $\varphi \rightarrow \psi$ and $\neg\psi$ true. The same holds for the other direction. Clearly, Or-to-if-inference is also Strawson-valid: any worlds in which $\varphi \vee \psi$ is true and in which $\neg\varphi \rightarrow \psi$ has a truth value, is a world in which $\neg\varphi \rightarrow \psi$ is true. Thus, assuming that the statements are either true or false, we get the inferences we want.

What does this mean for our inferences in (24) and (25)? In as far as these are valid, they are enthymematic inferences, i.e. inferences that rely on an additional tacit premise: that the statements involved have a (classical) truth value. It could well be that Strawson-entailment describes the way that human reasoning naturally works. Moreover, it seems that other linguistic phenomena are also sensitive to Strawson-entailment: von Fintel (1999) argues that NPI licensing is sensitive to Strawson-downward entailment.

Note that it also follows that (28a) and (28b) are Strawson-valid (they are Strawson-entailed by any tautology):

(28) a. If it rains or snows tomorrow, then if it doesn't rain tomorrow, it will snow.
b. If it rains or snows tomorrow and it doesn't rain tomorrow, then it will snow.

If our intuitions are indeed guided by Strawson-entailment, it is thus explained why these sentences, even though they are strictly speaking not tautologies, nevertheless seem trivial.

6 Relation to presupposition

Truth value gaps have often been used to model presuppositions, but the partiality we have written into the semantics of *if* must obviously be distinguished from presupposition. This was already observed by Belnap:[8]

> Suppose we say that A S-"presupposes" B if whenever A is assertive$_w$, B is true$_w$. This is, I take it, a semantic rendering in the present context of Strawsonian presupposition, for then to say that A S-"presupposes" B is to say that the truth of B is a necessary condition for the assertiveness of A. But then it turns out for categorial A that (A/B) S-"presupposes" A, for the truth of the antecedent, A, is a necessary condition for the assertiveness of the conditional, (A/B), and indeed is the paradigm case of such. But it would be mad to suggest that "If Sam is a crow, then Sam is black" presupposes "Sam is a crow", a madness which accounts for the shudder quotes in 'S-"presupposes"'. For A to presuppose B in the pragmatic sense, it should be the case that one who utters A somehow commits himself to the truth of B. It should be that he has done something pragmatically unacceptable if he utters A when B is false. Something like this surely obtains when one utters "The present king of France is bald". But of course the whole point of conditional assertion is to be able to avoid any commitment whatsoever when the antecedent turns out false. Thus, although definable, S-"presupposition" should not be taken as a semantic analogue of pragmatic presupposition. (Belnap, 1973, 70)

Someone who utters 'All John's children are bald' in case John has no children, counts as having misled her audience. But this does not hold for a speaker who uttered a conditional with a false antecedent. In fact, if conditionals presupposed their antecedent, one would expect that natural language didn't contain any conditionals. On Gricean assumptions, if it were given that John has children, one shouldn't say 'If John has children, they are bald', but just 'His children are bald'.[9]

Perhaps we should assume that the presupposition of conditionals is of the kind that is never already given, but that always has to be accommodated? This won't work. Following Gazdar (1979), it is usually assumed that conditionals 'If φ, ψ' give rise to the clausal implicatures $\Diamond\varphi$ and $\Diamond\neg\varphi$, and that if a presupposition clashes with a clausal implicature, the implicature 'wins', i.e. the presupposition is canceled. It follows that if conditionals presupposed their antecedent, this presupposition would automatically be canceled.[10] To sum up, Belnap-partiality must be concluded to have nothing to do with presupposition.[11]

[8]Note that Belnap uses the slash / as his conditional connective, whereas I use the arrow $\rightarrow$.

[9]Ordinarily, that is. In some situations, for instance in an argument via modus ponens it is allowed to assert a conditional whose antecedent is already given.

[10]See also Stalnaker (1975) and van der Sandt (1988), though these authors do not work in Gazdar's framework. For instance, in van der Sandt's system, the presupposition is canceled because it clashes with the fact that the conditional was uttered. Of course, the underlying intuition is similar to Gazdar's.

[11]Soames (1989) distinguishes so-called 'expressive presuppositions':

Given some presupposition theories, this is problematic. For instance, Heim's (1983) context change potentials are essentially based on a partial semantics. If we were to combine this theory with our Belnap-semantics, we would thus be assuming two distinct kinds of partiality. But this seems impossible in as far as undefinedness comes down to a lack of semantic value; how can we distinguish between two non-existing values? On the other hand, other presupposition theories, most notably the anaphoric binding theory of van der Sandt (1992); Geurts (1999), are fully independent of truth value gaps. Adopting Belnap's semantics thus does not automatically commit us to there being different kinds of undefinedness. At any rate, it is clear that Belnap-gaps just are not presupposition-gaps.[12]

7 Conclusion

In this paper I have argued in favor of a new way to avoid Gibbard's conclusion that the meaning of iterated *if*-clauses implies that the semantics of *if* cannot be stronger than material implication. The solution is to assign a partial semantics to indicative conditionals: a conditional only has a truth value in case its antecedent is true. And if the antecedent is true, the truth value of the entire conditional is the truth value of the consequent. I have argued that this semantics can be made to yield a plausible logic for conditionals, and I have explained why Belnap-partiality should be distinguished from the partiality that is often associated with presupposition failure.

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(i) Sentence S expressively presupposes proposition A relative to a context of utterance C iff the truth of A is necessary for S to semantically express a proposition in C.

So perhaps, had we opted for the less boring version of Belnap's semantics, we would have been able to link Belnap-partiality to (a very specific kind of) presupposition. But of course, we have good reason not to have opted for this semantics.

[12]Note that the difference between presupposition and conditional assertion just alluded to provides another reason why we shouldn't recruit Belnap's semantics for all kinds of domain restriction. Quantifiers are normally felt to presuppose their domain (Strawson, 1952; Geurts & van der Sandt, 1999), precisely because uttering "Every crow is black" in case there are no crows is misleading. But analyzing this sentence in terms of $\rightarrow$ would suggest that it is felicitous if there are no crows.

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