

Future and indeterminateness

Fabio Del Prete

CLLE-ERSS (CNRS & Université de Toulouse II)

fabio.del-prete@univ-tlse2.fr

Preliminaries about tense, I

- Common view from tense logic (Prior 1967): **Past/Present/Future** (\Rightarrow **ternary tense system**)
 - a. “PAST(p)” (*it has been the case that p*) is true at t_0 if and only if for some $t_1 < t_0$ “ p ” is true at t_1
 - b. “FUT(p)” (*it will be the case that p*) is true at t_0 if and only if for some $t_1 > t_0$ “ p ” is true at t_1
- The **future** as the **mirror image** of the **past**
- Common view from linguistic studies on European languages (e.g. Comrie 1985, Broekhuis & Verkuyl 2014): **Past/Non-Past** (\Rightarrow **binary tense system**)
 - (1) John *ran* yesterday / *is running* today / *is running* tomorrow. (“**will** run” would involve a **modal auxiliary**)
 - Why shouldn’t a language be endowed with a genuine future **tense**?
 - **Unreality/indeterminateness of the future**: the future as the realm of what is only possible (and not yet real/determinate)

Preliminaries about tense, II

- **But...** Not only do speakers talk about *the future* by using present tense forms. Sometimes they talk about *the past* by using present tense forms (see examples (2) and (3) from Italian).

(2) Maria *corre*_(Ind., Pres.) domani / Domani *piove*_(Ind., Pres.). ('Maria is running tomorrow' / 'Tomorrow it will rain')

(3) Il ghiacciaio *ha scavato*_(Ind., Pres. Perf.) la valle. ('The glacier has carved the valley.')

One might argue that, in both cases, speakers talk *stricto sensu* about *the present*:

- present mental (attitudinal) signs or present external (anticipatory) signs of future events (in (2))
- present effects or traces of past events (in (3))

- **Future/Non-Future binary systems** (Hua, West-Greenlandic): reference to future events is obligatorily marked by a future tense while the same form used to speak of the present can be systematically used to speak of the past.

- Should we conclude from the less-known Future/Non-Future systems that it is *the past* which is unreal/indeterminate (for speakers of these systems) while the future would be real/determinate?

Preliminaries about tense, III

- **Tenseless languages** (intended: *without tense features marked on the verb*; Tonhauser 2011): Chinese, Burmese, Dyrbal
 - Should we conclude that speakers of, e.g., Chinese perceive neither past nor future (nor present) events as real?
- A moral I will subscribe to in this talk: we should be cautious in drawing inferences about whether a certain temporal domain (e.g., the future) is ontologically real/determinate for the speakers of a language \mathcal{L} from considerations pertaining to the existence of a grammaticalized tense in \mathcal{L} for that temporal domain.
- More interesting it will be to look at the various ways in which **reference to future events** can be effected in language and ask **what the semantics is of the relevant constructions**.
- In the next step I will focus on **imperfective aspect** and temporal **before-clauses**. Later on I will focus on the **future tense** proper.

Reference to the future and imperfectivity

- We have just seen that in some languages **present tense forms** can be used to refer to **future events**:

(4) Domani **ritorno**_(Ind., Pres.) a Tolosa. [Italian]
'I'm going back to Toulouse tomorrow.'

- **Italian present tense** is arguably to be analysed as a combination of a **tense operator** proper, **PRES**, *and* an **aspectual imperfective operator**, **IMPF**.

(A too oft neglected fact – scholars sometimes believe that future time reference is an inherent possibility of the present tense operator, e.g. Broekhuis & Verkuyl 2014 seem to defend this view.)

- A related fact: in Italian, futures in the past can be expressed through a combination of a past tense *and* IMPF, i.e., through the form known as **Imperfetto**.

(5) Mi disse che il giorno dopo **ritornava**_(Ind., Imperf.) a Tolosa.
'He told me that he was going back to Toulouse the next day.'

Extensional analysis of IMPF

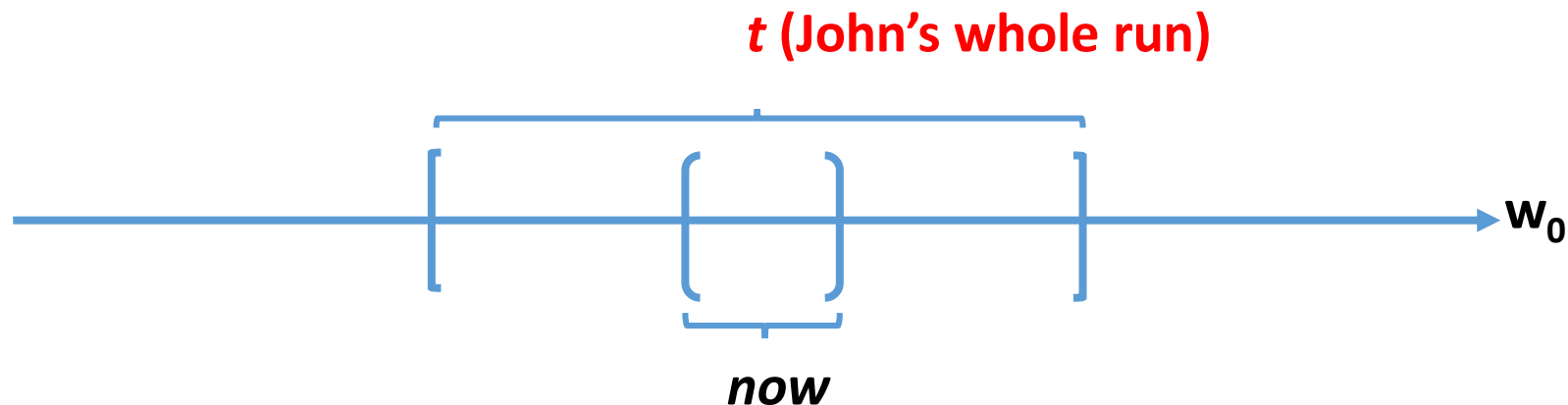
○ Bennett & Partee (1972):

(i) John is running in the park.

(Italian: *John corre*_(Ind., Pres.) *nel parco.*)

(ii) $[[(i)]]$ _{w₀, now} = TRUE *if and only if* $\exists t$ (*now* \subseteq_{nf} t & $[[\text{John run in the park}]]$ _{w₀, t} = TRUE)

(John runs in the park at a time-interval t of which the present time, *now*, is a non-final subinterval)



Imperfective paradox

(6) E mia madre: “Era un viandante. Andava_(Ind., Imperf.) a Palermo e aveva attraversato tutta la Sicilia.”

E io: “Andava a Palermo? Andò_(Ind., Perf.Past) a Palermo?”

E mia madre: “**Andava, ma non andò.** Andò fino a Bivona e lì trovò lavoro in una zolfara.”

[Elio Vittorini, *Conversazione in Sicilia*]

My mother: “He was a wayfarer. He was going to Palermo and he had crossed Sicily.”

And I: “He was going to Palermo? Did he go to Palermo?”

And my mother: “**He was going, but he didn’t go.** He went to Bivona and there he found a job in a zolfatara.”

[Elio Vittorini, *Conversations in Sicily*]

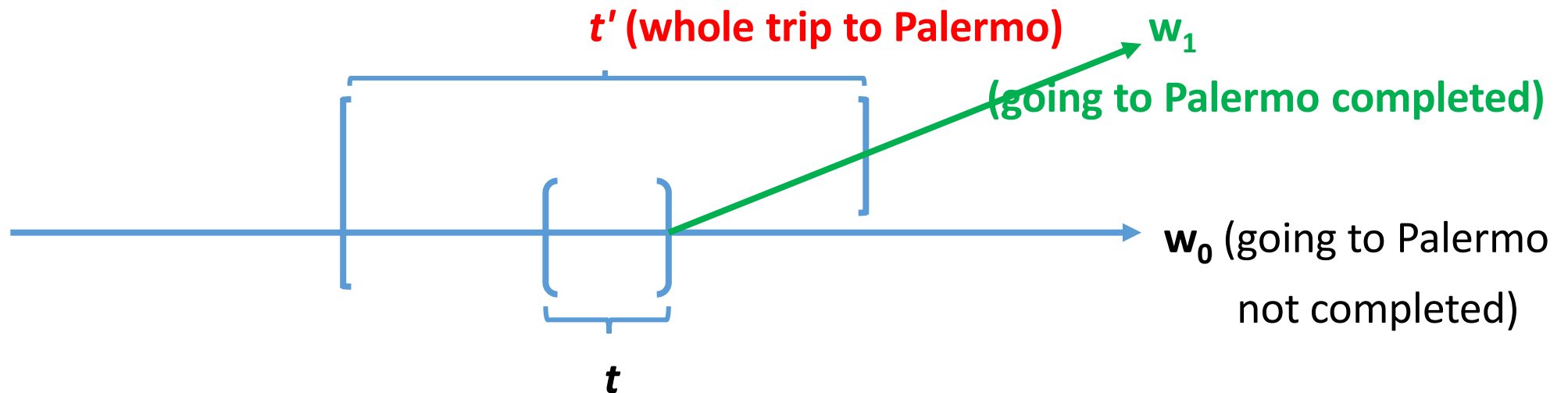
Modal analysis of the imperfective

○ Dowty (1979):

(iii) He was going to Palermo (but he stopped in Bivona).

(iv) $[[(iii)]]$ $_{w_0, now} = \text{TRUE}$ iff $\exists t (t < now \ \& \ \forall w_1 (w_0 \approx_t w_1 \supset \exists t' t \subseteq_{nf} t' \ \& \ [[\text{he go to Palermo}]]$ $_{w_1, t'} = \text{TRUE})$

(there is a time-interval t in the past of now and every world w_1 which is a historical alternative to w_0 at t is such that the relevant person goes to Palermo in w_1 at a time t' of which t is a non-final subinterval)



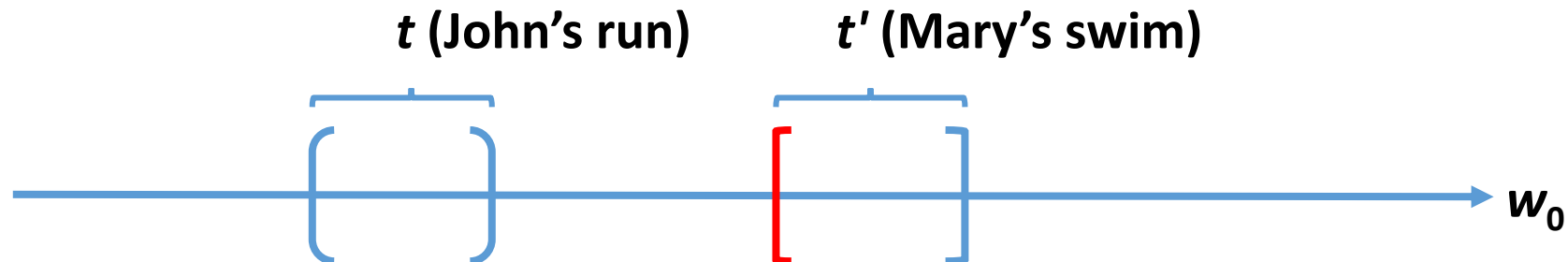
Reference to the future in “before”-clauses

(7) John ran before Mary swam.

- John ran at some time t and Mary would swim at a later time t'
(i.e., Mary’s swim lay in the future of John’s run)

○ Beaver & Condoravdi 2003 (first version, extensional analysis):

(7') $\exists t [t < \text{now} \wedge \text{John-run}(w_0, t) \wedge t < \text{earliest}(\lambda t'. \text{Mary-swim}(w_0, t'))]$



Non-veridicality of “before”-clauses

- (8) John was hit by a car before he crossed the street.
- John was hit by a car at some time t and he would NOT cross the street at a later time t'

○ Beaver & Condoravdi’s extensional analysis doesn’t work for (8):

(8') $\exists t [John\text{-hit-by-car}(w_0, t) \wedge t < \text{earliest}(\lambda t'. John\text{-cross-the-street}(w_0, t'))]$

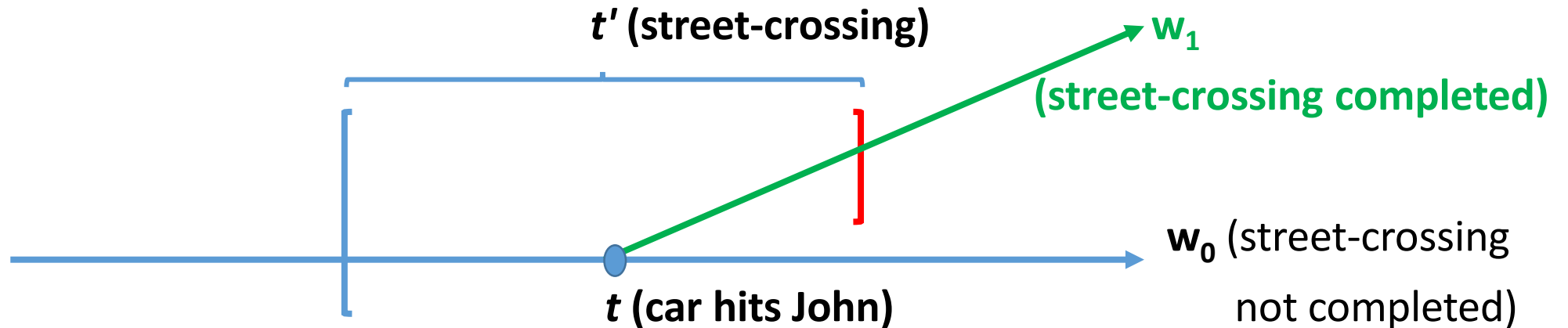
- the problem is that set $\lambda t'. John\text{-cross-the-street}(w_0, t')$ is empty!
(w_0 is the actual world and John doesn’t manage to cross the street in w_0)

Modal analysis of “before”-clauses

○ Beaver & Condoravdi 2003 (refined analysis, modal):

(8) John was hit by a car before he crossed the street.

(8'') $\exists t [t < now \wedge John\text{-hit-by-car}(w_0, t) \wedge \forall w_1 [w_0 \approx_t w_1 \supset t < \textit{earliest}(\lambda t'. John\text{-cross-the-street}(w_1, t'))]]$



Future “tense” and modality

○ **Future auxiliary** “will” has been regarded by many linguists as a **modal**.

(9) I’ll marry you. (I **promise** to marry you.)

➤ In all future worlds in which my promises are fulfilled, I marry you

(10) I’ll do the dishes. (I **commit** to doing the dishes.)

➤ In all future worlds in which my commitments are honoured, I do the dishes

(11) The next Summer Olympics will be held in Tokyo. (The next Summer Olympics are **planned** to be held in Tokyo.)

➤ In all future worlds compatible with the current plans, the next Summer Olympics are held in Tokyo

(12) That’ll be the postman at the door. (The person at the door **must** be the postman.)

➤ In all future worlds compatible with the speaker’s current evidence, the person at the door turns out to be the postman

Synthetic future and modality

- Even in languages with a **synthetic** (i.e., inflectional) **future**, what would be plausibly described as a future tense appears to have **modal meanings** (see examples from Italian below).

(13) Ti **amerò**_(Ind., Fut.) per sempre. [promissory]
'I'll love you forever.'

(14) Mi **occuperò**_(Ind., Fut.) io delle prenotazioni. [commissive]
'I'll deal with the bookings.'

(15) Le prossime Olimpiadi si **terranno**_(Ind., Fut.) a Tokyo. [planning]
'The next Olympics will be held in Tokyo.'

(16) **Sarà**_(Ind., Fut.) il postino. [epistemic]
'That'll be the postman.'

Linguistic evidence for the modality of “will”

A. A **past tense form “would”** which expresses future in the past and is clearly modal (Condoravdi 2003).

- (17) a. [John at 3PM:] “I **will** go to the movies at 8PM.”
b. John said at 3PM that he **would** go to the movies at 8PM.

Cf. Italian (18a,b) (future-in-the-past is expressed through verbal forms with modal meaning):

- (18) a. [John at 3PM:] “Alle 8 **vado**_(Ind., Pres.) al cinema.”
b. Alle 3 John ha detto che alle 8 **andava**_(Ind., Imperf.)/**sarebbe andato**_(Cond., Past) al cinema.

➤ Notice that (17b-18b) are compatible with the continuation “but he had an accident on his way to the movie theatre, so he didn’t go to the movies in the end.”

B. “Unless”, a **domain subtractor** for **universal NPs** (von Stechow 1991; see [11] below), can act as a domain subtractor for “will” (Condoravdi 2003; see [12] below)

(19) All students are charged tuition *unless they can demonstrate extenuating circumstances*.

$ALL_x(Sx)(Px)$, where S includes all the students *except those who can demonstrate ext. circ.*

(20) He will eat fish *unless there's steak available*.

$ALL_w(Fw)(\text{he eats fish in } w)$, where F includes all the future worlds *except those in which there's steak available*

(Cf. (20') *He ate fish unless there was steak available.*)

➤ In (20) “unless” would work as a domain subtractor for a universal quantifier underlying “will” (cf. (20')), in which “unless” would just “qualify the assertion”; Condoravdi 2003)

C. Modals are known to allow for **variations in their modal flavour** (Kratzer 1991):

- (21) a. You **must** help your neighbour. **[deontic]**
Modal base: the set of worlds in which the normative demands made in the evaluation world are fulfilled
- b. [Given your dripping nose] You **must** have a cold. **[epistemic]**
Modal base: the set of worlds that are compatible with the evidence the speaker has in the evaluation world

“Will”-sentences too appear to allow for that:

- (22) a. At high temperature, four hydrogen atoms will fuse into one helium atom. **[dispositional]**
Modal base: the set of worlds in which the laws of atomic physics hold true
- b. John will be home for vacations now. **[epistemic]**
Modal base: the set of worlds that are compatible with the evidence the speaker has in the evaluation world

○ What **modal force** does “will” have? *Prima facie*, a good guess is: a **∀-force**

(22) a. At high temperature, four hydrogen atoms will fuse into one helium atom.

➤ in **all** future worlds compatible with the laws of atomic physics (and in which temperature has risen above a threshold), four hydrogen atoms fuse into a helium atom.

b. John will be home for vacations now.

➤ in **all** future worlds compatible with the speaker’s current evidence, John is home for vacations at the current time.

○ Evidence of \forall -force of “will” might come from **modal concord** relations (Lyons 1977, Geurts and Huytink 2006)

○ Prototypical examples of modal concord:

(nec) You *must obligatorily* return the book by tomorrow.
 \square (you return the book by tomorrow)

(pos) You *may permissibly* ask for personal information.
 \diamond (you ask personal information)

○ **Condition on modal concord:** *The modal verb and the modal adverb must agree with each other in modal force and modal flavour* (Geurts and Huytink 2006).

➤ Cf. “You *may*_(\exists , epistemic) *have*_(\forall , deontic) to return the book by tomorrow”; this is read as **doubly modalized:** $\diamond\square$ (you return the book by tomorrow)

○ “Will” indeed likes **universal modal adverbs**:

- (22') a. At high temperature, four hydrogen atoms will *necessarily* fuse into one helium atom.
- b. John will *certainly* be home for vacations now.

Cf. behaviour of possibility modal “may”:

- (23) a. At high temperature, four hydrogen atoms may *possibly* fuse into one helium atom.
- b. John may *possibly* be home for vacations now.

- **Plain temporal futures:** “will”-sentences simply *referring to a future time*, with *no apparent modal flavour*

(24) There will be a sea battle tomorrow.

- Plain temporal futures, too, appear to have \forall -force, in intuitive contrast with existential “may”-futures

- (25) a. There will be a sea battle tomorrow. ??But there will also be none.
b. There may be a sea battle tomorrow. But there may also be none.

The modal view on “will”

○ Enç 1996, Condoravdi 2003, Copley 2009, Broekhuis & Verkuyl 2014 (a.o.)

i. “will” is a **necessity modal operator**

ii. Reference to a time successive to the evaluation time (as observed in plain temporal futures) is due to the semantics of the modal itself:

“Modals uniformly **expand the time of evaluation forward**” (Abusch 1985, Condoravdi 2003)

(a) John should/must/may come tomorrow/*yesterday.

○ $[[\text{WILL}(p)]]$ ^{t, w} = 1 iff **for every w' accessible to w at t**, $[[p]]$ ^{[t, +∞), w'} = 1

- $[[\text{WILL}(p)]]^t, w = 1$ iff for every w' **accessible to w at t** , $[[p]]^{[t, +\infty), w'} = 1$

- “**accessible to w at t** ” allows for the interpretations: “**historical alternative to w at t** ”, “**compatible with what the speaker knows in w at t** ”, and possibly others...

- Different clauses for the temporal instantiation of **stative** vs. **eventive** propositions (this accounts for different temporal interpretations of *That'll be the postman at the door* vs. *He'll go home tomorrow*):
 - a. When p_{st} contains a **stative** predicate S :

$$[[p_{\text{st}}]]^M, t, w = 1 \text{ iff } \exists t^* t^* \cap t \neq \emptyset \ \& \ S(t^*, w)$$

 - b. When p_{ev} contains an **eventive** predicate E :

$$[[p_{\text{ev}}]]^M, t, w = 1 \text{ iff } \exists e E(e, w) \ \& \ \tau(e, w) \subset t \quad [\tau = \text{temporal trace function}]$$

(24) There will be a sea battle tomorrow.

(24') All worlds w **such that ... w ...** are such that there is a sea battle in w

○ **The modal base in plain temporal futures** is the same we have already met in the modal analysis of imperfective aspect and “before”: the set of worlds that are metaphysically possible continuations of the actual world @ given what has happened in @ up to a given time t (t is called *the time of branching*). Let's call these worlds the *historical alternatives to the actual world @ at t* (Thomason 1984).

○ The time of branching for (24) is the time *now* at which (24) is uttered

(24') All world-histories h **such that h is a historical alternative to @ at *now*** are such that there is a sea battle which occurs in h at some moment following *now*

One problem for the modal analysis of the future: “Stalnaker’s asymmetry”

○ Stalnaker’s dialogue with a modal (Stalnaker 1981):

(25) A - President Carter **has to appoint** a woman to the Supreme Court.

B - Who do you think he has to appoint?

A - He doesn’t have to appoint any particular woman, he just has to appoint some woman or other.

○ Stalnaker’s dialogue with “will” (Stalnaker 1981):

(26) A - President Carter **will appoint** a woman to the Supreme Court.

B - Who do you think he will appoint?

A - #He won’t appoint any particular woman, he just will appoint some woman or other.

(27) Carter has to appoint a woman, but he doesn't have to appoint any particular woman.

for every deontic alternative w of Carter's to @, there is a woman x in w s.t. Carter appoints x in w but there is no woman x in @ s.t. for every deontic alternative w of Carter's to @, Carter appoints x in w

(28) ??Carter will appoint a woman, but he won't appoint any particular woman.

IMPOSSIBLE READING: for every historical alternative w to @ at N , there is a woman x in w s.t. Carter appoints x in w but there is no woman x in @ s.t. for every historical alternative w to @ at N , Carter appoints x in w

○ If “will” is a quantifier over modal alternatives in (28), why can't we interpret “a woman” within the quantifier scope in the left sentence and outside of it in the right sentence (as we do for the minimally different [27])?

However...

○ Karttunen-type sequences (Karttunen 1976)

(29) Mary will marry **a rich man**. He **will have to** be a banker.

(It is **required** by Mary that **whoever she will marry** be a banker.)

(30) [I'm looking to bid farewell to my trusty 1997 Audi A4 2.6 Estate which has 200,000km on the clock.] I will be buying **a used car** and it **must** be under 6,000 pounds.

(31) When your EP comes out, I will buy **a copy**. It **must** be Autographed though!

➤ **Teleological** modality is associated with a **non-specific indefinite**

Synthesis: my proposal

- The speculative idea I want to put forward today is that “will” is a **tense** which somehow got to like **pluralities**.
- Whenever there is a plurality around, “will” is happy to go along with, like a **plural definite determiner**.
- **Indeterminateness of the future** is a way for a **plurality of possible worlds** to come in.
- The modality affecting the interpretation of “will”-sentences is **indeterminateness-based modality** and is not rooted in an inherently modal semantics of “will”.

World as an “open parameter” of the utterance context (Bonomi and Del Prete 2007)

- Speakers represent the future state of the world as open to themselves, in terms of a plurality of possible futures branching off from the present situation. All these possible futures are equally eligible candidates for the truth-conditional evaluation of a “will”-statement.
- **Contexts:** $c = \langle c_t, @ \rangle$
 - the world of the context, $@$, is a plurality of histories h , with $c_t \in h$, which represent the possible futures for the speaker of c at the time c_t
- **Evaluation function:** $[[\cdot]]_{c, g, w}$
 - in the case of **denotation-in-context**, the world parameter w of $[[\cdot]]_{c, g, w}$ is the plurality $@$; this has modal effects on the interpretation of “will”-statements

An excursus: Non-modality of the future in “narrative” contexts

- The claim that the world parameter of $[[\cdot]]$ _{c,g,w} may be set in some cases to a *particular history* $w = h$ (rather than to a *plurality of histories*) might seem untenable to the strict proponent of Branching Time (e.g. Belnap et al. 2001).
- It seems however to correspond to a situation that actually obtains in “narrative” contexts:

(33) 1941 - Richard Cheney is born in Lincoln, Nebraska, on January 30th. He will grow up in Casper, Wyoming, and earn his bachelor’s and master’s of arts degrees from the University of Wyoming.
- The purely temporal value of “will” appears clearly from examples of this type, where the narrated events are located in the past (in spite of being reported in the present tense) and the narrator has complete information about the relevant sequence of events (no plurality of possible futures involved in the evaluation of the “will”-sentence).

Homogeneity of plural predication, I

- Previous comparison with plural definite determiner allows us to introduce a central feature of plural predications: **homogeneity of plural predication** (Križ 2015)

(34) Adam wrote the books.

True *iff* Adam wrote all the books

(35) Adam didn't write the books.

True *iff* Adam wrote none of the books

- There is a gap here: in situations where Adam wrote *some*, but not *all* of the books, neither sentence is true.

Homogeneity of plural predication, II

- Future tensed sentences also display **homogeneity of plural predication** – a circumstance that has puzzled proponents of the necessity modal analysis of the future (*why can't the negation scope above the universal quantification over possible worlds?*).

(36) Mary will come at 3pm.

=> TRUE *iff* **in all futures worlds** Mary comes at 3pm

(37) Mary won't come at 3pm.

=> TRUE *iff* **in no futures worlds** does Mary come at 3pm

- There is a gap here too: in situations where Mary comes at 3pm in *some* of the open futures, but not in *all* of the open futures, neither sentence is true.

[In this slide I rely on Križ (2015) PhD thesis.]

- Observation: All distributive predicates in natural language are homogeneous. This has resulted in some attempts to locate the source of homogeneity in the distributivity operator (Schwarzschild 1994, Gajewski 2005).
- Distributive predicates are primitively defined only for atoms; a distributivity operator applies to them in order to make them applicable to pluralities and it adds a presupposition that the plurality is homogeneous:

$$(H) \quad [[\text{dist}]] = \lambda P. \lambda x: (\forall x' \in x P(x')) \vee (\forall x' \in x \neg P(x')). \quad \forall x' \in x P(x')$$

- In Bonomi and Del Prete (2007) we proposed a modal analysis of “will” *cum* Settledness Condition:

$$\text{Settled}(P, t, w) =_{\text{Def}} \forall h \in w \exists z \in h [t < z \wedge P(w)(z)] \vee \forall h \in w \neg \exists z \in h [t < z \wedge P(w)(z)]$$

$$[[\text{will}]]_{c,g,w} = \lambda P. \lambda t: \text{Settled}(P, t, w). \forall h \in w \exists z \in h [t < z \wedge P(w)(z)]$$

- The role of the Settledness Condition was precisely to capture the homogeneity of “will”-statement (*Mary will come at 3pm* => **in all futures** Mary comes at 3pm / *Mary won't come at 3pm* => **in no futures** does Mary come at 3pm)

- A different proposal today: **no necessity modal in the semantics!**
- This allows to account for the possibility of **other-than-universal modal adverbs** in future tensed sentences (Bertinetto 1979; Del Prete 2010, 2014; Giannakidou & Mari 2013):

(22'') a. At high temperature, four hydrogen atoms *will probably/possibly* fuse into one helium atom.

In *many/some* future worlds compatible with the laws of atomic physics (and in which temperature has raised above a threshold), four hydrogen atoms fuse into a helium atom

b. John *will probably/possibly/hardly* be home for vacations now.

in *many/some/few* future worlds compatible with the speaker's current evidence, John is home for vacations at the current time

- “Will” has the semantics of a tense: it introduces a temporal variable s whose value is presupposed to be a situation in the future of the utterance situation

$$[[\text{will}_s]]_{c, g, h} = \lambda P_{\langle i, t \rangle} : c_t < g(s, h). P(g(s, h))$$

- “Will” takes a property of situations as argument and yields a truth value, provided that a domain condition is satisfied
- The domain condition $c_t < g(s, h)$ is the presupposition triggered by “will” according to which the value of the temporal variable s has to be in the future of the utterance situation c_t along the history of evaluation h

- On top of *will*'s temporal semantics, a **universal quantification over the open possible futures** comes into play as a supervaluational strategy to overcome their plurality

$[[\text{Mary will}_s \text{ come}]]_{c, g, @} \Rightarrow (\forall h \in @) \{c_t < g(s, h)\} \text{come}(g(s, h), \text{Mary})$

- This quantification introduces a modal feature in the interpretation of *will*
 - Since this quantification is not semantically contributed by any linguistic element, it invariantly takes maximum scope (this will be crucial to account for Stalnaker's asymmetry)
- $[[\text{Mary will}_s \text{ not come}]]_{c, g, @} \Rightarrow (\forall h \in @) \{c_t < g(s, h)\} \neg \text{come}(g(s, h), \text{Mary})$

Interactions with negation

(38) You must not solve all these problems!

(=> it's not necessary)

(38') $\sim \Box \forall x [\text{problem}(x) \supset \text{solve}(\text{you}, x)]$

(39) You will not solve all these problems!

(=> it's necessary that not)

(39') $\Box \sim \forall x [\text{problem}(x) \supset \text{you solve } x]$

Back to Stalnaker's asymmetry

(40) Carter has to appoint a woman to the Supreme Court, but **no one in particular**.

(40') $\forall w$ [ALT_{deontic}(@, w, Carter) \supset appoint(w, Carter, f(woman, w))] \wedge $\neg \exists f^* \forall w$
 [ALT_{deontic}(@, w, Carter) \supset appoint(w, Carter, f*(woman, @))]

(41) Carter will_s appoint a woman to the Supreme Court, # but **no one in particular**.

(41') $(\forall h \in @) \{c_t < g(s, h)\}$ appoint(g(s, h), Carter, f(woman, h)) \wedge $(\forall h \in @) \neg \exists f^* \{c_t <$
 $g(s, h)\}$ appoint(g(s, h), Carter, f*(woman, @))

- Indefinite object IS non-specific in (41') (f chooses a different woman for each history making up the @-plurality).
- Nevertheless, the continuation “no one in particular” is inconsistent because: (i) the pragmatically-triggered quantification $\forall h \in @$ takes scope over the component $\neg \exists f^*$ which denies the existence of a choice function selecting a particular @-woman; (ii) for every $h \in @$ there has to be a choice function selecting a particular @-woman appointed in h , since h is an integral part of @.

Back to Karttunen-type sequences

(42) I will_s buy a safe. It should be the best and most secure available.

(43) $\forall h \in @ \{c_t < g(s, h)\} \exists x [f(\text{safe}, g(s, h)) = x \wedge \text{buy}(g(s, h), \text{speaker}, x)] \wedge \forall h \in @$
[ALT_{boule}(@, h, speaker) \supset best(f(safe, g(s, h)))]

Back to “modal concord”

- Modal concord data are far from settling the issue of *will*'s modal force:

(44) a. At high temperature, four hydrogen atoms will *probably/possibly* fuse into one helium atom.

In *many/some* future worlds compatible with the laws of atomic physics (and in which temperature has risen above a threshold), four hydrogen atoms fuse into a helium atom

b. John will *probably/possibly/hardly* be home for vacations now.

in *many/some/few* future worlds compatible with the speaker's current evidence, John is home for vacations at the current time

- These data seem to point to a **quantificational variability of “will”** (Del Prete 2009, 2010, 2014)
- What are the relative merits of the proposed analysis *vis à vis* one which treats “will” as a necessity modal in accounting for the interaction with modal adverbs of varying quantificational force?
- A possible line of research to be developed: look at the modal adverbs in (44a,b) as **homogeneity removers** in the sense of Križ 2015.

Homogeneity removers (Križ 2015)

(45) Adam didn't write the books.

Homogeneous: true *iff* $\forall x[\text{book}(x) \supset \sim \text{wrote}(\text{Adam}, x)]$

(45') Adam didn't write *all* the books.

Non-homogeneous: true *iff* $\sim \forall x[\text{book}(x) \supset \text{wrote}(\text{Adam}, x)]$

(46) You will not solve all these problems!

Homogeneous: true *iff* $\Box \sim \forall x[\text{problem}(x) \supset \text{solve}(\text{you}, x)]$

(46') You will not *necessarily* solve all these problems!

Non-homogeneous: true *iff* $\sim \Box \forall x[\text{problem}(x) \supset \text{solve}(\text{you}, x)]$

Suggestion for an implementation

- $[[\text{Mary will}_s \text{ come}]]_{c, g, @} = 1$ iff $(\forall h \in @) \{c_t < g(s, h)\} \text{ come}(g(s, h), \text{Mary})$
- $[[\text{Mary will}_s [\text{Mod-Adv } \alpha] \text{ come}]]_{c, g, @} = 1$ iff (for few/some/many/all $h \in @$) $\{c_t < g(s, h)\} \text{ come}(g(s, h), \text{Mary})$

where $\alpha =$ hardly/possibly/probably/necessarily

- Unlike the pragmatically-triggered quantification $(\forall h \in @)$ over the single histories in the @-plurality, the linguistically-triggered quantification (for few/some/many/all $h \in @$) is part of the truth-conditional content and can thus interact with negation

Conclusions

- A **non-quantificational temporal analysis of the future *will*** in a Branching Time framework designed to capture indeterminateness.
- *Will* is not inherently modal; the modality of the future is due to the **plurality of possible world-histories against which “will”-sentences are evaluated** – it is “*indeterminateness-based modality*”.
- Interaction of *will* with negation and indefinite NPs (Stalnaker’s asymmetry) is explained by assuming a **homogeneity condition** known to hold of plural predications.

- Abusch, D. 1985. On Verbs and Time. Ph.D. thesis, University of Massachusetts Amherst.
- Beaver, D. and C. Condoravdi. 2003. A uniform analysis of 'before' and 'after'. In *Proceedings of SALT XIII*.
- Belnap, N. and M. Green. 1994. Indeterminism and the thin red line. *Philosophical Perspectives*, 8: 365–388.
- Belnap, N., M. Perloff and M. Xu. 2001. *Facing the Future: Agents and Choices in Our Indeterminist World*. Oxford University Press, Oxford.
- Bertinetto, P. M. 1979. Alcune ipotesi sul nostro futuro (con osservazioni su "potere" e "dovere").
- Bonomi, A. and F. Del Prete. 2007. Evaluating future-tensed sentences in changing contexts. Manuscript, Dipartimento di Filosofia, Università degli Studi di Milano.
- Broekhuis, H. and H. Verkuyl. 2014. Binary tense and modality. *Natural Language and Linguistic Theory* 32.3, 973-1009.
- Comrie, B. 1985. *Tense*. Cambridge University Press.
- Condoravdi, C. 2003. Modalities for the future. Paper presented at UC Santa Cruz.
- Copley, B. 2009. *The Semantics of the Future*. Routledge Outstanding Dissertations in Linguistics, NY.
- Del Prete, F. 2009. Relativizing truth of future-tensed sentences. In P. Égré (ed.), *Proceedings of the 2nd Paris-Barcelona Picasso Workshop*, 21-36, Institut Jean Nicod, CNRS-EHESS-ENS.
- Del Prete, F. 2010. Non-monotonic futures. Paper presented at *PALMYR IX: Logic and the Use of Language*. ILLC, Amsterdam.
- Del Prete, F. 2014. The interpretation of indefinites in future tensed sentences. A novel argument for the modality of *will*? In M. Kissine, P. de Brabanter and S. Sharifzadeh (eds.), *Future Times, Future Tenses*. Oxford University Press.

- Enç, M. 1996. Tense and modality. In S. Lappin (ed.), *Handbook of Semantic Theory*, 345-358. Blackwell, Oxford.
- Giannakidou, A. and A. Mari. 2013. A two dimensional analysis of the future: modal adverbs and speakers bias. In M. Aloni, M. Franke and F. Roelofsen (ed.), *Proceedings of the 19th Amsterdam Colloquium*.
- Geurts, B. and H. Huitink. 2006. Modal Concord. In P. Dekker and H. Zeijlstra (eds.), *Proceedings of the Workshop on Concord and the Syntax Semantics Interface*.
- Karttunen, L. 1976. Discourse Referents. In J. D. McCawley (ed.), *Syntax and Semantics 7*, Academic Press, NY.
- Kissine, M. 2008. Why will is not a modal. *Natural Language Semantics* 16.2, 129-155.
- Kratzer, A. 1991. Modality. In A. von Stechow and D. Wunderlich (eds.), *Semantik*. Berlin: Walter de Gruyter, 825-834.
- Križ, M. 2015. Aspects of Homogeneity in the Semantics of Natural Language. PhD thesis, University of Vienna.
- Lyons, J. 1977. *Semantics*. Cambridge University Press.
- Stalnaker, R. 1981. A Defense of Conditional Excluded Middle. In W. L. Harper, R. Stalnaker, and G. Pearce (eds.), *Ifs : conditionals, belief, decision, chance, and time*. Reidel, Dordrecht.
- Thomason, R. 1984. Combinations of Tense and Modality. In D. Gabbay and F. Guenther (eds.), *Handbook of Philosophical Logic*, vol. II. Reidel, Dordrecht.
- Tonhauser, J. 2011. Temporal reference in Paraguayan Guaraní, a tenseless language. *Linguistics and Philosophy* 34: 257–303.