The broader epistemic future

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© Commitment phenomena through the study of evidential markers in Romance languages
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Outline

1. Introduction
2. Temporality
3. Commitment
4. Conclusions
Many Romance languages\textsuperscript{1} have a future tense that overlaps with an epistemic future.

\textsuperscript{1}And not only - see English (Condoravdi, 2003), German (Vater, 1975), Greek (Giannakidou and Mari, 2012), Hindi (Shapiro, 1989), Uzbek, etc.
Many Romance languages\textsuperscript{1} have a future tense that overlaps with an epistemic future.

Example

(1) a. Il negozio chiuderà alle 4 del pomeriggio (future tense)  
the shop close.FUT.3SG at 4 of afternoon  
‘The shop will close at 4 pm.’

b. A quest’ora Giovanni sarà a casa (epistemic future)  
at this.hour Giovanni be.FUT.3SG at home  
‘At this time, Giovanni will be at home.’  
(Mari, 2009)

\textsuperscript{1}And not only - see English (Condoravdi, 2003), German (Vater, 1975), Greek (Giannakidou and Mari, 2012), Hindi (Shapiro, 1989), Uzbek, etc.
The Romanian future tense and epistemic future

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Goal

To provide a unified account from the point of view of their temporal and epistemic-evidential properties.
1 Introduction

2 Temporality

3 Commitment

4 Conclusions
The temporal properties of epistemic modals (Condoravdi, 2002, 2003)

Definition
Temporal perspective: the time at which the epistemic claim is made.

(2) a. He might be home.
  b. Va/O fi acasă.

X be home
‘He will be home.’
= PRES(MIGHT/X(he be home)
= It is now that it is epistemically possible/X that...
The temporal properties of epistemic modals (Condoravdi, 2002, 2003) II

**Definition**

Temporal orientation: the time of evaluation of the proposition in the scope of a modal.

(3) a. He might be home now / later.
    b. Va/o fi acasă acum / mai târziu.  
       X be home now / later  
       ‘He will be home now / later.’  
       = PRES(MIGHT/X(STATIVe now / later))
    c. He might sing *now / later.
    d. Va/o cânta *acum / mai târziu.  
       X sing now / later  
       ‘He will sing *now / later.’  
       = PRES(MIGHT/X(EVENTIVe *now / later))
A progressive in the scope of a modal turns an eventive predicate into a stative:

\[
\begin{align*}
(4) & \quad \text{He might be singing now / later.} \\
& \quad \text{He will be singing now / later.}
\end{align*}
\]

\[
\begin{align*}
(5) & \quad \text{He might have been home / sung yesterday / tomorrow.} \\
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• A perfect in the scope of a modal shifts the temporal orientation backwards. Adverbials provide
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(5)  
   a. He might have been home / sung yesterday / tomorrow.

‘He will have been home / sung yesterday / tomorrow.’
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PRES(X((By(TOMORROW)(PERFECT (he leave))))
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(5) a. He might have been home / sung yesterday / tomorrow.
    b. Va/o fi fost acasă / cântat ieri / mâine.
   X be been home / sung yesterday / tomorrow
   ‘He will have been home / sung yesterday / tomorrow.’
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The temporal properties of both X.LIT and X.COLLOQ fall out from the same formula describing the interaction between epistemic modality, tense, aspect, and predicate type.
The temporal properties of both X.LIT and X.COLLOQ fall out from the same formula describing the interaction between epistemic modality, tense, aspect, and predicate type.

Temporally, our X future tense is merely a special case of \( \text{PRESENT}(X.LIT/COLLOQ \ (\text{STATIVE/EVENTIVE})) \) which picks out X.LIT as an auxiliary and only the future orientation option of statives.
Introduction

Temporality

Commitment

Conclusions
Modals can be captured in terms of 3 dimensions:

- **modal force**: necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, probability
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- **modal force**: necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, probability

- **modal base**: epistemic (possibly further differentiations, like knowledge coming from certain sources, facts of a special kind - i.e. evidentiality)
Modals can be captured in terms of 3 dimensions:

- **modal force**: necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, probability

- **modal base**: epistemic (possibly further differentiations, like knowledge coming from certain sources, facts of a special kind - i.e. evidentiality)

- **ordering source**: deontic, bouleptic, stereotypical, doxastic, etc.
Example

Modal force: Necessity.
Modal base: In the real world, the light is on in John’s room, it is a warm summer evening, etc.
Ordering source: When the light is on in John's room, he is home.

Inference/Epistemic necessity: John must be home.
“[...] a conversational background is the kind of entity which might be referred to by the utterance of a phrase like what is known [...] What is known is different from one possible world to another. And what is known in a possible world is a set of propositions. In our semantics, a conversational background will therefore be construed as a function which assigns sets of propositions to possible worlds. In particular, the meaning of what is known will be that function from W into the power set of the power set of W, which assigns to any world w of W the set of all those propositions which are known in w.” (Kratzer, 1981, 43)
Set of possible worlds: $W = \{ w_1, w_2, ..., w_n, ... \}$
Set of possible worlds: \( W = \{ w_1, w_2, ..., w_n, ... \} \)

The power set of \( W \):
\[
P(W) = \{ \{ w_k, ..., w_k \}, \{ w_k, ..., w_k \}, ... \} \]

Definition
A proposition \( p \) is a set of possible worlds:
\[
p = \{ w_1, w_2, ..., w_n, ... \}
\]

\[
P(W) = \{ \{ p_1 \}, \{ p_2 \}, ... \}
\]

\[
P(P(W)) = \{ \{ p, p \}, \{ p, p \}, ... \}
\]
Conversational backgrounds II

- Set of possible worlds: \( W = \{ w_1, w_2, ..., w_n, ... \} \)
- The power set of \( W \):
  \[ P(W) = \{ \{ w_k, ..., w_k \}, \{ w_k, ..., w_k \}, ..., \{ w_k, ..., w_k \} \} \]

**Definition**

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Conversational backgrounds II

- Set of possible worlds: $W = \{w_1, w_2, \ldots, w_n, \ldots\}$
- The power set of $W$:
  $$P(W) = \{\{w_k, \ldots, w_k\}, \{w_k, \ldots, w_k\}, \ldots\}$$

**Definition**

A proposition $p$ is a set of possible worlds: $p = \{w_1, w_2, \ldots, w_n, \ldots\}$

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A conversational background is a function which assigns sets of propositions to possible worlds. In particular, the meaning of *what is known* will be that function from \( W \) into the power set of the power set of \( W \), which assigns to any world \( w \) of \( W \) the set of all those propositions which are known in \( w \).
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\[
f : W \rightarrow P(P(W))
\]

\[
= f : \{ w_1, w_2, ..., w_n, ... \} \rightarrow \{ \{ p_k, ..., p_k \}, ..., \{ p_k, ..., p_k \}, ... \}
\]
Ordering of accessible worlds

- modal base for \( w_@ \): \( f(w_@) = \{p_1, p_2\} \)
  
  \( p_1 = \{w: \text{The light is on in John’s room in } w.\} = \{w_@, w_1, w_2, w_3\} \)

  \( p_2 = \{w: \text{It is a warm summer evening in } w.\} = \{w_@, w_3, w_5\} \)
Ordering of accessible worlds

- modal base for \( w_\circ \): \( f(w_\circ) = \{p_1, p_2\} \)
  
  \( p_1 = \{w: \text{The light is on in John's room in } w.\} = \{w_\circ, w_1, w_2, w_3\} \)

  \( p_2 = \{w: \text{It is a warm summer evening in } w.\} = \{w_\circ, w_3, w_5\} \)

Definition

Worlds accessible from \( w_\circ \): \( \cap f(w_2) = \{w_\circ, w_3\}. \)
Ordering of accessible worlds

- modal base for $w_@$: $f(w_@) = \{p_1, p_2\}$
  - $p_1 = \{w: \text{The light is on in John's room in } w.\} = \{w_@, w_1, w_2, w_3\}$
  - $p_2 = \{w: \text{It is a warm summer evening in } w.\} = \{w_@, w_3, w_5\}$

Definition

Worlds accessible from $w_@$: $\cap f(w_2) = \{w_@, w_3\}$.

- ordering source for $w_@$: $g(w_@) = \{q_1, q_2\}$
  - $q_1 = \{w: \text{When the light is on in John's room in } w, \text{ he is home in } w.\} = \{w_@, w_4, w_7\}$
  - $q_2 = \{w: \text{Nobody other than John goes into John's room in } w.\} = \{w_@, w_3\}$
Ordering of accessible worlds

- modal base for \( w_@ \): \( f(w_@) = \{ p_1, p_2 \} \)
  \[ p_1 = \{ w: \text{The light is on in John's room in } w. \} = \{ w_@, w_1, w_2, w_3 \} \]
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**Definition**

For any pair of worlds \( w_1 \) and \( w_2 \), we say that \( w_1 \) comes closer than \( w_2 \) to the ideal set up by \( Q \) iff the set of propositions from \( Q \) that are true in \( w_2 \) is a proper subset of the set of propositions from \( Q \) that are true in \( w_1 \).
[must (in view of the facts) (in view of what the speaker knows/believes) (John be at home)] =
= 1 iff \( \forall w' \in \max_g(w_\oplus)(\cap f(w_\oplus)) \): John is at home in \( w' = \)
= 1 iff \( \forall w' \in \max_{\{q_1,q_2\}}(\{w_\oplus, w_3\}) \): John is at home in \( w' = \)
= 1 iff \( \forall w' \in \{w_\oplus\} \): John is at home in \( w' = \)
= 1 iff John is at home in \( w_\oplus \)
must has a dual, X doesn’t.
- The equivalent of must in Romanian is trebuie, which also has a dual - ‘(se) poate’.
must has a dual, X doesn’t.
- The equivalent of must in Romanian is trebuie, which also has a dual - ‘(se) poate’.

must is associated with necessity, X - with probability.
X seems to express sometimes possibility, sometimes necessity
- a variable epistemic force!
- (But see (Yanovich, 2013) for arguments that must used to be a variable force modal too...)

Teodora Mihoc

The broader epistemic future
The variable epistemic force of X - I

(Examples from Fălăuș, 2014.)

- The contradiction test:

\[\text{It may be and it may not be, it's too early to tell.}\]
The variable epistemic force of X - I

(Examples from Fălăuș, 2014.)

- The contradiction test:

\[(6)\quad I\ have\ just\ been\ offered\ a\ new\ position,\ but\ I\ don’t\ have\ all\ the\ details\ yet,\ I\ am\ asking\ if\ you\ think\ it’s\ a\ good\ opportunity:\

\[\text{a.} \quad \text{O}\ X.COLL\ 3SG \ fi \ s¸\ a \ SUBJ \ spunem.\]

\[\text{b.} \quad \text{Poate} \ s¸\ a \ SUBJ \ fie, \ be.\SUBJ.3SG \ nu \ not, \ be.\SUBJ.3SG \ e \ is \ prea \ too \ devreme \ s¸\ a \ SUBJ \ spunem.\]

\[\text{c.} \quad \text{Trebuie} \ c˘\ a \ that \ este \ s¸\ a \ and \ trebuie \ c˘\ a \ that \ nu \ not \ este, \ e \ is \ prea \ too \ devreme \ s¸\ a \ SUBJ \ spunem.\]

'It may be and it may not be, it's too early to tell.'

'Teodora Mihoc

The broader epistemic future
The variable epistemic force of X - I

(Examples from Fălăuș, 2014.)

- The contradiction test:

\[ I \text{ have just been offered a new position, but I don't have all the details yet, I am asking if you think it's a good opportunity:} \]

a. O fi și nu o fi, e prea devreme să spunem.
X.COLLOQ.3SG be and not X.COLLOQ.3SG be is too early SUBJ tell.SUBJ.1PL

b. Poate fie și nu fie, e prea devreme să spunem.
'Very early, it may be and it may not be, it's too early to tell.'

c. Trebuie că este și nu este, e prea devreme să spunem.
'This must be and it must not be, it's too early to tell.'
The variable epistemic force of X - I

(Examples from Fălăuș, 2014.)

• The contradiction test:

\[ (6) \quad \text{I have just been offered a new position, but I don't have all the details yet, I am asking if you think it's a good opportunity:} \]

a. O fi și nu o fi, e prea devreme să spunem.

b. Poate să fie și poate să nu fie, e prea devreme să spunem.

c. Trebuie că este și trebuie că nu este, e prea devreme să spunem.

'It may be and it may not be, it's too early to tell.'
The variable epistemic force of X - I

(Examples from Fălăuș, 2014.)

- The contradiction test:

\[(6) \quad I \ have \ just \ been \ offered \ a \ new \ position, \ but \ I \ don't \ have \ all \ the \ details \ yet, \ I \ am \ asking \ if \ you \ think \ it's \ a \ good \ opportunity:\]

\[a. \quad \text{O fi și nu o fi, e prea devreme să spunem.}
\]
\[\text{X.COLLOQ.3SG be and not X.COLLOQ.3SG be is too}
\]
\[\text{early SUBJ tell.SUBJ.1PL}
\]

\[b. \quad \text{Poate să fie și poate să nu fie,}
\]
\[\text{may SUBJ be.SUBJ.3SG and may SUBJ not be.SUBJ.3SG}
\]
\[\text{e prea devreme să spunem.}
\]
\[\text{is too early SUBJ tell.SUBJ.1PL}
\]
\[\text{‘It may be and it may not be, it’s too early to tell.’}
\]

\[c. \quad \text{Trebuie că este și trebuie că nu este, e prea devreme}
\]
\[\text{must that is and must that not is is too early}
\]
\[\text{să spunem.}
\]
\[\text{SUBJ tell.SUBJ.1PL}
\]
\[\text{‘It must be and it must not be, it’s too early to tell.’}
\]
Inference patterns:
The variable epistemic force of X - II

- Inference patterns:

  a. He may be home. In fact, he must be home (he never goes out on Sunday).
  b. He must be home. In fact, he may be home.
  c. OX.COLLOQ.3SG fi be acas˘ a. De înfapt, fact trebuie/#poate must/may s˘ a SUBJ fie be.SUBJ.3SG acas˘ a. 'He is probably home. In fact, he must/#may be home.'
Inference patterns:

(7) a. He may be home. In fact, he must be home (he never goes out on Sunday).
Inference patterns:

(7)  
a.  He may be home. In fact, he must be home (he never goes out on Sunday).
    b.  #He must be home. In fact, he may be home.
Inference patterns:

(7)  a. He may be home. In fact, he must be home (he never goes out on Sunday).
b. #He must be home. In fact, he may be home.
c. O fi acasă. De fapt, X.COLLOQ.3SG be home in fact trebuie/#poate să fie acasă. must/may SUBJ be.SUBJ.3SG home ‘He is probably home. In fact, he must/#may be home.’
Moore’s paradox:

- He must have been home at the time of the murder, but I don't believe it.
- He might have been home at the time of the murder, but I don't believe it.
- O X.COLLOQ.3SG been at home in momentul crimei, but nu cred.
Moore’s paradox:
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(8) a. #He must have been home at the time of the murder, but I don’t believe it.
Moore’s paradox:

(8) a. #He must have been home at the time of the murder, but I don’t believe it.
b. He might have been home at the time of the murder, but I don’t believe it.
Moore’s paradox:

(8) 

a. #He must have been home at the time of the murder, but I don’t believe it.

b. He might have been home at the time of the murder, but I don’t believe it.

c. #O fi fost acasă în momentul X.COLLOQ.3SG be been home in time.the crimei, dar nu cred.
murder.GEN but not believe.1SG
compatibility with adverbs of various strengths:
Compatibility with adverbs of various strengths:

(9) Sigur / Precis / Probabil / Poate
    for-sure / certainly / probably / perhaps
    o fi plecat din oraş.
    X.COLLOQ.3SG be gone from town
    ‘S/he certainly / undoubtedly / probably / possibly is out of
town.’
X is similar to the variable force epistemic modal $k'a$ from St’át’imcets (Rullmann et al., 2008).
- X is similar to the variable force epistemic modal $k’a$ from St’át’imcets (Rullmann et al., 2008).
- Variable force modals = *it is somewhat probable that* (Kratzer, 2012, 46-9).
X is similar to the variable force epistemic modal $k’a$ from St’át’imcets (Rullmann et al., 2008).

Variable force modals = *it is somewhat probable that* (Kratzer, 2012, 46-9).

They can be accounted for by the same mechanism of domain restriction via the ordering source. Depending on how much ordering shrinks the set of accessible worlds, the epistemic force of FUT will be perceived as weaker or stronger, with an admissible probability ranging from, for example, 50% to a maximum of 100%.
\( w_3 \prec Q \ w_2 \prec Q \ w_1 \prec Q \ w_0 \)
Probability

- \( w_3 < Q w_2 < Q w_1 < Q w_0 \)
- \( Pr(\{w_3\}) > Pr(\{w_2\}) > Pr(\{w_1\}) > Pr(\{w_0\}) \)
\[ w_3 < Q w_2 < Q w_1 < Q w_0 \]
\[ Pr(\{w_3\}) > Pr(\{w_2\}) > Pr(\{w_1\}) > Pr(\{w_0\}) \]
\[ Pr(w_0) = .35, \ Pr(w_1) = .55, \ Pr(w_2) = .70, \text{ and } Pr(w_3) = .85 \]
$w_3 < Q w_2 < Q w_1 < Q w_0$

$Pr(\{w_3\}) > Pr(\{w_2\}) > Pr(\{w_1\}) > Pr(\{w_0\})$

$Pr(w_0) = 0.35$, $Pr(w_1) = 0.55$, $Pr(w_2) = 0.70$, and $Pr(w_3) = 0.85$

$Pr(\{w_0\}) + Pr(\{w_1\}) + Pr(\{w_2\}) + Pr(\{w_3\}) = 1$
\[ w_3 < Q w_2 < Q w_1 < Q w_0 \]

- \( Pr(\{w_3\}) > Pr(\{w_2\}) > Pr(\{w_1\}) > Pr(\{w_0\}) \)
- \( Pr(w_0) = 0.35, \Pr(w_1) = 0.55, \Pr(w_2) = 0.70, \) and \( \Pr(w_3) = 0.85 \)
- \( Pr(\{w_0\}) + Pr(\{w_1\}) + Pr(\{w_2\}) + Pr(\{w_3\}) = 1 \)
- \( Pr(\{w_0\}) + Pr(\{w_1\}) + Pr(\{w_2\}) + Pr(\{w_3\}) = \frac{15}{15} \)

<table>
<thead>
<tr>
<th>Event Set</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \emptyset )</td>
<td>0 ( % )</td>
</tr>
<tr>
<td>( {w_0} )</td>
<td>( \frac{1}{15} )</td>
</tr>
<tr>
<td>( {w_1} )</td>
<td>( \frac{2}{15} )</td>
</tr>
<tr>
<td>( {w_0, w_1} )</td>
<td>( \frac{3}{15} )</td>
</tr>
<tr>
<td>( {w_2} )</td>
<td>( \frac{4}{15} )</td>
</tr>
<tr>
<td>( {w_0, w_2} )</td>
<td>( \frac{5}{15} )</td>
</tr>
<tr>
<td>( {w_1, w_2} )</td>
<td>( \frac{6}{15} )</td>
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<tr>
<td>( {w_0, w_1, w_2} )</td>
<td>( \frac{7}{15} )</td>
</tr>
<tr>
<td>( {w_3} )</td>
<td>( \frac{8}{15} )</td>
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<tr>
<td>( {w_0, w_3} )</td>
<td>( \frac{9}{15} )</td>
</tr>
<tr>
<td>( {w_1, w_3} )</td>
<td>( \frac{10}{15} )</td>
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<tr>
<td>( {w_0, w_1, w_3} )</td>
<td>( \frac{11}{15} )</td>
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<td>( {w_2, w_3} )</td>
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<td>( \frac{14}{15} )</td>
</tr>
<tr>
<td>( {w_0, w_1, w_2, w_3} )</td>
<td>( \frac{15}{15} )</td>
</tr>
</tbody>
</table>
For all $p, q$ from the set of propositions, $p$ is a better possibility than $q$ iff $\Pr(p) > \Pr(q)$. 

The broader epistemic future
For all $p, q$ from the set of propositions, $p$ is a better possibility than $q$ iff $\Pr(p) > \Pr(q)$.

For presumptive meanings the $X$ proposition can be any one of these 15 combinations, except for the empty set and $w_0, w_1, w_2, w_3$, since the probability value associated with a presumptive is greater than 0 and less than 1.
For all $p, q$ from the set of propositions, $p$ is a better possibility than $q$ iff $\Pr(p) > \Pr(q)$.

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The future tense meanings of $X$, they can be understood in exactly the same way, with the constraint that the probability of the epistemic judgement has to be 1.
indirect evidentiality is hard-wired in the meaning of epistemic modals (von Fintel and Gillies, 2007, 2010), coded as a presupposition acting as a definedness condition.
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presumptive $X$ is defined iff the modal base is determined by incomplete evidence
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future tense $X$ is defined iff the modal base is determined by complete evidence
1. Introduction
2. Temporality
3. Commitment
4. Conclusions
The future tense and the presumptive/epistemic future are just different manifestations of the same basic modal, with all the temporal, quantificational, and evidential properties that this entails.
Thank you!

Condoravdi, C. (2003). Moods and modalities for *will* and *would*. In *Invited communication at Amsterdam Colloquium*.


