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RESEARCH PAPER

# Epistemic Future and epistemic modal verbs in Portuguese

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This paper discusses the semantics of two epistemic operators in Portuguese: the epistemic Future and modal verbs. The idea sustained in the literature for other languages that the epistemic Future has the same semantics as the modal verb (equivalent to) MUST does not account for the Portuguese data. The proposal is made that, though epistemic Future and epistemic modal verbs are devices to convey uncertainty, they operate on different grounds. Epistemic modal verbs are quantifiers over possible worlds, expressing a degree of epistemic commitment towards a proposition, while the epistemic Future is argued to be a mark signaling lack of evidence at the context of utterance. The other modal verbs of Portuguese, in their epistemic reading, are also considered, the proposal being made that Portuguese has also a modal verb that existentially quantifies over the set of Best worlds. This shows a very symmetric picture of Portuguese modal verbs: two of them select an ordered modal base and two others an unordered modal base; for each domain of quantification – the entire modal base or the set of Best Worlds (a subset of the modal base) – there will be an existential and a universal quantifier.

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## 1 Introduction

In Portuguese, as in other languages, the verbal suffix of Future tense (henceforth Future) may have a purely modal, epistemic, interpretation, as in (1a), with the simple Future, or in (2a), with the compound form:

- (1) a. Atualmente, **haverá**<sub>-FUT</sub> menos de cinquenta tigres no parque.  
'Nowadays, there will be less than fifty tigers in the park.'
- b. Atualmente, **há**<sub>-PRES</sub> menos de cinquenta tigres no parque.  
'Nowadays, there are less than fifty tigers in the park.'
- (2) a. A esta hora, alguém já **terá**<sub>-FUT</sub> **aberto**<sub>-PAST-PARTICIPLE</sub> a sala.  
'At this time, someone will already have opened the room.'
- b. A esta hora, alguém já **abriu**<sub>-PAST</sub> a sala.  
'At this time, someone opened the room already.'

In (1a) and (2a), the Future signals uncertainty. While the assertion of (1b) and (2b) expresses the assumption, on the part of the speaker, that the propositions 'there are less than fifty tigers in the park' and 'someone already opened the door', respectively, are true, the assertion of (1a) and (2a), with the Future, expresses a lower degree of certainty on the truth of the propositions. Thus, in these sentences, the Future appears to have the same semantic contribution as modal verbs (in the epistemic reading) or other modal operators.

In fact, the question whether epistemic Future does or does not have the same meaning as (the equivalent of) *must* has been widely debated in the literature. Focusing on data from Portuguese, this paper investigates whether there are semantic differences between the Portuguese epistemic Future and epistemic *dever* ('must') and, if so, what is the semantic contribution of the epistemic Future.

The paper is organized as follows: section 2 presents proposals available in the literature concerning the semantics of the epistemic Future; on section 3 arguments are given to show that these proposals, that were based on data of (mainly) other Romance languages, are not extensible to Portuguese; in section 4 the proposal made in this paper concerning the semantics of Portuguese epistemic Future is detailed, after what, in section 5, a comparison between the epistemic Future and the Portuguese modal verbs (in their epistemic reading) is conducted; the main conclusions being presented in the final section.

## 2. Epistemic Future and MUST – state of the art

In this section, I will present two opposite views: the claim that the epistemic Future differs from (the equivalents) of *must*,<sup>1</sup> and the proposal of Giannakidou & Mari (2016), according to whom no semantic difference exists between epistemic Future and MUST. I will first present, on sections 2.1 – 2.3, the view that there is a semantic difference between the epistemic Future and MUST, after what Giannakidou & Mari's proposal will be considered, on section 2.4.

### 2.1 Epistemic Future, MUST, and degree of epistemic commitment

A common observation is that a difference between epistemic Future and MUST exists and that it relies on the degree of certainty expressed by each of these operators. In other words, between the epistemic Future and MUST there will be a difference of the same nature as between strong and weak epistemic modal verbs. This idea doesn't seem to be sustainable. As Dendale (2001) points, some authors consider that MUST expresses a higher degree of certainty than epistemic Future, while others observe the opposite, that MUST expresses a lower degree of certainty than the epistemic Future. On the same vein, Pietrandrea (2005) claims that in Italian the epistemic Future is unmarked as to the degree of certainty:

«The epistemic future, a form unmarked as to the degree of certainty, can express, depending on the contexts and the intonation profiles, a strong, medium, or weak judgement.» (Pietrandrea 2005: 101)

The same observation is valid also for Portuguese. As illustrated by the following example, a sentence with epistemic Future can co-occur with expressions that convey different degrees of certainty, an argument that is commonly used to show that the epistemic Future is unmarked as to the degree of epistemic commitment:

- (3) Como vocês **saberão**<sub>-FUT</sub> melhor do que eu {**com certeza** / **provavelmente** / **talvez** / ...}, não há consenso sobre a data precisa em que este edifício foi construído.  
 'As you will {certainly / probably / maybe / ...} know better than me, there is no consensus about when exactly this building was made.'

This being so, it is too simplistic to say that the epistemic Future differs from epistemic MUST concerning the degree of epistemic commitment that each form conveys. MUST is a strong modal verb, that, in the epistemic reading, expresses a high degree of confidence that the

<sup>1</sup> Henceforth MUST if no particular language is considered, i.e., MUST stands for Portuguese *dever*, French *devoir*, etc.

proposition under its scope is true. As for the epistemic Future, if it is unmarked concerning the degree of certainty being expressed, one cannot say that the difference (if any) between epistemic Future and *MUST* relies on the conveyed degree of certainty and that it is, thus, parallel to the difference between strong and weak modal verbs (e.g., *MUST* and *MIGHT*).

A different kind of idea, explored for French (cf. Dendale 2001), as well as for Italian (cf. Pietrandrea 2005 or Squartini 2010), is that epistemic Future and *MUST* differ in that the latter expresses an inference, while epistemic Future might be not associated with the same kind of information. The two next sub-sections are devoted to the presentation of the main arguments given by Dendale (2001) for French and by Pietrandrea (2005) and Squartini (2010) for Italian. The validity of these arguments will be tested against data from Portuguese, in order to figure out whether the proposal at issue is extensible to this language.

## 2.2 Epistemic Future, *MUST*, and inference

Dendale (2001) argues that, in French, *devoir* ('must') is an inferential marker, signaling that the modalized proposition follows from a set of premises:

«Dans le cas de *devoir<sub>E</sub>* nous avons montré (Dendale 1994) que ce n'est pas par observation directe de la réalité décrite, ni par emprunt de l'information à autrui, mais par une opération mentale complexe qui est fondamentalement inférentielle.» (Dendale 2001: 5)

[In the case of *devoir<sub>E</sub>* ('must') we have shown (Dendale 1994) that it is not by direct observation of the described reality nor by borrowing information from others but by a complex mental operation that is fundamentally inferential.]

As for the epistemic Future, he claims that this form signals an inference less careful than the one signaled by epistemic *devoir*:

“une assertion au futur<sub>E</sub> pourrait être considérée comme *une hypothèse ou un commentaire quelque peu rapide* (...), une conclusion qui n'est pas basée (...) sur une longue et soigneuse recherche de la vérité, alors qu'une affirmation modalisée avec *devoir<sub>E</sub>* se présente comme une conclusion qui s'impose après réflexion, au bout du processus mental. *Devoir<sub>E</sub>* est donc à considérer comme un *marqueur de la quête soigneuse ou de la quête pénible de la vérité.*” (Dendale 2001: 13)

[An assertion with the future could be considered as a somewhat precipitous hypothesis or commentary (...), a conclusion which is not based on a long and careful search for truth, whereas a modalized affirmation with *devoir<sub>E</sub>* ('must') presents itself as a conclusion that imposes itself after reflection, at the end of the mental process. *Devoir<sub>E</sub>* is to be considered as a marker of the careful quest or the painful quest for truth.]

The author observes that this hypothesis explains the oddity of the Future in (4), in contrast with its acceptance in examples like (5) [judgements of acceptance presented in Dendale 2001]:

- (4) [A drunk stinks alcohol]  
 Il {*doit être* / \**sera*} *tombé* dans un tonneau de vodka, une telle odeur ne peut pas s'expliquer autrement. (Schrott 1997, *apud* Dendale 2001)  
 'He must / \*will have fallen into a barrel of vodka, such an odor cannot be explained otherwise.'

- (5) a. Voilà Yvette avec un coup de soleil. Elle est partie se coucher. Elle était comme un coquelicot, la pauvre enfant, elle a une migraine atroce. Vouz vous **serez promené**s en plein soleil, vous **au**rez fait des folies. Que sais-je, moi? (Maupassant, *in* Dendale 2001)  
 ‘Here is Yvette with a sunburn. She went to bed. She was like a poppy, poor child, she has an atrocious migraine. You will have been strolling in full sun, you will have splurged. What do I know?’
- b. Pas un signe de Paul. Il **aura oublié** le rendez-vous. Qu’est-ce qu’il peut être distrait!  
 ‘Not a sign of Paul. He will have forgotten the appointment. How absent-minded he can be!’

These observations and Dendale’s proposal do not seem to be extensible to Portuguese. In fact, in the Portuguese equivalents of these examples, the epistemic Future would be odder than *dever* (‘must’) not only in (4), like in French, but also in (5), unlike what is verified for French, according to Dendale (2001). Moreover, in Portuguese the epistemic Future is perfectly acceptable in sentences that may well correspond to conclusions of careful thoughts. Such is the case of the following examples, where the sentences with the epistemic Future are preceded by an indication of what their assertion is based on and clearly do not convey a «somewhat precipitous hypothesis or commentary»:

- (6) Após longa reflexão e debate, a única coisa que podemos dizer é que, muito provavelmente, o manuscrito {**será**<sub>-FUT</sub> / **deve ser**} egípcio.  
 ‘After a long reflection and debate, all we can say is that, quite probably, the manuscript {will / must} be Egyptian.’
- (7) Se as últimas sondagens estiverem certas, atualmente o PS {**será**<sub>-FUT</sub> / **deve ser**} o partido com mais simpatizantes.  
 ‘If the last polls are correct, nowadays PS will be the most popular party.’

Hence, Dendale’s proposal that the epistemic Future signals a thoughtless inference does not seem extendable to Portuguese. As shown by (6) and (7), both the epistemic Future as the modal verb may be used to express an inference that follows from a conscious mental process of reflection.

### 2.3 Epistemic Future and conjecture

A similar view to the one of Dendale (2001) is provided for Italian by Pietrandrea (2005) and Squartini (2010). Both these authors claim that *dovere* (‘must’) is inferential, the Future being a different kind of epistemic marker.

According to Squartini (2010), in Italian the epistemic Future may express the “dubitative mood” or the “conjectural mood”, while *dovere* (‘must’) expresses “the inferential mood”. He observes that in declarative clauses both the Italian epistemic Future and the modal *dovere* (‘must’) can occur, while in conjectural questions only the Future is allowed:

- (8) [The door bell rings.]
- a. **Sarà**<sub>-FUT</sub> il postino.  
 ‘It will be the postman.’
- b. **Deve essere** il postino.  
 ‘It must be the postman.’

- (9) [The door bell rings.]  
 a. **Sarà**<sub>FUT</sub> il postino?  
 ‘It will be the postman?’  
 b. ??**Deve essere** il postino?  
 ‘Must it be the postman?’

Likewise, Pietrandrea (2005) presents several arguments sustaining the claim that in Italian *dovere* (‘must’) is inferential and the epistemic Future is not.

One of these arguments, also presented by Dendale (2001) for French, comes from the observation that, while the equivalent of *must* expresses a high degree of confidence that the proposition under its scope is true, the epistemic Future may express a high or a low degree:

«distinctions in the prosodic profile force us to interpret the same utterance modalized through an epistemic Future marker both as a strong judgement and as a weak judgement. For instance, the utterance in (11) can assume either the meaning in (12) or that in (13), depending on the prosodic profile:

- (11) *Star-à a cas-a*  
 Stay.IND.FUT.-3SG to house-SG  
 “(S)he must be at home”
- (12) *Star-à a cas-a, immagin-o*  
 Stay.IND.FUT.-3SG to house-SG imagine-IND.PRES.1SG  
 “(S)he must be at home, I think”
- (13) *Star-à a cas-a, ne sono secur-o*  
 Stay.IND.FUT.-3SG to house-SG DEM.GEN be-IND.PRES.1SG sure-M.SG  
 “(S)he must be at home, I am sure” (Pietrandrea 2005: 72)

As Pietrandrea states:

«the reason why DEVE [‘must’] expresses a strong degree judgement is to be sought in the fact that this form indicates that the speaker has objective knowledge, from which (s)he can infer the certainty of the conclusion introduced by DEVE. (...) In other words, DEVE condenses a syllogistic process based on more or less explicit premises, from which it is necessary to draw the conclusion introduced by DEVE.»  
 (Pietrandrea 2005: 81)

As for the epistemic Future, she claims that:

«(...) unlike modals, the future seems not to condense any inferential process, but appears to function as the form expressing the speaker’s genuine opinion about the propositional content.» (*ib.*: 93)

Other arguments that Pietrandrea presents to sustain this hypothesis are the following:

- (i) In contexts referring to the speaker’s opinion, the Future can be used, modal verbs cannot. She considers the following context: «a friend has lost his watch and he is asking us where we think that watch can be. We do not know anything about that watch» (p. 94). According to Pietrandrea (2005), in such a context it would be appropriate to answer (10), but not (11), unless «we have details that justify our inference» (p. 95), as in (12):

- (10) L' **avrà**<sub>-FUT</sub> **lasciato** a casa  
 "You may have left it at home"
- (11) a. ??**Puoi averlo** lasciato a casa  
 'You can have left it at home'  
 b. ??**Devi averlo** lasciato a casa  
 'You must have left it at home'
- (12) **Devi averlo** lasciato a casa l'ho visto sul tavolo  
 'You must have left it at home, I have seen it on the table'

(ii) It is possible to ask someone on which bases he sustains an utterance with modal verbs, but it is not possible to do the same if the utterance is modalized resorting to the epistemic Future:

- (13) A: Il negozio {**deve** / **potrebbe**} **essere** già chiuso.  
 'The store {must / could} be already closed.'  
 B: Perché {**deve** / **potrebbe**} **essere** già chiuso?  
 'Why {should / could} it be already closed?'
- (14) A: Il negozio **sarà**<sub>-FUT</sub> già chiuso.  
 'The store will be already closed.'  
 B: \*Perché **sarà** già chiuso?  
 'Why will it be already closed?'
- (15) A: Ci **deve essere** un tesoro essere nascosto su quell'isola  
 'There must be a hidden treasure on that island.'  
 B: Come lo sai?  
 'How do you know that?'
- (16) A: Ci **sarà**<sub>-FUT</sub> un tesoro essere nascosto su quell'isola  
 'There will be a hidden treasure on that island.'  
 B: \*Come lo sai?  
 'How do you know that?'

(iii) As Dendale (2001) observes for French, Pietrandrea remarks that in ironic utterances like the following, in Italian the equivalent of *must* is acceptable, while the epistemic Future is not:

- (17) Se anche Babbo Natale un tempo fosse esistito... in questo momento {**deve essersi** / ?**si sarà**<sub>-FUT</sub>} sicuramente vaporizzato!  
 'Even if Santa Claus did exist formerly... he surely {must have / ?will be} evaporated by now!'

On the basis of these arguments, Pietrandrea (2005) claims that the epistemic Future in Italian is not inferential.

Concerning Portuguese, we can observe that also in this language the epistemic Future, both the simple and the compound form, can be used in utterances that do not express an inference, as in the following examples:

- (18) a. Atualmente **seremos**<sub>-FUT</sub> uns dez milhões, suponho.  
‘We will be about ten million today, I suppose.’
- b. A Ana não chegou. Provavelmente **terá**<sub>-FUT</sub> perdido o comboio, mas não faço ideia.  
‘Ana didn’t arrive yet. Probably she missed the train, but I have no idea.’
- (19) a. Está alguém a tocar à porta. **Será**<sub>-FUT</sub> o carteiro? / Quem **será**<sub>-FUT</sub>?  
‘Someone is knocking at the door. Will it be the postman? / Who can it be?’
- b. A Ana não veio. **Terá**<sub>-FUT</sub> perdido o comboio?  
‘Ana didn’t come. Will she have missed the train?’

However, the Future can also occur in utterances that express an inference, as in (6)–(7), above, or in (20):

- (20) a. Na última contagem havia 73 pessoas inscritas. Entretanto já passou algum tempo e houve divulgação, mas o programa não é muito apelativo. **Por isso**, o número atual não **ultrapassará**<sub>-FUT</sub> as 100 inscrições.  
‘At the last count there were 73 people enrolled. Meanwhile, some time has passed and there have been publicity actions, but the program is not very appealing. **Therefore**, the current number **will** not surpass 100 people inscribed.’
- b. Sabemos que os casos mais complexos são enviados para outra unidade e que o caso da Ana era particularmente complexo. **Portanto**, **terá**<sub>-FUT</sub> **tido** encaminhado para os serviços centrais.  
‘We know that the more complex cases are sent to another unit and that Ana’s case was particularly complex. **Therefore**, it **will** have been sent to the central services.’

Congruently, the second argument of Pietrandrea presented above to sustain the claim that in Italian the epistemic Future is not inferential does not apply to Portuguese. It is perfectly possible to reply with a question like “why do you think so?” to an utterance with the epistemic Future, contrary to what Pietrandrea states to be the case in Italian.

In sum, in contrast with what Dendale (2001) observes for French and Pietrandrea (2005) and Squartini (2010) for Italian, in Portuguese the epistemic Future can be inferential (as shown by, e.g., (20)), though it might also be used in utterances not expressing an inference (as shown by (18) or (19)).

#### 2.4 Epistemic Future, MUST, and partial knowledge

Giannakidou & Mari (2016) present a formal analysis of the semantics of the epistemic Future in Greek and Italian, arguing that its semantics is the same as the one of epistemic MUST. Their proposal departs from the observation that epistemic MUST and epistemic Future are *epistemic weakeners*, a category which would include also modal particles such as *wohl*, *wel* in German and Dutch. The analysis they propose is sketched as follows.

In unmodalized assertions, the speaker expresses full commitment with the truth of the asserted proposition. That is, every possible world compatible with what the speaker knows or beliefs is a *p*-world (a world where the situation described by *p* holds). In contrast, epistemic Future, as well as the modal verb MUST, indicates that not all worlds compatible with what the speaker knows or beliefs are *p*-worlds. This is shown by the possibility of a continuation revealing weakened certainty, in contrast with unmodalized assertions:

- (21) a. I Ariadne ine/itan arosti, #ala dhen ime ke endelos sigouri.  
 b. Giacomo è malato, #ma non sono sicura.  
 ‘Ariadne/Giacomo is/was sick, #but I am not entirely sure.’
- (22) a. I Ariadne tha ine arosti, ala dhen ime ke endelos sigouri.  
 b. Giacomo sarà malato, ma non sono sicura.  
 ‘Ariadne/Giacomo must be sick, but I am not entirely sure.’

In other words, sentences with *MUST* or with the epistemic Future will indicate that the set of possible worlds compatible with what the speaker knows or believes is non-veridical, a non-homogeneous logical space, containing both *p*-worlds and non-*p* worlds, contrary to the modal space of an unmodalized sentence, which is a veridical space, one that contains only *p*-worlds.

There are two kinds of non-veridical epistemic modal spaces: ordered and unordered modal bases. In unordered modal bases, there is equilibrium between *p* and  $\neg p$ . For instance, if the speaker assumes that the possibility that it rained yesterday is as likely as the possibility that it didn't rain, the epistemic state of the speaker contains worlds where it rained yesterday and worlds where it didn't rain, no ordering existing between them. To describe such epistemic state, a weak modal verb can be used (*it might have rained yesterday*), but *must* can't. *Must* requires an ordered modal base. In ordered modal bases the worlds are ranked according to a dimension. The possible worlds compatible with what the speaker knows or assumes can be ordered according to their proximity to ‘what the law stipulates’ (deontic ordering), ‘what is the normal course of events’ (stereotypical ordering), and so on. For instance, prior to a game between a very strong team and a very weak one, any of the teams may win the game (i.e., the modal base includes possible worlds in which the first team wins as well as possible worlds where it is the other team that wins), but it is more likely that the stronger team wins. Hence, possible worlds where the strong team wins are better ranked than the others; the modal base is, therefore, ordered (some possibilities are more likely than others). Thus, an ordered modal base contains a set of Best worlds (in the given example of the game, the set of Best worlds is formed by worlds in which the stronger team wins), which is a subset of the set of worlds in the epistemic modal base. The modal verb *MUST* universally quantifies over the set of Best worlds.

In sum, weak modals are existential quantifiers over the modal base, *MUST* is a universal quantifier over the set of Best worlds, a subset of the modal base. This is the classical analysis of modal verbs in formal semantics after Kratzer's seminal work.

Giannakidou & Mari (2016) observe no difference between *MUST*-statements and those with the epistemic future, claiming that the epistemic Future has the same semantics as *MUST*, both *MUST* and the epistemic Future being quantifiers over the set of Best worlds. Informally, the idea is that both the epistemic Future as *MUST* indicate that the speaker is not sure that the proposition under the scope of the modal operator is true (the epistemic state of the speaker contains *p* and non-*p* worlds; it is a non-veridical epistemic state), but he is more inclined to consider that it is true than that it is false. In their words, *MUST* and the epistemic Future are biased modals, and biased modals are both strong and weak. They are strong because the set of Best worlds contains only *p*-worlds, but they are weak because the modal base also contains non-*p* worlds. Therefore, an utterance with a biased modal, as (23b), expresses a weaker commitment of the speaker towards the propositional content than the assertion of an unmodalized sentence, as (23a), which indicates that the epistemic state of the speaker contains only *p*-worlds:



- (23) a. It rained yesterday.  
 b. It must have rained yesterday.  
 c. It might have rained yesterday.

This classical, Kratzerian, analysis of *must* (which Giannakidou & Mari extend to the epistemic Future) is challenged by Fintel & Gillies (2010). They argue that *must* is always strong and the intuition that (23b) conveys a weaker statement than (23a) is due to a presupposition that *must* triggers: that the speaker bases his statement on indirect evidence. Giannakidou & Mari (2016) contest this idea and claim that the epistemic weakening conveyed by sentences with *MUST* or the epistemic Future is due to partial knowledge, not to indirect evidence, as defended by Fintel & Gillies (2010) for *must*. In their words, «epistemic weakness arises because the speaker is reasoning with partial knowledge, and she knows that she does not have all the facts» (Giannakidou & Mari 2016: 95). They sustain this proposal by bringing into consideration a set of examples:

- (24) [context: Direct visual perception of rain]  
 a. #It must be raining.  
 b. #Tha vrexì. / #Pioverà.  
     FUT rain. / rain-FUT.3SG.  
 d. #Tha prepì na vrexì. / #Dovrà piovere.  
     FUT must SUBJ rain. / Must-FUT.3SG rain.

In this context, no epistemic weakener is possible because:

«If I see the rain, I know that it is raining, and knowledge is veridical: if I know *p*, then all worlds compatible with my knowledge are *p* worlds. My epistemic space is not partitioned, but the opposite: it is homogeneously supporting *p*. Epistemic weakeners are incompatible with the state of complete, homogenous knowledge that comes with direct perception» (Giannakidou & Mari 2016: 96)

- (25) [context: I see a wet umbrella]  
 a. It must be raining.  
 b. Tha/Prepì na vrexì. / Deve star piovendo. / Pioverà.  
     FUT/Must SUBJ rain. / Must be raining. / FUT-rain.3SG.  
 c. Deve star piovendo, ma non sono sicura.  
     ‘It must be raining, but I am not sure.’  
 d. Deve probabilmente star piovendo.  
     ‘It must probably be raining.’
- (26) [Context: I am in a room with no windows, but I hear sounds of water falling on the roof]  
 a. It must be raining.  
 b. Tha / prepì na vrexì. / Pioverà.  
     FUT / must SUBJ rain. / rain-FUT.3SG.

In these contexts, the information that it is raining is an inference. There is no direct perception of the rain. The sound might be caused by something else than the rain. Thus, only in the Best worlds the sound of water falling is due to rain, the modal base also contains non-*p* worlds.

In reportative contexts, they observe, neither the epistemic Future<sup>2</sup> nor the equivalents of *must* are allowed in Greek or Italian, as shown by the following example modeled after Smirnova (2013):

- (27) [context: you and your sister were out of touch for a couple of years. Today she calls you on the phone to catch up. She tells you that her daughter Maria plays the piano. Later, you tell your husband:]
- a. #I Maria tha/prepi na pezi piano.  
#Maria must play the piano.
  - b. #Maria suonerà il piano.  
#Maria must-FUT.3SG play the piano.

They claim that «the reason why the universal modal is blocked in this context is that here the speaker has knowledge that *p* provided by her sister’s utterance. The assertion ‘Maria plays the piano’ is part of the common ground due to the report, so the speaker’s epistemic state is veridical, and it contains no worlds that negate this information. FUT is incompatible with this state, and so is MUST. This example clearly shows that it is not indirectness that matters but whether the speaker knows.» (Giannakidou & Mari 2016: 99) By contrast, the inferential context will be compatible with MUST and with the epistemic Future because it would present partial knowledge. Elaborating on Smirnova’s example, Giannakidou & Mari (2016) consider the following context:

«You and your sister were out of touch for a couple of years. Today you visit her for the first time. As she shows you around her apartment, you see that there is a piano. Later, you tell your husband:

- (64) (...)
- b. Maria tha pezi/prepi na pezi piano.  
Maria FUT play/must SUBJ play piano.
  - c. Maria suonerà/deve suonare il piano.  
Maria play.FUT.3SG/must play the piano.
  - d. Maria must play the piano.

Here we have a piano, but we don’t actually see Maria playing it, hence the knowledge is partial. An inferential context with missing premises is therefore an excellent environment for FUT, MUST and the other weakening devices. Again, it is not a matter of indirectness, as we see the piano directly: it is simply reasoning with incomplete knowledge so that we can effectively partition the modal base into worlds that support the proposition and those that do not, as is required by epistemic weakening.» (Giannakidou & Mari 2016: 99–100).

In sum, Giannakidou & Mari propose that the epistemic Future has the same semantics as MUST, both operators indicating that the speaker is not completely sure that the sentence under the scope of the modal operator is true because he has partial knowledge (i.e., he has not enough evidence to be sure that the proposition is true). They defend that both MUST and the epistemic Future are biased modals. The assertion of a sentence with one of these forms indicates that the proposition under the scope of the modal operator is probably true, though the speaker is not completely sure that it is true, this epistemic weakening being due to partial knowledge. The authors explicitly state that they follow

<sup>2</sup> Contrary to Portuguese, which is known to have the “reportative Future”.

the same semantics for *MUST* and epistemic Future. They observe the possibility of the Future morpheme (in Italian) or particle (in Greek) to co-occur with *MUST*, claiming that this is an instance of modal concord:

- (28) I Ariadne tha prepi na milise xthes.  
the Ariadne FUT must SUBJ talk.past.3SG yesterday.  
'Ariadne must have spoken yesterday.'
- (29) Giacomo dovrà aver parlato ieri.  
Giacomo must-FUT.3SG have spoken yesterday.  
'Giacomo must have spoken yesterday, but I am not entirely sure'

An example that Giannakidou & Mari discuss as being potentially problematic for their proposal is an inference where all the premises are stated:

- (30) a. La palla è in A, B, o C.  
'The ball is in A, B or C.'
- b. Non è nè in A, nè in B.  
'It is neither in A nor in B.'
- c. #Sarà in C.  
'It will be in C.'
- d. Deve essere in C  
'It must be in C.'

As predicted by their analysis, in Italian the Future is disallowed in this case because there is full knowledge (the speaker has enough evidence to be sure that the proposition *the ball is in C* is true). However, they observe that, contrary to the prediction of their proposal, the modal verb *dovere* ('must') is accepted, and that in Greek both the equivalent of *must* as the Future are allowed:

- (31) a. The ball is in A, B or C  
b. The ball is neither in A nor B.  
c. I bala prepei na ine / tha ine sto C.  
the ball must SUBJ be.3s / FUT be.3s in.the C  
'The ball must be / will be in C.'

They suggest that in these data the modal operators do not have a pure epistemic reading, but rather «They present an 'impure' (...) use of the universal modal, where epistemic reasoning is mixed with alethic modality; or they are simply just alethic because a conclusion is drawn based on the mathematical/logical disjunctive schema:  $p$  or  $q$  or  $r$ ,  $\neg p$  and  $\neg q$ , therefore  $r$ .» (Giannakidou & Mari 2016: 101).

In Portuguese, in this context neither the epistemic Future nor *dever* ('must') can occur, as predicted by Giannakidou & Mari's analysis. However, their proposal of equivalence between the epistemic Future and *MUST* does not seem to be tenable for Portuguese, as I will try to show in the next section.

### 3 Non-applicability to Portuguese of the given proposals

The proposals sketched above can be summarized as follows: Dendale (2001) argues that the epistemic Future differs from *devoir* ('must') in that the latter signals a careful, attentive inference, while the former expresses a careless one, a conclusion that is not based on a

conscious mental process of reflection. Pietrandrea (2005) and Squartini (2010) push forward this idea, claiming that the epistemic Future might express not an inference at all, having instead a “conjectural” reading or being an epistemic marker that merely signals the “the speaker’s genuine opinion about the propositional content” (Pietrandrea 2005: 93), while the epistemic verb equivalent to *must* is inferential. This vision contrasts with the analysis of Giannakidou & Mari (2016), who claim that the epistemic Future and the modal verb *MUST* have the same semantics, both being epistemic weakeners, used to express reasoning based on partial information.

Portuguese data challenges both these approaches. Concerning the hypothesis that the epistemic Future is not inferential, recall the following examples:

- (32) Após longa reflexão e debate, a única coisa que podemos dizer é que, muito provavelmente, o manuscrito {**será**<sub>-FUT</sub> / **deve ser**} egípcio.  
‘After a long reflection and debate, all we can say is that, quite probably, the manuscript {will / must} be Egyptian.’
- (33) Se as últimas sondagens estiverem certas, atualmente o PS {**será**<sub>-FUT</sub> / **deve ser**} o partido mais votado.  
‘If the last polls are correct, nowadays PS will be the most popular party.’
- (34) De acordo com os meus cálculos, o número de inscrições no programa já {**será**<sub>-FUT</sub> / **deve ser**} o mais elevado de sempre.  
‘According to my calculations, the number of inscriptions in the program {will / must} already be the highest of any time.’
- (35) a. Na última contagem havia 73 pessoas inscritas. Entretanto já passou algum tempo e houve ações de divulgação, mas o programa não é muito apelativo. Por isso, o número atual {**andar**<sub>-FUT</sub> / **deve andar**} pelas 100 inscrições.  
‘At the last count there were 73 people enrolled. Meanwhile, some time has passed and there have been publicity actions, but the program is not very appealing. Therefore, the current number {will be / must be} around 100 entries.’
- b. Sabemos que os casos mais complexos são enviados para outra unidade e que o caso da Ana era particularmente complexo. Por isso, {**terá**<sub>-FUT</sub> / **deve ter**} sido encaminhado para os serviços centrais.  
‘We know that the more complex cases are sent to another unit and that Ana’s case was particularly complex. Therefore, it {will / must} have been sent to the central services.’

In these cases, the modalized sentence corresponds to a conclusion that follows from an inferential process and both the epistemic Future as the modal verb *dever* (‘must’) might be used in any of these sentences, contrary to what Pietrandrea and Squartini state to be the case in Italian. Moreover, the modalized proposition expresses a conclusion sustained on a careful process of reasoning. So, contrary to what Dendale (2001) argues to be the case in French, in Portuguese the epistemic Future does not necessarily express a conclusion or a judgement that one utters without giving much attention to its sustainability.

Giannakidou & Mari’s proposal that the epistemic Future and *MUST* are equivalent is also problematic for Portuguese. In fact, the assumption of equivalence between epistemic Future and *MUST* faces at least three problems. First, it is not the case that one of these forms can always replace the other. Second, while epistemic *MUST* always expresses a high degree of confidence that the proposition under its scope is true, an utterance with the

epistemic Future can express a high, a low or a medium degree of belief, as shown above. Thus, Pietrandrea's observation that the epistemic Future is neutral concerning the degree of confidence on the truth of the propositional content seems tenable also for Portuguese. Third, the epistemic Future morpheme might co-occur with the modal verb *dever* as it might co-occur with any other modal verb, including the weak modal *poder* ('might'):

- (36) a. A esta hora, a Ana **deverá**<sub>-FUT</sub> estar a almoçar.  
'At this time, Ana must<sub>-FUT</sub> be having lunch'
- b. Não tenho a certeza de que o Pedro ainda esteja no escritório. **Poderá**<sub>-FUT</sub> ter saído mais cedo.  
'I'm not sure that Pedro is at the office yet. He might<sub>-FUT</sub> have left earlier.'

Giannakidou & Mari (2016) propose that co-occurrences of MUST and the epistemic Future, as (36a), are cases of modal concord. However, the same explanation cannot be given to co-occurrences of the modal verb *poder* ('might') and the epistemic Future, as in (36b), while keeping the assumption that the epistemic Future has the same semantics as MUST. *Poder* ('might') and *dever* ('must') have different meanings. So, if the epistemic Future is equivalent to MUST, *poderá* ('might<sub>-FUT</sub>') cannot be a case of modal concord. Moreover, if the epistemic Future and MUST are equivalent, the reading of (36b) should be the same as the one of a sentence with the sequence of the modal verbs *dever* ('must') and *poder* ('might'). However, this is not the case. The two following sentences have different meanings:

- (37) a. A Ana **deve poder** vir.  
'Ana must be able to come.'
- b. A Ana **poderá**<sub>-FUT</sub> vir.  
'Ana might come.'

As is known, when the same sentence has a sequence of modal verbs, only the first one can receive an epistemic interpretation. In (37a) the modal *dever* ('must') has an epistemic reading, while the modal *poder* can only have a root interpretation (i.e., it may have a deontic reading, an ability reading, and so on, but it does not have an epistemic reading). By contrast, in (37b) only an epistemic reading is available. So, the fact that (37a) and (37b) have different readings is an argument against the proposal that epistemic Future has the same semantics as MUST. Moreover, (37b) expresses a higher degree of uncertainty than (37a). This is also unexpected if the epistemic Future and *dever* ('must') have the same semantics.

Another possible argument against the hypothesis that in Portuguese the epistemic Future has the same semantics as the modal verb *dever* ('must') comes from the contrast between the use of the epistemic Future and the use of the Future with a purely temporal reading. At the present stage of the language, as commonly observed, the use of the Future morpheme to indicate futurity with respect to speech time is very rare and stylistically marked. Temporal posteriority with respect to speech time is most naturally expressed by the use of the periphrastic form with the (equivalent of the) verb *to go*. The following sentences have the same meaning, but (38a) is more natural in ordinary language than (38b), which is stylistically marked:

- (38) a. **Vou** sair daqui a pouco.  
*go*<sub>-1ST-SG-PRES-IND</sub> leave from-here to little

- b. **Sairei**                    daqui     a pouco.  
*leave*<sub>-1ST-SG-FUT-IND</sub> *from-here to little*  
 ‘I will leave in a while.’

The reduced use of temporal Future could be explained as following from a competition between two equivalent forms. Since Portuguese has at least two forms to express the same meaning (the Future morpheme and the periphrastic form with the verb *ir* (‘to go’)), it is natural that one of them is abandoned. Given this, if the epistemic Future is equivalent to *dever* (‘must’), one could also expect one of the forms to be discarded, the other one continuing to be used. However, both epistemic *dever* as the epistemic Future are quite alive at the present stage of Portuguese. At the very least, epistemic Future is much more natural than the Future with a temporal reading. Thus, if the Future with temporal reading is being replaced by the use of a competitive form, equivalent to it, it could be expected that the same would happen with the epistemic Future if this form was indeed equivalent to epistemic *dever* (‘must’). However, this prediction is not confirmed. Instead, the aliveness both of *dever* (‘must’) as of the epistemic Future in Portuguese points to the direction that these two modal operators are not equivalent. The widespread use of one and another form is only natural if the two forms are not always interchangeable.

Nevertheless, despite the arguments against the hypothesis that MUST and the epistemic Future have the same semantics, it is a fact that in some cases one or the other form can occur and no difference in meaning is perceived. This is the case of, for instance, the following example:

- (39) [Context: Ana is at school, the speaker is home. Usually, the kids at school have lunch at a certain hour]
- a. A Ana **deve** estar a almoçar agora.  
 ‘Ana must be having lunch now.’
- b. A Ana **estará**<sub>-FUT</sub> a almoçar agora.  
 ‘Ana will be having lunch now.’

Thus, an analysis of the epistemic Future in Portuguese should account for the equivalence between these two modal operators in cases as (39), while taking into consideration the arguments against the hypothesis that epistemic Future and MUST are equivalent.

#### 4 Epistemic Future and evidence

Giannakidou & Mari’s term *epistemic weakener* is particularly felicitous. The use of a modal verb or of the epistemic Future is a device to indicate that the epistemic state of the speaker includes non-*p* worlds. When the epistemic Future co-occurs with a modal verb, the epistemic weakening is greater than if the speaker uses just one of these devices (the epistemic Future or a modal verb). In the following examples, both (40a) as (40b) express the possibility that the new manuscript is older than the other ones, but (40a) indicates a lower degree of commitment with such possibility:

- (40) a. Encontrámos um novo manuscrito, que **poderá**<sub>-FUT</sub> ser mais antigo do que os anteriores.
- b. Encontrámos um novo manuscrito, que **pode**<sub>-PRES</sub> ser mais antigo do que os anteriores.  
 ‘We have found a new manuscript, which might be older than the previous ones.’

Likewise, (41a), where epistemic *dever* ('must') and epistemic Future co-occur, indicates more distancing on the part of the speaker than (41b) or (41c), sentences with only the epistemic Future or only the modal verb *dever* ('must'):

- (41) a. O avião **deverá**<sub>-FUT</sub> ter aterrado há menos de uma hora.  
*The plane must*<sub>-FUT</sub> *have landed there-is less than one hour*
- b. O avião **terá**<sub>-FUT</sub> aterrado há menos de uma hora.  
*The plane has*<sub>-FUT</sub> *landed there-is less than one hour*  
 'The plane will have landed less than an hour ago.'
- c. O avião **deve**<sub>-PRES</sub> ter aterrado há menos de uma hora.  
 'The plane must have landed less than an hour ago.'

More precisely, (40a) indicates that at utterance time the speaker has no particular evidence that the manuscript is older than the other ones, but there is such possibility. The sentence could be uttered during an archaeological expedition and at a time previous to the analysis of the manuscript. A natural continuation of the utterance would be (the equivalent of) *we'll see*. As for (40b), it could be uttered in the same context, but also in a context where the analysis of the manuscript already began and information was collected that is compatible with the manuscript being older than the other ones, though also compatible with the opposite. In one context and the other, the speaker relies on partial knowledge. However, in the former context the partial information on which the speaker bases his judgement is more reduced. Therefore, the confidence of the speaker on the truth of the proposition is lower. That is, the fact that (40a) expresses a lower degree of commitment than (40b) can be a consequence of a lower amount of information on which the speaker bases his judgement.

Let us now consider examples (41) and the following contexts:

Context 1: the speaker is at the airport and he has visual evidence that a plane landed a short time ago (for instance, he sees passengers coming from the inside, carrying their luggage).

Context 2: the speaker is not at the airport, he knows that the plane was scheduled to land at a certain hour and he has no knowledge of some delay on the landing neither the confirmation that the plane has landed.

In context 1, the speaker could naturally assert (41c), but more hardly (41a) or (41b). In context 2, the assertion of any of the sentences in (41) would be natural. The assertion of (41a), where the epistemic Future and *dever* ('must') co-occur, would be the preferred option if we add the information that we haven't been watching the news and we don't know whether there is any strike, whether there is any storm near the airport or if there is any other issue that might cause a delay in the landing.

On the basis of this, the conclusion can be drawn that the use of the epistemic Future is conditioned by the amount and/or kind of information that the speaker relies on to base his assertion. That is, though any epistemic weakener involves partial knowledge, as Giannakidou & Mari (2016) observe, the Portuguese epistemic Future seems to impose further restrictions on the information on which the speaker bases his judgement.

My proposal is that in Portuguese the epistemic Future is a device to signal lack of evidence **at the context of utterance**. Therefore, contrary to modal verbs, the epistemic Future in Portuguese is not a form that expresses a degree of belief, but a mark to signal that the speaker is not basing his assertion on evidence available at the context of utterance. In this sense, the Future will be an evidential. The assertion of  $p_{-FUT}$  signals that at the

context of utterance there are no facts that would allow the inference that *p* is true, hence, the epistemic weakening provided by the Future.

The idea that the Future is an evidential has also been argued for Italian by Mari (2010), a proposal that will be considered at the end of this section. Before that, let us evaluate the hypothesis at stake, that in Portuguese the Future indicates lack of evidence at the context of utterance.

This hypothesis explains why (41a) or (41b) could be asserted at Context 2, above, but more hardly at Context 1. In this last context, the partial knowledge that the speaker relies on is visual information available at the context of utterance, whereas in Context 2 the speaker reasons on the basis of information collected previously to the assertion. The fact that (41c), with the modal verb *dever* ('must') but not the Future, could be asserted naturally both at Context 1 and at Context 2 shows that this modal verb does not impose the same restrictions on the kind of information on which the speaker bases his judgement. When using this verb, the speaker relies on partial knowledge, regardless whether this knowledge was obtained previously or is available in the context of utterance. The use of the epistemic Future, on its side, requires that the partial knowledge on which the speaker bases his inference does not include facts available at the context of utterance. In Context 2, the speaker knows that the plane was scheduled to land at a certain hour and he has no information that something unusual happened. He reasons that, given the normal course of events, at utterance time the plane would have landed. At the same time, he has partial information. It is possible that something happened and the landing of the plane suffered some delay. Thus, by using the Future, the speaker indicates that he reasons with information unavailable at the context of utterance. In contrast, by using the modal verb *dever* ('must'), the speaker indicates simply that he reasons on partial information (that he does not have enough information to be absolutely sure that the proposition is true). Hence it is possible to utter (41c) both at Context 1 as at Context 2. In both contexts the speaker has partial information. He does not have enough information to be certain that the proposition is true, for which he cannot use the plain assertion *the plane has landed less than an hour ago* and needs to resort to an epistemic weakener, be it a modal verb or the epistemic Future. According to the sketched proposal, the choice for the epistemic Future is only allowed if whatever evidence the speaker might have to sustain his assertion is not evidence available at the context of utterance, while epistemic *dever* ('must') does not impose such restriction.

By evidence unavailable at the context of utterance I mean facts available at the context of utterance that point to the truthfulness of *p*. For instance, smoke is evidence that there is a fire, footprints are evidence that someone passed by, dark clouds are evidence that it will rain, and so on. The observed data suggests that in Portuguese when such kind of evidence is present at the context of utterance an assertion with the Future is odd.

Other data also point to the direction that in Portuguese the epistemic Future signals absence of evidence at the context of utterance.

Ginnakidou & Mari (2016) observe that in Italian and in Greek both the equivalents of *must* as the epistemic Future may occur in (42) and (43), below. In Portuguese, the epistemic Future is odd in this context, while *dever* ('must') is completely acceptable:

- (42) [context: I see a wet umbrella]  
 a. #**Estará a chover.**  
*rain*<sub>-FUT</sub>  
 'It will be raining'  
 b. **Deve** estar a chover.  
*Must be at raining*  
 'It must be raining.'



- (43) [Context: I am in a room with no windows, but I hear sounds of water falling on the roof]
- a. #**Estará a chover.**  
*rain*<sub>-FUT</sub>  
 ‘It will be raining’
  - b. **Deve estar a chover.**  
*Must be at raining*  
 ‘It must be raining.’

In these contexts, the speaker reasons on the basis of partial knowledge, but the evidence that sustains his assertion (visual or auditory information) is available at the context of utterance. The fact that in Portuguese *dever* (‘must’) is fine in these sentences, while the Future is odd, shows that the last form has the restriction that at the context of utterance the speaker has no evidence to sustain his assertion.

The epistemic Future is also unnatural, in Portuguese, in the famous following example (the original example, *that will be the postman*, comes from Palmer 1986):

- (44) [The bell rings]
- a. #**Será**<sub>-FUT</sub> o carteiro.  
 ‘That will be the postman.’
  - b. **Deve ser** o carteiro.  
 ‘It must be the postman.’

Also in this case the speaker relies on information present at the context of utterance: the ringing of the bell. The inference that it must be the postman follows from knowledge that the postman usually comes at a certain hour, that the speaker is not expecting anyone else and that the bell is ringing. Given that some knowledge on which the speaker bases his inference is available at the context of utterance (the auditory information that the bell is ringing), the epistemic Future is ruled out.

However, in the same context the Future is perfect if the sentence is a question, not an assertion, while *dever* (‘must’) would be odd:

- (45) [The bell rings]
- a. **Será**<sub>-FUT</sub> o carteiro?  
 ‘Will that be the postman?’
  - b. #**Deve ser** o carteiro?<sup>3</sup>  
 ‘Must it be the postman?’

This is not problematic. By making a question, the speaker indicates that he does not have evidence to sustain that *p* or that *not p*. This is compatible with the hypothesis that the epistemic Future indicates absence of evidence at the context of utterance. It is also compatible with the impossibility of using epistemic *dever* (‘must’), which indicates a high degree of belief that the proposition under its scope is true. Being a biased modal, the strangeness of MUST in conjectural questions is only natural.

Likewise, in ironic sentences, as (46), also the Future can be used in Portuguese (contrary to what will be the case in French or Italian, according to Pietrandrea 2005):

<sup>3</sup> As an anonymous reviewer points, this sentence is possible in a tag question (*deve ser o carteiro, não?*), but these questions have a first part that is declarative.

- (46) a. Se o Pai Natal existiu... já se {**deve** ter / **terá**<sub>-FUT</sub>} evaporado!  
 ‘Even if Santa Claus did exist formerly... he {must have / will be} evaporated by now!’
- b. Mais uma vez, a Paula não nos veio ajudar... **Estará**<sub>-FUT</sub> doente novamente...  
 ‘Once again, Paula didn’t come to help us... She’ll be sick again...’

The possibility of using the epistemic Future in contexts of irony is expectable if the Future signals absence of evidence at the context of utterance. By using irony, the speaker utters a proposition that is clearly false. This, obviously, is congruent with indicating absence of evidence that *p* is true. Notice that in (46a) (the equivalent in Portuguese of an example from Pietrandrea 2005) the epistemic Future occurs in the consequent of the conditional. It signals absence of evidence at the context of utterance that Santa Claus evaporated, not that Santa Claus existed. But the proposition ‘Santa Claus evaporated’ presupposes that Santa Claus existed, what the conditional is meant to deny. So, signaling absence of evidence that Santa Claus evaporated, which presupposes that Santa Claus existed, is congruent with the information conveyed by (46a) that Santa Claus never existed. More precisely, the reasoning expressed in (46a) can be detailed as a simple case of Modus Tollens: the consequent of the conditional is false; therefore, the antecedent is also false. The epistemic Future, in the consequent of the conditional, signals absence of evidence at the context of utterance that the proposition is true (i.e., it signals absence of evidence that Santa Claus evaporated), which is consistent with the information, conveyed by irony, that such proposition is false and, therefore, that the antecedent of the conditional is also false.

Finally, the hypothesis that the epistemic Future signals absence of evidence at the context of utterance explains why it can be used in cases where the speaker reasons on the basis of evidence previously collected. For instance, if we know when an airplane has departed and we also know its route and how long the journey takes, but we don’t know anything else concerning the airplane, (47a) could be asserted felicitously:

- (47) a. A esta hora, o avião **estará**<sub>-FUT</sub> a sobrevoar a Sibéria.  
 ‘By now, the plane will be over Siberia.’
- b. A esta hora, o avião **deve** estar a sobrevoar a Sibéria.  
 ‘By now, the plane must be over Siberia.’

This is a case where no difference is perceived between the epistemic Future and *dever* (‘must’). Both in (47a) as in (47b) the certainty is weakened, in one case by the use of a modal verb – *dever* (‘must’) – that selects a modal base containing *p* and non-*p* worlds, in the other case by the use of a form that indicates lack of evidence at the context of utterance.

To summarize, the observed data points in the direction that in Portuguese the epistemic Future signals that the speaker does not base his assertion on evidence available at the context of utterance. Therefore, the Future can occur in, e.g., conjectural questions, conjectural statements, ironic utterances, and also in sentences expressing an inference provided that the inference is not based on evidence available at the context of utterance. As for the modal verb *dever* (‘must’), it can be used to express an inference regardless whether evidence is available at the context of utterance or not.

If this hypothesis is on the right track, there will be a fundamental difference between epistemic modal verbs and epistemic Future. Epistemic modal verbs indicate the degree of confidence that the speaker has concerning the truth of the proposition under their scope. Epistemic Future, according to the sketched proposal, does not do the same (recall the common observation that the epistemic Future is neutral as to the degree of belief

being conveyed). Instead, it signals epistemic weakening because it will be a device to signal that the speaker is not basing his statement on evidence available at the context of utterance. That is, the epistemic Future signals absence at the context of utterance of facts on which the speaker can rely to support his statement, rather than the degree of commitment of the speaker on the truth of the propositional content of his assertion.

This explains why the Future can co-occur both with weak as with strong modal verbs (e.g., *poderá*, ‘might<sub>-FUT</sub>’, *deverá*, ‘must<sub>-FUT</sub>’). If the epistemic Future and the modal verbs have different functions, it is only natural that they can co-occur. The two forms provide different contributions to the meaning of the sentence.

Of course, there is a straight connection between degree of belief and evidence on which such belief is sustained. There is a large amount of literature and a long standing debate concerning the relation between epistemic modality and evidentiality. Regardless whether one accepts that these are two different systems or an integrated one, it is unquestionable that the evidential and the epistemic dimensions are related. In formal semantics, modal verbs are classically described as quantifiers over possible worlds, as seen above. The set of worlds over which the modal verb quantifies is formed by worlds compatible with what is known or assumed. That is, modal verbs require a conversational background: «The truth-conditional content of a modal is given relative to a context of use that fixes the modal base» (Kaufmann *et al.* 2006). The information that fixes the modal base may be explicitly given, with expressions as *in view of ...*, *given that...*, but it more often is unexpressed and given by context. The set of possible worlds compatible with this contextual information constitutes the modal base. Modal verbs are quantifiers over the modal base or, in the case of modals that require an ordered modal base, as *MUST*, over a subset of it (the set of Best worlds). Giannakidou & Mari (2016) propose that the epistemic Future has the same semantics as *MUST* and, thus, quantifies over a subset of the modal base. As seen above, such assumption has the problem of explaining why the epistemic Future might co-occur with modal verbs. If its co-occurrence with *MUST* can be seen as a case of modal concord, as Giannakidou & Mari do, the possibility that the epistemic Future co-occurs with weak modals (*poderá*, ‘might<sub>-FUT</sub>’) cannot be described also as a case of modal concord while assuming that the epistemic Future is equivalent to *MUST*. By contrast, the proposal that the function of the epistemic Future is to indicate absence of evidence at the context of utterance, the possibility of the epistemic Future to co-occur with any modal verb follows straightforwardly: the modal verb quantifies over (a subset of) the modal base and the epistemic Future operates at the evidential component of the modal verb.

In other words, the function of the epistemic Future will be akin to ‘in view of’ phrases: it is a linguistic cue that guides the hearer in realizing on what kind of information the speaker bases his assertion. In the case of the epistemic Future, its contribution will be to indicate the hearer that, whatever information the speaker is relying on to make his utterance, it is not evidence corresponding to facts available at the context of utterance.

In her seminal work, Kratzer (1977, 1981) points that, in language, various expressions set the conversational background, like ‘in view of phrases’, and she distinguished two major types: ‘in view of facts’ and ‘in view of what is known’. The first expression sets a realistic conversational background, and the second one an epistemic conversational background. The proposal made in this paper amounts to say that in Portuguese the Future is a device to set an epistemic conversational background: it indicates that the speaker is basing his utterance on his (partial) knowledge and not on facts available at the context of utterance. The Future is, then, incompatible with the expression of inferences that follow from facts.

In addition to the epistemic Future, other values of the Future have been identified in the literature (see Giomi 2010). Among them are the “reportative Future” and the “concessive Future”, illustrated by (48) and (49) (an example of Boléo 1973), respectively:

- (48) a. (Segundo o INE,) a taxa de desemprego **estará**<sub>-FUT</sub> atualmente em 9,3%.  
‘According to the NSI, the unemployment rate will now be at 9.3%.’
- b. (De acordo com a polícia,) o suspeito **terá**<sub>-FUT</sub> **feito**<sub>-PAST-PARTICIPLE</sub> reféns.  
‘According to police, the suspect will have taken hostages.’
- (49) A – Estás desvairada.  
‘You are out of your mind.’
- B – Sim, **estarei**<sub>-FUT</sub>. Mas que me deixem.  
*Yes, I will be. But that me let*  
‘Yes, if you say so. But leave me alone.’

Also in these cases the speaker bases his assertion on information of others, not on evidence available to him at the context of utterance.

In sum, “conjectural”, “inferential”, “reportative”, and “concessive” are values of the Future have been individuated in the literature. What is common to all of these uses of the Future is that the assertion of the speaker is not based on personal evidence available at the context of utterance. According to the hypothesis presented here, in Portuguese what the epistemic Future indicates is that the speaker does not base his assertion on facts available at the context of utterance. The speaker may either have no evidence at all (“conjectural Future”), he may rely on information previously collected (“inferential Future”) or on information given by others (“reportative Future” and “Concessive Future”), but not on evidence corresponding to facts available at the context of utterance.

As said before, the idea that the Future is an evidential has also been defended for other languages. Mari (2010) claims that «the future, in Italian, belongs to the category of evidential terms» (p. 1). She argues that «The future marks that the speaker has indirect access to the event» (p. 4), and, following Fintel & Gilles 2008, that «epistemic modality and evidentiality become one category because epistemic modals mark indirect evidence as the source of the information conveyed by the utterance.» (p. 1). She observes a distinction between objective and subjective knowledge and a distinction between indexical and non-indexical knowledge, claiming that in Italian the Future is an evidential that has an epistemic interpretation when it uses indexical knowledge and a non-epistemic (temporal) interpretation when it uses non-indexical knowledge.

She defines subjective knowledge as the one that relies on beliefs held by (a group including) the speaker, while objective knowledge relies on facts, evidence external to the speaker. In the first case the modal base is epistemic (beliefs), while objective knowledge relies on a realistic modal base (facts). As for the distinction between indexical and non-indexical knowledge, Mari (2010) defines indexical knowledge as knowledge of a present fact: «The available evidence exists in the context of an utterance and allows one to conjecture about whether something has happened or is happening. For instance, Jim being absent from school can be used as evidence that he is sick; smoke can be used as evidence that there is a fire; or chocolate on a boy’s lips can be used as evidence that he ate chocolate.» (pp, 8–9). Non-indexical knowledge will consist of «knowledge ‘for’ non-present facts». In her words, «Jim being absent can be used as evidence for his later arrival; smoke can be used as evidence for the fact that people will need to be evacuated; and chocolate on a boy’s lips can be used as evidence that he will get a stomach ache» (p. 9). She observes that in Italian both subjective as objective knowledge can be used in an indexical (see (50)) or a non-indexical way (see (51)), as shown by the following examples she presents:

- (50) a. Secondo me, sarà a casa. [subjective, indexical]  
*In my opinion, he will be at home.*

- b. Visto quello che è successo, sarà partito. [objective, indexical]  
*In view of what has happened, he will have left.*
- (51) a. Secondo me, sarà a casa alle 10h00. [subjective, non-indexical]  
*In my opinion, he will be at home at 10h00.*
- b. Visto quello che è successo, partirà presto. [objective, non-indexical]  
*In view of what has happened, he will leave soon.*

Both indexical as non-indexical knowledge are available at utterance time. As she states, when one looks out of the window and truthfully and felicitously utters *It will rain shortly*, «at the utterance time, a set of propositions is true in  $w$ , such that the event in  $p$  occurs at a later time  $t'$  following the utterance time. For instance, it is true that the sky is grey, it is true that there are a lot of clouds, and so on» (p. 9). What distinguishes indexical from non-indexical knowledge is the time of assessment, «the time at which it is decided whether  $p$  occurred or is obtained (...). Indexical knowledge sets the time of the assessment at the utterance time. Plans set the time of assessment at a time succeeding the utterance time». To put simply, and if I understood correctly, the idea is that on the basis of the evidence that he has at utterance time, the speaker infers what might be or have been the case (indexical knowledge) or what will happen (non-indexical knowledge). Mari's proposal is that in Italian the modal interpretation of the Future emerges when indexical knowledge is used and a non-epistemic (temporal) interpretation when non-indexical knowledge is used.

In Portuguese, the distribution of the Future is different. In this language, the Future would be acceptable in the equivalents of (50a) and (51a), but it would be odd in the equivalent of (50b) (whose translation for Portuguese with a modal verb – *dado o que sucedeu, deve ter saído* – would be most proper) and stylistically marked in the equivalent of (51b) (where the use of periphrastic form – *dado o que se passou, ele vai sair cedo* – would be more natural). In other words, contrary to what is verified in Italian, in Portuguese the Future is hardly compatible with a realistic modal base. If, as Mari (2010) defends, in Italian there is a relation between epistemic interpretation of the Future and indexical knowledge, in Portuguese the relation will be between the epistemic interpretation of the Future and subjectivity as defined in Mari (2010); i.e., non-realistic Modal Base. If the proposal made in this paper is on the right track, in this language, the Future is an evidential that signals subjective knowledge, it indicates that the speaker is basing his assertion on beliefs, not on facts.

## 5 Epistemic Future and epistemic modal verbs in Portuguese

Etymologically, the Portuguese Future (of the indicative) derives from the Latin auxiliary verb *habere* ('have'). The same verb is at the origin of *haver de* ('have to'), which appears to be a modal verb (cf. Oliveira & Mendes 2013) and may have an epistemic interpretation, as in the following example:

- (52) Ela já **há-de** ter uns trinta anos.  
*She already has-to have some thirty years*  
 '(I guess) She will be about thirty years old now.'

The other modal verbs of Portuguese are *poder* ('can/might/may'), *dever* ('must') and *ter de* ('have to'<sup>4</sup>). All of them can have an epistemic reading:

<sup>4</sup> Portuguese has, then, two modal verbs corresponding to *have to*. One of them, *haver de*, comes from the Latin verb HABERE. The other one, *ter de*, comes from the Latin verb TENERE. Both these Latin verbs gave also origin to two temporal auxiliary verbs in Portuguese, *haver* and *ter*, the former having been replaced by the latter in the history of the Portuguese language (cf., e.g., Mattos da Silva 1989).

- (53) Leva um chapéu de chuva. **Pode** chover.  
‘Take an umbrella. It **might** rain.’
- (54) A esta hora a Ana **deve** estar a almoçar.  
‘By this time Ana **must** be having lunch.’
- (55) Se ninguém lhe mexeu, a chave **tem de** estar na gaveta.  
‘If nobody moved it, the key **has to** be in the drawer.’

The meaning of *dever* (‘must’) and *poder* (‘can/might/may’) is perfectly accounted for by the analysis of Giannakidou & Mari (2016). Briefly, *dever* (‘must’) requires partial knowledge, an epistemic modal base that contains *p*-worlds and non-*p* worlds (i.e., a partitioned modal base) and an ordering source. The verb expresses universal quantification over the set of Best worlds. In a nutshell, *dever p* (‘must *p*’) indicates that the set of worlds compatible with what the speaker knows includes *p*-worlds and non-*p* worlds, but *p*-worlds are better ranked than non-*p* worlds (i.e., *p* is more likely than non-*p*). The weak modal verb *poder* (‘can/might/may’) requires partial knowledge, an epistemic modal base that contains *p*-worlds and non-*p* worlds, but no ordering source. The verb expresses existential quantification over the set of worlds forming the modal base. In other words, *poder p* (‘might *p*’) just indicates that *p* is compatible with what the speaker knows (it indicates that the Modal Base, the set of worlds compatible with what the speaker knows, contains at least one *p*-world).

The modal verb *ter de* (‘have to<sub>1</sub>’) is less described in the literature than *dever* (‘must’) and *poder* (‘can/might/may’). The most commonly referred aspects of *ter de* are that this modal verb is stronger than *dever* (‘must’) and that it is frequently used as a deontic modal verb. However, as has been recognized by, e.g., Oliveira & Mendes (2013), *ter de* may express other modal values. In (55) *ter de* has an epistemic reading, as it does in the following example, from Oliveira & Mendes (2013):

- (56) **Tens de** estar cansado, depois de tão longa viagem.  
‘You **have to** be tired, after such a long journey.’

In both (55) and (56), *ter de* (‘have to<sub>1</sub>’) could be replaced by *dever* (‘must’), but a lower degree of epistemic commitment would then be expressed. In the conclusion of a logical argument, *ter de* (‘have to<sub>1</sub>’) can be used, but *dever* (‘must’) cannot:

- (57) a. A bola está em A, em B ou em C.  
‘The ball is in A, B or C.’
- b. A bola não está em A nem em B.  
‘The ball is neither in A nor B.’
- c. Então, a bola {**tem de** / **#deve**} estar em C.  
‘Therefore, the ball {**has to** / **#must**} be in C.’

As seen above, this last example is discussed by Giannakidou & Mari (2016), who observe that in Greek both the Future as the equivalent of *must* may occur in (57c), while in Italian the Future is odd, but the equivalent of *must* is acceptable. In Portuguese, neither the Future nor *dever* (‘must’) are acceptable in (57c). The only possibilities to express the conclusion of the argument are to use a non modalized proposition (*então, a bola está em C* ‘therefore, the ball is in C’) or to use *ter de* (‘have to<sub>1</sub>’), as in (57c).

The oddity of *dever* (‘must’) in this example is expectable given the semantics of **MUST** described above: this verb expresses universal quantification over the set of Best worlds, but it selects a partitioned modal base, one that contains *p* worlds and non-*p* worlds. In

(57c), the modal base contains only  $p$ -worlds, for the premises entail the conclusion. The fact that *ter de* ('have to<sub>1</sub>') may occur in (57c) shows that this verb does not select a partitioned modal base. On the contrary, it seems to be a universal quantifier over the set of worlds that form the modal base: (57c) indicates that in every world compatible with what is taken the ball is in C. In other words, *ter de* ('have to<sub>1</sub>') indicates that the proposition under its scope necessarily follows from what is known (i.e., that every world compatible with what is known or taken for granted is a  $p$ -world).

Assertion of a non modalized proposition also indicates that every world compatible with what the speaker knows or believes is a  $p$ -world (cf., e.g., Portner 2009, Giannakidou & Mari 2016). However, *ter de* ('have to<sub>1</sub>') is only acceptable if an inference is expressed, while a simple assertion does not need to be the conclusion of an argument. By asserting a non modalized proposition, the speaker indicates that every world in his epistemic state is a  $p$ -world. By asserting a proposition with *ter de* ('have to<sub>1</sub>'), the speaker indicates that what he knows implies the acceptance of the proposition under the scope of the modal verb.

In sum, the meaning of the three considered modal verbs in Portuguese can be described using basic ingredients of Kratzerian semantics. Modal verbs are quantifiers over possible worlds. The set of worlds compatible with what is known or assumed forms the modal base, which can be ordered or unordered. *Dever* ('must') selects an ordered modal base, while *poder* ('can/might/may') and *ter de* ('have to<sub>1</sub>') select unordered modal bases. *Poder* is an existential quantifier; *ter de* and *dever* are universal quantifiers. The first quantifies over the set of worlds that form the modal base, the latter quantifies over the set of Best worlds. **Table 1** summarizes this information:

**Table 1:** Epistemic modal verbs in Portuguese and Modal Base.

Modal Base	Partitioned ( $p$ -worlds + non- $p$ worlds)	No		<i>ter de</i>
		Yes	Ordered	<i>dever</i>
			Unordered	<i>poder</i>

As for the epistemic Future, in the previous section the proposal was made that it is not a quantifier over possible worlds, but an evidential, a mark that signals that the speaker is not relying on facts available at the context of utterance.

Given this, the question arises whether *haver de* ('have to'), in examples like (58a), is a quantifier over possible worlds, as the (other) modal verbs, or a mark similar to the epistemic Future, with which it shares the etymology:

- (58) a. Ela já **há-de** ter uns trinta anos.  
*She already has-to have some thirty years*
- b. Ela já **terá**<sub>-FUT</sub> uns trinta anos.  
*She already have*<sub>-FUT</sub> *some thirty years*  
'She will be about thirty years old now.'

I will not attempt a definite answer to this question, but signal some observations.

On one side, although sharing the etymology with the Future, *haver de* ('have to<sub>2</sub>') does not seem to be equivalent to the epistemic Future.

First, *haver de* expresses a high degree of epistemic commitment, while the epistemic Future, as seen above, may be associated with different degrees of epistemic commitment. In fact, both (58a) as (58b), above, indicate uncertainty, but (58a) conveys a high degree of confidence on the part of the speaker, while (58b), depending on the intonation, can convey a high or a low degree of confidence that the proposition *she is thirty years old now* is true.

Second, in Portuguese, the Future can have a reportative reading, *haver de* does not:

- (59) a. Segundo o INE, a taxa de desemprego {**estará**<sub>-FUT</sub> / #**há-de estar**} actualmente em 9,3%.  
 ‘According to the NSI, the present unemployment rate will be at 9.3%.’
- b. De acordo com a polícia, o suspeito {**terá**<sub>-FUT</sub> **feito**<sub>-PAST-PARTICIPLE</sub> / #**há-de ter feito**} vários reféns.  
 ‘According to police, the suspect will have taken hostages.’

Third, both the epistemic Future as *haver de* (‘have to<sub>2</sub>’) can co-occur with *poder* (‘might’), but when co-occurring with *haver de*, *poder* does not have an epistemic reading, which is available when it co-occurs with the epistemic Future:

- (60) a. Não tenho a certeza de que o Pedro ainda esteja no escritório. **Poderá**<sub>-FUT</sub> ter saído mais cedo.  
 ‘I’m not sure that Pedro is at the office yet. He might<sub>-FUT</sub> have left earlier.’
- b. Não tenho a certeza de que o Pedro ainda esteja no escritório. Ele **há-de ter podido** sair mais cedo.  
 ‘I’m not sure that Pedro is at the office yet. For sure he might have been able to leave earlier.’

In (60b) an epistemic interpretation of the modal verb *poder* (‘can/might/may’) is unavailable, only a root interpretation (ability, deontic, ...) being allowed, while in (60a) *poder* has an epistemic interpretation.

Fourth, the epistemic Future can occur in questions like (61), *haver de* (‘have to<sub>2</sub>’) cannot, behaving, in this respect, like (other) modal verbs:

- (61) [The bell rings]  
 {**Será**<sub>-FUT</sub> / #**há-de ser** / #**deve ser** / #**pode ser**} o carteiro?  
 ‘{Will / #shall / #must / “might} that be the postman?’

On the other side, there is some evidence that approximates *haver de* (‘have to<sub>2</sub>’) and the epistemic Future, while distinguishing these forms from modal verbs.

First, both *haver de* (‘have to<sub>2</sub>’) as the epistemic Future are unnatural in contexts where the speaker bases his inference on facts available at the context of utterance:

- (62) A Ana {**deve estar** / #**há-de estar** / #**estará**<sub>-FUT</sub>} doente. Olha como está pálida.  
 ‘Ana {must be / has to be / will be} sick. Look how pale she is.’
- (63) [the speaker is in a room with no windows]  
 {**Deve estar** / #**há-de estar** / #**estará**<sub>-FUT</sub>} a chover. As pessoas trazem os sapatos molhados.  
 ‘It must be raining. People wear wet shoes.’
- (64) O céu está carregado. **Deve** chover / #**há-de chover** / ?**choverá**<sub>-FUT</sub>} em breve.  
 ‘The sky is very cloudy. It must rain soon.’

Second, both the epistemic Future as *haver de* (‘have to<sub>2</sub>’) can be used when the speaker has no particular evidence at all and expresses a conjecture:



- (65) A: Onde é que está a Ana?  
‘Where is Ana?’  
B: Não sei, a esta hora {**estará**<sub>-FUT</sub> / **há-de** estar} em casa...  
‘I don’t know, by now she will be home...’
- (66) Alguém desligou o computador. {**Terá**<sub>-FUT</sub> / **Há-de** ter} sido a Ana...  
‘Someone turned off the computer. It will have been Ana...’

The modal verb *dever* (‘must’) could also occur in these sentences:

- (67) Onde é que está a Ana?  
‘Where is Ana?’  
B: A esta hora **deve** estar em casa.  
‘By now she must be home.’
- (68) Alguém desligou o computador. **Deve** ter sido a Ana.  
‘Someone turned off the computer. It must have been Ana.’

However, unlike the epistemic Future or *haver de* (‘have to<sub>2</sub>’), *dever* (‘must’) would indicate that the speaker has some evidence to sustain his opinion. In other words, (65)–(66), with the Future or *haver de* (‘have to<sub>2</sub>’), express a conjecture, while (67)–(68), with *dever* (‘must’), express an inference. It is possible to reply to (67) or (68) with a request of what information sustains the utterance (e.g., *how do you know? Why do you say that?*), but the same kind of reply to (65) or (66) would be odd.

In fact, the most natural utterances with *haver de* (‘have to<sub>2</sub>’) are expressions of a conjecture. This form indicates that the speaker has no particular evidence to sustain his assertion. See also the following examples:

- (69) Vou perguntar àqueles desconhecidos. Alguém **há-de** saber onde fica a rua X.  
‘I will ask those unknown people. Someone will know where the street X is.’
- (70) Eu não sei qual é a resposta, mas **há-de** haver quem saiba.  
‘I don’t know the answer, but certainly someone knows.’

The use of *haver de* (‘have to<sub>2</sub>’) is very natural in examples like these. Clearly, in these cases the speaker conveys the information that he has no specific evidence that someone knows where the street X is, in (69), or that someone knows the answer, in (70). The speaker may rely on general knowledge (e.g., it is normal that local people know the direction to a street of their town), but not on specific evidence.

At the same time, *haver de* (‘have to<sub>2</sub>’) conveys a high level of confidence on the part of the speaker that the sentence under its scope is true. Examples (69) and (70) also convey the information that, according to the speaker, it is only likely that someone knows where the street X is or what the answer is.

Thus, *haver de* (‘have to<sub>2</sub>’) has this peculiar aspect of indicating great confidence on the truth of the proposition under its scope and, simultaneously, conveying the information that the speaker has no particular evidence to sustain his opinion. A hypothesis that would explain this fact is that *haver de* (‘have to<sub>2</sub>’) is an existential quantifier over the set of Best worlds. That is, *haver de* (‘have to<sub>2</sub>’) selects a partitioned modal base (one that contains *p*-worlds and non-*p* worlds); it requires an ordered modal base (it indicates that some of the worlds in the modal base are closer to what is normal than others); and

existentially quantifies over the set of Best worlds, therefore indicating that the set of Best worlds includes *p*-worlds.

To clarify this hypothesis, consider the example repeated below:

- (71) A: Onde é que está a Ana?  
 ‘Where is Ana?’  
 B: Não sei, a esta hora **há-de** estar em casa...  
 ‘I don’t know, by now she will be home...’

The reply of B could be felicitous in a context where (s)he does not know where Ana is, but assumes that Ana followed the usual routine and went back home after work. Let us assume that it is very rare that Ana has to work extra hours, that normally she goes home after work and that she uses to take a bus to go home. In her way home, Ana stops at the supermarket sometimes, but not always. By asserting the reply in (71), the speaker indicates that the possibility of Ana being home is more likely than other possibilities compatible with what is known or assumed. For example, Ana being at the office is a possibility compatible with what is known, but is not something usual (hence, not a likely possibility). Likewise, the possibilities that the bus had a mechanical problem and got stopped on the road, that Ana didn’t take the bus, but got kidnapped, and so on, are possibilities compatible with what is known, but the worlds where this happens are less normal than worlds where Ana leaves her work, gets the bus and goes home. So, Ana being home is a better possibility than Ana being at work, Ana having been kidnapped and so on. But the possibility that Ana is not at home because in her way home she went to the supermarket and got delayed is a possibility as likely as the possibility of Ana being home. Given this scenario, the set of Best worlds includes worlds where Ana is at home and also worlds where Ana is at the supermarket (that is, the set of Best worlds includes *p*-worlds and non-*p* worlds). If the speaker has no particular evidence pointing that Ana is at home, he might reply as in (71). By doing so, he indicates that, given the normal course of events, Ana being home is a better possibility than others (such as Ana being still at work), but not better than every other possibility compatible with what he knows. For instance, the possibility that Ana went to the supermarket and did not reach home yet is as good as the possibility that she is already home. The proposed hypothesis, thus, is that *haver de* (‘have to<sub>2</sub>’) indicates that the set of Best worlds includes *p*-worlds. That is, the possible worlds compatible with what is known or assumed are ordered (according to their proximity to what is normal), giving rise to a set of Best worlds (those that are closer to what is normal). In the given scenario, this set includes *p*-worlds (worlds where Ana is at home) and non-*p* worlds (worlds where Ana is not at home because she went to the supermarket first). The proposed hypothesis is that this is the kind of modal base that *haver de* (‘have to<sub>2</sub>’) requires. This verb will indicate that the set of Best worlds includes *p*-worlds. In other words, it will be an existential quantifier over the set of Best worlds (or, equivalently, it indicates that *p* is a possibility at least as good as any other; see, e.g., Kratzer 1991 or Portner 2009 for formal definitions of *good possibility*).

Notice that, in (71), if B uses instead the verb *dever* (‘must’), replying *a esta hora a Ana deve estar em casa* (‘by now, Ana *must* be home’), he indicates that Ana being home is a better possibility than any other possibility compatible with what is known. This sentence would indicate that the possibility of Ana being home is better than the possibility of she being still at work, as it is better than the possibility that she went to the supermarket and did not reach home yet, and so on. That is, *dever* (‘must’) indicates that the set of Best worlds includes only *p*-worlds. If the possibility of Ana being at home is, in principle, as natural as the possibility that she passed by the supermarket in her way home from

work, and if, even so, the speaker asserts that she must be home, then he conveys the information that he has some evidence that allows him to order these possibilities (for example, he knows that Ana was planning to go straight home today).

In sum, the hypothesis concerning *haver de* ('have to<sub>2</sub>') is that this is an existential quantifier over the set of Best worlds, while *dever* ('must') is a universal quantifier over the set of Best worlds.

One argument in favor of the hypothesis that *haver de* ('have to<sub>2</sub>') involves existential quantification over a set of possible worlds (as weak modals, like *can*, do) is the equivalence between *haver de* ('have to<sub>2</sub>') and *poder* ('might/can') in rhetorical questions, as in B's reply in the following example:

- (72) A: Quem é que abriu a porta?  
'Who opened the door?'
- a. B: A Ana! Quem mais **havia de** ter sido?!  
*The Ana. Who more have to have been?!*
- b. B: A Ana! Quem mais **podia** ter sido?!  
*The Ana. Who more could have been*  
'Ana did it. Who else would have been?!

Both the rhetorical question in (72a) as the one in (72b) indicate that, according to B, there is no one else apart from Ana who might have opened the door. An acceptable translation of (72a) and (72b) would be, respectively *who else would be likely?* And *who else would possibly have been?* Likewise, in example (71), an acceptable correspondence of *haver de* ('have to<sub>2</sub>') is the predicate *to be likely*. In short, the given observations point to the conclusion that an assertion with *haver de* ('have to<sub>2</sub>') indicates that the speaker has no evidence to sustain his opinion, but bases his utterance on the basis of what is normal and says that the proposition under the scope of the modal verb is likely.

Given this, the following picture of epistemic modal verbs in Portuguese emerges: *haver de* ('have to<sub>2</sub>') and *dever* ('must') select an ordered modal base (i.e., the set of worlds compatible with what is known or assumed is ordered), while *poder* ('might') and *ter de* ('have to<sub>1</sub>') do not impose an ordering on the modal base. Hence, the domain of quantification of *haver de* ('have to<sub>2</sub>') and *dever* ('must') is the set of Best worlds (a subset of the modal base), while *poder* ('can/might/may') and *ter de* ('have to<sub>1</sub>') quantify over the entire modal base. The modal verbs *haver de* ('have to<sub>2dever ('must') and *poder* ('can/might/may') select a partitioned modal base (one that contains *p*-worlds and non-*p* worlds), while *ter de* ('have to<sub>1</sub>') selects a modal base that contains only *p*-worlds. *Ter de* ('have to<sub>1</sub>') is a universal quantifier over the modal base. The verb *poder* ('can/might/may') has the same domain of quantification, but it is an existential quantifier. It indicates that the set of worlds compatible with what is known or assumed includes some *p*-worlds. The verbs *dever* ('must') and *haver de* ('have to<sub>2</sub>') quantify over the set of Best worlds (a subset of the modal base), the first of these verbs being a universal quantifier and the latter one an existential quantifier. **Table 2** summarizes these observations:</sub>

**Table 2:** Modal verbs in Portuguese and domain of quantification.

		Universal quantification	Existential quantification
Domain of	Entire Modal base	<i>ter de</i>	<i>poder</i>
quantification	Set of Best worlds	<i>dever</i>	<i>haver de</i>

Notice that this table does not include the Future. As argued before, I claim that the epistemic Future is an evidentiality operator, not a quantifier over possible worlds. In other words, modal verbs (in their epistemic reading) are devices to indicate the degree of confidence on the truth of the proposition under their scope, while the Future (in the usually called ‘epistemic reading’ or ‘modal reading’, to be distinguished from the ‘temporal reading’, which was not considered in this paper) is a device to indicate the kind of information on which the speaker bases his utterance.

## 6 Conclusion

In this paper, the semantics of the Portuguese epistemic Future and of the Portuguese modal verbs in their epistemic interpretation were considered. Concerning the epistemic Future, three proposals available in the literature were considered. These proposals were made on the basis of data of other languages, and none of them seems to be extendable to Portuguese. Giannakidou & Mari’s proposal that the epistemic Future has the same semantics as *MUST* faces several difficulties when Portuguese data is considered. It does not explain why the epistemic Future and *dever* (‘must’) are not always interchangeable; it does not account for the fact that the epistemic Future is undetermined for modal force, unlike *dever* (‘must’), and the fact that the epistemic Future can co-occur with any modal verb is also problematic for an analysis that treats equally the epistemic Future and *dever* (‘must’). The proposal of Pietrandrea (2005) and Squartini (2010) that in Italian the equivalent of *must* is inferential and the epistemic Future is not does not seem extendable to Portuguese, a language where the epistemic Future can be used in the expression of an inference. Likewise, the proposal of Dendale 2001 (based on French data) that, unlike the equivalent of *must*, the epistemic Future signals a careless inference does not seem to be applicable to Portuguese. Examples from Portuguese were provided where the epistemic Future can be used to express a conclusion of a careful reflection. The hypothesis was advocated that in Portuguese the epistemic Future is a mark whose function is to indicate that the evidence on which the speaker sustains his utterance does not correspond to facts available at the context of utterance. The Future is, thus, an evidential, it indicates that the assertion is based on beliefs, not on facts (in other words, it signals a non-realistic, epistemic, modal base).

As for the Portuguese modal verbs, apart from the better described *dever* (‘must’) and *poder* (‘can/might/may’), also *ter de* (‘have to<sub>1</sub>’) and *haver de* (‘have to<sub>2</sub>’) were taken into consideration. The hypothesis sketched in this paper is that *haver de* (‘have to<sub>2</sub>’) is an existential quantifier over the set of Best worlds. If this is so, the system of modal verbs in Portuguese is very symmetric. There will be two modal verbs whose domain of quantification is the entire modal base, and two other modal verbs that quantify over the set of Best worlds (a subset of the modal base). For each of these domains of quantification there will be an existential quantifier and a universal quantifier.

If the proposals made in this paper are on the right track, the modal verb *haver de* (‘have to<sub>2</sub>’) and the epistemic Future, which share the same etymology, are different kinds of operators in Portuguese. *Haver de* will be a modal verb, a quantifier over possible worlds; the epistemic Future will be a mark to express that possible information on which the speaker bases his assertion is not available at the context of utterance. Whatever was the process of diachronic evolution of the Latin form that evolved into the Future tense mark in Romance languages and to *haver de* (‘have to<sub>2</sub>’) in Portuguese, it is possible that the epistemic Future in different Romance languages is at different stages of evolution or that it followed different patterns of evolution in different languages. Either way, though the epistemic Future exists in different languages, it appears to be associated with some cross linguistic variation. Hopefully, this paper is a contribution to a better understanding of the epistemic Future and other epistemic weakeners in Portuguese.

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## Competing Interests

The author has no competing interests to declare.

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