The future of Greek and Italian: An epistemic analysis

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Abstract. In this paper we examine the epistemic and temporal uses of Italian and Greek future and argue that, in both readings, future morphemes in these two languages are epistemic modal operators that assess indirect evidence at the utterance time. We show that the future reading arises when an overt adverb is used, or in virtue of a mechanism ensuring indirect access to the eventuality. By treating FUT as an epistemic modal across its available interpretations, our account differs from previous analyses that posit metaphysical/epistemic ambiguity for FUT operator.

1. Introduction: is the future tense or modality?

In Italian and Greek the future morphemes (henceforth FUT) can combine with past and non-past (present) lower tenses (of both eventives and statives, as we see below)—yielding past (with past), and present or future orientation respectively:

(1) a *I Ariadne tha troi tora*. (epistemic, now)
        the Ariadne FUT *eat.non-past3sg* now
     b   Giacomo ora mangerà
           Giacomo *now FUT-eat*
           'Giacomo/Ariadne must be eating now.'

(2) *I Ariadne tha milise xthes*. (epistemic, past)
      the Ariadne FUT talk.past.3sg yesterday
      'Ariadne must have spoken yesterday.'

(3) *Giovanni sarà malato*. (epistemic, now)
      Giovanni FUT-be sick
      'John must be sick.'

(4) *Giovanni sarà stato malato*. (epistemic, past)
      Giovanni FUT-be been.PERF. sick
      'John must have been sick.'

None of the examples in (1)-(4) is 'future', i.e. referring to an event that follows the utterance time. Rather, as can be seen in the translations, these are all modal sentences; *tha*/Italian FUT are equivalent to *must*. Contrary to Condoravdi (2002: 69), who imposes obligatory forward-shifting with with eventives, eventives, as we see, do not necessarily forward-shift with FUT (see the Greek and Italian examples (1) with non-past especially).

The future reading, which we will call *predictive,* arises with the specific combination of FUT plus non-past, *when a future adverb is present:*

(5)   *Giovanni   arriverà   alle   5 del pomeriggio/domain* (future)
        Gianni   FUT-arrive   at   5 pm/tomorrow
        'John will arrive at 5 pm/tomorrow.'
(6)   *O   Janis   tha   ftasi   stis 5pm/avrio*
        The   John   FUT   arrive.nonpast.perf.3sg   at 5pm/tomorrow
        'John will arrive at 5pm/tomorrow.'

Given its vast epistemic usage, and that the presence of FUT does not always impose forward-shifting, it becomes plausible to argue that FUT is an epistemic modal. We argue here indeed that the Greek and Italian FUT is an epistemic modal in all uses, with present perspective, and depends on available knowledge or evidence. When a future adverb is present, it serves as a modifier of the lower tense—a temporal domain restriction that locates the eventuality in the time after the utterance time (t_u). This makes a very simple, and in our view, appealing analysis of the future reading, and there is no need to invoke metaphysical alternatives. Our theory makes better predictions than Condoravdi 2002 — recall the non-future reading with eventives in (1)—and makes less stipulations, i.e., it avoids the, as it turns out, unmotivated switch to metaphysical modality with the scoping of the modal under past. In Greek and Italian, FUT never scopes under past, as we show in our discussion in section 3; it is therefore an epistemic modal with genuine present orientation. We also show that, *pace* Condoravdi, the lower tense is interpreted—it supplies the temporal orientation of the modality—, and *FUT p* is nonveridical (Giannakidou 1998), thus *p* is unsettled in all cases.

The structure of the paper is as follows. In sections 2 and 3 we present in more detail the distributions and interpretations of Italian and Greek FUT in order to establish their epistemic nature. In section 4 we propose our modal analysis. In section 5, we finally discuss the forward shifting, future reading of FUT, and spell out our idea that it involves temporal domain restriction motivated by knowledge that relies on direct evidence (supplied by the future adverb). We also explain how the forward-shifting arises in absence of overt temporal adverbs. Section 6 concludes the paper.

2. Epistemic and future readings of FUT: Greek

In both Italian and Greek, the purely epistemic and future readings of FUT arise under predictable conditions. We start with Greek, giving also the necessary background of *tha* and its interaction with tense/aspect.

The Greek verb is obligatorily inflected for tense and aspect, and the particle *tha* is used with *all* four tense and aspect combinations: perfective non-past (PNP), perfective past (PP), imperfective non-past (INP) and imperfective past (PP). We illustrate the basic temporal/aspectual distinctions below:

(7) a. *graf-*   -   *o* (INP)   b.   *grap-*   *s-*   *-o* (PNP)
      write.imperf   -1sg.nonpast   write- perf.1sg.nonpast
      'I am writing (right now).'   [no English equivalent; * on its own]
      'I write (generally).'
(8) a. *e-*   *graf-*   *-a* (IP)   b.   *e-*   *grap-*   *s-*   *a* (PP)
      past- write.imperf. 1sg.past   past- write- perf.1sg.past
      'I used to write.'   'I wrote.'
      'I was writing.'

The basic temporal contrast is between past, marked by the prefix *e-* to the verbal stem and specific inflection; and a nonpast signaled by the absence of *e-* (hence the label *nonpast*), and which has its own inflection. The form PNP is not possible on its own, but only in combination with nonveridical particles (Giannakidou 1998, 2009), i.e. the subjunctive *na, tha*, the optative *as*, *an* 'if':

(9) a. *As fiji*   *o Janis.*
      as leave.PNP.3sg   the John
      'Let John go.'   (optative)
   b. *Na*   *fiji*   *o Janis.*
      na   leave.PNP.3sg   the John
      'Let John go.'   (subjunctive)
   c. *Tha*   *fiji*   *o Janis.*
      tha   leave.PNP.3sg   the John
      'John will leave.'   (future)

The combination of the particle with PNP is key to interpreting these structures, as we elaborate in section 4. We proceed now with the evidence for modality. To keep the facts clear, we start with Greek, and then show the parallel with Italian.

2.1. Epistemic reading with past and non-past

The epistemic reading of FUT arises as a 'pure' reading—in the sense that there is no future reading— in combinations of *tha* with *imperfective non-past* (INP) and *perfective past* (PP). We describe in detail the combination of *tha* with nonpast; the reading with the PP is exactly the same, only about a past event.
Consider the sentences below first, with non-past:

(10)   a. *I Ariadne*   *tha*   *kimate*   *(tora).*
      The Ariadne   FUT   sleep.INP.3sg now
      'Ariadne *must* be sleeping now.'
   b. *I Ariadne*   *tha*   *ine*   *giatros.*
      The Ariadne   FUT   be.INP.3sg doctor
      'Ariadne *must* be a doctor.'
   c. *I Ariadne*   *tha*   *pezi*   *(tora).*

the Ariadne   FUT   play.INP.3sg now
'Ariadne *must* be playing now.'

We use both stative and non-stative predicates, and as we see, in all cases, the most plausible paraphrase is the one indicated in the translations where the verb *must* is used. The reading is inferential: I am considering information I have, and draw an inference based on that information. For example, with regard to (10a), I know that Ariadne has the habit of taking a nap at 2pm, I also know that she always sticks to schedule, and I also know that today has been a regular day. So at 2:10 pm, I utter the sentence expressing my relative certainty that Ariadne is, *for all I know,* asleep. Likewise, I know also that usually by 6 pm Ariadne is down at the yard playing with her friends. At any time after 6 pm then, I can utter (10c) with the same degree of certainty. Finally, (10b) expresses an inference based on evidence: I have witnessed Ariadne expressing opinion on medical matters, she cites reliable medical sources all the time etc., hence I am entitled to conclude (b).

The perfective past (PP) gives rise to a similar epistemic reading, only now we are assessing a past event, like with combinations of *must* with present perfect:

(11)   a. *I Ariadne   tha   kimithike   (prin apo dyo ores).*
           the Ariadne   FUT   sleep.PP.3sg   before two hours
           'Ariadne must have fallen asleep two hours ago.'
       b   *I Ariadne   tha   milise   (xthes).*
           the Ariadne   FUT   talk.PP.3sg   yesterday
           'Ariadne must have talked yesterday.'

I know Ariadne's habits, plans etc. So I can infer *now* that at some point *two hours ago*, Ariadne fell asleep. The past adverbials 'two hours ago' and 'yesterday' are fine with FUT, and function as domain restrictors, giving the time frame for the eventuality. Without the adverbs, FUT contributes an epistemic component, namely that the events of Ariadne's sleeping and Ariadne's talking are highly probable or almost certain—but the lower eventuality remains temporally unrestricted and therefore relatively vague. Crucially, if the reading of future were genuine for *tha,* we would not expect compatibility the past adverbials, notice the contrast with *will: #Ariadne will have slept two hours ago. Will* does move the time of sleep forward, unlike *tha.*

2.2. Evidential component

Additional evidence for the epistemic nature of FUT comes from the fact that *tha* exhibits evidential behavior. In this, again, it is similar to *must* (for a recent discussion see von Fintel and Gillies 2010). In view of direct perceptual evidence, e.g. if I am watching the rain falling, the *tha* sentence is infelicitous:

(12)   Context: I am watching the rain through the window. I say:
       #Tha vrexi!
       'It must be raining.'

This seems to suggest sensitivity to the nature of evidence: if I am directly evidencing the rain, I cannot use *tha*. The statement with *tha* is weaker than the non-modalized 'It is raining'. And it is weaker in the sense of nonveridical (Giannakidou 1998, 1999), i.e. it does not entail the truth of the sentence in the context, it does not add the proposition 'it is raining' to the common ground. *Indirect* evidentials are reported to likewise not entail the truth of the sentence (Faller 2002, Smirnova 2011, Murray 2012). If direct evidence supports the stronger statement, I am not being co-operative in choosing a weaker statement with FUT; for more discussion see section 4, and Giannakidou and Mari 2012.

2.3 Compatibility with adverbs of necessity

Tha co-occurs with high probability adverbs e.g. *malon* 'probably/most likely', and necessity *sigoura* 'certainly', *oposdhipote* 'definitely'—but is bad with mere possibility adverbs such as *isos* 'maybe/perhaps' and *pithanon* 'possibly':

(13) *I Ariadne   {malon/profanos/sigoura }   tha   ine jatros.*
      the Ariadne   probably/obviously/certainly FUT   be.3sg doctor
      'Ariadne must {probably/obviously/certainly} be a doctor.'
(14) *I Ariadne   {isos/pithanon}   *tha   ine   jatros.*
      the Ariadne   maybe/possibly   FUT   be.3sg doctor
      'Maybe Ariadne is a doctor.'

This contrast suggests that the force of the modality of *tha* is stronger than mere possibility, and parallel facts about FUT and adverbials hold in Italian (section 3). Note that *tha* is compatible with a variety of adverbs ranging from high probability to necessity. The same pattern characterizes the Greek necessity modal *prepi* (the only necessity modal *verb* in Greek), which combines with the same range of adverbs, *but also with FUT itself*:

(15) *I Ariadne   {malon/#isos}   tha   prepi   na   efije.*
      Ariadne   probably/#possibly FUT   must   subj left.PNP.3sg
      'Ariadne {?probably/#possibly} must have left.'
(16) *I Ariadne (tha) prepi   na   efije.*
      Ariadne   FUT   must   subj   left.PNP.3sg
      '?Ariadne probably must have left.'
(17) *Ta   pedia   prepi oposdhipote   na   ine   sto   spiti.*
      The   children   must   definitely   SUBJ be. 3pl in-the home
      Epistemic necessity: 'The children must definitely be at home.'

(All complementation is finite in Greek, and modal verbs take subjunctive *na* complements). *Prepi* is compatible with a range of adverbs above a certain threshold of high probability reaching to necessity—and in this, *prepi* differs from English since *must* resists modification by

adverbs other than strong necessity modals (though such occurrences are not unattested, as David Lassiter communicated to us).[1] It seems plausible to say that Greek collapses the Kratzerian distinction between *should (*weak necessity*)* and *must* (necessity), and that what counts as necessity seems to be 'more flexible' in Greek—a fact that can also be used to support of measure function based theories of modality such as e.g. Lassiter 2011—as suggested in Giannakidou 2012. At any rate, what is important for our purposes here is the parallel between *tha* and *prepi* in that they both combine only with necessity adverbs, and with each other— indicating matching modal force ('modal concord' in the sense of Huitink 2012).

2.3. FUT plus perfective non-past: future *and* epistemic reading

The combination of FUT and perfective non-past (PNP) gives the future reading:

(18)   *O   Janis   tha   ftasi   stis   5 pm/avrio.*   (future)
        The   John   FUT   arrive.PNP.3sg   at   5 pm/tomorrow.
        'John {will/#must} arrive at {5 pm/tomorrow}.'

A paraphrase with *must* is pretty odd in this case. Notice also that we have the adverbials 'at 5 pm' and 'tomorrow'. Without them, the epistemic reading is free to surface:

(19)   Context: It's late, the weather is bad, and we know Ariadne is travelling. You worry, and
        I want to reassure you and say:
        Min anisixis.   *I   Ariadne   tha   ftasi.*   (epistemic)
        Not worry.imperative.2sg.   the Ariadne   FUT   arrive.PNP.3sg.
        'Don't worry. Ariadne will arrive.'

In this case, I am expressing a certainty that Ariadne will arrive which I mean to be comforting. This is a reading that we also get with *will*.
The epistemic reading is also prominent with the evidential expression "ipan" 'they say':

(20)   *O   Janis   tha   gini kala,   ipan.*
        the John   FUT   recover.3sg   said.3pl.
        'John will recover, they say.'

In this context too, the sentence seems to be more about assessing a future recovery of John's. We call this interpretation *epistemic-future reading*. Finally, consider the following case (Holton et al. 1997, see also Chiou 2012):

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[1] Dan Lassiter offers the following, corpus retrieved, examples with *must possibly* and *must perhaps:*

(i) The Parish borders the North Downs and is on the edge of a designated Area of Outstanding Natural Beauty. Surrounded by this amazing countryside it offers outstanding views. Just stand at Eastwell Towers and gaze out towards the Wye Crown, *it must possibly be one of the finest views in the South East.*

(ii) This book is an odyssey, a journey up through the mists of time from the remote past. It explores what *must perhaps be the most fundamental of all questions* - who we are.

(21) Kathe proi *tha* sikothi, *tha* pji to kafedhaki tu, *tha* dhiavasi tin
efimeridha tu, kai kata tis 8.30 *tha* fiji jia to grafio tu.
"Every morning he *will* get up, drink his coffee, read his newspaper
and at approximately 8.30 he will leave for the office."

This is a series of generic sentences, with no reference to the future—in Greek or in English. So, the 'future' reading of *tha*, without specific future adverbials is never 'pure', never devoid of epistemic modality. We will now go through the Italian facts and show the exact parallels in the patterns we identified here.

3. The epistemic nature of Italian FUT

3.1. Epistemic reading with past and non-past

Extending the decomposition used for Greek to Italian, we assume that simple and perfect future sentences in Italian reveal FUT > NON-PAST and FUT > PAST, respectively. In both these combinations, FUT has an epistemic interpretation. We do not raise here the question of the distinction between stative and eventives, which is discussed elsewhere (see Mari, 2009, 2010; Giannakidou and Mari, 2012). We begin with non-past future sentences:

(22) a. *Giacomo dormirà*.
Giacomo FUT-sleep.
'Giacomo *must* be sleeping.'
b. *Giacomo sarà dottore*.
Giacomo FUT-be doctor.
'Giacomo *must* be a doctor.'
c. *Giacomo giocherà adesso*.
Giacomo FUT-play now.
'Giacomo *must* be playing now.'

We use both stative and non-stative predicates, and like in Greek, in all cases, the most plausible paraphrase is the one indicated in the translations where the verb *must* is used. The reading is epistemic: I am considering information I have, and draw an inference based on that information. With regard to (22a), and like Ariadne in our Greek examples, I know that: Giacomo has the habit of taking a nap at 2pm, he sticks to schedule, and today has been a regular day. So at 2 pm, I utter the sentence expressing my relative certainty that Giacomo is, *for all I know*, asleep (for a previous version of this example, see Mari, 2009[2]). Likewise, I know also that usually by 6 pm Giacomo is down at the yard playing with her friends (again, just like Ariadne!). Note again that,

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[2] By using this type of examples, Mari (2009) shows that eventive predicates do not necessarily give rise to the future, forward-shifted interpretation, contra Bertinetto 1979; Condoravdi, 2002.

in all these cases the time of the eventuality described coincides or overlaps with the utterance time (Mari, *ibid*.[3])

When scoping over PAST, FUT also has a similar epistemic interpretation, only now we are assessing a past event, just like with Greek:

(23) *Giacomo avrà   dormito   due ore fà.*
       Giacomo FUT-have   slept   two hours ago.
       'Giacomo must have slept two hours ago.'

I know Giacomo's habits, plans etc. So I can infer *now* that at some point *two hours ago*, Giacomo fell asleep. As with the Greek examples, the past adverbial 'two hours ago' functions as 'domain restrictor', giving the time frame for the eventuality. In its absence, FUT merely contributes an epistemic component, as in Greek (recall our discussion earlier with FUT embedding a past).

3.2 Evidential use

FUT cannot be used in Italian when direct evidence is available, just like with epistemic modal *must* in English and *tha*:

(24)   While raining
          #Pioverà.
          FUT-rain

For extensive discussion on the evidential properties of FUT, see Squartini, 2004; Pietrandrea, 2005, Mari, 2010, and Giannakidou and Mari 2012.

3.3. Compatibility only with necessity adverbs

Italian FUT is bad with weak possibility modals like *possibilmente* 'possibly':

(25) *Possibilmente Giacomo sarà   un dottore.*
       Possibly   Giacomo FUT-be a doctor.
       'Ariadne must possibly be a doctor.'

FUT is good with stronger modals, just like in Greek, and patterns like modal *must* rather than *can* (*pace* Bertinetto, 1979, Mari 2010).

(26) *Probabilmente   Giacomo sarà   un dottore.*
       Probably   Giacomo FUT-be a doctor

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[3] For previous related views, see Mari's notion of 'knowledge for the present' vs. knowledge for the future' (Mari, 2009,2010).

'Giacomo must probably be a doctor.'

3.4. The epistemic *and* future interpretation of FUT

In Italian, when an overt temporal adverb is used the future interpretation also arises. In this case the paraphrase with *must* is odd.

(27) *Gianni   arriverà   alle   5 del pomeriggio*. (future reading)
      Gianni   FUT-arrive   at   5 pm.
      'Gianni{will/#must} arrive at 5 pm.'

In the absence of the adverbials, the epistemic reading of the FUT is free to surface, as in the scenario below, which replicates the Greek example:

(28) Context: It's late, the weather is bad, and we know Giacomo is travelling. You worry, I want to reassure you and say:
      Non ti preoccupare.   *Giacomo arriverà* (epistemic)
      Not worry.imperative.2sg. Giacomo FUT   arrive. 3sg
      'Don't worry. Giacomo will arrive.'

In this case, I am expressing a certainty that Giacomo will arrive which I mean to be comforting for the worrying addressee. I am not making a predictive statement about his arrival.

4. An epistemic modal analysis of Greek and Italian FUT

In this section, we propose our analysis of FUT as an epistemic necessity operator. We start with Giannakidou 2009, and then develop the modal analysis. An important premise that we adopt here is that the lower tense has an actual contribution (*pace* Condoravdi 2002 who claims that it does not). We saw in our earlier data in both Greek and Italian that the lower tense is clearly responsible for locating the eventuality in the past, or non-past.
Giannakidou says that Greek nonpast denotes an interval whose left boundary is a dependent (Giannakidou 1998) variable *t*.

(29) $[\![$ nonpast $]\!] = \lambda P \, \lambda t \, P((t, \infty))$

A dependent variable cannot remain free, but must be valued by some higher value. This idea is relies on Abusch's (2004) analysis of *WOLL* as a substitution operator. According to Abusch, "in the substitution operator, t is a bound variable that corresponds to the tense argument of *will* [which is *n*, coming from the higher PRES; clarification ours]. For a top-level occurrence of *will*, *the effect is to substitute (n, ∞) for n*" (Abusch, 2004:39).
The Greek non-past, Giannakidou suggests, is like WOLL, but unlike *will,* which triggers PRES by default (Abusch 2004: (48)), the Greek non-past cannot trigger PRES; so it becomes necessary to have an overt exponent of PRES in the structure, otherwise the structure is illicit:

(30)   * TP: $\lambda t \ \exists e$ [write (j, e) $\wedge$ e $\subseteq$ (t, ∞) 'grapsi o Janis' 'John write.PNP'

T^0: non-past
$\lambda P \ \lambda t \ P((t , \infty))$ AspectP: $\lambda t \ \exists e$ [write (j, e) $\wedge$ e $\subseteq$ t]

Asp^0 :PFT=
$\lambda P \ \lambda t \ \exists e$ [P (e) $\wedge$ e $\subseteq$ t   VP: λt write (j, t)
                                                                    'write.PNP John
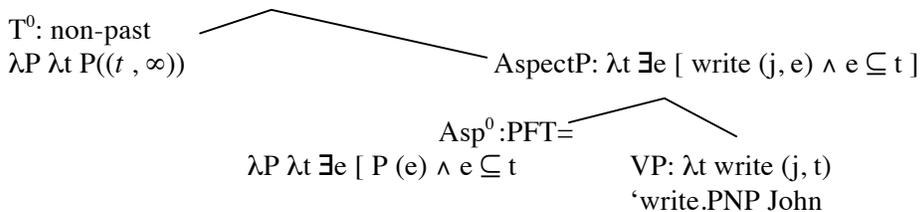
The interval (t, ∞) is ill-formed, because *t* remains unvalued. But with the addition of *tha*, *t* can now be identified with the present now of the context t_u, because, Giannakidou 2009 argues, *tha* functions as PRES and gives the utterance time t_u:

(31)   [[tha]] = t_u
(32)   [[tha]] (TP (22))= $\lambda t \ \exists e$ [write (j, e) $\wedge$ e $\subseteq$ (t, ∞) (n) = $\exists e$ [write (j, e) $\wedge$ e $\subseteq$ $\underline{(t_u, \infty)}$

The event will now be located at the interval that starts at the utterance time and stretches through infinity. This explains the future reading of *tha* plus PNP, while saying that *tha* is *not* a future tense. The analysis says that *tha* simply contributes the utterance time. This is an assumption we will adopt, as it appears that *tha* consistently maintains present perspective.

But *tha* cannot be just t_u. We must assume that FUT contains also modal force, and this is the line we pursue here. We propose the following semantics for FUT in Greek and Italian:

(33)   For any world w, and conversational backgrounds *f*, *g*:
         [[FUT]] w,f,g = $\lambda q{<}st{>}$. $\forall$w'$\in$ $Best_{g(w)}(\cap f(w))$: q(w') = 1;
         where $Best_{g(w)}(X)$ selects the most ideal worlds from X, given the ordering *g(w)*

We assume the theory of modality in Kratzer 1981, 1991, Portner 2009, and Hacquard 2011. Kratzer posits two conversational backgrounds as arguments of a modal expression—the modal base and the ordering source. The modal base *f* is the factual background, and the ordering source *g* is a normative background. With FUT, the modal base is epistemic; specifically, it is the set of propositions known by an individual, i.e. the speaker in an unembedded context: $\cap f_{epistemic}(w) = \lambda w'$. w' is compatible with what is known by the speaker in w.

The ordering source *g(w)*, on the other hand, orders the worlds in $\cap f(w)$ with respect to how well they conform to a given norm or ideal (often sensitive to the context). Modal expressions of necessity quantify over those worlds *that adhere to the norms in the ordering source as much as possible*. We can call these worlds $Best_{g(w)}(\cap f(w))$, following Portner (2009). Crucially, with the necessity modal, only in the *Best* worlds is *p* true, therefore the universal modal is nonveridical: *the modal base is a non-homogenous space* containing *p* and *non-p* worlds, as can be seen in the diagram below:

(34)

$\bigcap f(w)$ Best ($\bigcap f(w)$)   *p*
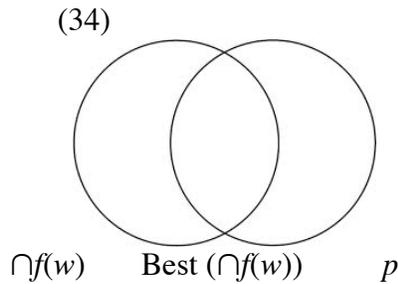
This explains why the modalized sentence, is 'weaker' than a non-modalized assertion: there are worlds in the modal base $\bigcap f$(w) where *p* is not true, as we see.

(35)   *Veridical and nonveridical modal space*   (Giannakidou 1998, 1999)
          (i) A modal space (a set of worlds) W is *veridical* with respect to a proposition *p* just
          in case *all* worlds in W are *p*-worlds. (*Homogeneity*).
          (ii) If there is at least one world in W that is a *non-p* world, *W* is nonveridical. (*Non-homogenous space*).

All modals come with non-homogeneous, therefore nonveridical spaces (*pace* von Fintel and Gillies 2010). The idea of homogeneous and non-homogeneous, nonveridical modal space has also been expressed in terms of *diversity* in Condoravdi 2002. Just to make sure that we appreciate the nonveridicality property, consider the following case:

(36)   Context: Ariadne is sneezing, has a fever, watery eyes, etc.
          B: She *must* have the flu.
          a. *Prepi* na   exi   gripi.
             must   subj   have.3sg   flu
          b *Tha*   exi gripi.
             FUT-have.3sg   flu

(36)   Same context
          a. *Giacomo deve avere   la febbre*
             Giacomo must have   the flu
             'Giacomo must have the flu.'
          b. *Avrà*   la febbre
             FUT-have the flu
             'He must have the flu.'

Given what the doctor sees and knows (the symptoms, his knowledge of what the symptoms mean, the time of the year, etc.) he is entitled to conclude that Ariadne and Giacomo have the flu. In the worlds compatible with his best knowledge and given the evidence, this is his verdict. However, in making this claim and choosing to use the modalized sentence, he also allows in the modal base allows worlds in which the kids do not have the flu (*non-p*) but an allergy or pneumonia. The doctor's judgment may be that these worlds are less ideal, they are not best; but

they are there in the modal base. If the doctor wanted to exclude *non-p* worlds, he would have made the stronger statement without *must/FUT/prepi*, that relies on a veridical epistemic space which is homogenous (for more detailed discussion see Giannakidou 1998, 1999).

Now, putting the temporal component of our analysis (that FUT makes reference to t_u) together with the modal gives us the following truth conditions, for the scopings FUT>nonpast and FUT>past respectively; ($\cap f(w,t_u)$) provides the alternatives available to the speaker at the utterance time, and q(w',t') states that q is true in the projected alternatives at time t' that either coincides or follows the evaluation time t_u:

(38) $[[\text{FUT non-past/tha PNP}]]^{w,f,g} = 1$ iff: $\forall w' \in \text{Best}_{g(w)}(\cap f(w,t_u))$: $\underline{\exists t' \in [t_u, \infty)}$ q(w',t') = 1; where $Best_{g(w)}(X)$ selects the worlds of best indirect evidence from X, given the ordering *g(w)*.

(39) $[[\text{FUT past/tha PAST}]]^{w,f,g} = 1$ iff: $\forall w' \in \text{Best}_{g(w)}(\cap f(w,t_u))$: $\underline{\exists t' < t_u}$ q(w',t') = 1; where $Best_{g(w)}(X)$ selects the worlds of best indirect evidence from X, given the ordering *g(w)*.

Besides covering the data presented in sections 2 and 3, this analysis accounts for two other characteristics that the future shares with epistemic modals.

(i) FUT with past

First, in both Greek and Italian, FUT cannot be interpreted below past. This is consistent with our analysis, because epistemic operators generally scope above tense operators (see especially Portner 2009 for discussion, and von Fintel and Iatridou 2003). (40) does not mean that it was true *given what I knew in the past* that John arrive in the past. It can only mean that, according to what the speaker knows at the utterance time, it must be the case that John arrived (in the past).

(40)   *Gianni sarà arrivato*
         'John must have arrived'

This reading has present assessment. Crucially, the t_u perspective of FUT remains constant, and does not interact with a lower past, even in the counterfactual reading, as shown in the contrast below between the plain modal, which can be evaluated in the past, and FUT which can't:

(16) Poteva   vincere   la   battaglia   (counterfactual)
      Can-IMPERF   to win   the   battle
      'He might win the battle.'   *'future of a past'*
(17) Giovanni **sarà** arrivato   No 'future of a past' with FUT
      'John will have arrived.'
      #'It might have been true in the past that John was arrived.'

So, in both Greek and Italian FUT, the time of assessment ('modal perspective') cannot be in the past, hence there is no need to invoke metaphysical alternatives (as Condoravdi 2002 suggests for precisely this case). The counterfactual reading, following Giannakidou 2011, can be due to an implicature, but space prevents us from expanding more here.

(ii) FUT and negation
FUT is also interpreted above negation, again as epistemic modals tend to (e.g. Cinque, 1999; Hacquard, 2006; Homer, 2011) and modal-evidentials across languages, e.g., Japanese (McCready & Ogata 2007). On the epistemic interpretation, (41a) and (42b) respectively mean that, according to what the speaker knows, John is not arriving, and John is not sick.

(41)   a.   *Gianni non   arriverà   mica*
            Gianni not   FUT-arrive   even
            'Gianni must not be arriving.'
       b.   *Gianni non sarà malato*
            'Gianni will not be sick / John must not be sick.'

This concludes our basic discussion of the modality of FUT and its interaction with the lower tense. We now move on to explain the future reading.

5. The forward shifting of FUT: Direct and indirect knowledge

We claim that the future reading arises as a temporally specific reading, when the speaker is in possession of direct knowledge of a relevant time for the embedded eventuality. This typically happens when we have a future adverb. When the adverb is present, the speaker knows, i.e. has *evidence* that there is a plan for the embedded eventuality to materialize. Recall that with direct *perceptual* evidence (the rain example), the epistemic reading of FUT is too weak; with the evidence that the future adverbial supplies, FUT can now function epistemically, but the eventuality will shift to the time of the adverbial. So, the future reading is forward shifting, not of the evaluation time of FUT—which remains PRES—but of the time of the lower event. We designate the relevant scoping below:

(42)   *Arriverà   alle 5 del pomeriggio.*
       FUT-arrive.3sing   at 5pm
       'He will arrive at 5 pm.'

(43)   FUT > *alle 5 del pomeriggio* > arrive

In other words, the adverb takes VP scope, and after application of FUT, the reading of FUT is a predicting one, relying on the temporal difference between the time of knowledge/evidence (always the utterance time), and the time of the event (pushed forward, after now, because of the overt adverbial, as we saw).

Though non-veridical—at the time of knowledge/assessment *p* is in fact not true—the forward shifted, predictive reading of FUT obtained with a future adverb, does seem to express more certainty. This is because we have temporal domain restriction, therefore the vagueness of the purely epistemic statement disappears (compare e.g. *He will arrive* and *He will arrive at 5 pm*). The speaker has knowledge about a (likely scheduled) time when the event will take place. This temporal specificity, we believe, is the essence of prediction—but the trigger is not FUT, it is the adverb.

In the absence of temporal adverbs, here is what happens. We have a mechanism of ***indirect knowledge*** that goes as follows: if the speaker has indirect knowledge that *p* in the context of utterance, then the epistemic-present reading arises.

(44) Piov erà / The vrexi
     'It must / will be raining.'

The street is wet, but I cannot see the sky. In this case, I have indirect knowledge, and the interpretation is purely epistemic. Note that, in principle, even the epistemic-future interpretation is available, as it is always possible to have an epistemic-future reading. The knowledge-based account requires that in order to obtain a certain epistemic interpretation, knowledge is needed. Indirect knowledge is a necessary condition for the epistemic-interpretation. Since, in this context no knowledge grounds the epistemic-future reading, this reading doesn't surface (e.g. the speaker has heard the forecast on TV, etc.).

Our account differs from Condoravdi's in that it does not use metaphysical modality. We derive epistemic and future/predictive readings from epistemic modality, plus temporal information provided by temporal adverbials and lower tense. To obtain future readings (future of the present or future of the past) Condoravdi assumes (a) metaphysical modality, (b) obligatory forward-shifting of eventive verbs, and (c) temporal contribution of the modal itself (i.e. a right open interval, that begins at the time of the evaluation of the modal, which is also the time at which worlds branch), but not of the lower tense. As we showed in (1) already, eventives do not necessarily forward-shift; and there is no need to resort to a metaphysical modal basis with the past. Finally, and most importantly, we showed that the vehicle of the temporal information is, crucially, the lower tense, and *not,* as Condoravdi posits, the modal (FUT) itself.

6. Conclusion

We proposed here that the future morphemes in Greek and Italian are epistemic modal operators that, in the absence of specific temporal information, access indirect evidence at the utterance time (t_u). The future interpretation arises with evidence, at the utterance time, about a future time in $[t_u, \infty)$. This time then serves to locate the eventuality of the sentence. Our analysis offers a relatively simple account of both epistemic and future readings of the FUT morphemes, and, among other things, opens the question of whether it would be plausible to reduce *all* futures to epistemic modality. If it turns out that epistemic modality is sufficient to account for the future in general, then the category 'future' by itself becomes redundant—and with it the notion of metaphysical modality that was meant to describe it.

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