Disambiguating *will*-conditionals*

Ivano Ciardelli[1] and Adrian Ommundsen[2]

[1] Università di Padova, ivano.ciardelli@unipd.it
[2] Ludwig-Maximilians Universität München, adriankommundsen@gmail.com

Abstract

We bring together two ideas that are widely accepted in the literature: (i) conditionals with modal consequents are systematically ambiguous between a reading on which the if-clause restricts the modal, and a reading on which the if-clause introduces an epistemic supposition and the modal is unrestricted; (ii) 'will' is a modal. Together, (i) and (ii) imply that 'will'-conditionals are systematically ambiguous between a reading as restricted historical claims, and one as unrestricted historical claims made under a supposition. We argue that this prediction is correct and that the existence of the relevant ambiguity has far-reaching repercussions for several important debates concerning conditionals.

1 Introduction

In this paper we discuss how two widely accepted ideas, when taken together, have important implications for the analysis of *will*-conditionals. The first idea is that conditionals with modals in consequent are ambiguous in a systematic way [12]: on one reading, called the *O-reading*, they are restricted modal claims; on another reading, called the *C-reading*, they are conditional assertions of unrestricted modal claims. The second idea is that *will* is a modal: like other modals, its semantics involves a modal base, which may be restricted by *if*-clauses [1, 4, 5, 18]. Together, these ideas imply that conditionals of the form "if A, will B" are systematically ambiguous between an O-reading on which they express a restricted historical claim, and a C-reading on which they are conditional assertions of unrestricted historical claims.

In this paper we have two related goals. The first goal is to provide empirical evidence in support of the existence of the C/O ambiguity for *will*-conditionals. The second goal is to show that the existence of this ambiguity has important implications for several long-standing debates about conditionals, including the debate on the relation between past tense indicatives and counterfactuals, the debate on whether *will*-conditionals belong with the former or with the latter kind, and the debate on the relations between conditionals and supposition.

To be clear, we are by no means the first to claim that *will*-conditionals are ambiguous (see in particular [24, 19]). However, our aim is not just to show that such conditionals are ambiguous, but to show that they are ambiguous in the particular way predicted by a plausible theoretical story. Moreover, we believe the far-reaching repercussions of the existence of this ambiguity have not yet been sufficiently appreciated, and we hope to make a contribution in this direction.

2 Background: The C/O ambiguity

Geurts [12] has pointed out that conditionals whose consequent contains a modal or an adverbial quantifier are systematically ambiguous. For an illustration, consider (1):

*Thanks to David Boylan, Fabrizio Cariani, Magda Kaufmann, Matt Mandelkern, Paolo Santorio, Una Stojnic, and three AC reviewers for precious feedback on the ideas presented here and pointers to the literature.

(1) If Beryl is in Paris, she often visits the Louvre.

On one reading, (1) is a claim of conditional frequency: on many of the occasions on which she's in Paris, Beryl visits the Louvre. As this paraphrase makes clear, this reading arises when the *if*-clause restricts the set of occasions that the adverbial quantifier *often* ranges over. Geurts calls this the *O-reading* of (1), since the *if*-clause restricts the range of the Overt operator *often*.

On another reading, (1) is a conditional claim of unconditional frequency: it asserts that, under the supposition that Beryl is in Paris, we can conclude that she visits the Louvre often. (Imagine that Beryl is an art lover who is spending her sabbatical in a European capital, but we don't know which one.) In this case, the role of the *if*-clause is not to restrict the range of the quantifier *often*, but rather to introduce a supposition, just as in the typical examples of indicative conditionals. This effect is naturally modeled by taking the *if*-clause to restrict a set of epistemic possibilities, so that the consequent is asserted relative to this restricted set. Geurts calls this the *C-reading* of (1) since, following Kratzer [21], he takes it to arise from the *if*-clause restricting a Covert epistemic modal (as discussed in [7], this assumption is not unavoidable; however, the details of how the C-reading arises are not crucial for our purposes).

For an illustration of how the C/O ambiguity arises with modals, suppose Alice and Bob are colleagues and consider:

(2) If Alice leaves, Bob must stay.

On one reading, (2) is a statement of conditional obligation: it is true in a situation in which one of Alice and Bob has to be present—it doesn't matter who. In this situation, Bob is not required to stay, but he is required to stay *conditionally on Alice leaving*. This arises naturally as an O-reading, with the *if*-clause acting as a restrictor of the deontic modal base [20]: on this analysis, (2) asserts that all permissible worlds where Alice leaves are worlds where Bob stays.

On another reading, (2) is a conditional claim of unrestricted obligation: this reading is true in a situation in which a specific employee—Alice or Bob, we don't know who—is required to be present. Given Alices's conscientiousness, if she leaves we may conclude that it is Bob who is required to stay. This is naturally analyzed as a C-reading, with the antecedent introducing an epistemic supposition and the deontic modal remaining unrestricted.

It will be useful to fix a notation that allows us to refer quickly to the LFs that give rise to the two readings in question. In case case of (2), letting A and B stand, respectively, for "Alice leaves" and "Bob stays", we will denote the relevant LFs as follows:

$$\text{O-reading: } \mathsf{must}_{\mathsf{A}}(\mathsf{B}) \qquad \text{C-reading: } \mathsf{A} \rightarrow \mathsf{must}(\mathsf{B})$$

One should not read too much into this notation: in particular, we do not mean to suggest that conditionals are lexically ambiguous between a restrictor reading and an epistemic reading. On the contrary, we are convinced that a uniform analysis in terms of restriction behavior is right. But there are different proposals for such an analysis (e.g., see [12] and [7]), and we need not settle on one here. The above notation has the merit of being suggestive of the crucial point, namely, whether or not the antecedent restricts the modal in the given LF.

As Geurts [12] has argued, C/O ambiguity arises generally for conditionals involving modals in the consequent. In recent years, several authors have argued that *will* is a modal and have proposed accounts of *will* within the general framework of modal semantics [1, 4, 5, 18]. We thus expect the C/O ambiguity to arise, in particular, for conditionals whose consequent contains *will*. Since these conditionals play such a prominent role in the way we think and talk about the future, formulate predictions, and make decisions, it seems crucial to ask whether this expectation is borne out. In the next section, we will argue that it is.

3 The C/O ambiguity in *will*-conditionals

Consider Gibbard's [13] famous riverboat scenario. Sly Pete is playing poker with Mr. Stone on a Mississippi riverboat. Stone has bet up to the limit for the hand, and it is now up to Pete to call or fold. Secretly, Zack has signalled to Pete the content of Stone's hand. Now consider:

(3) If Pete calls, he will win.

Is (3) true? Intuitively, there seem to be two natural answers.

- Answer 1: uncertain. If Pete has a winning hand, then (3) is true; but if he has a losing hand, (3) is false. We don't know whether Pete has a winning hand or a losing hand, and so we don't know whether (3) is true.[1]
- Answer 2: true. Pete knows his opponent's cards, is a competent poker player, and plays to win: he is not going to call with a losing hand. So if he calls, that means he has a winning hand, and so he will win. Therefore, (3) is true.

These two reactions are exactly what we would expect to see if (3) allows both for an O-reading and for a C-reading. Let us see why.

Consider first the C-reading, $\mathsf{call} \rightarrow \mathsf{will}(\mathsf{win})$. To assess it, we have to consider what we can infer from the epistemic supposition that Pete calls. Given the context, one thing we can infer is that he has winning cards, and then, from this and the supposition that he calls, we can infer that he will win. Hence, this reading of (3) is true. To spell out this prediction a bit more formally, suppose an epistemic conditional $\mathsf{A} \rightarrow \mathsf{B}$ is true if in every epistemic possibility where A is true, B is true.[2] In the described scenario, we may take ourselves to know that Pete will call only if he has a winning hand. So, our information state rules out worlds where Pete calls with a losing hand. As a consequence, every world in our epistemic state where Pete calls is a world where he calls with a winning hand and, therefore, a world where he will win. So, in every epistemic possibility where the antecedent of $\mathsf{call} \rightarrow \mathsf{will}(\mathsf{win})$ is true, the consequent is true. As a consequence, the C-reading of (3) is predicted to be true, which explains Answer 2.

Let us now turn to the O-reading, $\mathsf{will}_{\mathsf{call}}(\mathsf{win})$. In order to see what is predicted in this case, we need to build on a theory of *will*. We adopt the theory of Cariani and Santorio [4, 5] (henceforth: C&S), although other theories (for instance, the one by Kaufmann in [18]) would lead to the same predictions in our example. According to C&S's theory, the semantics of *will* involves two parameters: a modal base m, which is initialized by context to the map sending a world w to the set $m(w)$ of worlds which are duplicates of w up to the time of utterance; and a selection function f, which maps a world w and a set of worlds X to a world $f(w, X)$ with the constraints that (i) $f(w, X) \in X$ whenever $X \neq \emptyset$, and (ii) $f(w, X) = w$ whenever $w \in X$. A claim $\mathsf{will}(\mathsf{A})$ is true at a world w relative to m and f in case A is true at $f(w, m(w))$.

Now consider a world w in which Pete has a losing hand. All worlds in the historical modal base $m(w)$ (i.e., all historical duplicates of w up to the time of utterance) are worlds where Pete has a losing hand. Now suppose we restrict $m(w)$ to worlds where Pete calls. Then every world in the restricted set is a world where Pete calls with a losing hand and therefore loses. So no matter which world is picked by the selection function for will, the prejacent win is false at that world.Therefore, the restricted modal claim $\mathsf{will}_{\mathsf{call}}(\mathsf{win})$ is false at w. Reasoning in a

[1] Another way to elicit this intuition is to ask ourselves: should Pete call? Well, not necessarily. After all, it is not obvious that if he calls he will win: it depends on the cards he has.

[2] On several accounts (e.g., [6, 14, 27, 30, 31]) epistemic conditionals are not strictly speaking true or false. On these accounts, our informal talk of a conditional being *true* just tracks the fact that the conditional is *fully acceptable*, or *supported*, on the basis of the availabe information. This does not affect our argument here.

similar way, we can see that in a world w where Pete has a winning hand, the claim $\mathsf{will}_{\mathsf{call}}(\mathsf{win})$ is instead true. So, the prediction is that on the O-reading, (3) is true if and only if Pete has winning cards. Since we are uncertain whether Pete has winning card, we are uncertain about whether the O-reading is true. This accounts for Answer 1 above.

Summing up: empirically, there seem to be two natural ways to react to (3) in the context we described. These two reactions are exactly what we would expect to see if (3) is ambiguous between a C-reading and an O-reading. So, there is empirical reason for thinking that *will*-conditionals are not an exception: just like other modal conditionals, they are ambiguous in a systematic way, and this ambiguity must be taken into account when theorizing about them. In the rest of this paper we will see how taking into account this ambiguity has important repercussions for some long-standing debates about conditionals.

4 The classification of conditionals

The literature is dominated by a classification of conditionals into two kinds: *indicatives*, and *subjunctives*. The distinction is motivated by the following contrast, pointed out by Adams [2]:

(4) a. If Oswald didn't kill Kennedy, someone else did.
b. If Oswald hadn't killed Kennedy, someone else would have.

The two sentences are judged and interpreted differently. (4-a) receives an epistemic reading: in supposing the antecedent, we revise our beliefs about what the world is like; (4-b) receives a historical reading: in supposing the antecedent, we entertain a non-actual course of history.

It has been supposed that the difference is due to the morphology of the relevant antecedents, and many proposals have been formulated [9, 28, 29, 30] to account for the difference in terms of the contribution of indicative or subjunctive marking.[3] But, is the basic assumption correct?

We saw that the difference between epistemic readings and historical readings arises even for a single *will*-conditional like (3). To see that this is the same difference manifested by the pair in (4), take again the riverboat scenario, and suppose we leave the room before Pete calls or folds. Time goes by: the events are now in the past, but our information has not changed. Now we are clearly in a position to accept (5-a): if Pete called, that means he had a winning hand, so he won. But we are not in a position to accept (5-b): after all, perhaps Pete had a losing hand and folded; in that case, if he had called, he would have lost; so (5-b) may be false.

(5) a. If Pete called, he won.
b. If Pete had called, he would have won.

This strongly suggests that (5-a) shares the acceptable epistemic reading of (3), while (5-b) shares the uncertain historical reading of (3). Hence, the difference between the past indicative (5-a) and the past *would*-conditional (5-b) presumably comes about in just the same way as the difference between the two readings of (3). And this seems independently plausible: after all, (5-a) contains no modal to restrict, so only an epistemic reading is available; by contrast, (5-b) contains the historical modal *would*, which may be restricted by the *if*-clause yielding a historical reading. The same goes, of course, for Adams' pair in (4). To be clear, we are not denying that mood and tense plays an important semantic role in conditionals. However, we believe the previous discussion indicates that the very different interpretation of the Adams' sentences in

[3] Or, perhaps more appropriately, the contribution of *O-marking* and *X-marking* [11]; it has been argued that it many languages, including English, the relevant distinction is not one of indicative vs. subjunctive mood.

(4) is due primarily to the fact that the *if*-clause targets different semantic parameters in the two cases: a set of epistemic possibilities in (4-a), a set of historical possibilities in (4-b).

This perspective also suggests an alternative to the traditional classification of conditionals into indicatives and subjunctives. Indeed, on the basis of the restrictor view, a semantically natural way to classify conditionals is according to the parameter targeted by the *if*-clause: we will thus have epistemic conditionals, historical conditionals, deontic conditionals, etc., depending on whether the *if*-clause restricts a set of epistemic, historical, or deontic possibilities. Of course, this classification applies at the level of LF; so for instance, (2) may be interpreted either as a deontic conditional or as an epistemic conditional with a deontic consequent; similarly, (3) may be interpreted as a historical conditional or as an epistemic conditional with a historical consequent. We will close the paper by illustrating the merits of this alternative classification.

5 The indicative constraint

It is widely held that indicative conditionals require their antecedents to be epistemically possible; if this condition is not met, an indicative conditional cannot be used felicitously. E.g., if we are certain that Pete didn't call, an utterance of (6) is infelicitous.

(6) #If Pete called, he lost.

However, there are apparent counterexamples to this claim. Some of these counterexamples involve *will*-conditionals. For instance, suppose I tell you that Pete will definitely not call. You accept this, but you want to know *why* he won't call. As an explanation, I offer:

(7) If he calls, he will lose. And he knows that.

My utterance seems perfectly felicitous. For another counterexample, this time involving an adverbial quantifier, consider the following discourse.

(8) A: How about inviting Beryl for dinner?
B: She's not in town.
A: Oh, I see. How do you know?
B: If she's in town, she always gives me a call.

Again, the conditional is perfectly felicitous. How should we make sense of these observations?

The solution is to avoid sweeping generalizations about indicative conditionals, and instead pay attention to the more fine-grained classification discussed in the previous section. Some indicative conditionals are epistemic, but some are not, and their semantic properties are bound to be different from those of epistemic conditionals. The correct generalization, in our view, is: conditionals require their *if*-clause to be true at some possibility *within the domain it targets*.[4]

Let us see how this proposal allows us to explain the data above. In the case of epistemic conditionals, the relevant domain of possibilities is the set of *epistemic* possibilities open in the context. So, for these conditionals our requirement boils down to the standard requirement that the antecedent be epistemically possible, explaining the infelicity of (6).

However, in the case of historical conditionals, the *if*-clause does not target a set of epistemic possibilities, but a set of *historical* possibilities—the set of histories open at a given time.

[4]This subsumes as special cases proposals that have been often made before about epistemic conditionals (see, e.g., [9, 15]) and counterfactuals (see, e.g., [10, 16]). Also, note that the requirement we propose amounts to the condition that the domain resulting from the restriction with an *if*-clause be nonempty; so, it is presumably grounded in a more general ban against empty domains of quantification.

The requirement will then be that the antecedent be true at some of these possibilities—i.e., historically possible. In (7), since Pete has not yet acted, the possibility of calling is presumably regarded as historically open by the speaker, which explains why the conditional is felicitous.[5]

Finally, in (8), the relevant interpretation of the conditional is one where the *if*-clause restricts a set of relevant occasions. Thus, the requirement amounts to the existence of occasions on which Beryl was in town. This requirement may well be satisfied even though Beryl is not in town on the current occasion, which explains why the conditional is felicitous.

6 Conditionals and supposition

The *Ramsey test* idea, in its general version, is the idea that to bear an attitude to a conditional is to bear that attitude to the consequent on the supposition of the antecedent. Thus, e.g., to accept a conditional is to accept the consequent on the supposition of the antecedent; to have a certain degree of credence in a conditional is to have that degree of credence in the consequent on the supposition of the antecedent (Adams' thesis); and so on. The idea has great psychological appeal and is well-supported by empirical data. Nevertheless, the literature contains apparent counterexamples [17, 22, 23, 25, 26]. Most of them (but not all) involve *will*-conditionals.[6]

To get a sense of how these counterexamples work, consider again our conditional (3) in the scenario above. We saw that, on one reading, this conditional is true if and only if Pete has a winning hand. So, the probability of (3) under this reading is just the probability that Pete has a winning hand; we may suppose that this probability is low, since (let us stipulate) we know that Stone has an excellent hand. At the same time, since we consider it nearly certain that Pete will call only if he has a winning hand, the conditional probability of Pete winning given that he in fact calls is very high. So, it would appear, we have low credence in the conditional (3), even though we have high credence in the consequent on the supposition of the antecedent, in contrast with Adams' thesis and with the Ramsey test idea.

But this conclusion is mistaken: what we are doing here is to compare our attitude towards a *historical* conditional, $\mathsf{will}_{\mathsf{call}}(\mathsf{win})$, with our attitude to the consequent under the *epistemic* supposition of the antecedent. However, the correct way to understand the Ramsey test is as relating kinds of conditionals to corresponding kinds of supposition (cf. [3]): our attitude to an *epistemic* conditional $\mathsf{A} \to \mathsf{B}$ should reflect our attitude to B under the epistemic supposition of A; but our attitude to a *historical* conditional $\mathsf{will}_{\mathsf{A}}(\mathsf{B})$ should reflect our attitude to B under the *historical* supposition of A. In particular, since Bayesian conditionalization corresponds to the *epistemic* mode of supposition, Adams' thesis that the probabilities of conditionals are conditional probabilities should be understood as a claim about the probabilities of *epistemic* conditionals. It is not expected to apply to historical readings of *will*-conditionals.

In this way, many (though not all) alleged counterexamples to the Ramsey test and to Adams' thesis can be diagnosed as stemming from equivocation. Once the ambiguity of *will*-conditionals is properly taken into account, these seeming counterexamples are dispelled.

[5] An interesing observation, due to Matt Mandelkern (p.c.) is that in contrast to (i-a), (i-b) is infelicitous:

(i) a. Pete won't call. If he calls, he will lose.
b. Pete won't call. #If he will call, he will lose.

We may explain this if we assume that the historical modal base for *will* may not be restricted by a *will*-clause (this requires an explanation, but does not seem implausible). This rules out a historical interpretation of the conditional in (i-b), leaving an epistemic interpretation as the only option, with the associated requirement that the antecedent be epistemically possible.

[6] Out of our list of references, the exception is McGee's counterexample [23], which does not use *will*-conditionals. See [8] for a possible response.

References

[1] Dorit Abusch. Sequence of tense and temporal de re. *Linguistics and philosophy*, pages 1–50, 1997.

[2] Ernest Adams. Subjunctive and indicative conditionals. *Foundations of Language*, 6(1):89–94, 1970.

[3] Richard Bradley. A defence of the ramsey test. *Mind*, 116(461):1–21, 2007.

[4] Fabrizio Cariani. *The modal future: A theory of future-directed thought and talk*. Cambridge University Press, 2021.

[5] Fabrizio Cariani and Paolo Santorio. Will done Better: Selection Semantics, Future Credence, and Indeterminacy. *Mind*, 127(505):129–165, 02 2018.

[6] Ivano Ciardelli. Restriction without quantification: embedding and probability for indicative conditionals. *Ergo*, 8(21):598–636, 2021.

[7] Ivano Ciardelli. The restrictor view, without covert modals. *Linguistics and Philosophy*, 45:1–28, 2022.

[8] Ivano Ciardelli and Adrian Ommundsen. Probabilities of conditionals: updating Adams. *Noûs*, 2022.

[9] Kai von Fintel. The presupposition of subjunctive conditionals. *The interpretive tract*, 25:29–44, 1998.

[10] Kai von Fintel. Counterfactuals in a dynamic context. *Current Studies in Linguistics Series*, 36:123–152, 2001.

[11] Kai von Fintel and Sabine Iatridou. Prolegomena to a theory of X-marking. Forthcoming in *Linguistics and Philosophy*.

[12] Bart Geurts. On an ambiguity in quantified conditionals. Manuscript, University of Nijmegen. Available at http://ncs.ruhosting.nl/bart/papers/conditionals.pdf, 2004.

[13] Allan Gibbard. Two recent theories of conditionals. In *Ifs: Conditionals, beliefs, decision, chance, time*, pages 211–247. Reidel, Dordrecht, 1980.

[14] Anthony Gillies. Epistemic conditionals and conditional epistemics. *Noûs*, 38(4):585–616, 2004.

[15] Anthony Gillies. Counterfactual scorekeeping. *Linguistics and Philosophy*, 30(3):329–360, 2007.

[16] Anthony Gillies. On truth-conditions for if (but not quite only if). *Philosophical Review*, 118(3):325–349, 2009.

[17] Stefan Kaufmann. Conditioning against the grain. *Journal of Philosophical Logic*, 33(6):583–606, Dec 2004.

[18] Stefan Kaufmann. Conditional truth and future reference. *Journal of semantics*, 22(3):231–280, 2005.

[19] Justin Khoo. On indicative and subjunctive conditionals. *Philosophers' Imprint*, 15(32):1–40, 2015.

[20] Angelika Kratzer. The notional category of modality. In H.J. Eikmeyer and H. Rieser, editors, *Words, Worlds, and Contexts: New Approaches in Word Semantics*, pages 38–74. Berlin: Walter de Gruyter, 1981.

[21] Angelika Kratzer. Conditionals. *Chicago Linguistics Society*, 22(2):1–15, 1986.

[22] Matthew Mandelkern and Justin Khoo. Against preservation. *Analysis*, 79(3):424–436, 2019.

[23] Vann McGee. To tell the truth about conditionals. *Analysis*, 60(265):107–111, 2000.

[24] Adam Morton. Indicative versus subjunctive in future conditionals. *Analysis*, 64(4):289–293, 2004.

[25] Sarah Moss. *Probabilistic Knowledge*. Oxford University Press, 2018.

[26] Daniel Rothschild. Do indicative conditionals express propositions? *Noûs*, 47(1):49–68, 2013.

[27] Paolo Santorio. Path semantics for indicative conditionals. *Mind*, 131(521):59–98, 01 2022.

[28] Katrin Schulz. Conditionals from a linguistic point of view: Two case studies. *Journal of Philosophical Logic*, 44(6):805–816, 2015.

[29] Robert Stalnaker. Indicative conditionals. In *Ifs*, pages 193–210. Reidel, 1976.

[30] William Starr. A uniform theory of conditionals. *Journal of Philosophical Logic*, 43(6):1019–1064, 2014.

[31] Seth Yalcin. Epistemic modals. *Mind*, 116(464):983–1026, 2007.