

# Modalization and bias in questions

Anastasia Giannakidou & Alda Mari

October 2019

## Abstract

In this paper, we propose an analysis of the question operator as an epistemic possibility modal akin to MIGHT. Evidence for our analysis is provided by a number of empirical similarities between epistemic modal expressions of possibility and questions, including the use of possibility, but not necessity, modals in questions, and the robust use of possibility particles in questions crosslinguistically. The result of modalization is a weakening of the question, which we explain by using the theory of *modal spread*. Our analysis allows us to unify the two hitherto unconnected phenomena of bias and weakening in questions. Regarding bias, we explore the purely semantic properties of epistemic modals and negation to derive it, thus rendering appeal to a speech act operator for questions unnecessary. The broader implications of our analysis supports the view that, if we take into consideration nonveridicality, the difference between questions and assertions is not categorical.

## 1 Questions, assertions, and the nonveridical stance

In the literature on speech acts, a categorical distinction between assertions and non-assertions (such as questions, imperatives, and exclamatives) is taken almost as a truism. Typically, the different syntactic types of declarative, interrogative, and imperative are said to map onto distinct speech acts such as assertions, questions, and commands respectively. When it comes to assertions and questions, indeed languages distinguish them by intonational or syntactic means, or may employ question markers (e.g. East Asian languages, see section 2). Pragmatically, the two are also described as differing in illocutionary force, i.e., discourse function: the declarative sentence provides information, while the interrogative requests information.

Most formal analyses assume a logical language that reflects a clearcut syntactic distinction between declaratives and interrogatives often containing a designated speech act operator such as ASSERT and ? respectively (Krifka 1995). Ciardelli et al. (2013) call those analyses *syntactically dichotomous*, and usually such analyses are also semantically dichotomous in assigning different semantic values to assertions (propositions) and questions which are taken to denote sets of propositions.

In a recent paper, Giannakidou 2013 questioned the dichotomous analysis because asserting and questioning both reveal that the speaker is in a nonveridical information state where  $p$  is not settled, i.e.,  $p$  and its negation being open possibilities. Therefore, in terms of what the speaker knows, the difference between a question and modalized assertion is not categorical: both raise the possibility of the prejacent  $p$  being true, but do not commit the speaker to  $p$ , they do not assert  $p$ .<sup>1</sup> Consider:

---

<sup>1</sup> $p$  is the prejacent of the modal, or the proposition within the scope of the question operator.

- (1) Ernie must be a communist.
- (2) Ernie may/might be a communist.
- (3) Ernie is a communist.
- (4) Is Ernie a communist?

Of the sentences above, only the unmodalized assertion conveys the information that Ernie is a communist, and adds it to the common ground. Only in this case does the speaker know, or is committed to, Ernie being a communist. The modal sentences and the question reveal non-veridicality in the epistemic state: the speaker considers it possible or even likely (with *must*) that Ernie is a communist; but the issue of whether he is is still open in the modal base. Regular information questions are equivalent to possibility assertions in simply raising the possibility of *p* (see also Groenendijk et al. 2012). Therefore, when we consider veridicality, Giannakidou argues, the difference between questions and assertions cannot be categorical. The speaker, in choosing to utter modalized sentences and questions takes a *nonveridical* stance (Giannakidou and Mari to appear).

The line is blurred also with biased questions, which do not seem to be used as genuine requests for information but are rather assertion-like, seeking to confirm non-trivial informative content espoused by the questioner. Sadock coined the term *queclarative* (Sadock 1971) for this reason. Consider:

- (5) Isn't Ernie a communist?

The speaker chooses to utter this sentence because she has already some body of information that supports Ernie being a communist; but she doesn't *know* the Ernie is a communist— if she did, she wouldn't be asking the question.

Nonveridicality, therefore, "allows us to see that the distinction between assertion and question is not as basic as we thought", Giannakidou 2013 states, and this, she continues, "seems to support an approach to meaning as semantically non-dichotomous" (Giannakidou 2013: 117). She concludes: "In the end, what seems to matter is whether a sentence presents the epistemic agent with one or more possibilities about the world, i.e. whether it reflects a homogenous or non-homogenous epistemic space. Superficially, this appears to correspond to the contrast between assertion vs. question. However, nonveridical assertions (which are 'inquisitive') show us that the contrast is just that: superficial. The more fundamental distinction is between a partitioned or not epistemic space [...] Thus, it seems unavoidable to conclude that nonveridical partitioning vs. homogeneity is telling us something very essential about the logic of human language". (Giannakidou 2013: 126)

In this paper, we expand on the idea that the distinction between assertion and question is not categorical semantically. We argue that questions and possibility epistemic modals are identical in expressing *nonveridical equilibrium*, and share the same modal skeleton (Larrivé and Mari 2019). Given the default state of nonveridical equilibrium, we will argue that the question operator is an epistemic possibility modal. The occurrence of actual possibility modals such as *might*, *can* observed in English questions (Hacquard and Wellwood 2011) and crosslinguistically, as well as the systematic occurrence of possibility particles crosslinguistically as we show in this paper, gives strong support for treating the question operator as a possibility modal.

The discussion proceeds as follows. In section 2, we present empirical evidence for the existence of a possibility modal structure in questions, relying on examples from English, Greek, Korean and French. In sections 3 and 4, we outline framework of modality and nonveridicality developed in Giannakidou and Mari 2018b that we will adopt, and we proceed with the analysis

of modal spread in questions. In section 5, we discuss the issue of negative bias. Our analysis offers a unifying account of weakening and strengthening in terms of modal structure. The discourse function of ‘canonical’ assertions and questions is still distinct, we will argue, but the difference is not syntactic or semantic, but rather a discourse effect.

## 2 Overt exponents of modality in questions

For a long time, it was thought that epistemic modal verbs do not occur in questions (Coates 1983, Drubig 2001, Jackendoff 1972, Leech 1971, McDowell 1987). Jackendoff, specifically, claimed that while *may* can either be interpreted deontically or epistemically in a declarative sentence (*John may leave early tonight*), it can only be interpreted deontically in a question (*May John leave early tonight?*). *Must*, as we said earlier, is also known to resist questions. At the same time, Ernst 2009 presented examples with modal adverbs in questions:

(6) Is she possibly/\*probably a spy?

(7) Might/\*must she be a spy?

The acceptability judgements of adverbs mirror those of the modal verbs: *must* and *probably* are impossible, but *possibly* and *might* are possible in questions. Though most of the literature on English (with the exception of Ernst *ibid.* and references therein) discusses modal verbs, our understanding of ‘modal expression’ includes modal adverbs as well as mood and modal particles.

Here we start with known data pertaining to English and Greek existential modality in questions, and then continue with new data pertaining to the Greek particles, showing that they have a behavior parallel to the one described for Korean.

### 2.1 Modal verbs in English and Greek questions

#### 2.1.1 MIGHT in questions

A recent corpus study by Hacquard and Wellwood (2011) offers data with modal verbs in questions, clearly challenging the older view that epistemic modals are disallowed. The data for possibility and necessity modals are summarized in Figures 1 and 2.

Environment	<i>might</i>		<i>can</i>		<i>p</i>
Total corpus	149,219	100.00%	475,590	100.00%	
Antecedents of conditionals	30	0.02%	9,292	1.95%	**
Matrix questions	523	0.35%	17,971	3.78%	**
Complements of attitudes	17,252	11.56%	36,864	7.75%	**
<b>Total embedded</b>	<b>17,805</b>	<b>11.93%</b>	<b>64,127</b>	<b>13.48%</b>	

**Table 1** Distribution of *might* and *can* in various environments: \*\*  $p < 0.001$ , Fisher's exact test. Compares the distribution of *might* and *can* in each environment against their wider distribution in the corpus.

Figure 1: Hacquard and Wellwood 2012 - Table 1

The Tables summarize the general patterns of embeddability of English modals found in the New York Times section of the English Gigaword Corpus. It is stated that "we find that epistemic modal meanings occurred in the environments we looked at, though not always to

Environment	Total <i>must</i>		By flavor			
			Epistemic <i>must</i>		Root <i>must</i>	<i>p</i>
Total corpus	88,859	100.00%				
Antecedents of conditionals	213	0.24%	1	0.00%	212	0.24% **
Matrix questions	277	0.31%	34	0.04%	243	0.27% *
Complements of attitudes	8,034	9.04%	80	0.09%	451	0.50% -
<b>Total embedded</b>	<b>8,524</b>	<b>9.59%</b>				
Matrix clauses	79,887	89.90%	68	17.00%	332	83.00%

**Table 2** Distribution of epistemic and root *must* in various environments: \*\*  $p < 0.001$ , \*  $p < 0.05$ , -  $p > 0.05$ , Fisher's exact test. Compares the distribution of epistemic and root *must* in each embedded environment to *must*'s distribution by flavor in a sample of 400 matrix declaratives (italicized). 'Complements of attitudes' comprises a random sample of 400 verb complements and all 134 adjective complements (italicized).

Figure 2: Hacquard and Wellwood 2012 - Table 2

the same extent and in the same way as root modal meanings. In particular, epistemics are rarer in antecedents of conditionals and matrix, but not embedded, questions. They appear in the complements of some attitude verbs, but not others: in particular, they seem restricted from complements of attitudes expressing desires or commands." (Hacquard and Wellwood 2011: 5).

In other words, English epistemic modal verbs do occur in questions. Overwhelmingly, as the Tables show, the occurring modals are *can*, *might*. The following examples are also from Hacquard and Wellwood (2011).

- (8) a. With the owners and the players on opposite sides philosophically and economically, what might they talk about at the next bargaining session?  
b. Might he be blackballed by all institutions of higher learning?  
c. What might the Grizzlies have been like if their leading scorer and rebounder, 6-foot-10 center Brent Smith, had not missed his third straight game because of a sprained ankle?

The authors thus conclude that modals of possibility are very natural in questions. Hacquard and Wellwood do not offer an analysis of the meaning of the modals in questions, but the discussion of the subjunctive in Greek will help understand better the nature of these questions.

### 2.1.2 The weakening effect of modality

In Greek, in addition to possibility modals, we find in questions the so-called *epistemic subjunctive* (Giannakidou 2016). The examples below are from Giannakidou 2016 (see earlier discussions in Giannakidou 2009, Rouchota 1994):

- (9) Pjos irthe sto party?  
Who came.3SG to the party  
Who came to the party?
- (10) Pjos *na* irthe sto party?  
Who SUBJ came.3SG to-the party  
Who might have come to the party?
- (11) Pjos *boril* \**prepi na* irthe sto party?  
Who might/ must SUBJ came.3SG to-the party  
Who might/\*must have come to the party?

(12) *Na* tou milise (arage/mipos/taxa)?  
 SUBJV him talked-3SG Q-particle  
 Might she have talked to him?

(13) Tou milise?  
 him talked-3SG  
 Did she talk to him?

We see here that the MUST equivalent *prepi* is unacceptable, but the possibility modal *bori* is fine. The subjunctive can be used in both polar and wh-questions. We see, finally, that other modal particles can be used such as *arage/mipos/taxa*, which we will discuss in the next section.

According to Giannakidou 2016, the modalized question differs from the canonical information question in being open-ended and reflective. It is not necessarily posed as a question that requires an actual or full answer; for instance, *Pjos bori/na irthe sto party?* ‘Who might have come to the party’ can perfectly well be a question that one poses to oneself, without expecting a definitive answer. Bare questions cannot be used this way. This open-endedness characterizes also particle questions in Japanese and Korean (Kang and Yoon 2018, 2019) as we will see soon, as well as subjunctive questions in Salish (which Matthewson 2010 calls ‘conjectural’ following a similar reasoning).<sup>2</sup>

Modalized questions, then, are weakened versions of the regular information seeking question. Notice that they can be continued by “Who knows?”, unlike regular information questions:

(15) A: Pjos (arage) na irthe sto party? Pjos kseri!  
 Who SUBJV came-3SG to-the party who knows  
 Who might have come to the party? Who knows!

(16) A: Pjos na irthe taxa sto party? Pjos kseri!  
 Who SUBJV came-3SG particle to-the party who knows  
 Who might have come to the party? Who knows!

(17) A: Pjos irthe sto party? #Pjos kseri!  
 Who SUBJV came-3SG to-the party who knows  
 Who came to the party? #Who knows!

Giannakidou argues that the possibility modal and the subjunctive are equivalent:

(18) *na* (SUBJ) = *bori* / *might*

(19) Who might have come to the party?

Without the existential modals, we have a regular information question. With the MIGHT question, the answer set contains modalized propositions:

(20) [Who came to the party?] = {Bill came to the party, Marina came to the party, Ariadne came to the party, Nicholas came to the party,...}

(21) [Who might have come to the party?] = {it is possible that Bill came to the party, it is possible that Marina came to the party, it is possible that Ariadne came to the party, it

<sup>2</sup>Similar reflexive existential modal interpretation arises with French questions questions (Roussarie, XXXX).

(14) Est-ce qu’il se peut qu’il soit venu ?  
 QUES se-possible that he be.SUBJ.3SG come ?  
 Is it possible that he come ?

is possible that Nicholas came to the party,... }

We will consider whether this analysis gives us the weakening we need in section 4, where we conclude that it does not, and offer an alternative account of the weakening effect as *widening*.

## 2.2 Possibility particles in questions

### 2.2.1 Greek and beyond

The subjunctive is not the only particle that occurs in questions. Let us now offer some new data concerning the use of the particles *arage/mipos*. These are two distinct particles, which share the fact that they can only occur in questions. As we see, they are ungrammatical in assertions:

- (22) Mipos/araje/taxa kimithike i Ariadne ?  
mipos/araje slept.3SG the Ariadne  
Did Ariadne sleep? Ariadne slept maybe?
- (23) (\*Mipos/araje/taxa) kimithike i Ariadne.  
mipos/araje slept.3st the Ariadne  
Ariadne slept.

As we can see, a natural translation is with *maybe* or just a bare question.<sup>3</sup> The particles are clearly question dependent, and Giannakidou 2016 argues that *arage* is the instantiation of the question operator. Here we will pursue the idea that the particles are not themselves instantiations of the operator, but illustrate that the operator is existential and that they enter in a relation of modal spread with it.<sup>4</sup>

*Mipos*, interestingly, emerges from a historical path that fused the subjunctive negation *mi* (which also occurs in questions as a possibility modal, Chatzopoulou 2018), with the indicative complementizer *pos*. Negation itself can also weaken:

- (27) Min eidate ton Jani?  
neg saw.2PL the John  
Did you maybe see John?

---

<sup>3</sup>The order can be variable, and makes no difference in meaning.

- (24) Kimithike (mipos/araje/taxa) i Ariadne (mipos/araje/taxa)?  
slept.3st mipos/araje/taxa the Ariadne (mipos/araje/taxa)  
Did Ariadne sleep? Ariadne slept maybe?

<sup>4</sup>Synchronically, *mipos* is also used as a complementizer with verbs of fear to express fear of a possibility, comparable to English *lest* (Giannakidou and Mari, to appear):

- (25) O Pavlos fovate mipos di tin Maria.  
the Paul fears lest see the Maria.  
Paul fears lest he see Mary. / Paul is afraid at the possibility of seeing Mary.

The *lest* complement is admittedly of higher register, therefore not as common and somewhat archaic sounding and marked. Greek *mipos*, on the other hand, is a quite common word with other related uses, and the pattern of *mipos* with the fear predicate is also largely attested. Another important use of *mipos* is as an interrogative complementizer, equivalent to ‘whether’:

- (26) Me rotise an/mipos efaga.  
me asked.3SG if/whether ate.1sg.  
‘She asked me if/whether I ate.’

See Giannakidou and Mari (to appear) for more discussion.

This use of negation as a possibility modal is a bit archaic but remains productive in literary and other registers. Negation, in other words, behaves like a modal particle, and the flavor of the question is overall similar to the one we described for the subjunctive: more open-ended, potentially self reflective. The use of negation as a modal particle in Greek is interesting because it shows that negation is not used only to creating rhetorical bias (as is well known). The fact that both weakening and bias happens with negation in Greek allows us to understand the two operations being manifestations of a single phenomenon, i.e., modal spread, as we will argue.

The German modal particle *wohl* is reported to have similar use of adding a speculative component to a question (the example is from Zimmermann 2011 with his translation):

- (28) Hat Hans wohl Maria eingeladen?  
 has Hans prt Mary invited  
 What do you reckon: Has Hans invited Mary?

Zimmerman (2013) writes: "The question above is not about whether or not Hans has invited Mary, but by using *wohl* the speaker indicates her awareness that the addressee may not be fully committed to her answer." (Zimmermann 2011, p. 2020). In agreement with what we just observed about Greek, then, we can generalize that modal particles, and generally the use of a possibility modal, creates a question that differs from a neutral information question in that it is reflective, does not require an actual or full answer, and might not even require an addressee (self-reflective). It is in this sense that the modalized question is weaker.

Finally, to see that the phenomenon on modalization is robust crosslinguistically, consider this data from Italian. The adverb *forse* reveals reflectiveness in a manner parallel to *mipos* and the subjunctive:

- (29) a. È a casa ?  
 Is at home ?  
 Is he at home ?  
 b. È forse a casa ?  
 Is maybe at home ?  
 Is he maybe at home ?

DARU questions in Japanese and NKA in Korean have similar behavior, as we proceed to show.

## 2.2.2 Modalized questions in Japanese and Korean

Kang and Yoon (2018, 2019) draw attention to the use of modal particles in questions in Japanese and Korean, and the effects they observe are very similar to the modalized questions in Greek, English, and Italian we just described. One distinct characteristic in Japanese and Korean is that the particles compose with the question operator, which is always overt in Korean and Japanese. According the Kang and Yoon, unlike regular questions, modalized questions are used not for requesting information from an addressee, but in order to express "a speaker's epistemic uncertainty or conjecture on the propositional content." They acknowledge the similarity with Greek *na* subjunctive questions and Salish. Consider the case of Japanese *darou*:

- (30) John-ga kuru darou. [Japanese]  
 John.NOM come DAROU  
 John is coming, I bet.  
 (31) John-ga kuru ka.  
 John.NOM come Q

Is John coming?

- (32) Yurie-wa wain-o nomu darouka.  
Yurie-TOP wine.ACC drink  
I wonder if Yurie drinks wine.

*Darou*, an epistemic marker, is used with the Q-operator to produce a meaning equivalent to *mipos, na, MIGHT*.

Korean employs the particle *nka* with the Q-marker *ni*. This, according to Kang and Yoon, contrasts with the regular factual question marker *ni* in the following way. Imagine a context where Mary, a reporter, was waiting for John and Bill, who were competing with each other for the win in the finals of the chess competition. She was ready to interview Bill, because Mary was told from her boss that Bill was the strong front-runner of the competition. After the match, John and Bill came out of the room. John had a very subtle smile and Bill had a poker face. Given their facial expressions, she infers that John might have won. But at the same time, John is unlikely to be the winner given her boss's comment. In complete uncertainty about her inference, Mary says:

- (33) Con-i wusungca-i-nka? [Korean]  
John-NOM winner-be-NKA  
Maybe John is the winner, maybe not?
- (34) Con-i wusungca-i-ni?  
John-NOM winner-be-Q  
Is John the winner?

The meaning carried by *nka* is not simply an extension of the general use of questions, Kang and Yoon argue. Rather, the *nka* question is a non-factual question (Seo 1987; Jang 1999; Park 2005; C. Kim 2010, Lee 2015b, Kang 2015). By using *nka*, the speaker questions her own background assumptions on whether John might have won the game or not, and is not simply requesting information from the addressee.

Let us move on now to the analysis of the weakening effect in questions. This will allow us to present the core of our theory.

### 3 The question as possibility: nonveridical equilibrium

We have empirically identified modalized questions as open-ended, reflective, not directed to an addressee. What does it mean, for a question, to not be directed to an addressee, to not require a complete and true answer? These are signs of 'weakening' of the illocutionary force of the question— which is, for a regular yes/no question, an information request. But weakening of illocutionary force is highly problematic if we assume that the illocutionary force is expressed in the logical form by means of an operator, because the force of the operator would have to be manipulated which would, in effect, render it useless. Our claim is that the apparent weakening in the illocutionary force is a reflex of the weakening in the semantics of the question itself, and thus derive the pragmatic effects from a semantic core.

Questions can be modalized, we argue, because they are themselves epistemic modal operators in every respect to begin with (Larrivéee and Mari 2019). Just like epistemic modals question operators feature modal bases and, possibly, ordering sources. They question operator, we will argue, is an epistemic possibility modal (Giannakidou 2013). The occurrence of modal



particles will be treated as case of modal spread (Giannakidou and Mari 2018b)— which justifies, besides modal bases and ordering sources, also a layer of metaevaluation and can account for the weakening effects.

Let us start with the discussion of veridicality first, and then move on to modal spread and questions.

### 3.1 Veridicality, nonveridicality, epistemic commitment

Giannakidou (1998, 1999, 2013) and more recently Giannakidou and Mari (2016, 2018b, to appear) develop the idea that modal expressions are *anti-knowledge* markers: a speaker uses a modal only in case she does not know  $p$  to be true. The modal is therefore nonveridical. Crucially, then a speaker asks an information question, they are in the same nonveridical state of not knowing. Both with questions and modals, the speaker chooses to convey uncertainty about the prejacent  $p$  and not  $p$  itself because she doesn't know  $p$  to be true. Questions and modal sentences have this common basis (see also Sherman, 2018).

What does it mean for an expression to be veridical or nonveridical? Veridicality is a semantic property of any expression that entails the truth of its argument (Zwarts 1995, Giannakidou 1994, 1997, 1999:<sup>5</sup>

- (35) *Objective veridicality*: A function  $F$  is veridical iff  $Fp$  entails  $p$ ; otherwise  $F$  is nonveridical.

This notion of objective veridicality relies on truth, and is equivalent to factivity. When we consider modality, MODAL  $p$  does not entail  $p$ , hence modals are objectively nonveridical. Veridicality, however, can also be defined subjectively, and in this case, the veridicality judgement is based on what an epistemic agent knows or believes (or, remembers, imagines, is aware of, etc, see Giannakidou and Mari to appear)<sup>6</sup>:

- (36) *Subjective veridicality and agent commitment*
- a. Truth assessment is relativized to epistemic agents.
  - b. In unembedded sentences the epistemic agent is the speaker.
  - c. In embedded sentences, possible epistemic agents are the speaker and the embedding clause subject.
  - d. In texts, an additional epistemic agent is the hearer/reader.
  - e. Nothing else is a relevant epistemic agent.

The crucial ingredient of (non)veridicality understood this way is that it makes reference to some agent's epistemic state, by default the speaker's. Every sentence is evaluated with respect to an agent's epistemic state. Following Giannakidou and Mari, we will call the agent 'individual anchor' (a term used by Farkas 1985). The anchor's epistemic state is what update semantics calls an *information state*: a set of worlds, representing what the epistemic agent  $i$

<sup>5</sup>Montague 1969 characterizes direct perception verbs such as *see* as veridical because if *I see a unicorn* is true, then a unicorn exists, but Zwarts and Giannakidou offer definitions based on truth.

<sup>6</sup>Subjective (non)veridicality is shown, in recent work, to be important in extracting truth assessment from texts; Marneffe and Potts, 2012) say that 'unadorned' declaratives like *Ariadne left* convey firm speaker commitment, whereas qualified variants with modal verbs or embedded sentences 'imbue the sentence with uncertainty' (de Marneffe 2012: 102). Trnavač and Taboada 2012, in a recent study, examine the interactions between nonveridicality and evaluative structure in corpora, and conclude that a nonveridical device 'tampers with the evaluative content of utterances, with the result of weakening the evaluation (Trnavač and Taboada 2012: 316).

knows or believes. Every sentence, then, can be defined as veridical or nonveridical with respect to the epistemic state of the anchor. In main sentences, the relevant epistemic state is that of the speaker. A proposition  $p$  of an unembedded sentence will be evaluated with respect to this state:

- (37) *Information state of an individual anchor  $i$*   
An information state  $M(i)$  is a set of worlds associated with an individual  $i$  representing worlds compatible with what  $i$  knows or believes.
- (38) *Truth in an epistemic state (=full commitment of  $i$ ; Giannakidou 2013)*  
A proposition  $p$  is true in  $M(i)$  iff  $M(i) \subseteq p$ :  $\forall w[w \in M(i) \rightarrow w \in \{w' | p(w')\}]$

$M(i)$  is the private space of  $i$ 's thoughts, belief and knowledge, and it can include also one's perceptions, expectations, etc. Veridicality can be understood as being relative to that state. In an unmodalized unembedded sentence,  $i$  is the speaker, and the sentence is felicitous if and only if all the worlds in the speaker's  $M(\text{speaker})$  are worlds in which Ariadne left. This is a veridical information state:

- (39) Efije i Ariadne.  
left.3sg the Ariadne.  
'Ariadne left.'
- (40) *Veridical information state*  
An information state  $M(i)$  is veridical iff:  $\forall w[w \in M(i) \rightarrow w \in \{w' | p(w')\}]$ .

A veridical state is a *homogenous* state, and conveys commitment of  $i$  to  $p$ .  $p$  is settled in the veridical state, it is the only option. A veridical state, in other words, entails  $p$ . A co-operative speaker, in uttering the sentence *Ariadne left* follows Gricean Quality (Be truthful), and this means that she asserts  $p$  only if she is in a veridical state, i.e., she knows or believes  $p$  to be true:

- (41)  $[[ \text{Ariadne left} ]]^{M(\text{speaker})} = 1$  iff  $\forall w[w \in M(\text{speaker}) \rightarrow w \in \{w' | \text{Ariadne } w'\}]$

The requirement for a veridical state is, in other words, a prerequisite for assertion:

- (42) *Veridical information state as a prerequisite for assertion* (Giannakidou and Mari 2016, to appear)  
A sentence  $S$  is assertable if and only if the speaker is a veridical state about  $S$ .

A veridical state is the foundation for the speaker's – or, more broadly, the individual anchor's – *commitment* to the sentence.

We can now define veridicality subjectively wrt the epistemic states  $M$ :

- (43) *Subjective veridicality*  
i. A function  $F$  that takes a proposition  $p$  as its argument is subjectively veridical with respect to an individual anchor  $i$  and an information state  $M(i)$  iff  $Fp$  is homogenous.  
ii.  $M(i)$  is homogenous iff  $\forall w'[w' \in M(i) \rightarrow p(w')]$ .

A nonveridical function, on the other hand, allows both possibilities open,  $p$  and  $\neg p$ .

- (44) *Subjective veridicality*  
A function  $F$  that takes a proposition  $p$  as its argument is subjectively nonveridical with respect to an individual anchor  $i$  and an epistemic state  $M(i)$  iff  $Fp$  is not homogenous, i.e., iff  $\exists w' \in M(i) p(w') \& \exists w'' \in M(i) \neg p(w')$ .

The nonveridical information state leaves both  $p$  and  $\neg p$  open:

(45) *Veridical and nonveridical information states*

- a. An information state (a set of worlds)  $M(i)$  relative to an epistemic agent  $i$  is *veridical* with respect to a proposition  $p$  iff all worlds in  $M(i)$  are  $p$ -worlds.
- b. An information state (a set of worlds)  $M(i)$  relative to an epistemic agent  $i$  is *nonveridical* with respect to a proposition  $p$  iff  $M(i)$  is partitioned into  $p$  and  $\neg p$  worlds.

In a nonveridical state  $M(i)$   $p$  and  $\neg p$  are open possibilities. In this case, the anchor is uncertain about  $p$ . When the speaker uses a modal expression, she does so because she does not know  $p$  to be, she cannot commit to it:

(46) Ariadne might be at the party.

(47) Ariadne must be at the party.

In both cases, the speaker is uncertain that Ariadne is at the party, and leaves open the possibility that she might not be. The same is true for questions: when asking a question, the speaker does not know  $p$ , does not believe  $p$  to be true. Regular information questions and possibility modals are, further, in nonveridical equilibrium:

(48) *Nonveridical equilibrium* (= prototypical inquisitiveness; Giannakidou 2013)

An information state  $M$  is in nonveridical equilibrium iff  $M$  is partitioned into  $p$  and  $\neg p$ , and there is no bias towards  $p$  or  $\neg p$ .

With respect to equilibrium, possibility epistemic modals and questions are identical. MUST modals, on the other hand, convey nonveridical states with bias, i.e., while both  $p$  and  $\neg p$  are in the modal base, the speaker seems to favor  $p$ . She still, however, does not know or believe  $p$  to be true. Giannakidou and Mari 2016, 2018b and Lassiter 2016 offer numerous examples to illustrate the nonveridicality of MUST; see also Lassiter *ibid.* for attested examples supporting illustrating MUST without knowledge of  $p$ :

(49) *I don't know for sure, sweetie, but she must have been very depressed. A person doesn't do something like that lightly.*

(50) *It must have been a Tuesday (but I don't know for sure), I can't remember"*

Based on these veridicality distinctions, Giannakidou and Mari 2016 posit a scale of epistemic commitment. The unmodalized sentence implies knowledge or belief of  $p$ , as we said, and expresses the highest commitment. Modal verbs produce *epistemic weakening*, which means that they express weaker commitment to  $p$ . MUST expresses partial commitment, and the possibility modal expresses the weakest commitment of simply raising (or, not excluding) the possibility of  $p$  (called *trivial* commitment below):

(51) Scale of epistemic commitment (Giannakidou and Mari 2016)

$\langle p, \text{MUST } p, \text{MIGHT } p \rangle$ ;

where  $p$  conveys *full* commitment of  $i$  to  $p$ ; MUST  $p$  conveys *partial* commitment, and MIGHT  $p$  conveys *trivial* commitment.

The criterion for epistemic commitment is (non)veridicality: full commitment corresponds to a veridical  $M(i)$ , and reduced commitment to nonveridical  $M(i)$ .

Following Giannakidou and Mari 2016, 2018a,b, we formulate nonveridicality as a precondition on modalities in the form of the axiom below:<sup>7</sup>

- (52) *Nonveridicality Axiom of modals*  
 MODAL (M(i)) (*p*) can be defined if and only if the modal base M(i) is nonveridical, i.e. only if M(i) contains *p* and  $\neg p$  worlds.

With the exception of aleithic modality, all modals feature a nonveridical epistemic state, including MUST.<sup>8</sup> Questions, as it is clear, also follow the nonveridical axiom:

- (53) QUES (M(i)) (*p*) can be defined if and only if the modal base M(i) is nonveridical, i.e. only if M(i) contains *p* and  $\neg p$  worlds.

When we take into account nonveridicality, then, there is no categorical difference in terms of knowledge between a question and an epistemic modal: they both have the nonveridical state as a prerequisite, a presupposition for their utterance. *Is Ariadne at home?* and *Ariadne might be at home* are thus semantically identical.

- (54) a. Might(*p*) is defined iff  $\exists w' \in M(i) : \neg p(w', t_u)$  and  $\exists w'' \in M(i) p(w'', t_u)$   
 b. QUES(*p*) is defined iff  $\exists w' \in M(i) : \neg p(w', t_u)$  and  $\exists w'' \in M(i) p(w'', t_u)$

The two differ only in discourse function: QUES (*p*) is used as a request for information, and is uttered to solicit an answer response. Might (*p*), on the other hand, is uttered as a statement soliciting agreement or disagreement.

If we assume that QUES is MIGHT, then the multiple occurrences of possibility expressions we noted earlier instantiate modal spread. Let us focus now on this phenomenon.

### 3.2 Modal spread and the modal skeleton

Giannakidou and Mari 2018b introduce the notion of modal spread for the co-occurrence of multiple modal exponents, as illustrated below with modal verbs with adverbs:

- (55) a. John must probably/certainly be sleeping.  
 b. John may possibly be a doctor.

*Must* and *may* co-occur with *probably/certainly* and *possibly*, respectively. Lyons 1977 talks about ‘harmony’— the idea being that there is a concord running through the clause which results in the double realization of a single modality (Lyons 1977: 808; see also Willer 2013). Here are some more examples:

- (56) a. Prepi malon/oposdhipote na ine giatros.  
 must probably/definitely subj be.3SG doctor  
 ‘He must probably/definitely be a doctor.’  
 b. Deve probabilmente/sicuramente essere un dottore.  
 must.3SG.PRES probably/certainly be a doctor.  
 ‘He must probably/definitely be a doctor.’

- (57) To these causes conjointly, therefore, must probably be ascribed the very delicate light ring not having been noticed by the observers of the late transit of Venus.<sup>9</sup>

<sup>7</sup>This is also known in the literature as a diversity condition, Condoravdi, 2002; Mari, 2015,2017

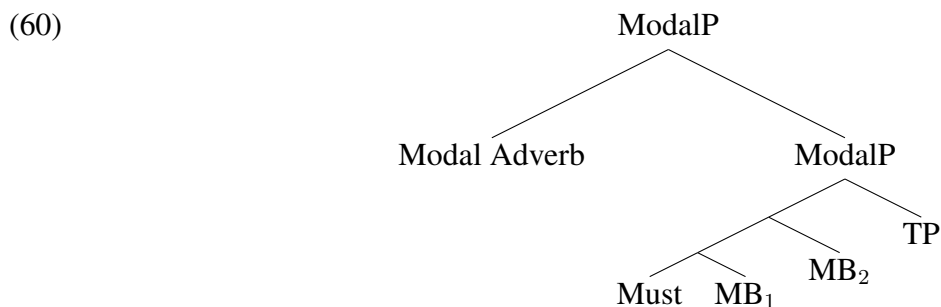
<sup>8</sup>*Pace* von Fintel and Gillies 2010 see for detailed discussion Giannakidou and Mari 2018b

<sup>9</sup>Source: adsabs.harvard.edu/full/

Giannakidou and Mari also show that we are not always dealing with harmony. We can find non-agreeing combinations too, and this the reason we talk about modal ‘spread’ rather than ‘modal harmony’ or concord:

- (58) a. Le luci sono accese. Gianni deve forse essere a casa.  
 The lights are switch-on. Gianni must.3SG.PRES maybe be at home.  
 b. Ta fora one anamena. O Janis prepei #isos na ine spiti.  
 The lights are on. The John must maybe be at home.  
 ‘The lights are on. John must maybe be at home.’  
 c. So there must maybe be some glitch somewhere along the line or something that makes this happen. I am sure is a cache or technical glitchup.<sup>10</sup>
- (59) a. #Bori malon/opsdhipote na efije noris.  
 May probably/definitely subj left.3SG early  
 b. Può probabilmente essere partito presto.  
 Can.3SG.PRES probably/certainly be left early.  
 ‘#He may have probably/definitely left early.’  
 c. In some cases, however, the psychosis might definitely be due to anxieties and conflicts associated with the pregnancy.

Giannakidou and Mari argue that the additional layer of the adverbial is a necessary component of the modal head, and posit the following structure, which we call the ‘modal skeleton’ following Larrivé and Mari (2019).



We recognize here two Kratzerian arguments for the modal: a primary ( $MB_1$ , what we referred to as  $M(i)$ ), and a secondary modal base which in the Kratzerian framework is the ordering source. At the top of the structure, we see a modal adverb. The task of the modal adverb is to compare the two modal bases, and it appears in the higher position since it is an adverb (see Giannakidou and Mari 2018b for more syntactic arguments).

To unfold this structure, we introduce three key elements: nonveridicality of  $MB_1$  (which we discussed already), ideal worlds, and metaevaluation.

### 3.3 Meta-evaluation and bias

The modal base of epistemic MUST is nonveridical about the proposition  $p$  denoted by its prejacent, and contains both  $p$  and  $\neg p$  worlds. To derive the truth conditions of MUST we assume with the literature (see e.g. Kratzer, 1991/Portner, 2009) that MUST uses a set of propositions  $\mathcal{S}$  which describe shared stereotypical/normalcy conditions.

<sup>10</sup>Source: <https://www.blackhatworld.com/seo/ogads-com-mobile-cpa-cpi-incent-network-mobil704909/page-26>

The Kratzer/Portner semantics posits an ordering source Best which ranks worlds according to how close they are to the stereotypical ideal. Our account encodes that the modal base is partitioned into stereotypical and non-stereotypical worlds, but we dissociate stereotypicality from ranking. This allows us to capture possibility modals as undergoing the initial partition between stereotypical and non-stereotypical worlds without necessary ordering. Ranking in our system is expressed via a meta-evaluation which ranks the two sets of worlds produced by the initial partition. The adverb is the manifestation of the ranking, as we will argue.

As an epistemic modal, MUST associates with an epistemic modal base  $M(i)$  which is the set of propositions known by the speaker  $i$  at  $t_u$  (the utterance time).  $w_0$  is the world of evaluation, by default the actual world:

$$(61) \quad M(i)(t_u)(w_0) = \lambda w'(w' \text{ is compatible with what is known by the speaker } i \text{ in } w_0 \text{ at } t_u)^{11}$$

The epistemic modality is thus by default subjective, and knowledge changes with time. Epistemic modality is therefore parametric to knowledge at  $t_u$ , as is often acknowledged in the literature (see Portner 2009, Hacquard 2006,2010, Giannakidou and Mari 2016).

In the epistemic modal base  $M(i)(t_u)(w_0)$ , we define  $\text{Ideal}_S$  as a function over  $M(i)(t_u)(w_0)$ , still in the spirit of Portner 2009. The output  $\text{Ideal}_S$  is a subset of  $M(i)(t_u)(w_0)$ :

$$(62) \quad \text{Ideal}_S(M(i)(t_u)(w_0)) = \{w' \in M(i)(t_u)(w_0) : \forall q \in S(w' \in q)\}$$

So defined,  $\text{Ideal}_S$  delivers the worlds in the modal base in which all the propositions in  $S$  are true.  $S$  is a set of propositions that corresponds to common ground norms.<sup>12</sup> The set  $\text{Ideal}_S$  is also parametric to time. Unless otherwise stated, we consider that  $\text{Ideal}_S$  is determined at the actual world and at the utterance time (this will always be the case in the remainder of the paper).

Epistemic MUST has the basic truth conditions in (63), requiring that  $p$  is true in the Ideal set of  $M(i)$ . Tense comes from below (a semantic present or past; see Giannakidou and Mari, 2018a for discussion of tense). We assume that, by default,  $M(i)$  is projected at the time of utterance in the actual world. Given a set  $\text{Ideal}_S$  and the utterance time  $t_u$ ,

$$(63) \quad \text{(to be completed)} \\ \llbracket \text{prepi/devere/must (PAST } (p)) \rrbracket^{M,i,S} \text{ is defined only if } M(i) \text{ is nonveridical and is partitioned into } \text{Ideal}_S \text{ and } \neg\text{Ideal}_S \text{ worlds. If defined,} \\ \llbracket \text{prepi/devere/must (PAST } (p)) \rrbracket^{M,i,S} = 1 \text{ iff } \forall w' \in \text{Ideal}_S : \exists t' \prec t_u \wedge p(w', t')$$

$$(64) \quad \text{(to be completed)} \\ \llbracket \text{prepi/devere/must (PRES } (p)) \rrbracket^{M,i,S} \text{ is defined only if } M(i) \text{ is nonveridical and is partitioned into } \text{Ideal}_S \text{ and } \neg\text{Ideal}_S \text{ worlds. If defined,} \\ \llbracket \text{prepi/devere/must (PRES } (p)) \rrbracket^{M,i,S} = 1 \text{ iff } \forall w' \in \text{Ideal}_S : p(w', t_u)$$

We will now postulate that  $\text{Ideal}_S$  and  $\neg\text{Ideal}_S$  worlds are ranked according to an ordering source  $\mathcal{O}$ . Giannakidou and Mari 2018b propose that  $\mathcal{O}$  is a ‘meta-evaluation’ that compares  $\text{Ideal}_S$  to its complement in  $M(i)$ . Universal modals are positively biased:

$$(65) \quad \text{Positive bias of epistemic necessity modals (final).} \\ \text{Ideal}_S \text{ is weak necessity with respect to } \neg\text{Ideal}_S, \text{ relative to } M(i) \text{ and } \mathcal{O}. \text{ This means} \\ \text{that Ideal worlds are better possibilities than non-Ideal worlds.}$$

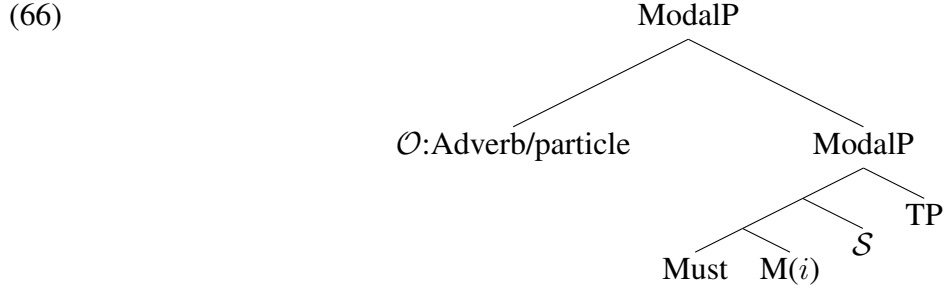
<sup>11</sup>Our notation  $M(i)$  corresponds to the Kratzerian notation using set intersection  $\cap f_{epistemic}(w_0, i, t_u)$ , where this returns the set of worlds compatible with what it is known in  $w_0$  by  $i$ .

<sup>12</sup>Since only those worlds are considered in which *all* the propositions in  $S$  are true, the function  $\text{Ideal}_S$  determines a cut-off point.

The function of the adverbs is to reflect overtly the bias by supplying the meta-evaluation  $\mathcal{O}$ . The additional layer is thus necessary to reflect the ranking.

### 3.4 The complete modal skeleton

We are now ready to fully understand the structure in ??, repeated here in (66).



The  $\mathcal{O}$  function manifests itself in the form of an adverb or a particle. Within ModalP, we find the two arguments  $M(i)$  and  $\mathcal{S}$ , which are typically covert (unless there is an overt *if* clause to restrict the modal base). The following are thus equivalent semantically:

- (67)
- a. John is probably sick.
  - b. John must probably be sick.
  - c. John must be sick.

When only the adverb is used, a silent modal is present. If no overt adverb appears, there is a silent adverb, indicated as  $\emptyset$ . The lexical entry for this silent adverb is as follows.  $q$  is the modal proposition  $\text{MUST}(\text{TENSE}(p))$ . For any  $\text{Ideal}_{\mathcal{S}}$ ,

- (68)  $\llbracket \emptyset \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = \lambda q. \text{Ideal}_{\mathcal{S}}$  is a weak necessity with respect to  $\neg \text{Ideal}_{\mathcal{S}}$  relative to  $M(i)$  and  $\mathcal{O} \ \& \ q$

By combining the modal proposition  $\text{MUST}(\text{TENSE}(p))$  with the adverbs, we obtain what follows (we only consider inner PRES, but nothing hinges on this).

- (69)  $\llbracket \emptyset \text{ MUST (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}}$  is defined only if the modal base  $M(i)$  is nonveridical and it is partitioned into  $\text{Ideal}_{\mathcal{S}}$  and  $\neg \text{Ideal}_{\mathcal{S}}$  worlds. If defined,  
 $\llbracket \emptyset \text{ MUST (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = 1$  iff:  $\text{Ideal}_{\mathcal{S}}$  is a weak necessity with respect to  $\neg \text{Ideal}_{\mathcal{S}}$  relative to  $M(i)$  and  $\mathcal{O} \ \& \ \forall w' \in \text{Ideal}_{\mathcal{S}} : p(w', t_u)$

The default empty  $\emptyset$  adverb introduces lexically the weak necessity and the meta-evaluation  $\mathcal{O}$ . It ranks  $\text{Ideal}_{\mathcal{S}}$  worlds as higher with respect to  $\neg \text{Ideal}_{\mathcal{S}}$ .

- (70)  $\llbracket \text{Probably/mallon/probabilmente} \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = \lambda q. \text{Ideal}_{\mathcal{S}}$  is a weak necessity with respect to  $\neg \text{Ideal}_{\mathcal{S}}$  relative to  $M(i)$  and  $\mathcal{O} \ \& \ q$

There are three nuances of strength that manipulate the bias. These are not exhaustive, but they are faithful of the range of possibilities observed so far:

- (71) Effect of the adverbs with universal modals.
- a. DEFINITELY (It. *assolutamente*; Gk. *oposdhipote*; Eng. *definitely*): Strengthening the default positive bias.

- b. PROBABLY (It. *probabilmente*; Gk. *mallon*; Eng. *probably*): Maintaining the default.
- c. MAYBE (It. *forse*; Gk. *isos*; Eng. *maybe*): Weakening the default.

Existential modality does not use ordering sources (see Kratzer, 1991). MAYBE thus maintains the default lack of bias; adding function DEFINITELY/PROBABLY would introduce a bias. This is, we will argue in section 5, what happens with negative biased questions.

- (72) Effect of the adverbs with existential modals.
- a. DEFINITELY (It. *assolutamente*; Gk. *oposdhipote*; Eng. *definitely*): Introducing positive bias.
  - b. PROBABLY (It. *probabilmente*; Gk. *mallon*; Eng. *probably*): Introducing positive bias.
  - c. MAYBE (It. *forse*; Gk. *isos*; Eng. *maybe*): Maintaining the default.

DEFINITELY type of adverbs, strengthen the bias. Existential adverbs give the information that  $\mathcal{O}$  is empty.

- (73)  $\llbracket \text{Definitely/oposdhipote/sicuramente} \rrbracket^{\mathcal{O}, M, i, S} = \lambda q. \text{Ideal}_S$  is a necessity with respect to  $\neg \text{Ideal}_S$  relative to  $M(i)$  and  $\mathcal{O} \ \& \ q$
- (74)  $\llbracket \text{Maybe/Forse/Isos} \rrbracket^{\mathcal{O}, M, i, S} = \lambda q. \mathcal{O}$  is empty  $\ \& \ q$

We will now see how this works with existential modals and in questions.

## 4 Modal spread in questions: weakening

Following the Kratzerian analysis of possibility, we take it that epistemic possibility modals are existential quantifiers lacking ordering sources.<sup>13</sup> The absence of ordering sources with epistemic possibility modals renders  $p$  and  $\neg p$  equal possibilities revealing that the assessor is in a state of *nonveridical equilibrium*—the state characterizing also information questions.

- (75) Nonveridical equilibrium (= True uncertainty)  
A partitioned ( $p$  and  $\neg p$ ) space  $M(i)$  is in nonveridical equilibrium if the ordering  $\mathcal{O}$  is empty.

Nonveridical equilibrium implies that  $p$  and  $\neg p$  are equal possibilities, none is privileged over the other. We take equilibrium to be the default for epistemic possibility (see Giannakidou 2013, Giannakidou and Mari 2018b for further discussion). Possibility modals, however, are not exempt from using stereotypicality conditions. These conditions are always at play (see the literature on generics and causal reasoning, Krifka et al. 1995; Mari et al. 2012 and references therein).

### 4.1 The modal skeleton for questions

We assume now, following the discussion of MUST, that a default adverb is located at the adverbial higher slot, and preserves the equilibrium (maintaining the default). For simplicity again we only consider the PRES inner tense:

<sup>13</sup>Deontic possibility modals are claimed to use a circumstantial modal base and a deontic ordering source (Portner, 2009).

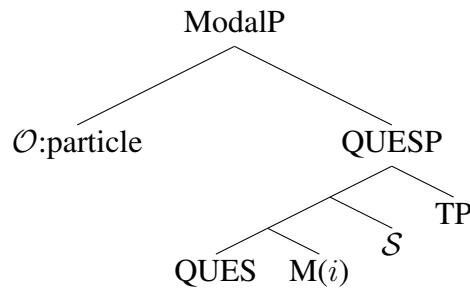


- (76)  $\llbracket \emptyset \text{ MIGHT (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}}$  is defined only if  $M(i)$  is nonveridical and partitioned into  $\text{Ideal}_{\mathcal{S}}$  and  $\neg\text{Ideal}_{\mathcal{S}}$  worlds. If defined,  
 $\llbracket \emptyset \text{ MIGHT (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = 1$  iff  $\mathcal{O}$  is empty &  $\exists w' \in M(i)p(w', t_u)$

The covert adverb adds the presupposition that  $\mathcal{O}$  is empty. Note also that the existential quantifier operates on the entire modal base  $M(i)$  and not on one of the subsets created by  $\mathcal{S}$  (and  $\text{Ideal}_{\mathcal{S}}$  in particular).

Following Larrivé and Mari (2019), we claim that questions and modals share the same modal skeleton.

- (77) The modal skeleton for questions.



Like modals that convey nonveridical equilibrium, yes/no questions and regular information non-biased questions convey a state of true, balanced, uncertainty. The secondary modal base  $\mathcal{S}$  is not empty, as we mentioned above; what is empty is the adverb slot, or, by default there is a silent adverb that maintains the nonveridical equilibrium of the question.

- (78)  $\llbracket \emptyset \text{ QUES (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}}$  is defined only if  $M(i)$  is nonveridical and partitioned into  $\text{Ideal}_{\mathcal{S}}$  and  $\neg\text{Ideal}_{\mathcal{S}}$  worlds. If defined,  
 $\llbracket \emptyset \text{ QUES (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = 1$  iff  $\mathcal{O}$  is empty &  $\exists w' \in M(i)p(w', t_u)$

The modalized questions we saw with particles illustrate that a natural manipulation of the default in questions is towards weakening. Crucially, weakening emerges as *widening* of the options, as we show next.

## 4.2 Modal particles in questions

Recall our description of the particle question. We have noted that the use of a particle creates a weaker question in the sense that the question becomes more reflective and open-ended, does not seem to require an actual answer, and may not even require an addressee:

- (79) Mipos/araje/na kimikthike i Ariadne ?  
 mipos/araje/SUBJ slept.3SG the Ariadne  
 Ariadne slept maybe?

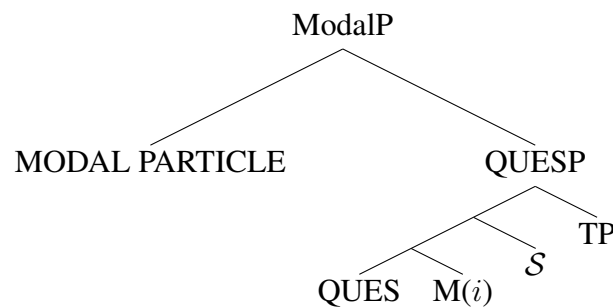
- (80) a. Is he home ?  
 b. Is he home perhaps?

From this perspective, the modalized question, though it appears syntactically as a question, it does not have the discourse function of the information question, namely to request a true answer from an addressee. As we suggested, here the categorical barrier between an assertion and a question is relaxed—a fact supporting that the illocutionary force of a question is not fixed, and can itself be manipulated.

But, of course, relaxing the illocutionary force cannot be stated meaningfully if we assume that a speech act operator is present in the question. If such an operator existed, manipulation would entail either that the operator is flexible in force—which is another way of saying that it is ‘ambiguous’; or it would entail that another operator is used. Either option would be stipulatory because it doesn’t predict when and why this happens. We will provide, instead, a semantic explanation for the relaxing of of the illocutionary force. The apparent force manipulation can more plausibly be understood as suggesting that there is no illocutionary operator in the sentence.<sup>14</sup>

We explain the weakening as bias manipulation. The particle, we claim, further weakens the default equilibrium by adding options, and creates widening.

(81)



Our proposal is that the particles widen the domain of quantification by introducing possibilities beyond those of  $M(i)$ . Technically this is achieved by intersecting the set of worlds in  $\mathcal{O}$  and imposing that this set is a superset of  $M(i)$ .

(82)  $\llbracket \text{Modal particle QUES (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, S}$  is defined only if  $M(i)$  is nonveridical and partitioned into  $\text{Ideal}_S$  and  $\neg\text{Ideal}_S$  worlds. If defined,  
 $\llbracket \text{PARTICLE QUES (PRES } (p)) \rrbracket^{\mathcal{O}, M, i, S} = 1$  iff  $\cap \mathcal{O} \supset M(i)$  &  $\exists w' \in M(i)p(w', t_u)$

Note that, with the particles, the domain of quantification itself does not broaden: the speaker just signals that there are options that are not taken into account. In other terms, the equilibrium now broadens: possibilities can expand indefinitely, which makes it harder to think of what would be a ‘correct’ or actual answer. The addressee, if there is one, is asked to choose an option, but the speaker signals that she is aware that the set of possibilities extends well beyond those that the addressee might take into account. This accounts for why these questions are more open ended and potentially self reflective: if I ask a question in a state of knowing that the possible answers expand indefinitely, I cannot assume that the addressee is capable of giving an actual answer. Naturally, then, such questions have a reflective character and are well suited to be posed to oneself.

### 4.3 Modal verbs in questions

Unlike the particles which are instantiations of the adverb slot, modal verbs, given their grammatical category, cannot occupy the metaevaluation position.

Recall our discussion around ??-??. Giannakidou (2016) offers the following hypothesis. The bare question is the following set:

<sup>14</sup>Other speech act types can be manipulated, e.g. imperatives can be used as commands as well as suggestions, requests, or protases of conditionals. It may be time to think anew the idea of illocutionary force operators as syntactic objects that are present in the syntactic structure of sentences.

- (83)  $\llbracket \text{Who came to the party?} \rrbracket = \{ \text{Bill came to the party, Marina came to the party, Ariadne came to the party, Nicholas came to the party, ...} \}$

With the MIGHT question, the answer set is the following:

- (84)  $\llbracket \text{Who might have come to the party?} \rrbracket = \{ \text{it is possible that Bill came to the party, it is possible that Marina came to the party, it is possible that Ariadne came to the party, it is possible that Nicholas came to the party, ...} \}$

The answer set now contains propositions of the form *It is possible that p*. When we consider polar questions, the difference seems to be preserved:

- (85)  $\llbracket \text{Did Ariadne come to the party?} \rrbracket = \{ \text{Ariadne came to the party, Ariadne did not come to the party} \}$

- (86)  $\llbracket \text{Might Ariadne have come to the party?} \rrbracket = \{ \text{it is possible that Ariadne came to the party, it is possible that Ariadne do not come to the party} \}$

(89) is the unpacking of (88), and (89) is just (87) as it is a set that contains only one set, the one in (87); hence (89) and (87) are equivalent, and because (89)=(88), then (88) and (87) are equivalent:

- (87)  $\llbracket \text{Might Ariadne have come to the party?} \rrbracket = \{ \{ \text{Ariadne came to the party, Ariadne did not come to the party} \}, \{ \text{Ariadne came to the party, Ariadne did not come to the party} \}, \dots \}$

There is thus no meaning difference between the MIGHT polar question and the one without it, as they denote the same set of possible answers. Since the possibility is just  $p$  and  $\neg p$ , questioning  $p$  and questioning the possibility of  $p$  amounts to the same question.

We must therefore undergo a different route, and we will do so by preserving the idea of widening with the particles. We call QUES-MIGHT the overt spell out of MIGHT in questions (to be distinguished from the mere modal MIGHT in assertions). As with the particles, adding the overt spell out adds meaning and thus QUES and QUES-MIGHT are not equivalent. Like the particles, MIGHT adds widening, but unlike with the particles, the enlarged set is now the domain of quantification, as the broadening comes from the modal itself. The speaker does not signal that there are other options that his modal state does not take into account (as with the particles); she instead considers a broad spectrum of possibilities that were not in the primary set of hypotheses  $M(i)$ . The possibility of  $p$  is thus felt as more remote, and as introduced by an operation (overt spell out) that creates a new domain of quantification.

- (88)  $\llbracket \emptyset \text{ QUES-MIGHT (PRES } (p)) \rrbracket^{\mathcal{O}, M, M', i, S}$  is defined only if  $\underline{M(i)} \subset \underline{M'(i)}$  and is partitioned into  $\text{Ideal}_S$  and  $\neg \text{Ideal}_S$  worlds. If defined,  
 $\llbracket \emptyset \text{ QUES-MIGHT (PRES } (p)) \rrbracket^{\mathcal{O}, M, M', i, S} = 1$  iff  $\mathcal{O}$  is empty &  $\exists w' \in \underline{M'(i)} p(w', t_u)$

Crucially, necessity modals are excluded from questions (Coates 1983, Drubig 2001, Jackendoff 1972, Leech 1971, McDowell 1987), a fact consistent with the default force of the modal being possibility:

- (89) Might/\*Must Ernie be a communist?

To the extent that *must* is acceptable in (89), it only receives a deontic interpretation akin to *Does he have to be*. This is common cross-linguistically, where MUST is banned from questions. By

widening the domain of quantification, MIGHT adds a flavor of endedness. Unlike MUST, however, it respects the existential force of the modal.

Bias can of course be introduced in questions, but it is driven by the metaevaluator, which is the bias regulator.

## 5 Negative bias: weakening by strengthening the negative

Another mechanism for manipulating the bias resorts to the use of negation and in this case weakening of the default equilibrium proceeds by introducing bias.

Let us first introduce some basic facts about negation in negative biased questions. In English, syntactically high negation can be interpreted in a high or low position.

- (90) Isn't John at home ?
- High negation: Isn't John at home ?
  - Low negation: Is John not at home ?

Across languages the ambiguity does not always arise, and high negation can only be interpreted in a high position.

- (91) Il n'est pas venu?  
He not is come?  
Hasn't he arrived?
- Intended interpretation: It is not true that he has arrived?
  - Impossible interpretation: Is it true that he has not arrived?

This data can be replicated for Greek. Our focus here is the high interpretation of the negation in English and crosslinguistically. Current accounts agree on a number of facts that hold uniformly across languages. High negation (i) it triggers the belief that  $p$  is true (92). (ii) The question triggers a confirmatory answer, which is expected to be positive.

- (92) a. N'est-il pas à la maison ? Je pensais qu'il l'était #Je ne pensais pas qu'il l'était.  
b. Isn't he home ? I thought he was / #I did not think he was.  
c. Dhen ine spiti? (Greek) Isn't he at home?

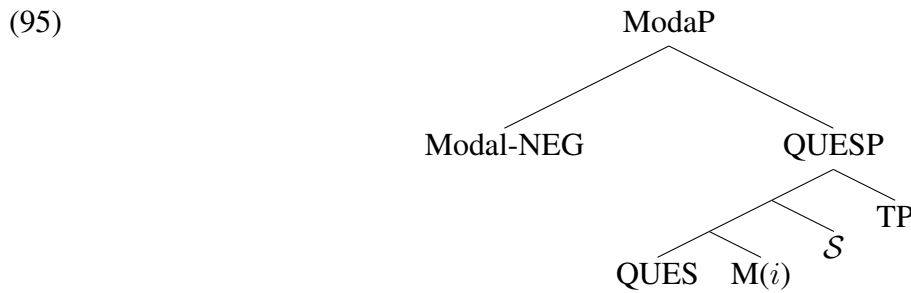
A variety of approaches to negative biased questions (NBQ) have been developed: (i) VERUM focus operator types of accounts (Romero et de Haan, 2002; see Repp 2012 for falsum ). (ii) Double speech-act accounts (Reese 2007). (iii) Commitment (Krifka 2015) and (iv) decision based accounts van Rooij and Šafářová 2003; (v) Evidence-based accounts (Büring and Gunlogson 2000, ; Sudo 2013, Roelofsen and Farkas 2015, Goodhue, 2018), stemming from the work of Ladd (1981). It would be impossible to render justice here to the whole literature on NBQ, and for the purpose of this paper we only focus here on the interrelations between MUST, NBQ and bias; for extended recent discussions see Krifka 2017, Larrivé and Mari 2019.

In the tradition of Ladd 1981, Larrivé and Mari establish a series of correlations between NBQ and MUST. MUST and NBQ share important similarities, namely (i) they are nonveridical, and (ii) they convey the belief that  $p$  is true. However, they are in complementary distribution in evidential contexts. MUST is felicitous in contexts that are compatible with  $p$ , whereas NBQs are felicitous in contexts that are incompatible with  $p$  (called 'negative evidence' by Büring and Gunlogson 2000, see also Sudo 2013).

- (93) John looked pretty happy coming back from school (Larrivé and Mari 2019)

- a. – Il doit avoir réussi son examen de math. / He must have passed the big maths test.  
 b. – #N’a-t-il pas réussi son examen de math ? / #Didn’t he pass the big maths test?
- (94) John looked pretty down coming back from school (Larrivée and Mari 2019)
- a. – #Il doit avoir réussi son examen de math. / #He must have passed the big maths test.  
 b. – N’a-t-il pas réussi son examen de math ? / Didn’t he pass the big maths test?

To capture these, we propose that negation occupies the metaevaluation slot of the modal thus further corroborating the proposal that questions are modals as evidenced by the possibility of manipulating the bias. The negation, we argue, when interpreted in high position, behaves like an adverb. It is thus not the truth-conditional negation that reverses the truth values of a proposition. It is a *modal negation* that reverses the bias.



Technically, the idea is that the ranking comes with a strengthening of the force of the quantifier from existential to universal. Indeed, the ranking highlights one of the inner domains of the modal base delivered by the secondary modal base, and an expectation is created that the modal operates over this highlighted domain rather than on the whole modal basis.

This strengthening from existential to universal, however, does not imply certainty. Indeed, depending on the ranking of the set over which the modal quantifies, the bias can be positive (as with MUST) or negative as with NBQ as we now implement it.

- (96)  $\llbracket \text{NEG QUES (PAST } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}}$  is defined only if the modal base  $M(i)$  is nonveridical and it is partitioned into  $\text{Ideal}_{\mathcal{S}}$  and  $\neg \text{Ideal}_{\mathcal{S}}$  worlds. If defined,  
 $\llbracket \text{MAYBE QUES (PAST } (p)) \rrbracket^{\mathcal{O}, M, i, \mathcal{S}} = 1$  iff  $\text{Ideal}_{\mathcal{S}}$  is less preferable with respect to  $\neg \text{Ideal}_{\mathcal{S}}$  relative to  $M(i)$  and  $\mathcal{O}$  &  $\forall w' \in \text{Ideal}_{\mathcal{S}} : \exists t' \prec t_u \wedge p(w', t')$

The negation with NBQ ranks the worlds on which the universal quantifier operates as *lower*, thus *reversing* the bias. (96) states that  $p$  is true in belief worlds that are less likely to be candidate for the actual world. The analysis in (96) also straightforwardly derives the fact that the speaker believes  $p$ , as quantification happens in the epistemic modal base; but since quantification happens over a set of implausible worlds in the epistemic modal base, the speaker seeks a confirmation that  $p$  is true. These facts are now captured in a unified framework where the bias is manipulated at the highest level of the modal structure and where the metaevaluation layer can host negation as a bias weakener device.

The reader might wonder why negation cannot be higher with MUST, delivering the same result observed with negative biased questions. Giannakidou and Mari 2018b offer an explanation of why regular negation cannot appear in the metaevaluation slot, but not why the modal negation that reverses the bias cannot appear with MUST. To offer a sketch of a solution here, we would suggest, with Sherman (2018) that, pragmatically, MUST sentences are used to solve a question, rather than raising it, based on evidence for the conclusion  $p$ . For this reason, MUST

cannot support a negation reversing the bias; its primary goal is to provide reasons to believe  $p$ . This is in accordance with the idea that assertion is to propose rather than generate alternatives. In this respect, even if MUST and questions are alike in their being nonveridical, their communicative function, still differ. Modal assertions are assertions and, in this respect, they rely on norms that advocate for  $p$  rather than against it.

## 6 Conclusion

The driving idea in this paper has been that questions and modalized assertions do not differ semantically. The question operator, we argued, is an epistemic modal of possibility. Questions and epistemic possibility modals denote by default the state of nonveridical equilibrium, which can then be manipulated by adverbs, particles, modal negation, and even overt modal verbs of possibility. These manipulations result in weakening the question, or strengthening it in which case we have rhetorical bias. The effects of question and modality can best be captured in the modal spread framework of Giannakidou and Mari 2018b, and support the idea that the difference between a possibility assertion and a question does not necessarily reflect the presence of a speech act operator in the syntax.

## References

- Büring, D. & Gunlogson, C. 2000. Aren't positive and negative polar questions the same? Ms. USCS/UCLA.
- Chatzopoulou, Katerina. 2018. Negation and Nonveridicality in the Diachrony of Greek. Oxford University Press.
- Ciardelli, I., Groenendijk, J., and Roelofsen, F. (2013). Inquisitive semantics: a new notion of meaning. *Language and Linguistics Compass* 7(9): 459-476.
- Ciardelli, I., Groenendijk, J., and Roelofsen, F. (2015). Might in inquisitive semantics. Ms.
- Coates, Jennifer. 1983. *The Semantics of the Modal Auxiliaries*. London: Croom Helm.
- Condoravdi, C. 2002. Temporal interpretation of modals: modals for the present and for the past. In *The Construction of Meaning*, eds D. Beaver, Luis D. Cassillas Maritinez, Brady Z. Clark, S. Kaufmann.
- Drubig, Hans Bernhard. 2001. On the syntactic form of epistemic modality. Ms. <http://www.sfb441.uni-tuebingen.de/b2/papers/DrubigModality.pdf>
- Ernst, T. 2009. Speaker oriented adverbs. *Natural Language and Linguistic Theory* 27, 497-544.
- Farkas, D. F. 1985. *Intensional Descriptions and the Romance Subjunctive Mood*. Garland, New York.
- von Fintel, K. and Gillies, A. 2010. Must...stay... strong ! *Nat. Language Semantics* 18: 351-383.
- Frana, Ilaria and Kyle Rawlins. to appear. Attitudes in Discourse: Italian Polar Questions and the particle mica. In *Semantics and Pragmatics*.
- Giannakidou, A. 2009. The dependency of the subjunctive revisited: temporal semantics and polarity. *Lingua* 120: 1883-1908.
- Giannakidou, A. 2013. Inquisitive assertions and nonveridicality. In *The dynamic, inquisitive, and visionary life of  $\phi$ ,  $?\phi$  and possibly  $\phi$* , A feestschrift for Jeroen Groenendijk, Martin Stokhof and Frank Veltman, ed. by Maria Aloni, Michael Franke, F. Roelofsen: 115-126.
- Giannakidou, A. and Mari, A. 2016. Epistemic Future and Epistemic MUST: Nonveridicality, Evidence, and Partial Knowledge. In *Mood, Aspect, Modality Revisited. New answers to old*

- questions*, ed. by Blaszack, J. et al., University of Chicago Press, pp. 75-124.
- Giannakidou, A. and Mari, A. 2018a. A unified analysis of the future as epistemic modality: the view from Greek and Italian. *Natural Language and Linguistic theory* 36: 85-129.
- Giannakidou, A. and Mari, A. 2018b. The semantic roots of positive polarity: epistemic modal verbs and adverbs in greek and italian. In *Linguistics and Philosophy* 41(6): 623-664.
- Giannakidou, A. and Mari, A. to appear. *Veridicality in Grammar and Thought: modality, propositional attitudes and negation*. The University of Chicago Press.
- Goodhue, D. 2018. *On asking and answering biased polar questions*. Ph.D. McGill.
- Grosz, P. 2010. Grading modality: a new approach to modal concord and its relatives. In *Proceedings of Sinn und Bedeutung 14*, pp. 185-201. <http://www.univie.ac.at/sub14/http://www.univie.ac.at/sub14/>.
- Geurts, B. and Huitink, J. 2006. Modal concord. In P. Dekker and H. Zeijlstra (eds.), *Concord and the syntax-semantics interface*. ESSLLI, Malaga, pp. 15-20.
- Hacquard, V. 2006. *Aspects of Modality*. PhD MIT.
- Hacquard, V. 2010. On the Event Relativity of Modal Auxiliaries. *Natural Language Semantics* 18(1): 79-114.
- Hacquard, V. Wellwood, A. 2012. Embedding epistemic modals in English: A corpus-based study. *Semantics and Pragmatics*, 5(4): 1-29.
- Huitink, J. 2012. Modal concord. A case study in Dutch. *Journal of Semantics* 29(3): 403-437.
- Huitink, J. 2014. Modal concord. Submitted to *The Blackwell Companion to Semantics*, edited by Lisa Matthewson, Cécile Meier, Hotze Rullman and Thomas Ede Zimmermann.
- Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.
- Jang, Youngjun. 1999. Two types of question and existential quantification. *Linguistics* 37. 847- 869.
- Kang A. and S. Yoon. (2018). Two types of speaker's ignorance over the epistemic space in Korean. *Proceedings of the Linguistic Society of America* 1, 21-1-15
- Kang A. and S. Yoon. (2019). Modalized questions in Korean. *Studies in Generative Grammar*, Volume 29, Number 3, 2019 459-483. The Korean Generative Grammar Circle.
- Knobe, J. and Szabo, G.S. 2013. Modals with a taste of the deontic. *Semantics and Pragmatics* 6: 1-42.
- Kaufmann, M. (2012). *Interpreting imperatives*. Springer.
- Kim, Chonghyuck. 2010. Korean Question Particles Are Pronominals: A transparent Case of Representing Discourse Participants in the Syntax. <http://ling.auf.net/lingBuzz/001157/>
- Kratzer, A. 1991. Modality. In *Semantics: An International Handbook of Contemporary Research*, ed. By A. von Stechow & D. Wunderlich, 639-650. Berlin: de Gruyter.
- Krifka, M., Pelletier, F. J., Carlson, G., Ter Meulen, A., Chierchia, G., Link, G. (1995). Generativity: an introduction. In G. Carlson and J. Pelletier (eds.) *The Generic Book*. Chicago University Press.
- Krifka, M. 2015. Bias in commitment space semantics: Declarative questions, negated questions, and question tags. *Proceedings of SALT* 25, 328-345.
- Ladd, D.R. 1981. A first look at the semantics and pragmatics of negative questions and tag questions. *CLS* 17.
- Lassiter, Daniel. 2016. Must, knowledge, and (in)directness. *Natural Language Semantics* 24: 117-163.
- Larrivé P. and Mari, A. 2019. Negative biased questions in the modal skeleton. Ms Caen University and Institut Jean Nicod, presented at Non-canonical Questions Workshop, Konstanz.
- Littell, Patrick, Lisa Matthewson Tyler Peterson. 2009. On the semantics of conjectural

- questions. Paper presented at the MOSAIC Workshop (Meeting of Semanticists Active in Canada), Ottawa.
- Lyons, J. 1977. *Semantics*. Cambridge University Press, Cambridge
- Leech, Geoffrey. 1971. *Meaning and the English verb*. London: Longman.
- Mari, A., Beyssade, C. and Del Prete, F. 2012. Introduction. In A. Mari, C. Beyssade and F. Del Prete (eds.). *Genericity*. Oxford: Oxford University Press, pp. 1-92.
- Mari, A. 2015. *Modalités et Temps*. Bern: Peter Lang.
- Mari, A. 2017. Actuality entailments: when the modality is in the presupposition. In *Lecture Notes in Computer Science*, Dordrecht: Springer Verlag, pp. 191-210.
- Mari, A. and Tahar, C. 2019. From prohibitive to expletive negation. *Sinn und Bedeutung* 24, Osnabrück.
- de Marneffe, M., C. Manning, and C. Potts. 2012. Did it happen? The pragmatic complexity of the veridicality judgement. *Computational Linguistics* 38: 300-333.
- Matthewson, Lisa. 2010. Cross-linguistic Variation in Modality Systems: The Role of Mood. *Semantics and Pragmatics* 3. 1-74.
- McDowell, Joyce. 1987. *Assertion and modality*. University of Southern California PhD thesis.
- Park, Jae Yon. 2005. Ensek yangtaywa uymwunmwunuy sangkwankwankyeyey tayhaye. (On the correlation of epistemic modality and interrogative). *eneyenkwa (Language Research)* 41(1). 101-118.
- Portner, P. 2009. *Modality*. Oxford University Press.
- Reese, B. 2007. *Bias in Questions*. PhD Austin.
- Repp, S. 2012. Common ground management: Modal particles, illocutionary negation, and VERUM. D. Gutzmann, & H-M. Gaertner (eds). *Expressives and beyond. Explorations of conventional non-truth-conditional meaning*. Oxford: OUP.
- Rizzi, Luigi. 1997. The fine structure of the left periphery. In L. Haegeman (ed.). *Elements of Grammar: A Handbook of Generative Syntax*. Dordrecht: Kluwer. 281-337.
- Roelofsen, F. & Farkas, D. F. 2015. Polarity particle responses as a window onto the interpretation of questions and assertions. *Language* 91(2), 359-414.
- Romero, M. & Chung-hye H. 2002. Verum focus in negative yes/no questions and Ladd's  $p / \neg p$  ambiguity. *SALT XII*, 204-224.
- Zimmermann, Malte. 2011. Discourse particles. In K. von Stechow, C. Maienborn, and P. Portner (eds.), *Semantics (HSK 33.2)*, Berlin: de Gruyter, 2011-20- 38.
- van Rooij, R. & Šafářová, M. 2003. On polar questions. *SALT XIII*.
- Sadock, J. M. (1971). *Queclaratives*. In *Seventh Regional Meeting of the Chicago Linguistic Society* 7, 223-232.
- Seo, Jeong-Mok. 1987. *kwuke uymwunmwun yenkwu (The study on Korean questions)*. Seoul: Top Publishing Company.
- Sherman, B. 2018. Open Questions and Epistemic Necessity. *The Philosophical Quarterly* 68: 819-840.
- Silk, A. 2019. Expectation Biases and Context Management with Negative Polar Questions. *Phil. Logic*.
- Sudo, Y. 2013. Biased polar questions in English and Japanese. In D. Gutzmann & H-M. Gaertner (eds.) *Beyond Expressives: Explorations in Use-Conditional Meaning*. Brill.
- Szabolcsi, A. 2004. Positive polarity – Negative Polarity. *NLLT* 22: 409-452.
- Willer, M. 2013. Dynamics of Epistemic Modality. *Philosophical Review* 122: 45-92.
- Zimmermann, Malte. (2011). Discourse particles. In K. von Stechow, C. Maienborn, and P. Portner (eds.), *Semantics (HSK 33.2)*, Berlin: de Gruyter, 2011-20- 38.