Why will is not a modal

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. Lewis’s and Kratzer’s views on modality being adopted, 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.

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 semantics (e.g. Palmer 1987; 1986: 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
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meanings (e.g. Comrie 1985: 43-48; Hornstein 1990; Kamp and Reyle 1993: 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 1987: chapter 7). However, the ambition of this paper is to defend a unitary non-modal semantics for will across the board. For that task 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 sub-set of the modal base of the 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 sub-category one might wish to single out among different uses of will.

In Section 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 Section 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 Section 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 Section 4, it will be shown that this fact

¹ Kamp and Reyle argue that will is a modal from a morpho-syntactic point of view, but when dealing with ‘future’ uses like (1) they assign it a semantics very much similar to the one to be defended below. Since they do not address ‘modal’ cases like (2-5), it is a reasonable (but a non-committal) guess to include them within the second group.
allows us to analyse (2-5) in a straightforward way, without contaminating the semantics of *will* with modal overtones.

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

**2.1 Will as a necessity**

I shall take as a starting point the often-quoted paper by Enç (1996) — which is quite a paradigmatic case of a modal approach to *will* within the model-theoretic framework — and then generalise my objections to every account that analyses *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 <w,i> iff in every world w accessible to w there is an interval i such that i < i and p is true at <w, i>. [...] 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: 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 is epistemically accessible to the actual world w at the time i (wE,iw) iff w is consistent with the set K, of what is known in w at i.

**Epistemic Accessibility (E)**

wE,iw iff K, is consistent with w

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

**Doxastic Accessibility (D)**

wD,iw iff B, is consistent with w

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I am following the 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 relativised to an individual: I shall assume thorough E or D-accessibility to be relative to the speaker’s beliefs or knowledge.
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 \( w_i \) is metaphysically accessible to the actual world \( w \) (\( wMw_i \)) iff \( w_i \) is consistent with \( w \).

**Metaphysical Accessibility (M)**

\[ wMw_i \text{ iff } w \text{ is consistent with } w_i \]

Now, every proposition that is known is also true — for every \( i \), \( K_wi \subseteq w \); therefore, if \( wMw_i \), then \( wEw_i \). Incidentally, it follows that what is sometimes called historical accessibility H — \( wHw_i \) iff, up to \( i \), \( w \) and \( w_i \) 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; Zimmermann 2000; Kaufmann, Condoravdi and Harizanov 2006).

**Transitivity**

If \( wRw_i \) and \( w_i Rw_2 \), then \( wRw_2 \)

**Euclideanness**

If \( wRw_i \) and \( wRw_2 \), then \( w_i Rw_2 \)

**Self-reflexivity**

If \( wRw_i \) then \( w_i Rw_2 \) iff \( wRw_2 \)

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. Euclideaness 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 analyse will as an epistemic necessity. Consider first a simplified set of possible worlds \( W^* = \{w, w_i, w_2\} \); what is known in \( w_2 \) does not matter here (nor in \( W^{**} \) below).

\[
\begin{align*}
W^* & \quad w = \{p\} & K_wi = \{p\} \\
& \quad w_i = \{p, \neg r\} & K_{w_i} = \{\neg r\}
\end{align*}
\]
If *will* is an epistemic necessity, (1), repeated for more convenience as (1a), has the truth-
conditions in (1b); unless specified otherwise, thorough 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 

\[ wE_iw_1, [Mary comes at i_1 > i] \in w_1. \]

Let us consider that *p* is the proposition [*Mary comes at i_1 > i*]. In *W^**, \(\neg(wE_iw_2), wE_iw_1, \) and

\[ p \in w_1; \] hence (1) is true in *w*. But take the 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*, \(\neg[Mary comes \at i_1 > i] \in w_2. \)

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

\[ \text{will}(p) \rightarrow \Box[\text{will}(p)]. \]

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

\[
\begin{align*}
W^** & \quad w = \{q, \neg r\} & K_wi = \{q\} \\
        & \quad w_1 = \{r, q, p\} & K_{wii} = \{p, r\}
\end{align*}
\]

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).
\[
w_2 = \{\neg p, q\}
\]

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 \( \text{will} \) is an epistemic necessity are given in (8b).

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

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

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

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

\[(10) \quad ? \text{ It is not the case that Mary will come and (for all that we know) it is possible}_{\text{epistemic}} \text{ that Mary will come.}\]

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

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

\[(1) \quad c. \quad [\text{Mary will come}] \text{ is true in } w \text{ iff for every possible world } w_1 \text{ such that } w \text{D}w_1, [\text{Mary comes at } i_1 > i] \in w_1.\]

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):

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\(^4\) Using \textit{would}, \textit{might} or \textit{could} instead of \textit{it is not the case that }\textit{will}(p)\text{ would beg the question, for nothing at this stage allows one to take for granted that }\textit{will} \text{ is a modal that has a dual in English.}
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\[ W' \quad w = \{p\} \quad B_wi = \{p\} \]

\[ w_1 = \{p, \neg r\} \quad B_{w_1}i = \{\neg p\} \]

\[ w_2 = \{\neg r, \neg p\} \]

In \( W' \), \( wD_i w_1 \), \( w_1 D_i w_2 \), but \( \neg(wD_i w_2) \). 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\(_{\text{doxastic}}\) that Mary will not come.

\[
\begin{align*}
&\text{b. } \text{(I believe that) it is possible}_{\text{doxastic}} \text{ that Mary will not come} \\
&\text{is true in } w \text{ iff there is at least one possible world } w_1 \text{ such that } wD_i w_1 \text{ and such that, for every possible world } w_2 \text{ such that } w_1 D_i w_2, \neg [\text{Mary comes at } i_i > i] \in w_2.
\end{align*}
\]

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\(_{\text{doxastic}}\) that Mary will not come.

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

\[ W'' \quad w = \{q, \neg r\} \quad B_wi = \{q\} \]

\[ w_1 = \{r, q, p\} \quad B_{w_1}i = \{p, r\} \]

\[ w_2 = \{\neg p, q\} \]

In \( W'' \), \( wD_i w_1 \) and \( wD_i w_2 \), but \( \neg(wD_i w_2) \). Under the reading of will as a doxastic necessity, (8a) would receive the truth-conditions in (8c), which entails that (8a) is true in \( w \).

(8) c. [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 \( wD_i w_1 \) and \( \neg [\text{Mary comes at } i_i > i] \in w_1 \).

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\(_{\text{doxastic}}\) that Mary will come.
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b. [(I believe that) it is possible\textsubscript{(doxastic)} that Mary will come] is true in \( w \) iff there is at least one possible world \( w_1 \) such that \( wDw_1 \) and such that, for every possible world \( w_2 \) such that \( w,Dw_2 \), \([Mary\ comes\ at\ i, > i]\in w_2\). 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 \( R \)

\[
[\Diamond \Box p] \text{ is true in } w \text{ iff there is at least one } w_1 \text{ such that } wRw_1 \text{ and such that, for every } \\
w_2 \text{ such that } w_1Rw_2, p \in w_2
\]

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.\(^5\)

\[
[\Box p] \text{ is true in } w \text{ iff for every } w_1 \text{ such that } wRw_1, p \in w_1
\]

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 make 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.

\(^5\) Geurts (2005) points out that, at the 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 — the one 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.
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It is possible that Mary must be in jail.

Could not we 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.

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

(9) c. \[(\text{For all that we know} \text{ it is possible}_\text{epistemic} \text{ that Mary will come})\] 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 \(w_1D_iw_2\), \([\text{Mary comes at } i_1 > i] \in w_2\).

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).

(15) a. Mary will not come.

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

As proved by the unacceptability of (16), such a compatibility is counter-intuitive.

(16) ? (For all that we know) it is possible_\text{epistemic} that Mary will come, and Mary will not come.

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

(13) c. \[(\text{I believe that} \text{ it is possible}_\text{doxastic} \text{ that Mary will come})\] 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 \(w_1E_iw_2\), \([\text{Mary comes at } i_1 > i] \in w_2\).

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.

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

The point specifically made against Enç can be easily generalised to any account that reduces the modal base of will to a sub-set 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).

(9)  d. [(For all that we know) it is possible\textsubscript{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 $w_1F^*_Ew_2$, [Mary comes at $i_j > i$] $\in w_2$.

(13) d. [(I believe) it is possible\textsubscript{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 $w_1F^*_Ew_2$, [Mary comes at $i_j > i$] $\in w_2$.

(15) d. [Mary will not come] is true in $w$ iff for every possible world $w_1$ such that $w_1F^*_Ew_1$, $\neg$[Mary comes at $i_j > i$] $\in w_1$.

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 $i_j$ — $K_wi$ or $B_wi$ is only required, by (9d) or (13d), to be consistent with $w_j$ 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 $i_j$ 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 sub-set of the modal basis 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).

(9)  e. [(For all that we know) it is possible\textsubscript{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 $w_1F^*_Dw_2$, [Mary comes at $i_j > i$] $\in w_2$.

(13) e. [(I believe) it is possible\textsubscript{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 $w_1F^*_Ew_2$, [Mary comes at $i_j > i$] $\in w_2$. 
(15) e. \([\text{Mary will not come}]\) is true in \(w\) iff for every possible world \(w_i\) such that \(wF_e^*w_i\), \(\neg [\text{Mary comes at } i_i > i] \in w_i\).

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

Things do not improve if the modality of \(\text{will}\) in (9a) or (13a) is claimed to be metaphysical. Let us begin by (9a), whose truth-conditions would thus read as (9f).

(9) f. \([\text{(For all that we know) it is possible[epistemic] that Mary will come}]\) is true in \(w\) iff there is at least one possible world \(w_i\) such that \(wE_w w_i\), and that, for every possible world \(w_2\) such that \(w_i M w_2\), \([\text{Mary comes at } i_i > i]\) \in w_2\).

Recall that \(w_i M w_2\) entails \(w_i E w_2\). It follows that, under such a reading, (9a) entails (17a), whose truth-conditions are given in (17b).

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6 Note that I have treated temporal expressions as referring expressions, and not as operators. As far I 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 evaluations are treated as ordered pairs \(<w, i>\) 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 \(W = \{w_0, w_1\}\) to be the set of possible worlds, let \(I = \{i_0, i_1\}\) to be the set of temporal intervals, and let the set-theoretical product \(W \times I\) to be the set of circumstances of evaluation. Let the proposition \([\text{Mary comes}]\) to be true in \(<w_1, i_i>\), and false in every other circumstance of evaluation. Let us posit that \(w_0 M w_0, w_0 M w_1, w_0 M w_0, w_1 M w_1;\) and that \(w_0 E w_0, w_1 E w_1, w_0 E w_1, w_1 E w_0, w_0 E w_1, w_1 E w_0\). As an anonymous reviewer pointed out, in this toy model metaphysical accessibility entails epistemic accessibility, but (9a) does not entail (17a). If \(\text{will}\) is a metaphysical necessity, (9a), repeated for convenience as (i), would receive the truth-conditions in (ii):

(i) \([\text{(For all that we know) it is possible[epistemic] that Mary will come}]\) is true in \(<w, i>\)

(ii) \([\text{(For all that we know) it is possible[epistemic] that Mary will come}]\) is true in \(<w, i>\) iff there is at least one possible world \(w_i\) such that \(wE_w w_i\) and such that, for every \(w_n\), such that \(w_i M w_2\), and for every \(i_i > i\), \([\text{Mary comes}]\) is true in \(<w_n, i_i>\).
(17) a. (For all that we know) it is possible that it is necessary that Mary comes at \( i_j > i \).

b. [(For all that we know) it is possible that it is necessary that Mary comes at \( i_j > i \)] is true in \( w \) iff there is at least one possible world \( w_l \) such that \( w \in w_l \) and such that, for every possible world \( w_2 \) such that \( w_l \in w_2 \), [Mary comes at \( i_j > i \)] \( \in w_2 \).

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

(18) (For all that we know) it is necessary that Mary comes at \( i_j > i \).

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).

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In our toy model, \( w_l \) is the only possible world that is epistemically accessible to \( w_0 \) at \( i_0 \); since the only possible world that is metaphysically accessible to \( w_l \) at \( i_0 \) is \( w_l \) 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 that it is necessary that Mary comes at \( i_j > i \).

(iv) [(For all that we know) it is possible that Mary will come is true] in \( <w, i> \) iff there is at least one possible world \( w_l \) such that \( w \in w_l \) and such that, for every \( w_n \), such that \( w_l \in w_2 \), and for every \( i_n > i \), [Mary comes] is true in \( <w_n, i_n> \)

The only possible world that is epistemically accessible to \( w_0 \) at \( i_0 \) is still \( w_l \); but since the only possible world epistemically accessible to \( w_l \) at is \( w_0 \), (iv) is not satisfied. However, the model under consideration implies that the proposition [Mary will not come] is true in \( <w_0, i_0> \); (15a), repeated as (v), would receive the truth-conditions in (vi).

(v) Mary will not come.

(vi) [Mary will not come] is true in \( <w_0, i_0> \) iff for every \( w_l \), such that \( w_0 \in w_l \) and such that, for every \( i_n > i \), [Mary comes] is false in \( <w_l, i_n> \).

The only possible world that is metaphysically accessible to \( w_0 \) is \( w_0 \) itself; hence the truth-conditions in (vi) are satisfied — we are back to the undesired compatibility of (9a), (of (i)) with (15a) (with (v)).
(13) f. [(I believe) it is possible\textsubscript{doxastic} that Mary will come] is true in \( w \) iff there is at least one possible world \( w_1 \) such that \( w_1 \text{D}_i w_1 \) and such that, for every possible world \( w_2 \) such that \( w_1 \text{M}_w w_2 \), \([\text{Mary comes at } i_1 > i] \in w_2 \).

Since \( w_1 \text{M}_w w_2 \) entails \( w_1 \text{E}_w w_2 \), 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 \textit{will} is taken to be a metaphysical necessity.\footnote{What if \textit{will} is a historical necessity in \( \Diamond \text{will}(p) \)? The truth-conditions of (13a) are as follows:}

\[ \Diamond \text{will}(p) \text{ is true in } w \text{ iff there is at least one possible world } w_1 \text{ such that } w_1 \text{E}_w w_1 \text{ and such that, for every possible world } w_2 \text{ such that } w_1 = w_2 \text{ up to } i, [p \text{ at } i_1 < i] \in w_2. \]

Either \( w_1 \text{E}_w w_2 \) or \( \neg(w_1 \text{E}_w w_2) \). 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.

Finally, it would not help to claim that the domain of \textit{will} is a sub-set of the domain of the metaphysical necessity. Since \( M \) entails \( E \), this would amount to claim that \textit{will} quantifies over a sub-set of epistemic accessibility, which brings us back to the cases whose drawbacks we have already identified.

Table 1 sums up different analyses of \textit{will} as a necessity and their problems.
(19) It will be possible\textsubscript{[epistemic]/[doxastic]} (at \(i_1\)) that Mary comes (at \(i_2\)).

This equivalence is counter-intuitive. 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\textsubscript{[epistemic]/[doxastic]} now that Mary will come (at \(i_2\)).

(21) It will be possible\textsubscript{[epistemic]/[doxastic]} that Mary comes (if John helps her), but this is impossible\textsubscript{[epistemic]/[doxastic]} now.

(22) ? It is possible\textsubscript{[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 \textit{will} «do[es] not refer to the future but rather specifies an epistemic notion similar to predictability» (Ludlow 1999: 160), is to analyse it as a possibility operator. For instance, Jaszczolt (2006) assigns to \textit{will} the default meaning of a weak epistemic acceptability (in the sense of Grice (2001)) towards a future eventuality. If I understand it correctly, in her view, (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 \textit{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 Jaszczolt 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 \textit{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:

\[(TS) \quad \text{Will}(p) \text{ is true at the utterance time } t \text{ iff there is an interval } i_1 \subseteq [t, \infty] \text{ such that it is true that } p \text{ at } i_1.\]

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).

\[(24) \quad \text{No, this is false.}\]

(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 like that if (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).

\[(25) \quad \text{Mary came.}\]

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 analyse *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 italicised 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.

Generalising 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 UK.

(27) If Mary is in UK, 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. 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** For every indicative conditional, the consequent is under the scope of a covert epistemic necessity in the absence of an overt modal.

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: 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, \( \ldots \) that S and A accept that \( q \) as true. A sentence (type) \( s \) is said to presuppose \( q \)

---

8 Actually, as shown by Geurts (forthcoming), 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 affect, in any way, the arguments to be developed below.
Why will is not a modal

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 in such a way as to include p among the set of presuppositions. If an assertion that p is interpreted literally, 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 has being under the scope of a covert epistemic necessity whose domain is restricted to C. Let me spell this in more detail with the help of the assumptions formulated above:

\[ C1 \]
For every asserted proposition p, and the set of presuppositions \( Q = \{q_1, \ldots, q_n\} \)

i. if p is true with respect to C, then “if \( \sum_{qn} q \), then p” is true in C

ii. if “if \( \sum_{qn} q \), then p” is true in C, then p is true with respect to C

iii. if “if \( \sum_{qn} q \), 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 \( \sum_{qn} q \), then p” is false in C

Therefore:

\[ C1' \]
Asserting that p with respect to C amounts to asserting that if \( \sum_{qn} q \), then p.

\[ C2 \]
Asserting that p with respect to C amounts to asserting that \( \square p \), where \( \square \) 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 \( c\square p \), where \( c\square \) 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 \( \{ \neg p \lor \neg q_1 \lor \ldots \lor \neg q_n \} \).\(^{10}\) By asserting that \( p \), S attempts to bring A to accept that it is true that every possible world of C is inconsistent with \( \neg p \), that is that \( c \Box p \). It is perhaps worth to emphasise 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 \( c \Box p \).

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 \( \text{will} \) 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 is 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 sub-set of the set W of possible worlds, but rather as a sub-set 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

\(^{10}\) 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 \( \sum_{q_1} q \), 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.
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 give a hint about how to dissolve the worry that might arise from the fact that if \textit{must} in (34) is taken to quantify over \( C \), it follows from my analysis implies that (34) and (35) are semantically equivalent.

\begin{align*}
(34) & \quad \text{It must be raining.} \\
(35) & \quad \text{It’s raining.}
\end{align*}

This equivalence is indeed correct.\(^{11}\) Our intuitive reluctance of admitting it stems precisely from the fact that if \textit{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 \textit{must} as ranging not over \( C \) but 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, \( D \subseteq C \). 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.

\section*{4 Explaining the ‘modal’ uses away}

\subsection*{4.1 Generic uses}

As mentioned in the introduction, \textit{will} may occur in examples, like (36), that resemble predications of generic properties, as in (37):

\begin{align*}
(36) & \quad \text{Oil will float on water.} \\
(37) & \quad \text{Oil floats on water.}
\end{align*}

\(^{11}\) 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 axiom, viz. that if \( p \) is valid with respect to a set of axioms (to which the
In this sub-section I shall argue, on the one hand, that unlike (37), (36) is no 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.

However, such a use is impossible with the ‘generic’ *will*, which strongly suggests that it is not generic after all:\(^ {14}\)

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

presupposition set \(Q\) may be assimilated in our case), so is \(\Box p\) (Hughes and Cresswell 1996: 23-36; see also Grice 2001: 60-62).

\(^{12}\) 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 colour 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.

\(^{14}\) In what follows I am indebted to Marc Dominicy.
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.\footnote{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:}

(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 \( \text{will} \) is false at the utterance time, i.e. with the fact that, in the actual world, no amount of oil is floating on any amount of water at the utterance time. Hence, by virtue of the first maxim of Quantity, and of (TS), the use of \( \text{will} \) in (36) commits the speaker to the falsity of \( p \). If, in the world of utterance, \( p \) is false 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 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.

\footnote{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.  
and I gather that this is so because the whole expression ‘boys will be boys’ came to denote a property idiomatically.
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 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 of acceptability between (47) and (48):

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

Abusch (1997) has made out 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 \( \text{will} \).

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

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

\[
(47) \quad \text{a. [Mary will be at the opera now] is true iff it is true at an interval } \begin{array}{c}
\subseteq [t, \infty] \text{ that Mary is at the opera at } t
\end{array}
\]

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

\[
(49) \quad \text{Mary is at the opera now.}
\]

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 Section 3, both (47) and (49) are under the scope of a covert epistemic necessity operator. Therefore, (47) is also truth-conditionally equivalent to (50).

\[
(50) \quad \text{Mary must be at the opera now.}
\]

Of course, the equivalence between (47) and (49), and between (47) and (50) holds if, and only if, the domains of the (c)overt 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: 54). (47) is true iff Mary is at

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\(^{16}\) Note that on this account (49) and (50) are also equivalent; as I hinted at the end of Section 3, the discursive differences entailed by the use of \( \text{must} \) (cf. Dendale 1994; von Fintel and Gillies forthcoming) should to be accountable by the same pragmatic mechanism of domain restriction.
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 \( t \). 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 \( i \subset \lbrack t, \infty \rbrack \). 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 \textit{will} is not a modal in (47), (b) that the domain of the covert necessity is restricted to the “verification” worlds.\(^{18}\)

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

\[
\begin{align*}
(51) & \quad \text{Mary will perhaps be at the opera now.} \\
(52) & \quad *\text{Mary must perhaps be at the opera now.}
\end{align*}
\]

This difference is correctly predicted by my account. In sentences with \textit{will}, the covert universal quantification is triggered by default and can be cancelled by an overt modal marker

\(^{17}\) In this paper I leave aside the combination of the future perfect with \textit{yesterday}:

\[
\begin{align*}
(i) & \quad \text{Mary will have been at the opera yesterday.}
\end{align*}
\]

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):

\[
\begin{align*}
(ii) & \quad \text{Mary was at the opera yesterday.}
\end{align*}
\]

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 \( i \subset \lbrack t, \infty \rbrack \):

\[
\begin{align*}
(i) & \quad \text{If you have been in London, you will know that it is a lovely city.}
\end{align*}
\]
like *perhaps*. By contrast, this universal quantification belongs to the semantic meaning of *must*, so that cancellation gives rise to inconsistency with this verb.\(^\text{19}\)

However, some 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 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: 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 sub-section that it is characteristic of predications 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, \(^\text{19}\) 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 forthcoming), 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.
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):

\[(58)\quad \text{In winter, Mary will always wear a green coat.} \quad [=\text{(4)}]\]

The intuitive feeling that there is a semantic volitional content 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: 83-102; 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: 101; see also Anscombe 1957: 91-93).

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:

\[(59)\quad \text{In winter, Mary will perhaps wear a green coat.}\]

Likewise, (60) and (61) clearly differ with respect to the reading where the car is described as a ‘person’ capable of entertain ‘intentions’: while (60) allows such a reading, (61) disfavours it strongly.\(^{20}\)

\(^{20}\) Thanks to Philippe De Brabanter for drawing my attention to this example.
(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):

(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: 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
Copley, B. (2002). The Semantics of the Future, MIT.
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