

Why *will* is not a modal

Mikhail Kissine

Published online: 15 April 2008
© Springer Science + Business Media B.V. 2008

Abstract In opposition to a common assumption, this paper defends the idea that the auxiliary verb *will* has no other semantic contribution in contemporary English than a temporal shift towards the future with respect to the utterance time. Strong reasons for rejecting the idea that *will* quantifies over possible worlds are presented. Given the adoption of Lewis's and Kratzer's views on modality, the alleged ‘modal’ uses of *will* are accounted for by a pragmatic mechanism which restricts the domain of the covert epistemic necessity operator scoping over the sentence.

Keywords Modality · Future tense · *Will* · Genericity · Assertion

“*Elle dit l'avenir. Et je suis chargé de le vérifier.*”

—Paul Eluard, “Nul,” *Capitale de la douleur*

1 Introduction

Most of the contemporary semantic literature endorses one of the following assumptions: (a) the English auxiliary *will* has a modal component within its

I'm extremely grateful to Marc Dominicy for his valuable remarks on earlier drafts. Detailed and penetrating comments by two anonymous referees helped me to improve this paper considerably. Parts of this work have been presented at the *Chronos VII* conference in Antwerp; I'm grateful to members of the audience for questions and remarks. My research is funded by a research fellow grant from the Fonds National de Recherche Scientifique (FNRS), Communauté Française de Belgique.

M. Kissine (✉)

FNRS, Laboratoire de Linguistique Textuelle et de Pragmatique Cognitive,
Université Libre de Bruxelles, CP 175 50, Avenue Franklin Roosevelt,
1050 Bruxelles, Belgium
e-mail: mkissine@ulb.ac.be

semantics (e.g. Palmer 1986, pp. 216–218; Smith 1978; Enç 1996; Yavas 1982; Jaszczolt 2006; Haegeman 1983; Sarkar 1998; Copley 2002; Condoravdi 2002); (b) *will* is ambiguous between modal and non-modal meanings (e.g. Comrie 1985, pp. 43–48; Hornstein 1990; Kamp and Reyle 1993, p. 535).¹ Whereas both camps agree that examples like (2)–(5) instantiate the inherent modality of *will*, only the second maintains that in ‘future tense’ cases like (1) *will* does not function as a modal.

- (1) Mary will come. [future/prediction]
- (2) Oil will float on water. [generic]
- (3) Mary will be at the opera now. [epistemic]
- (4) In winter, Mary will always wear a green coat. [habitual/dispositional/volitional]
- (5) You will leave tomorrow by the first train. [deontic]

To be sure, finer-grained distinctions may be made within each of the uses illustrated in (1)–(5) (Palmer 1979, Chap. 7). However, the ambition of this paper is to defend a unitary non-modal semantics for *will* across the board. To that end the distinction between future uses (1), on the one hand, and the (allegedly) metaphysical (2), epistemic (3), bouletic (4), and deontic (5) uses, on the other, should suffice. From a formal point of view, any further nuance made within the aforementioned categories amounts to describing the modal base of *will* as a subset of the modal base of pure metaphysical, epistemic, deontic, or bouletic necessity (more on this below). I shall argue that allowing *will* to quantify over any modal base whatsoever leads to wrong empirical predictions. Therefore, if correct, my claims *a fortiori* apply to any finer subcategory one might wish to single out among different uses of *will*.

In Sect. 2, I shall present strong reasons for rejecting the claim that in (1) *will* quantifies over possible worlds and thus for dismissing option (a) (Sarkar 1998 reviews previous attempts to make that point, and presents convincing arguments against them; see also Enç 1996). At the end of Sect. 2, I shall contend that the semantics of *will* is unitary: *will* extends the evaluation time towards the future, in conformity with Abusch’s (1998) proposal. In Sect. 3, I shall argue that once Kratzer’s and Lewis’s views on modality are reformulated within Stalnaker’s theory of context, it follows that every asserted sentence falls under the scope of a covert necessity operator. In Sect. 4, it will be shown that this fact allows us to analyse (2)–(5) in a straightforward way, without contaminating the semantics of *will* with modal overtones.

¹ Kamp and Reyle argue that *will* is a modal from a morphosyntactic point of view, but when dealing with ‘future’ uses like (1) they assign it a semantics very similar to the one to be defended below. Since they do not address ‘modal’ cases like (2)–(5), it is reasonable (but not stringently necessary) to include them within the second group.

2 *Will*: necessity, possibility, neither, or both?

2.1 *Will* as a necessity

I shall take as a starting point Enç (1996)—an often-quoted paper which is a paradigmatic case of a modal approach to *will* within the model-theoretic framework—and then generalise my objections to every account that analyzes *will* as a necessity operator in (1). Next, I shall argue that *will* cannot be a possibility operator either.

Enç formalises *will* as a forward-shifting necessity operator:

[*will* (*p*)] is true at $\langle w, i \rangle$ iff in every world w_1 accessible to w there is an interval i_1 such that $i < i_1$ and *p* is true at $\langle w_1, i_1 \rangle$. [...] i is the original time of evaluation, i.e. the utterance time. This time is replaced by a future time and the sentence in the scope of the modal is evaluated with respect to this new time. (Enç 1996, p. 354; notation adapted)

Relying on Yavas's (1982) proposal, Enç argues that *will* quantifies over the set of those possible worlds that are consistent with current predictions. Such an accessibility relation could be either epistemic accessibility (E) or doxastic accessibility (D) (cf. Zimmermann 1999). A possible world w_1 is epistemically accessible to the actual world w at the time i (wE_iw_1) iff w_1 is consistent with the set K_wi of what is known in w at i .²

Epistemic Accessibility (E)

wE_iw_1 iff K_wi is consistent with w_1 .

Doxastic accessibility relies on the weaker notion of belief: a possible world w_1 is doxastically accessible to the actual world w at i (wD_iw_1) iff w_1 is consistent with the set B_wi of what is believed to be true in w at i .

Doxastic Accessibility (D)

wD_iw_1 iff B_wi is consistent with w_1 .

The main difference between E and D is to be found in their relationship with what can be called alethic or metaphysical accessibility (M). A possible world w_1 is metaphysically accessible to the actual world w (wMw_1) iff w_1 is consistent with w .

Metaphysical Accessibility (M)

wMw_1 iff w is consistent with w_1 .

² I am following standard practice in conceiving of a possible world as the set of propositions that are true in that world. Epistemic and doxastic accessibility relations can also be relativized to an individual: throughout I shall assume E- or D-accessibility to be relative to the speaker's beliefs or knowledge.

Now, every proposition that is known is also true—for every i , $K_w i \subseteq w$; therefore, if $w M w_1$, then $w E_i w_1$. Incidentally, it follows that what is sometimes called historical accessibility $H = w H_i w_1$ iff, up to i , w and w_1 are identical—boils down to E , with the additional constraint that every proposition temporally indexed at times anterior or equal to i is known in w . By contrast, the fact that a proposition is believed to be true does not warrant its truth; so, metaphysical accessibility does not entail doxastic accessibility.

It is assumed, most of the time, that E and D are transitive and Euclidean, that is, self-reflexive (Zimmermann 1999, 2000; Kaufmann et al. 2006).

Transitivity

If $w R w_1$ and $w_1 R w_2$, then $w R w_2$.

Euclideanness

If $w R w_1$ and $w R w_2$, then $w_1 R w_2$.

Self-reflexivity

If $w R w_1$ then $w_1 R w_2$ iff $w R w_2$.

Transitivity implies positive introspection—if I know/believe that p , then I know/believe that I know/believe that p ; in other words, $\Box p \rightarrow \Box\Box p$ is valid. Euclideanness implies negative introspection—if I don't know/believe that p , then I know/believe that I don't know/believe that p ; $\neg\Box p \rightarrow \Box\neg\Box p$ is valid. This latter property prompts more frequent worries; however, at least as far as the analysis of *will* is concerned, it proves indispensable.

Let us try to analyze *will* as an epistemic necessity. Consider first a simplified set of possible worlds $W^* = \{w, w_1, w_2\}$; what is known in w_2 does not matter here (nor in W^{**} below).

$$\begin{array}{ll} W^* & w = \{p\} \quad K_w i = \{p\} \\ & w_1 = \{p, \neg r\} \quad K_{w1} i = \{\neg r\} \\ & w_2 = \{\neg r, \neg p\} \end{array}$$

If *will* is an epistemic necessity, then (1), repeated below as (1a), has the truth conditions in (1b); unless specified otherwise, throughout this section i stands for the utterance time, and w for the actual world;

(1)a. Mary will come.

b. [*Mary will come*] is true in w , iff for every possible world w_1 such that $w E_i w_1$, [*Mary comes at $i_1 > i$*] $\in w_1$.

Let us consider that p is the proposition [*Mary comes at $i_1 > i$*]. In W^* , $\neg(w E_i w_2)$, $w E_i w_1$, and $p \in w_1$; hence (1) is true in w . But now take example (6a), where *it is possible that* reads as an epistemic possibility whose truth conditions are given in (6b).

- (6)a. (For all that we know) it is possible_[epistemic] that Mary will not come.
 b. [(*For all that we know*) it is possible_[epistemic] that Mary will not come] is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world w_2 such that $w_1E_iw_2$, $\neg[\text{Mary comes at } i_1 > i] \in w_2$.

In W^* , wE_iw_1 , $w_1E_iw_2$, and $\neg p \in w_2$; therefore, (6a) is also true. Yet, the awkwardness of (7) shows that (1) and (6a) are incompatible.³

- (7) ?Mary will come and (for all that we know) it is possible_[epistemic] that she won't come.

In order to avoid such an outcome, it is sufficient to make E transitive, so that $will(p) \rightarrow \square[will(p)]$.

However, transitivity alone will not do if *will* is to be an epistemic necessity. To see why, let us now take W^{**} , where E is non-Euclidean. In W^{**} , wE_iw_1 , wE_iw_2 but $\neg(w_1E_iw_2)$:

$$\begin{array}{ll} W^{**} & w = \{q, \neg r\} \quad K_{w,i} = \{q\} \\ & w_1 = \{r, q, p\} \quad K_{w_1,i} = \{p, r\} \\ & w_2 = \{\neg p, q\} \end{array}$$

Still assuming that $p = [\text{Mary comes at } i_1 > i]$, the example in (8a), which is the truth-functional negation of (1a), is true in w ; the truth conditions it would receive if *will* were an epistemic necessity are given in (8b).

- (8)a. It is not the case that Mary will come.⁴
 b. [*It is not the case that Mary will come*] is true in w iff there is at least one possible world w_1 such that wE_iw_1 and $\neg[\text{Mary comes at } i_1 > i] \in w_1$.

But (9a), whose truth conditions are given in (9b), is also true in w : indeed, $p \in w_1$, and the only possible world E-accessible to w_1 is w_1 itself.

- (9)a. (For all that we know) it is possible_[epistemic] that Mary will come.
 b. [(*For all that we know*) it is possible_[epistemic] that Mary will come] is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world w_2 such that $w_1E_iw_2$, $[\text{Mary comes at } i_1 > i] \in w_2$.

However, such a compatibility is highly counterintuitive, as shown by the oddity of (10).

³ Here, and elsewhere in the paper, I set aside echoic or polyphonic readings where the person who produces the utterance does not commit herself to believing that the propositional content or some part of it is true (cf. Sperber and Wilson 1981; Ducrot 1984).

⁴ Using *would*, *might*, or *could* instead of *it is not the case that will(p)* would beg the question, for nothing at this stage allows one to take for granted that *will* is a modal that has a dual in English.

- (10) ?It is not the case that Mary will come and (for all that we know) it is possible_[epistemic] that Mary will come.

In order to predict the contradictory nature of (10), one has to make E Euclidean, which entails that $\neg\text{will}(p) \rightarrow \square[\neg\text{will}(p)]$.

It should be obvious by now that exactly the same argument can be made if *will* is a doxastic necessity. Under such a reading (1) has the truth conditions in (1c).

- (1c). [*Mary will come*] is true in w iff for every possible world w_1 such that wD_iw_1 , [*Mary comes at $i_1 > i$*] $\in w_1$.

Let us take $W' = \{w, w_1, w_2\}$, where D is not transitive (here, and in W'' below, what is believed in w_2 does not matter):

$$\begin{array}{ll} W' & w = \{p\} \\ & w_1 = \{p, \neg r\} \\ & w_2 = \{\neg r, \neg p\} \end{array} \quad \begin{array}{ll} B_w i = \{p\} \\ B_{w_1} i = \{\neg p\} \end{array}$$

In W' , wD_iw_1 , $w_1D_iw_2$, but $\neg(wD_iw_2)$. Since $p \in w_1$, the truth conditions in (1c) are fulfilled. Now, take (11a), whose truth conditions are given in (11b).

- (11)a. (I believe that) it is possible_[doxastic] that Mary will not come.
 b. [(I believe that) it is possible_[doxastic] that Mary will not come] is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that $w_1D_iw_2$, $\neg[\text{Mary comes at } i_1 > i] \in w_2$.

Since $\neg p \in w_2$, (11a) is also true in w . So, we reach the conclusion that, unless we admit that (1) and (11a) are compatible—which they are not, as shown by (12)—doxastic accessibility should be transitive.

- (12) ?Mary will come and (I believe that) it is possible_[doxastic] that Mary will not come.

Let us transform W' in $W'' = \{w, w_1, w_2\}$, where D is non-Euclidean:

$$\begin{array}{ll} W'' & w = \{q, \neg r\} \\ & w_1 = \{r, q, p\} \\ & w_2 = \{\neg p, q\} \end{array} \quad \begin{array}{ll} B_w i = \{q\} \\ B_{w_1} i = \{p, r\} \end{array}$$

In W'' , wD_iw_1 and wD_iw_2 , but $\neg(w_1D_iw_2)$. Under the reading of *will* as a doxastic necessity, (8a) would receive the truth conditions in (8c), which entails that (8a) is true in w .

- (8c). [*It is not the case that Mary will come*] is true in w iff there is at least one possible world w_1 such that wD_iw_1 and $\neg[\text{Mary comes at } i_1 > i] \in w_1$.

The problem, of course, is that (13a), whose truth conditions are given in (13b), is also true in w .

- (13)a. (I believe that) it is possible_[doxastic] that Mary will come.
 b. $[(I \text{ believe that}) \text{ it is possible}_{[\text{doxastic}]} \text{ that Mary will come}]$ is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that $w_1D_iw_2$, $[\text{Mary comes at } i_1 > i] \in w_2$.

As above, the only solution to prevent (8a) and (13a) from being compatible is to make D Euclidean.

So we reach the conclusion that if *will* is to be an epistemic or doxastic necessity, the corresponding accessibility relations have to be self-reflexive. However, since it entails positive and negative introspection, self-reflexivity implies that the following equivalence is valid: $\diamond\Box p \Leftrightarrow \Box p$. It is easy to see why.

For any relation R, $[\diamond\Box p]$ is true in w iff there is at least one w_1 such that wRw_1 and such that, for every w_2 such that w_1Rw_2 , $p \in w_2$.

If R is self-reflexive, then wRw_1 implies that every w_2 that is accessible from w_1 is also accessible from w and that every w_2 that is accessible from w is also accessible from w_1 . Therefore, the truth conditions of $\Box p$ are fulfilled.⁵

$[\Box p]$ is true in w iff for every w_1 such that wRw_1 , $p \in w_1$.

All this is very bad news for Enç, because if *will* is an epistemic necessity, then (1) and (9a) are equivalent, and if *will* is a doxastic necessity, then (1) and (13a) are equivalent.

The most obvious line of defence for Enç would be to argue that the possibility operator and *will* do not instantiate the same kind of modality, which would block the unwanted reduction of $\diamond\Box p$ to $\Box p$. To draw an analogy, (14) is unacceptable with the epistemic reading of *must*—most certainly because the equivalence $\Box p \Leftrightarrow \diamond\Box p$ makes the possibility redundant—but the same example is acceptable when *must* is read as a deontic necessity.

- (14) ?It is possible that Mary must be in jail.

Could we not say that *will* is a doxastic necessity in (9a) and/or an epistemic necessity in (13a)? Let us test this hypothesis of modal heterogeneity in more detail.

⁵ Geurts (2005) points out that, at first sight, the self-reflexivity of epistemic necessity entails that (i) is equivalent to (ii):

(i) It is possible that the book must be there and it is possible that the book must be here.
 (ii) The book must be there and the book must be here.

However, the solution offered by Geurts—which I believe to be correct—is not to abandon self-reflexivity but to assume that the domains of the two modals are provided contextually and do not overlap.

With *will* as a doxastic necessity, (9a) would have the truth conditions in (9c).

- (9c). [*(For all that we know) it is possible_[epistemic] that Mary will come*] is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world w_2 such that $w_1D_iw_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.

The truth conditions in (9c) do not rule out the situation where, in w , it is believed, although not known, at i that Mary does not come at i_1 . Hence, if *will* is a doxastic necessity, (9a) has to be compatible with (15a), whose truth conditions are given in (15b).

- (15a). Mary will not come.
 b. [*Mary will not come*] is true in w iff for every possible world w_1 such that wD_iw_1 , $\neg[Mary \text{ comes at } i_1 > i] \in w_1$.

As proved by the unacceptability of (16), such a compatibility is counterintuitive.

- (16) *?(For all that we know) it is possible_[epistemic] that Mary will come, and Mary will not come.*

Similarly, if in (13) *will* is an epistemic necessity, the truth conditions would be those in (13c).

- (13c). [*I believe that it is possible_[doxastic] that Mary will come*] is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that $w_1E_iw_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.

Nothing in these truth conditions implies that it is not known in w at i that Mary does not come at i_1 (for nothing implies that wE_iw_1). Since (15a) receives the truth conditions in (15c) if *will* is an epistemic necessity, we arrive at the absurd conclusion that (13a) and (15a) are compatible.

- (15c). [*Mary will not come*] is true in w iff for every possible world w_1 such that wE_iw_1 , $\neg[Mary \text{ comes at } i_1 > i] \in w_1$.

The point specifically made against Enç can be easily generalized to any account that reduces the modal base of *will* to a subset of the set of worlds epistemically accessible from w at i . Such approaches define the domain of *will* by using epistemic accessibility plus some relation of F_E^* -accessibility (say, the compatibility with Mary's intentions at i ; cf. Copley 2002). Under such an analysis, (9a) would receive the truth conditions in (9d), (13a) those in (13d), and (15a) those in (15d).

- (9d). [*(For all that we know) it is possible_[epistemic] that Mary will come*] is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world w_2 such that $w_1F_E^*w_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.

- (13d). *[(I believe) it is possible_{doxastic} that Mary will come]* is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that $w_1F_E^*w_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.
- (15d). *[Mary will not come]* is true in w iff for every possible world w_1 such that $wF_E^*w_1$, $\neg\neg[Mary \text{ comes at } i_1 > i] \in w_1$.

The truth conditions in (9d) or (13d) do not prevent K_wi or B_wi from being consistent with a possible world where it is true that Mary does not come at i_1 ; K_wi or B_wi is only required, by (9d) or (13d), to be consistent with w_1 , where it is true that Mary will come. Furthermore, nothing makes it impossible that all possible worlds that are E- or D-accessible to w at i and where it is true that Mary does not come at i_1 are all and the only worlds that are F_E^* -accessible to w , in which case (15d) is satisfied. Hence, we are back to the undesired compatibility between (9a) and (15a), and between (13a) and (15a).

Exactly the same rationale applies to any theory that takes *will* to quantify universally over a subset of the modal base of doxastic necessity, determined by the accessibility relation F_D^* . In this case, the truth conditions of (9a) would read as (9e), those of (13a) as (13e), and those of (15a) as (15e).

- (9e). *[(For all that we know) it is possible_{epistemic} that Mary will come]* is true in w iff there is at least one possible world w_1 , such that wE_iw_1 and such that, for every possible world w_2 such that $w_1F_D^*w_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.
- (13e). *[(I believe) it is possible_{doxastic} that Mary will come]* is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that $w_1F_E^*w_2$, $[Mary \text{ comes at } i_1 > i] \in w_2$.
- (15e). *[Mary will not come]* is true in w iff for every possible world w_1 such that $wF_E^*w_1$, $\neg[Mary \text{ comes at } i_1 > i] \in w_1$.

Nothing in (9e) or (13e) implies that K_wi or B_wi is inconsistent with the proposition that Mary does not come at $i_1 > i$, and nothing implies that among the possible worlds that are consistent with K_wi or B_wi , those that are F_D^* -accessible to w are also those where it is true that Mary does not come at $i_1 > i$. In other words, the satisfaction of (9e) or (13e) does not exclude that of (15e).

Things do not improve if the modality of *will* in (9a) or (13a) is claimed to be metaphysical. Let us begin with (9a), whose truth conditions would then read as (9f).

- (9f). *[(For all that we know) it is possible_{epistemic} that Mary will come]* is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world w_2 such that w_1Mw_2 , $[Mary \text{ comes at } i_1 > i] \in w_2$.

Recall that $w_1 \mathbf{M} w_2$ entails $w_1 \mathbf{E} w_2$. It follows that, under such a reading, (9a) entails (17a), whose truth conditions are given in (17b).⁶

- (17)a. (For all that we know) it is possible_[epistemic] that it is necessary_[epistemic] that Mary comes at $i_1 > i$.
- b. *[(For all that we know) it is possible_[epistemic] that it is necessary_[epistemic] that Mary comes at $i_1 > i$]* is true in w iff there is at least one possible world w_1 such that $w \mathbf{E}_i w_1$ and such that, for every possible world w_2 such that $w_1 \mathbf{E}_i w_2$, *[Mary comes at $i_1 > i$]* $\in w_2$.

Due to the self-reflexivity of the epistemic accessibility, (17a) is equivalent to (18).

⁶ Note that I have treated temporal expressions as referring expressions, and not as operators. As far as I can see, this is the only step in the argument where this theoretical choice really matters (for contrasting opinions on this issue, see e.g. King 2003; Recanati 2007). If circumstances of evaluation are treated as ordered pairs $\langle w, i \rangle$ of possible worlds and temporal intervals, we must admit that, in the same possible world w , the proposition expressed by, for instance, (1), can be true at i and false at i_n . Let $\mathbf{W} = \{w, w_1\}$ be the set of possible worlds, let $I = \{i, i_1\}$ be the set of temporal intervals, such that i is the utterance time, and let the set-theoretical product $\mathbf{W} \times I$ be the set of circumstances of evaluation. Let the proposition *[Mary comes]* be true in $\langle w_1, i_1 \rangle$, and false in every other circumstance of evaluation. Let us posit that $w \mathbf{M}_i w, w_1 \mathbf{M}_i w_1, w \mathbf{M}_{i_1} w, w_1 \mathbf{M}_{i_1} w_1$; and that $w \mathbf{E}_i w, w_1 \mathbf{E}_i w_1, w \mathbf{E}_{i_1} w, w_1 \mathbf{E}_{i_1} w_1, w \mathbf{E}_j w, w_1 \mathbf{E}_j w_1$. As an anonymous reviewer pointed out, in this toy model metaphysical accessibility entails epistemic accessibility, but (9a) does not entail (17a). If *will* is a metaphysical necessity, (9a), repeated for convenience as (i), would receive the truth conditions in (ii):

- (i) (For all that we know) it is possible_[epistemic] that Mary will come.
- (ii) *[(For all that we know) it is possible_[epistemic] that Mary will come]* is true in $\langle w, i \rangle$ iff there is at least one possible world w_1 such that $w \mathbf{E}_i w_1$ and such that, for every w_n such that $w_1 \mathbf{M}_i w_n$, and for every $i_n > i$, *[Mary comes]* is true in $\langle w_n, i_n \rangle$.

In our toy model, w_1 is the only possible world that is epistemically accessible to w at i ; since the only possible world that is metaphysically accessible to w_1 at i is w_1 itself, the truth conditions in (ii) are satisfied. The truth conditions of (17a), repeated here as (iii), would now read as (iv).

- (iii) (For all that we know) it is possible_[epistemic] that it is necessary_[epistemic] that Mary comes at $i_1 > i$.
- (iv) *[(For all that we know) it is possible_[epistemic] that Mary will come is true]* in $\langle w, i \rangle$ iff there is at least one possible world w_1 such that $w \mathbf{E}_i w_1$ and such that, for every w_n such that $w_1 \mathbf{E}_i w_n$, and for every $i_n > i$, *[Mary comes]* is true in $\langle w_n, i_n \rangle$.

The only possible world that is epistemically accessible to w at i is still w_1 ; but since w is epistemically accessible to w_1 at i , (iv) is not satisfied. However, the model under consideration implies that the proposition *[Mary will not come]* is true in $\langle w, i \rangle$; with *will* as a metaphysical necessity, (15a), repeated as (v), would receive the truth conditions in (vi).

- (v) Mary will not come.
- (vi) *[Mary will not come]* is true in $\langle w, i \rangle$ iff for every w_1 , such that $w \mathbf{M}_i w_1$ and such that, for every $i_n > i$, *[Mary comes]* is false in $\langle w_n, i_n \rangle$.

The only possible world that is metaphysically accessible to w is w itself; hence the truth conditions in (vi) are satisfied — we are back to the undesired compatibility of (i) (i.e., (9a)) with (v) (i.e., (15a)).

- (18) (For all that we know) it is necessary_[epistemic] that Mary comes at $i_1 > i$.

But, of course, the claim that (9a) entails (18) is absurd.

As for (13a), with *will* as a metaphysic necessity, it would have the truth conditions in (13f).

- (13)f. [*I believe it is possible_[doxastic] that Mary will come*] is true in w iff there is at least one possible world w_1 such that wD_iw_1 and such that, for every possible world w_2 such that w_1Mw_2 , [Mary comes at $i_1 > i$] $\in w_2$.

Since w_1Mw_2 entails w_1Ew_2 , the truth conditions in (13f) entail those in (13c). We have already seen that (13c) makes (13a) compatible with (15a); hence, the same problematic compatibility arises if *will* is taken to be a metaphysical necessity.⁷

Finally, it would not help to claim that the domain of *will* is a subset of the domain of the metaphysical necessity. Since M entails E, this would amount claiming that *will* quantifies over a subset of epistemic accessibility, which brings us back to the cases whose drawbacks we have already identified.

Table 1 sums up different analyses of *will* as a necessity and their problems.

It is fair to mention a second, quite unnatural option that would assume the forward-shifting necessity operator to scope over the possibility operator in (9a) and (13a). Under such a hypothesis, the truth conditions of (9a) and (13a) would read as (9g) and (13g) respectively.

Table 1

Possibility	Will	Consequence
D	D	(1) \Leftrightarrow (9a)
E	E	(1) \Leftrightarrow (13a)
E	D	(9a) compatible with (15a)
D	E	(13a) compatible with (15a)
E	Sub-set of modal basis E	(9a) compatible with (15a)
D	Sub-set of modal basis E	(13a) compatible with (15a)
E	Sub-set of modal basis D	(9a) compatible with (15a)
D	Sub-set of modal basis D	(13a) compatible with (15a)
E	M	(9a) entails (18)
D	M	(13a) compatible with (15a)
E	Sub-set of modal basis M	(9a) compatible with (15a)
D	Sub-set of modal basis M	(13a) compatible with (15a)

⁷ What if *will* is a historical necessity in $\Diamond\text{will}(p)$? The truth conditions of (13a) are as follows then:

$\Diamond\text{will}(p)$ is true in w iff there is at least one possible world w_1 such that wE_iw_1 and such that, for every possible world $w_1=w_2$ up to i , $[p \text{ at } i > i] \in w_2$

Either $w_1E_iw_2$ or $\neg(w_1E_iw_2)$. In the former case, in virtue of self-reflexivity, $\Diamond\text{will}(p) \Leftrightarrow \text{will}(p)$; in the latter case, nothing prevents $\text{will}(\neg p)$ from being known in w , in which case $\Diamond\text{will}(p)$ and $\text{will}(\neg p)$ should be compatible.

- (9g) *[(For all that we know) it is possible_[epistemic] that Mary will come]* is true in w iff for every possible world w_1 , such that $wE_{i_1}w_1$ ($i_1 > i$), there is at least one possible world w_2 such that $w_1E_{i_1}w_2$ and *[Mary comes at $i_2 \geq i_1 \in w_2$]*.
- (13g) *[(I believe that) it is possible_[doxastic] that Mary will come]* is true in w iff for every possible world w_1 such that $wD_{i_1}w_1$ ($i_1 > i$), there is at least one possible world w_2 such that $w_1D_{i_1}w_2$ and *[Mary comes at $i_2 \geq i_1 \in w_2$]*.

In other words, (9a) or (13a), depending on the reading of the possibility operator, should be equivalent to (19):

- (19) It will be possible_{[epistemic]/[doxastic]} (at i_1) that Mary comes (at i_2).

This equivalence is counterintuitive. For instance, whereas (19) is compatible with (20), as shown by (21), (9a) or (13a) and (20) contradict each other, as shown by the unacceptability of (22).

- (20) It is impossible_{[epistemic]/[doxastic]} now that Mary will come (at i_2).
- (21) It will be possible_{[epistemic]/[doxastic]} that Mary comes (if John helps her), but this is impossible_{[epistemic]/[doxastic]} now.
- (22) ?It is possible_{[epistemic]/[doxastic]} (now) that Mary will come, but it is impossible now that she will come.

2.2 Will as a possibility

Another way to support the claim that *will* “do[es] not refer to the future but rather specifies] an epistemic notion similar to predictability” (Ludlow 1999, p. 160) is to analyze it as a possibility operator. For instance, Jaszczołt (2006) assigns to *will* the default meaning of a weak epistemic acceptability (in the sense of Grice 2001) applied to a future eventuality. If I understand it correctly, her view implies that (1) is true in the world of utterance w at i iff the set of worlds determined by epistemic acceptability at i contains at least one world w_1 such that it is true in w_1 that Mary comes at some $i_1 > i$. To begin with, such an analysis is unacceptable independently of the modality of *will*, be it epistemic, doxastic, or metaphysic: $\Diamond p$ is compatible with $\Diamond \neg p$; hence (23) should not be contradictory.

- (23) ?Mary will come and Mary will not come.

Moreover, the reading postulated by Jaszczołt is intuitively unacceptable: everyone will feel reluctant to admit that (1) and (9a) (or, for that matter, (13a)) are equivalent. Imagine a speaker who predicts that p , and whose prediction proves wrong, even if it was doxastically or epistemically possible at the

utterance time that *p*. If *will* were a doxastic or an epistemic possibility operator, this speaker could not be charged with having made a false prediction. Notice that this problem bears on the very content of the prediction, and not on its evaluation. Indeed, it would be insufficient to argue that if Mary fails to come, the prediction is taken to be false because the audience modifies his/her view on the truth value of (1). There certainly exist circumstances where the fact that Mary did not come at i_1 proves compatible with the fact that, at the utterance time i , it was doxastically (or epistemically) possible for Mary to come at i_1 .

2.3 A temporal semantics of *will*

On the face of it, I think it preferable to adopt a non-modal interpretation for *will*. Abusch (1998) claims that *will* maps the properties of the utterance time or the properties of eventualities on properties of times located in the interval stretching from the utterance time to the future. Quite informally, this semantics of *will* may be described as follows:

- (TS)** *Will(p)* is true at the utterance time t iff there is an interval $i_1 \subseteq [t, \infty]$ such that it is true that *p* at i_1 .

Whenever *will* is combined with a ‘frame’ adverb like *tomorrow*, the temporal location of the eventuality in the scope of *will* is determined by the intersection of $[t, \infty]$ with the denotation of the adverb (Abusch 1998). For instance, if *tomorrow* is associated with the interval $(d, +1]$ —standing for the day following the day d of t —*Mary will come tomorrow* is true iff Mary comes at an interval $i \subseteq [t, \infty] \cap (d, +1]$.

In the rest of this paper, I shall show that **(TS)** is all that it takes to provide a unitary semantics of *will*.

3 Modal domains

The analysis of *will* as a modal rests on a crucial intuition that should be accounted for: indeed, a prediction may also be challenged at the utterance time. For instance, a reaction like (24) is a possible rejoinder to (1).

- (24) No, this is false.

(TS) entails that the truth value of (1) depends on the properties of the future interval i_1 ; hence, in order to assign a truth value to (1), one has to be acquainted with the relevant properties of i_1 . But, unless A and S think they are Laplacean daemons, who know everything about the future history of the actual world—which, in real life, I deem implausible—neither A nor S can

possibly check, at the utterance time, whether or not the truth conditions of (1) are fulfilled. So, it looks as if, assuming (TS) is correct, disagreeing about the truth of a prediction is very different from disagreeing about past events. Imagine that it is (25) and not (1) that is followed by (24).

- (25) Mary came.

Since (25) is temporally anchored in the past, it is physically possible for S and A to assign a truth value to (25) regarding what they know about the past; they can thus disagree about what they take to be the truth value of (25). By contrast, while **(TS)** predicts that the content of assertions about the future has a truth value at the utterance time t , it also entails that no truth value assignment to that content can possibly take place at t .

This discrepancy between the assignment of truth values to (1) and (25) dissolves by itself in approaches that analyze *will* as an epistemic necessity: in order to assign a truth value to a proposition under the scope of an epistemic necessity, all one has to do is to decide what is compatible with what is known at the utterance time. In other words, modal analyses of (1) seem to capture the intuition that what is challenged by (24) is a conclusion about Mary's coming that can be arrived at in the context of utterance. I believe that this intuition is correct; moreover, I also believe that (1) is in fact under the scope of such an epistemic necessity operator. However, we shall see in the rest of this section that this necessity has nothing to do with *will*.

According to the by now largely accepted view defended by Lewis (1979) and Kratzer (1991b), modals quantify over a domain that is provided either by the context of conversation or by the surrounding discourse.

- P1** The domain of modals is determined either by the context or the surrounding discourse.

Lewis (1975) also argued that *if*-clauses restrict the domain of quantified expressions in the consequent. For instance, in (26), the italicized adverbs quantify over the domain set up by the *if*-clause:

- (26) If Mary has a boyfriend, she *often/always/never/sometimes* goes to the pub before noon.

Generalizing Lewis's insight, Kratzer (1991a) claims that all *if*-clauses are domain restrictors. For instance, in (27) the domain of the epistemic necessity is restricted to those worlds where Mary is in the U.K.

- (27) If Mary is in the U.K., she must live in London.

- P2** Antecedents of indicative conditionals restrict the domain of quantification for every quantifying expression within the antecedent.

In cases where no overt quantifier is present, Kratzer posits a covert epistemic necessity operator.⁸ For instance, the interpretation of (28) is that Mary is having vodka in every epistemically (or doxastically, it does not matter for my purposes) accessible world w such that it is true in w that she went to the pub.

- (28) If Mary went to the pub, she is having vodka.

P3 In indicative conditionals, in the absence of an overt modal, the consequent is under the scope of a covert epistemic necessity.

Most predictions are implicitly restricted to the relevant set of evidence. For instance, any speaker would agree that asserting (29) commits her to (30), rather than to (31):

- (29) Mary will attend the meeting.
- (30) If the meeting is not cancelled/ if Mary is still alive/ if a comet does not hit the Earth meanwhile, Mary will attend the meeting.
- (31) In every possible future, Mary will attend the meeting.

Our intuitive feeling is that predictions should be interpreted with respect to the set of possible worlds which contain the presuppositions shared by the participants to the conversation. This, of course, is reminiscent of Stalnaker's (1999, pp. 96–113, 2002) definition of the conversational background, given as P4.

P4 The conversational background C is constituted by those, and only those, possible worlds that contain every member of the set Q of presupposed propositions.

I shall borrow some other definitions of Stalnaker's. A proposition q is presupposed if it is mutually accepted by S and A : that is, if S and A accept q as true, and S and A know that S and A know, ... that S and A accept that q as true.⁹ A sentence (type) s is said to presuppose q iff the conventional meaning of s is such that its use requires q to be mutually accepted by S and A (cf. also Soames 1982). According to Stalnaker, an assertion that p is an attempt to update the conversational background set C in such a way as to include p among the set of presuppositions. If an assertion that p is interpreted literally,

⁸ Actually, as shown by Geurts (2004), an overt modal within the consequent does not necessarily preclude the *if*-clause from restricting the domain of the covert necessity, which results in systematic ambiguity. I shall not deal with this problem here. It is perhaps worth noting that since the ambiguity posited by Geurts is not one of scope, its existence does not threaten my analysis in any way.

⁹ I shall neglect here those cases where what is mutually accepted to be true is known to be false by one or both interlocutors. Such an additional level of complexity does not in any way affect the arguments to be developed below.

the conversational background against which it is interpreted should include every presupposition associated conventionally with the sentence s that expresses p ; if any such presupposition was not mutually accepted prior to the utterance time, it will be accommodated in order to make interpretation possible (Stalnaker 2002; von Fintel 2000). What is of interest here is the relationship between C and p after the sentence s that expresses p has been uttered, when all the presuppositions associated with s have been accommodated, but p still does not belong to the presupposition set.

It follows from the combination of Kratzer's and Stalnaker's views that, at this stage of the interpretation process, every asserted proposition which is not under the scope of an explicit modal may be considered as being under the scope of a covert epistemic necessity whose domain is restricted to C . Let me spell this out in more detail with the help of the assumptions formulated above:

C1 For every asserted proposition p and the set of presuppositions

$$Q = \{q_1, \dots, q_n\},$$

- i. if p is true with respect to C , then “if $\sum_{qn}^{q1} q$, then p ” is true in C ;
- ii. if “if $\sum_{qn}^{q1} q$, then p ” is true in C , then p is true with respect to C ;
- iii. if “if $\sum_{qn}^{q1} q$, then p ” is false in C , then p is false with respect to C ;
- iv. if p is false with respect to C , then “if $\sum_{qn}^{q1} q$, then p ” is false in C .

Therefore:

C1' Asserting that p with respect to C amounts to asserting that if $\sum_{qn}^{q1} q$, then p .

C2 Asserting that p with respect to C amounts to asserting that $\Box p$, where \Box is an epistemic necessity whose domain is restricted to those worlds that contain every member of Q .

In other terms, updating C with p amounts to updating with $c\Box p$, where $c\Box$ is the epistemic necessity ranging over the conversational background C . In both cases, the updated C includes only those possible worlds that are inconsistent with $\{\neg p \vee \neg q_1 \vee \dots \vee \neg q_n\}$.¹⁰ By asserting that p , S attempts to bring A to accept that it is true that every possible world of C is inconsistent with $\{\neg p\}$, i.e. that $c\Box p$. It is perhaps worth emphasizing that until such an acceptance takes place (and is mutually recognised), p will not count among the presuppositions in force in the context of conversation; hence, neither p nor $c\Box p$ will be entailed by C . If A accepts that p (and if this acceptance is mutually manifest), p becomes a presupposition; in accepting p A accepts *eo ipso* that p is true in every possible world belonging to C , viz. that it is true that $c\Box p$.

¹⁰ If any doubts arise as to the relevance of applying Kratzer's approach to **C1'**, note that this would also be the result of updating C with ‘If $\sum_{qn}^{q1} q$, then p ’, if this conditional is interpreted as a material implication: by definition, in no world belonging to C can the antecedent be false, so the only remaining worlds are those where p is true.

Thus, what B's answer challenges in (32) is the fact that Mary's coming tomorrow should be added to the presupposition set, viz. that every possible world belonging to C is inconsistent with Mary's not coming tomorrow.

- (32) A: Mary will come tomorrow.
 B: I'm not so sure.
 A: OK, then. It's possible that she will come.

By no means is the presence of *will* determining here. Exactly the same exchange could take place with the present tense:

- (33) A: Mary is at her office.
 B: I'm not so sure.
 A: OK, then. It is possible that she's at her office.

As in (32), in (33) B refuses to accept that it is true that $C\Box p$.

This being said, the analysis of (2)–(5) requires a further qualification of the notion of a contextual background: in order to have a proper semantics for modals, the context should not be seen as a subset of the set W of possible worlds, but rather as a subset of the power set of W (as proposed by Kratzer 1991b). Domains for modal expression are selected on pragmatic grounds from the context. By default, the domain of the covert necessity we have just postulated is Stalnaker's conversational background C; however, there is nothing compulsory about that; theoretically, the domain of this covert necessity could be any member of the power set of W.

To give a foretaste of the use I shall make, in the next section, of this contextual dependence of modal domains, let me hint at how we might dispel the potential worry that if *must* in (34) is taken to quantify over C, it would follow from my analysis that (34) and (35) are semantically equivalent.

- (34) It must be raining.
 (35) It's raining.

This equivalence is indeed correct.¹¹ Our intuitive reluctance to admit it stems precisely from the fact that if *must* is not attributed a domain distinct from C, uttering (32) would violate the Manner Maxim. (Cases exhibiting this pattern—a logical equivalence that is unacceptable by conversational standards—are central to Grice's writings on logic and conversation.) In fact, I suspect that (34) conveys a weaker commitment than (35) (Karttunen 1972; Dendale 1994) because this violation is resolved by interpreting *must* as ranging not over C but

¹¹ In fact, this logical equivalence should not seem surprising at all: even the simplest enrichment of first-order propositional calculus with modal operators, the system K, requires the necessitation rule viz. that if p is valid with respect to a set of axioms (to which the presupposition set Q may be assimilated in our case), so is $\Box p$ (Hughes and Cresswell 1996, pp. 23–36; see also Grice 2001, pp. 60–62).

over S's doxastic set D, i.e. the set of the possible worlds compatible with what S believes to be true. Since not everything S believes or knows is mutually accepted by S and A, $D \subset C$. Under such an interpretation, (34) is weaker than (35) because the set of those worlds where it should be raining in case (34) is true is a strict part of the set of those worlds where it should be raining in case (35) is true.

4 Explaining the ‘modal’ uses away

4.1 Generic uses

As mentioned in the introduction, *will* may occur in examples, like (36), that resemble predication of generic properties, as in (37):

(36) Oil will float on water. [= (2)]

(37) Oil floats on water.

In this subsection I shall argue, on the one hand, that unlike (37), (36) is not a generic statement, but merely asserts the existence of a disposition, and on the other hand, that the felicity of assertions like (36) is constrained both by the possibility of accommodating the domain of the covert epistemic necessity and by pragmatic (Gricean) considerations of Quantity.¹²

One can utter (36) and (37) even if no water is in contact with oil at the utterance time, which is indeed characteristic of generic statements (Carlson 1989). However, for *bona fide* generic statements this ‘epistemic independence’ is only optional: since the relational property ascribed to oil and water is a generic one, (37) would also be felicitous in a context where at least one instantiation of the ascribed property is perceptually accessible.¹³

(38) [Pointing at an instance of oil floating on water:]
As you can see, oil floats on water.

¹² Notice that I use Grice’s jargon for ease of exposition. My pragmatic claims can be easily restated in terms of primary pragmatic processes (Recanati 2004), Relevance (Sperber and Wilson 1995), or by assuming the saturation of phonologically unrealised slots (Stanley 2000).

¹³ Copley (2002) claims the opposite. However, she uses *Oh look!* instead of *As you can see*. See the contrast below (to take one of her examples):

- (i) ?Oh look! Sheep in Scotland are black.
- (ii) As you can see, sheep in Scotland are black.

In fact, *Oh look!* indicates that the proposition expressed by the following sentence was not previously known by S: in the case of the color of sheep, the perceptual acquaintance with one example is not sufficient to ground genericity, so that (i) is pragmatically odd. However, *Oh look!* is acceptable in (iii), where one instance suffices to induce a law:

- (iii) Oh look! Oil floats on water.

However, such a use is impossible with the ‘generic’ *will*, which strongly suggests that it is not generic after all¹⁴:

- (39) [Pointing at an instance of oil floating on water:]
 ?As you can see, oil will float on water.

The difference here seems to be the one between a law-like statement, the truth of which can but need not be instantiated at the utterance time, and the attribution of a certain disposition. Clearly, the former entails the latter, and since in the case of (36) a unique instantiation is sufficient (if only in folk psychology) to induce a general law, taking this instantiation as nothing more than a manifestation of a disposition appears to be a violation of Grice’s (1975) first maxim of Quantity (“Make your contribution as informative as required”). However, in cases where it is not perfectly clear that the observed instantiation of a property suffices to consider it as essential, both options are allowed.¹⁵

- (40) [Looking at a machine that takes several kinds of inputs and produces perfect copies:]
 As you can see, the machine will take/takes several kinds of inputs and produce(s) perfect copies.
- (41) [Looking at a child who has again refused to eat carrots:]
 As we can see, she will be/is stubborn.

However, this is only half of the story. The truth of (36) is compatible not only with the fact that no amount of oil will ever be floating on any amount of water, but also with the fact the proposition *p* under the scope of *will* is false at the utterance time *t*, i.e. with the fact that, in the actual world, no amount of oil is floating on any amount of water at *t*. Hence, by virtue of the first maxim of Quantity, and of (TS), the use of *will* in (36) commits the speaker to the falsity of *p* at *t*. If, in the world of utterance, *p* is false at *t* while (36) is obviously true, this is due to the fact that some initial conditions remain unfulfilled; and the same conclusion holds for all worlds where *p* is false. Thus, (36) can be interpreted by restricting (pragmatically) the domain

¹⁴ In what follows I am indebted to Marc Dominicy.

¹⁵ Many thanks to an anonymous reviewer for bringing the following examples to my attention. I am not certain that another example of hers/ his can be treated in similar terms:

- (i) As you can see, boys will be boys.

In this case, the present seems less acceptable:

- (ii) As you can see, boys are boys.

I gather that this is so because the expression ‘Boys will be boys’ has come to denote a property idiomatically.

of the covert necessity operator to the set of those possible worlds where some initial conditions are fulfilled that prove sufficient for some amount of oil to float on some amount of water.

To confirm this, compare (36) with (42).

- (42) ?Bears will be mammals.

The proposition that bears are mammals is true at the utterance time, and it is also true in every possible world, including worlds where there are no (more) bears. Therefore, no pragmatic interpretation based on the Maxim of Quantity is available.

Ziegeler (2006) observes that while the example with *will* in (43) is odd, the introduction of a frequency adverb makes it perfectly acceptable.

- (43) ?Elephants will have long trunks.

- (44) Elephants will often have long trunks.

To be acceptable, the first example should express a disposition entailed by the law-like statement in (45).

- (45) Elephants have long trunks.

But if having long trunks is understood as being part of the definition of *elephant*, (43) is also true at the utterance time, which, exactly as in (42), blocks the pragmatic restriction of the domain of the covert necessity. The introduction of a frequency adverb cancels the generic character of the property assigned to elephants:

- (46) Elephants often have long trunks.

Indeed, since the last example is no necessary (analytic) truth, a pragmatic restriction to worlds where there are (observed) elephants may operate, exactly as in (36).

4.2 Epistemic uses

Let us turn now to the alleged ‘epistemic modal’ uses of *will*:

- (47) Mary will be at the opera now. [= (3)]

The first fact to account for is the difference in acceptability between (47) and (48):

- (48) *Mary will be at the opera yesterday.

Abusch (1997) has made an impressive case for positing, in the interpretation of tenses, a local time parameter n that is identified with the utterance time t at the top level. I shall borrow two further assumptions from Abusch (1998): (a) stative predicates, like *be in the opera*, take n as one of their arguments; (b) the interval $[t, \infty]$ substitutes for any free occurrence of n within the scope of *will*.

Let the denotation of *yesterday* be the interval $[-1; d)$ standing for the day preceding the day d of t (cf. Abusch 1998). Since $[-1; d) \cap [t, \infty] = \emptyset$, **(TS)** is sufficient to account for the unacceptability of (48).

Whereas in (48) the n argument of *be in the opera* remains free, in (47) the adverb *now* binds it to the utterance time t . **(TS)** provides the following interpretation for (47):

- (47)a. [*Mary will be at the opera now*] is true iff it is true at an interval $i \subseteq [t, \infty]$ that Mary is at the opera at t .

Obviously, the truth conditions in (47a) make (47) and (49) equivalent:

- (49) Mary is at the opera now.

Thus, by using a superfluous future-time marker, the speaker of (47) either violates or flouts the Manner Maxim. But this is not the only violation of the Manner Maxim that takes place. As shown in Sect. 3, both (47) and (49) are under the scope of a covert epistemic necessity operator. Therefore, (47) is also truth-conditionally equivalent to (50).

- (50) Mary must be at the opera now.

Of course, the equivalence between (47) and (49), and between (47) and (50), holds if, and only if, the domains of the (co)vert necessity operators are kept identical. Therefore, an obvious move towards an interpretation of (47) more in tune with the Maxim of Cooperation is to restrict somehow the domain of quantification of the covert necessity. Although the details of the process are theory dependent (cf. footnote 12), it is clear that such a pragmatic interpretation is particularly economic because it accounts for two apparent violations at the same time.¹⁶

We now have to determine the nature of this restriction. Like many other authors, Sweetser (1990) expresses the intuition that in (47) the reference to the future is made relative to some ‘verification’: “If we check, we will find out” (1990, p. 54). (47) is true iff Mary is at the opera at the utterance time. The truth value of the whole thus depends on the properties of the utterance time t . However, this does not imply that a truth value assignment can take place, viz. that the relevant properties of t are epistemologically available to S or A at t ; in fact, (47) will typically be used in case truth value assignment is impossible at t .

¹⁶ Note that on this account (49) and (50) are also equivalent; as I hinted at the end of Sect. 3, the discursive differences entailed by the use of *must* (cf. Dendale 1994; von Fintel and Gillies forthcoming) should be accountable by the same pragmatic mechanism of domain restriction.

Thus it seems natural to say that in (47) the domain of the covert necessity operator reduces to those accessible worlds where a verification of (47) takes place at some $i \subset [t, \infty]$. A further pragmatic implication is that the speaker has no means to ascertain the truth of (47) at the utterance time (see also Ziegeler 2006).¹⁷

To support this analysis of (47), we need empirical evidence for two points: (a) that *will* is not a modal in (47), and (b) that the domain of the covert necessity is restricted to the ‘verification’ worlds.¹⁸

The fact that the addition of *perhaps* proves acceptable with *will*, but awkward with *must*, provides decisive evidence for the first point (see Tasmowski and Dendale 1998):

- (51) Mary will perhaps be at the opera now.

- (52) *Mary must perhaps be at the opera now.

This difference is correctly predicted by my account. In sentences with *will*, the covert universal quantification is triggered by default and can be cancelled by an overt modal marker like *perhaps*. By contrast, in sentences like (52) this universal quantification belongs to the meaning of *must* already, so that cancellation gives rise to inconsistency with this verb.¹⁹

Some readers may feel that I am flogging a dead horse here, and object that the differences between *must* and *will* only show that *will* is not a pure epistemic necessity. But the example in (51) rules out any epistemic, doxastic,

¹⁷ In this paper I leave aside the combination of the future perfect with *yesterday*:

(i) Mary will have been at the opera yesterday.

I suspect that one may invoke the same pragmatic restriction as for (47). A necessary premise for such an explanation is the truth-conditional equivalence between (i) and (ii):

(ii) Mary was at the opera yesterday.

However, a proper articulation of this proposal requires a much more serious discussion of aspect than I could offer within the scope of the present discussion.

¹⁸ This restriction process does not put any constraint on who is supposed to verify the proposition in hand. But in the following example the domain of the covert necessity is restricted to those possible worlds where the addressee has been in London and where the speaker (or a third part) proceeds to the verification of the audience’s knowledge at some $i \subset [t, \infty]$:

(i) If you have been in London, you will know that it is a lovely city.

¹⁹ One might think that my explanation wrongly predicts the unacceptability of (i):

(i) Mary should perhaps be at the opera.

However, the epistemic *should* is weaker than the epistemic *must* (for a recent discussion, see Copley 2005), which may explain the difference observed:

(ii) Mary should be there, in fact, she must be.

(iii) ?Mary must be there, in fact, she should be.

or metaphysical modal base for *will* for exactly the same reasons that made this analysis unavailable for (9a) or (13a). It is sufficient to rerun every combination, summarised in Table 1, to see that if *will* is any kind of epistemic, doxastic, or metaphysic necessity, then (51) and (47) should be equivalent, or (51) should be compatible with (53), or (51) should entail (50).

- (53) Mary is not at the opera now.

Finally, *will* in (47) cannot be any sort of possibility operator, as shown by the pragmatic unacceptability of (54) versus the acceptability of (55) (from Palmer 1979, p. 47):

- (54) ?The French will be on holiday today, but I could be wrong about that.
- (55) The French are probably on holiday today, but I could be wrong about that.

As for the second line of objection, viz. that the nature of the domain restriction is *ad hoc*, a good piece of evidence for the claim that it is the ‘verification domain’ that is selected for the covert necessity can be drawn from another difference of use between *must* and the ‘epistemic’ *will*. The ‘epistemic future’ is restricted to the predication of non-generic properties (see Tasmowski and Dendale 1998):

- (56) It looks like Mary is not here. She will be tired.
- (57) It looks like Mary is not here. ?She will be lazy.

If laziness is a generic property of Mary, known to both the speaker and the addressee, it hardly needs verification; recall from the former subsection that it is characteristic of predication of generic properties that their truth does not depend on one instantiation or another of the property in question. Since no restriction to ‘verification worlds’ is available, the only interpretation that is not blatantly false is that Mary will become lazy at some point—which, of course, is not the intended reading. However, (57) proves more acceptable in a context where Mary is a person with whom the speaker and the addressee had an appointment for the first time.

4.3 Volitional/habitual/dispositional uses

Although there is a clear volitional overtone in (58), the explanation of this phenomenon does not require any modification of (**TS**):

- (58) In winter, Mary will always wear a green coat. [= (4)]

The intuitive feeling that there is a semantic component of volition in (58) stems from the fact that the proposition under the scope of *will* is taken to be true in every future winter conceivable in C (this owing to the covert necessity operator). Every rational intention to perform a given action has the property of being formed against a set of beliefs that is incompatible with the belief that it is impossible for this action to take place (Davidson 2001, pp. 83–102; see also Anscombe 1957, pp. 91–93; for an empirical confirmation, see Malle and Knobe 2001).

[An] intention assumes, but does not contain a reference to, a certain view of the future. A present intention with respect to the future is itself like an interim report: given what I now know and believe, here is my estimate on what kind of action is desirable. [...] Since the intention is based on one's best estimate of the situation, it merely distorts matters to say the agent intends to act in the way he does only if his estimate turns out to be right. (Davidson 2001, p. 101)

It follows that, in the absence of any independent causal explanation, the attribution of a future action to an agent with respect to every possible world in a certain domain usually implicates the attribution of the corresponding intention. This is the reason why the introduction of an overt possibility operator cancels (or at least diminishes) this ‘volitional’ effect:

- (59) In winter, Mary will perhaps wear a green coat.

Likewise, (60) and (61) clearly differ with respect to the reading where the car is described as a ‘person’ capable of entertaining ‘intentions’: while (60) allows such a reading, (61) disfavors it.²⁰

- (60) This car will not start.
 (61) Perhaps this car will not start.

4.4 Deontic uses

It should be clear by now that the alleged deontic use of *will* in (62) is to be accounted for with the help of pragmatic processes rather than by injecting modality within the semantics of *will*:

- (62) You will leave the town tomorrow morning with the first train. [= (5)]

Ziegeler (2006) points out that a genuine deontic modal may not be replaced with a ‘factive’ assertion. For instance, (63) is not equivalent to (64):

²⁰ Thanks to Philippe De Brabanter for drawing my attention to this example.

- (63) He must give you your money back.
- (64) He gives/will give you your money back.

Yet, even in its directive reading (62) may be replaced with (65):

- (65) It is the case that you leave the town tomorrow morning with the first train.

This indicates that the deontic interpretation of (62) should be pragmatically derived through the attribution of the adequate illocutionary force to the utterance (also Palmer 1986, p. 94). Since it is under the scope of a covert epistemic necessity, (62) implies the absence of any choice, which in turn leads to a directive interpretation.

5 Conclusion

I have argued that modal analyses of *will* face insurmountable objections. The only semantic contribution that should be attached to *will* is a forward expansion of the evaluation time. I have also suggested that all cases where *will* seems to act as a genuine modal are better explained by a restriction of the domain of quantification of a covert epistemic necessity.

A final remark: *will* and *would* are commonly assumed to be different morphosyntactic realisations of the morpheme *woll*: *will* = *woll* + Present, while *would* = *woll* + Past (Abusch 1988). Further research will have to determine whether the claims made above about *will* could be extended to *would*.

References

- Abusch, D. 1988. Sequence of tense, intensionality and scope. In *Proceedings of the Seventh West Coast Conference on Formal Linguistics*, ed. H. Borer, 1–14. Stanford: Stanford Linguistic Association.
- Abusch, D. 1997. Sequence of tense and temporal *de re*. *Linguistics and Philosophy* 20(1): 1–50.
- Abusch, D. 1998. Generalizing tense semantics for future contexts. In *Events and grammar*, ed. S. Rothstein, 13–33. Dordrecht: Kluwer.
- Anscombe, G.E.M. 1957. *Intention*. Oxford: Blackwell.
- Carlson, G.N. 1989. English generic sentences. In *Properties, types and meaning, Vol. 2: Semantic issues*, ed. G. Chierchia, B.H. Partee and R. Turner, 167–192. Dordrecht: Kluwer.
- Comrie, B. 1985. *Tense*. Cambridge: Cambridge University Press.
- Condoravdi, C. 2002. Temporal interpretation of modals. Modals for the present and for the past. In *The construction of meaning*, ed. D.I. Beaver, L.D.C. Martinez, B.Z. Clark, and S. Kaufmann, 59–88. Stanford: CSLI Publications.
- Copley, B. 2002. *The semantics of the future*. PhD dissertation, MIT.
- Copley, B. 2005. What should *should* mean? Paper presented at the Language Under Uncertainty Workshop, Kyoto University, January 2005.
- Davidson, D. 2001. *Essays on actions and events*. Oxford: Oxford University Press, Second edition.

- Dendale, P. 1994. *Devoir épistémique: marqueur modal ou évidentiel?* *Langue française* 102: 24–40.
- Ducrot, O. 1984. *Le dire et le dit*. Paris: Minuit.
- Enç, M. 1996. Tense and modality. In *The handbook of contemporary semantic theory*, ed. S. Lappin, 345–358. Oxford: Blackwell.
- Geurts, B. 2004. *On an ambiguity in quantified conditionals*. Manuscript, University of Nijmegen.
- Geurts, B. 2005. Entertaining alternatives: disjunctions as modals. *Natural Language Semantics* 13: 383–410.
- Grice, H.P. 1975. Logic and conversation. In *Syntax and semantics 3: Speech acts*, ed. P. Cole and J.L. Morgan, 41–58. New York: Academic Press.
- Grice, H.P. 2001. *Aspects of reason*. Oxford: Clarendon Press.
- Haegeman, L.M. 1983. *The semantics of will in present-day British English: a unified account*. Brussels: Royal Academy of Belgium.
- Hornstein, N. 1990. *As time goes by: tense and universal grammar*. Cambridge, Mass.: MIT Press.
- Hughes, G.E., and M.J. Cresswell. 1996. *A new introduction to modal logic*. London: Routledge.
- Jaszczolt, K.M. 2006. Futurity in default semantics. In *Where semantics meets pragmatics*, ed. K. von Heusinger and K. Turner, 471–492. Oxford: Elsevier.
- Kamp, H., and U. Reyle. 1993. *From discourse to logic: introduction to modeltheoretic semantics of natural language, formal logic and discourse representation theory*. Dordrecht: Kluwer.
- Karttunen, L. 1972. Possible and must. *Syntax and semantics*, Vol. 1, ed. J. Kimball, 1–20. New York: Academic Press.
- Kaufmann, S., C. Condoravdi, and V. Harizanov. 2006. Formal approaches to modality. In *The expression of modality*, ed. W. Frawley, 71–106. Berlin: de Gruyter.
- King, J.C. 2003. Tense, modality, and semantic values. *Philosophical Perspectives* 17: 195–245.
- Kratzer, A. 1991a. Conditionals. In *Semantics: an international handbook of contemporary research*, ed. A. von Stechow and D. Wunderlich, 651–656. Berlin: de Gruyter.
- Kratzer, A. 1991b. Modality. In *Semantics: an international handbook of contemporary research*, ed. A. von Stechow and D. Wunderlich, 639–650. Berlin: de Gruyter.
- Lewis, D.K. 1975. Adverbs of quantification. In *Formal semantics of natural language*, ed. E.L. Keenan, 3–15. Cambridge: Cambridge University Press.
- Lewis, D.K. 1979. Scorekeeping in a language game. *Journal of Philosophical Logic* 8: 339–359.
- Ludlow, P. 1999. *Semantics, tense, and time: an essay in the metaphysics of natural language*. Cambridge, Mass.: MIT Press.
- Malle, B.F., and J. Knobe. 2001. The distinction between desire and intention: a folk-conceptual analysis. In *Intentions and intentionality: foundations of social cognition*, ed. B.F. Malle, L.J. Moses, and D.A. Baldwin, 45–67. Cambridge, Mass.: MIT Press.
- Palmer, F.R. 1979. *Modality and the English modals*. London: Longman.
- Palmer, F.R. 1986. *Mood and modality*. Cambridge: Cambridge University Press.
- Recanati, F. 2004. *Literal meaning*. Cambridge: Cambridge University Press.
- Recanati, F. 2007. *Perspectival thought: A plea for (moderate) relativism*. Oxford: Oxford University Press.
- Sarkar, A. 1998. The conflict between future tense and modality: the case of *will* in English. *Penn Working Papers in Linguistics* 5: 91–117.
- Smith, C. 1978. The syntax and interpretation of temporal expressions in English. *Linguistics and Philosophy* 2: 43–99.
- Soames, S. 1982. How presuppositions are inherited: a solution to the projection problem. *Linguistic Inquiry* 13: 483–545.
- Sperber, D., and D. Wilson. 1981. Irony and the use-mention distinction. *Radical pragmatics*, ed. P. Cole, 295–318. New York: Academic Press.
- Sperber, D., and D. Wilson. 1995. *Relevance: communication and cognition*. Oxford: Blackwell, Second edition.
- Stalnaker, R.C. 1999. *Context and content*. Oxford: Oxford University Press.
- Stalnaker, R.C. 2002. Common ground. *Linguistics and Philosophy* 25: 701–721.
- Stanley, J. 2000. Context and logical form. *Linguistics and Philosophy* 23: 391–434.
- Sweetser, E. 1990. *From etymology to pragmatics: metaphorical and cultural aspects of semantic structure*. Cambridge: Cambridge University Press.
- Tasmowski, L., and P. Dendale. 1998. *Must/will and doit/future simple as epistemic modal markers. In English as a human language: To honour Louis Goossens*, ed. L. Goossens, J.v.d. Auwera, F. Durieux, and L. Lejeune, 325–336. Munich: LINCOM Europa.
- von Fintel, K. 2000. *What is presupposition accommodation?* Manuscript, MIT.

- von Fintel, K., and A.S. Gillies. (forthcoming). An opinionated guide to epistemic modality. In *Oxford Studies in Epistemology, Vol. 2*, ed. T. Szabó Gendler and J. Hawthorne. Oxford: Oxford University Press.
- Yavas, F. 1982. Future reference in Turkish. *Linguistics* 20: 411–429.
- Ziegeler, D. 2006. Omnitemporal *will*. *Language Sciences* 28: 76–119.
- Zimmermann, T.E. 1999. Scepticism *de se*. *Erkenntnis* 51: 267–275.
- Zimmermann, T.E. 2000. Free choice disjunction and epistemic possibility. *Natural Language Semantics* 8: 255–290.