Mari, Alda & Portner, Paul. 2021. Mood variation with belief predicates: Modal comparison and the raisability of questions. *Glossa: a journal of general linguistics* 6(1): 132, pp. 1–51. DOI: https://doi.org/10.16995/glossa.5726

Open Library of Humanities

Mood variation with belief predicates: Modal comparison and the raisability of questions

Alda Mari, Institut Jean Nicod CNRS/ENS/EHESS/PSL University, alda.mari29@gmail.com
Paul Portner, Georgetown University, paul.portner@georgetown.edu

This paper proposes that subjunctive in the complement of belief sentences in Italian expresses a relation between the attitude holder's beliefs and the common ground. In contrast to most other Romance languages, 'believe' commonly and prescriptively takes subjunctive in Italian, though indicative is found as well, and as has been observed in the literature, the choice of indicative or subjunctive has semantic effects. We show that the indicative with 'believe' is used when the belief statement describes the personal mental state of the holder of the attitude, an interpretation that follows from the traditional Hintikkean semantics. In contrast, we show that subjunctive with 'believe' is used to mark a relation between the content of belief and the discourse context. To analyze these facts, we propose that the modal quantification present in attitude reports comes not from the attitude verb, but instead from the embedded verbal mood. What differentiates Italian from related languages where 'believe' only takes indicative, is that Italian allows the subjunctive to access the common ground as a modal base, utilizing the verb's doxastic background as an ordering source. The fact that subjunctive relates the common ground to the subject's beliefs explains the discourse oriented meaning of this combination. We extend our analysis to several other predicates that show mood variation in Italian.

Glossa: a journal of general linguistics is a peer-reviewed open access journal published by the Open Library of Humanities. © 2021 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See http://creativecommons.org/licenses/by/4.0/.
OPEN ACCESS

1 Introduction

Across the majority of Romance languages, 'believe' selects the indicative and most theories of mood selection have been designed to explain this fact, illustrated in (1) (Farkas 1992a; Giannakidou 1998; Villalta 2008; Anand & Hacquard 2013, a.o.).

(1) a. Pierre croit que Marie est malade. (French)
Peter believe.IND.PRES.3SG that Mary be.IND.PRES.3SG ill
'Peter believes that Mary is ill.'

b. Pedro cree que María está enferma. (Spanish)
Peter believe.IND.PRES.3SG that Maria be.IND.PRES.3SG ill

c. Petru crede că Maria este bolnavă. (Romanian)
Peter believe.IND.PRES.3SG that Mary be.IND.PRES.3SG ill

However, in some Romance languages, notably Italian and Portuguese, 'believe' can take either the subjunctive or indicative. This fact is illustrated below.

(2) a. Piero crede che Maria sia malata. (Italian)
Peter believe.IND.PRES.3SG that Mary be.SUBJ.PRES.3SG ill
'Peter believes that Mary is ill.'

b. Piero crede che Maria è malata.
Peter believe.IND.PRES.3SG that Mary be.IND.PRES.3SG ill
'Peter believes that Mary is ill.'

(3) a. O Pedro crê/acredita que a Maria esteja doente. (Portuguese)
def Peter believe.IND.PRES.3SG that def Maria be.SUBJ.PRES.3SG ill
'Peter believes that Mary is ill.'

b. O Pedro crê/acredita que a Maria está doente.
def Peter believe.IND.PRES.3SG that def Maria be.IND.PRES.3SG ill
'Peter believes that Mary is ill.'

In this paper, we aim to understand this use of subjunctive with 'believe' in Italian, while also explaining why indicative is the mood selected by this verb across most related languages.[1,2]

---

[1] Subjunctive can occur under 'believe' in all of these languages when the matrix predicated is negated, as in (i), or questioned.

(i) Pierre ne croit pas que Marie soit malade. (French)
Peter neg believe.IND.PRES.3SG neg that Mary be.SUBJ.PRES.3SG ill
'Peter does not believe that Mary is ill.'

We are not able to explain this alternation, and we assume that this so-called 'polarity subjunctive' is to be analyzed in a different way (see Quer 1998 for arguments in favor of separating the two types).

[2] We have not yet investigated whether Portuguese shows the same semantic effects of mood variation as Italian, and so we do not claim that our analysis applies to this language.

The theoretically unexpected subjunctive with ‘believe’ cannot be dismissed as an isolated lexical exception. Subjunctive is possible in Italian with many other predicates that take indicative in related languages, such as ‘convinced’, ‘certain’, ‘imagine’, and ‘say’.

(4) a. Piero è convinto/certo che Maria sia/è malata.
Peter be.IND.PRES.3SG convinced/certain that Mary be.SUBJ/IND.PRES.3SG ill
‘Peter is convinced/certain that Mary is ill.’

b. Piero immagina che Maria sia/è malata.
Peter imagine.IND.PRES.3SG that Mary be.SUBJ/IND.PRES.3SG ill
‘Peter imagines that Mary is ill.’

c. Piero dice che Maria sia/è malata.
Peter say.IND.PRES.3SG that Mary be.SUBJ/IND.PRES.3SG ill
‘Peter says that Mary is ill.’

Moreover, the use of subjunctive or indicative with ‘believe’ is not simply a matter of free variation; rather, the choice is semantically significant. Consider the following:

(5) Context: Maria, an observant Catholic, is speaking with Cynthia, an atheist, during their joint visit to Rome. Both accept that Peter was a historical figure, but only Maria believes in souls and heaven. Maria says:

a. I believe that St. Peter’s bones are in the Vatican.

b. I believe that St. Peter’s soul is in heaven.

Maria and Cynthia may be wondering where Peter’s remains are, and (5-a) can be understood as suggesting an answer to this question. In other words, (5-a) is naturally understood as giving a reason for adding ‘St. Peter’s bones are in the Vatican’ to the common ground. In contrast, since Cynthia doesn’t believe in heaven or souls, (5-b) cannot have this function. Instead, Maria is simply asserting a personal opinion, an opinion that stands no chance of being added to the common ground.

In the kind of use illustrated in (5-a), where the speaker aims to make a discourse contribution concerning where St. Peter’s remains are, the proposition that St. Peter’s bones are in the Vatican is in a way highlighted over the belief predicate, and ‘believe’ is in a way a modifier of a discourse contribution made with that proposition. The second type of use illustrated in (5-b), where the speaker expresses or makes an assertion concerning his or her opinions, the attitude of belief is highlighted over the proposition that St. Peter’s soul is in heaven. Similar ideas about two uses of belief statements have been put forward by Ducrot (1972), Giorgi & Pianesi (1997), Beyssade & Marandin (2007), Simons (2007), AnderBois (2016), Mari (2017b), and others. We will elaborate on the connection to some of these works below.

In the context of (5), (5-a) would be expressed in Italian with subjunctive in the subordinate clause, as in (6-a), and indicative would be unnatural; (5-b) could naturally be expressed with indicative, though subjunctive is also possible, as illustrated in (6-b).

(6) [Context: As above]

a. Credo che le ossa di San Pietro siano/*sono in Vaticano.
believe.IND.PRES.1SG that the bones of Saint Peter be.SUBJ/*IND.PRES.3PL in Vatican
'I believe that St. Peter's bones are in the Vatican.'

b. Credo che l'anima di San Pietro è/sia in paradiso.
believe.IND.PRES.1SG that the soul of Saint Peter be.IND/SUBJ.PRES.3SG in heaven
'I believe that St. Peter's soul is in heaven.'

We explain this contrast in terms of a difference in meaning between the indicative and subjunctive moods in the complement clause. Informally, when the speaker aims to contribute to the conversation by saying something relevant to the truth or falsity of the complement clause, as in the case of (6-a), this fact must be marked, and the subjunctive serves to mark it. In contrast, when the speaker does not have this aim, and just contributes by saying something about the subject's beliefs, as in (6-b), the indicative becomes possible. We analyze this difference by proposing that the subjunctive with 'believe' generates a presupposition that the question of the truth or falsity of the complement clause is raisable in the context (see Mari 2017a; 2017b for an earlier proposal in this direction). When the question has in fact been raised and the sentence contributes to answering it, the subjunctive is required; in other contexts, the effects of mood choice are more subtle, and we will diagnose the exact difference by considering a number of different scenarios in Section 2 below.

Our analysis is grounded in a general theory of mood selection which aims to explain the different patterns found across Romance languages. The line of research on which we build has a long tradition, going back to Farkas's (1992b) analysis of crosslinguistic variation with emotive factives (specifically the fact that they take subjunctive in French but indicative in Romanian). Focusing on the similarities and differences between Italian and French, and building on the work of Mari (2016), Giannakidou & Mari (2021) and Portner & Rubinstein (2020), in Section 3.1 we develop a theory of mood selection that predicts the French pattern with belief verbs (and other similar predicates) as the basic case, and then propose an additional interpretive rule operating in Italian that explains the possibility of subjunctive with 'believe' and other verbs where Italian shows a more expansive distribution of this mood. An important advantage of our analysis is that it assigns the same meanings to 'believe' and to the indicative and subjunctive morphemes in the two languages. Crucially, the subjunctive is doing the same thing under 'believe' in Italian that it does when selected by any other verb in either language.

In Section 3.2, we combine our analysis of mood variation with ideas from Lewis (1988) and Yalcin (2016b) to explain how to derive the presupposition of the subjunctive under 'believe' from the interaction between the normal meaning of subjunctive and the special rule of interpretation which distinguishes Italian from French. The fact that both moods are grammatical in Italian allows it to mark a difference of the kind highlighted in (6) through the choice of subjunctive or

indicative in the complement clause. In contrast, because French only allows indicative, it cannot mark the difference in this way.[3]

2 Background on belief sentences

Our proposals build on two main areas of research which have addressed the semantics and pragmatics of belief sentences. The first aims to explain the distribution of verbal mood forms (indicative or subjunctive) in the complements of belief predicates; the second analyzes the different types of pragmatic contributions that can be made with belief sentences.

2.1 Belief verbs in theories of verbal mood

As discussed by Portner (2018), there are two main approaches to verbal mood selection in Romance, but neither by itself can fully explain the use of subjunctive with 'believe' in Italian. The first family of theories proposes that the subjunctive marks the argument of a verb which is comparative or evaluative, concepts formally modeled with an ordering relation over worlds or propositions (Giorgi & Pianesi 1997;[4] Villalta 2008; Portner 2018; Portner & Rubinstein 2020); for example, according to Giorgi and Pianesi 'want' takes subjunctive across Romance because it uses a bouletic ordering source in combination with a doxastic modal base.

For this family of theories, there are two related problems posed by Italian 'believe'. First, 'believe' is normally analyzed with a simple Hintikkean necessity semantics, without the use of an ordering source or other comparative/evaluative relation. In order to explain the use of subjunctive with 'believe' within this type of theory, one would have to say that it uses an ordering source or similar concept in the semantics of 'believe' in Italian. And second, if subjunctive is tied to the relevance of an ordering source, differences in mood selection seem to imply that Italian 'believe' means something different from its counterparts in French, Spanish, and the other languages where 'believe' selects indicative. Yet, we know of no evidence that Italian 'believe' means something different from its counterparts.

The second family of theories proposes that mood choice is based on a principle which says that indicative is used with predicates which imply commitment, certainty, or a related concept (Farkas 1985; Quer 1998; 2001; Homer 2007; Giannakidou 2009; 2011; Portner & Rubinstein 2013; Silk 2018; Giannakidou & Mari 2021). For example, Giannakidou proposes that VERIDICAL predicates select indicative, where an operator O is veridical iff $O(p)$ entails that $M \subseteq p$ in some relevant modal space M. The subject's belief worlds form a relevant modal space for propositional attitudes (in fact DOX_{Su} is the prototypical M), and hence 'believe' is veridical. Mari (2016) and Giannakidou & Mari (2021), propose that Italian 'believe' features a veridical doxastic modal

[3] As we suggest below, the difference can be marked in French through prosody (Beyssade & Marandin 2006).

[4] In Giorgi and Pianesi's book the comparative theory only applies in its pure form to French. In Italian another principle overrules the indicative with 'believe'.

base in the assertion and a non-veridical epistemic modal base in the presupposition, and that non-veridicality in the latter triggers subjunctive. Once again, the problem posed by Italian is that there is no reason to think that Italian 'believe' is different from its counterparts in other languages in terms of veridicality.

One strategy for dealing with the problem of Italian is to say that mood selection in this language does not mark something about the lexical semantics of the predicate that selects it, but rather some contextual feature of meaning that can vary from one use of 'believe' to another. For example, it is a common intuition that the indicative-subjunctive contrast with 'believe' in Italian marks the level of certainty or degree of belief. Homer (2007) develops this idea with the following principle:

(7) Generalized Strength Condition: In Italian, the indicative is possible in a clause φ embedded under an epistemic predicate and expressing proposition *p*, if the speaker or the subject of the attitude assigns a maximal degree of belief to *p*.

We think that Homer's approach is on the right track in connecting mood choice in Italian to something about the discourse context, but there is considerable evidence against the idea that it marks certainty or lack of certainty.[5] To begin with, our example (6-a) would be infelicitous with indicative (given the context), no matter how certain the speaker is about the location of Peter's remains. More evidence comes from the fact that subjunctive can be used with predicates of certainty and in combination with adverbs indicating certainty (see Mari, 2016):

(8) a. Sono certo che sia successo qualche cosa di brutto.
be.PRES.1SG certain that be.SUBJ.PRES.3SG happened some this of bad
'I am certain that something bad happened.'

b. Sono convinto che lei abbia ragione.
be.PRES.1SG convinced that she be.SUBJ.PRES.3SG reason
I am convinced that she is right.

(9) Credo davvero che il pranzo sia pronto.
believe.PRES.1SG really that the lunch be.SUBJ.PRES.3SG ready
'I really believe that the lunch is ready.'

These facts make it hard to defend the view that mood choice directly expresses (un)certainty.

Other proposals in the literature also foreshadow our analysis by claiming that the subjunctive with 'believe' is used to mark a relation between the belief and the discourse context. Giorgi and Pianesi argue that among verbs with non-comparative meaning, the Italian subjunctive is sensitive to the relation between the verb's modal background and the common ground. We think they are very much on the right track with this intuition, but as discussed by Portner (2018),

[5] See also Marques (2004) for a similar account for Portuguese.

their precise analysis faces problems.[6] Similarly, Schlenker (2005) proposes that indicative marks something similar to veridicality (more precisely, the presupposed truth of the complement in some accessible modal context *M*), and that in certain cases either the embedding verb or the matrix context can provide that modal context that is evaluated for veridicality. Schlenker's theory has not been applied to Italian, however, and it is difficult to see how to use it to explain patterns of crosslinguistic variation.[7]

Our proposal will share with these authors the idea that mood choice in complement clauses can depend on more than just the embedding verb. Our analysis is closer to Giorgi and Pianesi's in that we believe that discourse factors can trigger subjunctive, with indicative being licensed with 'believe' by context-independent lexical factors observable in other languages like French. This is in contrast to Schlenker, Homer, and also Portner (1997), who assume that subjunctive is the default mood, and that some contextual factor is needed to trigger indicative.

2.2 Two types of belief statements

A number of works have proposed that belief statements can have different pragmatic import, relating more to the subject's belief or more to the content of that belief, and that such differences can be grammatically marked. In this section, we introduce Simons's (2007) important ideas and their development by AnderBois (2016), and then discuss their relation to mood marking in Italian.

Different 'points of assertion' of belief statements. Simons (2007) initiates a new line of analysis that identifies two different types of belief statements which differ in terms of the "main point" of assertion.[8] Intuitively, with a belief sentence of the form '*X believes that φ*', the main

---

[6] Specifically, they argue that the subjunctive is sensitive to whether the verb's modal background (a modal base), at a given world compatible with the common ground, is disjoint from the typical common ground. They assume that it is possible for an individual's beliefs "not to share anything" (p. 216) with the common ground (for some relevant CG, $\{w \in \bigcap CG : DOX(w) \cap CG = \emptyset\}$ is not empty). They propose that the subjunctive is chosen under 'believe' in Italian because of this potential disjointness. However, as pointed out by Portner (2018), this reasoning is not convincing. The problem comes into focus as we consider the difference between 'believe' and *dire*, 'say', which selects indicative according to Giorgi & Pianesi. They claim that any reported conversation will share some propositions with the common ground (i.e. for all relevant CG, $\{w \in \bigcap CG : SAY(w) \cap CG = \emptyset\}$ is empty), such as "facts concerning the way the physical and human world is conceived of; culturally established facts, and so on" (p. 216). But there's no reason why one can't report a conversation between individuals who share different assumptions about the physical and human world, or different culturally established facts; and from the other side, it is awfully hard to imagine an individual whose beliefs really share nothing with reasonable common ground, not even that the past is different from the future or that something exists.

[7] If we were to say that Italian differs from French in that in Italian, the common ground is available under 'believe', while in French it is not, we would predict that the subjunctive is possible in Italian so long as the proposition is not presupposed true in the context. However, it also incorrectly predicts that indicative should be possible to mark that the complement is presupposed to be true in the context (i.e. that 'believe' + indicative can mean 'know'). Moreover, it would be unexplained why French does not allow the same use of subjunctive, since according to Schlenker it makes use of a parallel logical form with other verbs like *nier* 'deny'.

[8] For the same idea, applied to French, see Ducrot (1972).

point can involve either the subject's belief or φ. According to Simons, in English these types can be distinguished syntactically. When the belief proposition is the main point, an ordinary embedding structure is used, as in (10).

(10) Henry believes that it is raining.

In contrast, Simons proposes that when the attitudinal object φ is the main point, a parenthetical structure known as 'slifting' (Ross 1973) is possible. For example, (11) can be used in a context where the question under discussion is whether it is raining.

(11) It is raining, Henry believes.

As discussed by Simons, in this structure the parenthetical typically serves to give the evidential basis for φ or information about the reliability of φ. Thus, (11) addresses the question of whether it is raining with information supporting a positive answer, while also stipulating that nature of the support is the fact that Henry believes it (which may tell us something about its reliability).

Italian also has the parenthetical use of 'believe', as in (12):

(12) Piove, credo.
rain.IND.PRES.3SG, believe.IND.PRES.1SG
'It is raining, I believe.'

Our idea about the difference between indicative and subjunctive under 'believe' in Italian is similar to Simons's proposal. That is, when 'believe' embeds the indicative in Italian, it has a meaning similar to (10), and when it embeds subjunctive, it has a meaning similar to (11). However, there are several differences between the parenthetical construction and the use of subjunctive under 'believe'. First, there is no possibility of using subjunctive in a root clause with anything like the intended meaning, with or without a parenthetical.

(13) *Sia in ritardo, credo.
be.SUBJ.PRES.3SG in tardy, believe.PRES.1SG
Intended: 'He is late, I believe.'

Moreover, in parentheticals the belief predicate can only be in present tense first person singular,[9] and it cannot be modified by adverbs. In contrast, the embedding structure with subjunctive allows any main verb form and any normal syntactic modification:

(14) È in ritardo, *credevo/*crede.
is in late, believe.IMPF.1SG/PRES.3SG
'She is late, I believed/he believes.'

[9] For parallel facts in French, see e.g. Vet (1994).

(15) È in ritardo, credo *davvero.
is in late, believe.PRES.1SG really
'She is late, I really believe.'

(16) Crede/Credevo che sia in ritardo.
believe.PRES.3SG/IMP.1SG that be.SUBJ.PRES.3SG in late
'He believes/I believed that she is late.'

(17) Credo davvero che sia in ritardo.
believe.PRES.1SG really that be.SUBJ.PRES.3SG in late
'I really believe that she is late.'

These differences suggest that we cannot directly treat the embedding of subjunctive as an alternate way of marking a syntactically parenthetical status of the main verb.

At-issueness and the QUD. AnderBois (2016) builds on Simons's work in an interesting way. He assumes that the distinction proposed by Simons is to be understood in terms of Roberts's (2012) notion of Question under Discussion (QUD). Given this, he proposes that in the regular embedding construction, either the proposition expressed by the whole sentence or that expressed by the complement can address the QUD, while with the parenthetical, only the non-parenthetical material (corresponding to the complement) can do so. For example, according to this view (11) can be used to address the question of whether it is raining, but not the question of what Henry believes. AnderBois explores this idea through a detailed analysis of two different forms of attitude sentences in Yucatec Maya, the bare clause construction and the topic + clause construction, illustrated in (18):

(18) a. **Bare clause**
Ten-e' k-in tukl-ik le chaayma' chaka'an k-u pajtal u kíins-ik wáa máax.
me-TOP IMP-A1 think-SS DEF chaya NEG boiled IMP-A3 be.able A3 kill-SS or who
'I think that uncooked chaya can kill someone.'

b. **Topic + clause**
Ten-e' k-in tukl-ik-**e'** le chaay ma' chaka'an k-u pajtal u kíins-ik
me-TOP IMP-A1 think-SS-TOP DEF chaya NEG boiled IMP-A3 be.able A3 kill-SS
wáa máax.
or who
'I think that uncooked chaya can kill someone.'

The topic + clause pattern differs from the bare clause pattern in containing the topic marker *-e'* on the attitude verb, as seen in (18-b). AnderBois develops an analysis of the topic + clause construction according to which *-e'* marks the attitude content as not addressing the QUD. He phrases this in

terms of the concept of AT-ISSUENESS, adapted from Simons et al. (2011): a proposition *p* is at-issue if the speaker intends to address the QUD with *p* (for further constraints on this relation, see Simons et al. 2011 and AnderBois 2016). In these terms, the function of *-e'* in the topic + clause construction is to mark the attitude (i.e. what the subject thinks) as not-at-issue and the embedded clause (the content of the attitude) as at-issue. He identifies this use of *-e'* with the parenthetical construction in English, so we can say that what Henry believes is not-at-issue in (11), according to this theory.

In light of this perspective on parentheticals and related constructions, we can ask whether mood in Italian is another way of marking the (not-)at-issue status of information. As a first pass, our proposal is that with the indicative under 'believe', the subject's belief is at-issue, while with subjunctive, the content of the embedded clause is at-issue. Next we will present several pieces of evidence for this view. However, note that in the end our analysis is not completely analogous to the proposals of Simons and AnderBois; we derive the difference of at-issueness from a more fundamental feature of meaning associated with the subjunctive in all contexts, including under verbs like 'want' where at-issueness is irrelevant. This differs form AnderBois's proposal, where *-e'* and slifting more or less directly mark not-at-issueness.

At-issueness and mood marking in Italian. There are several contexts where we can observe a difference in the relevance of a belief sentence in context or in its felicity based on the choice of mood in the complement. We begin with cases where the subjunctive is perceived as creating a sentence that is more relevant than one based on the indicative.

The first case in point is when the explicit QUD concerns the truth or falsity of the complement proposition *p*:

(19) Perché Luisa non è venuta alla riunione?
Why Luisa not is come to-the meeting
'Why did Luisa not come to the meeting?'

a. Luca crede che è partita
Luca believes that be.IND.PRES.3SG left
'Luca believes that she left.'

b. Luca crede che sia partita.
Luca believes that be.SUBJ.PRES.3SG left
'Luca believes that she left.'

The statement (19-a) is felt as less relevant than (19-b) as an answer to the question. It describes the attitude of Luca and *p* only indirectly answers the question why Louisa did not attend the meeting. The subjunctive version (19-b) is a more relevant partial answer to the question.

The contrast becomes even more salient when the belief predicate is embedded under a wh operator that targets the belief. Compare the cases in (20). In both cases, the speaker asks the

reason for Luca's belief, but they differ in the status of the complement. With the indicative (20-a), 'that Luisa left' is not at issue and all that is relevant is the reason for Luca's belief. With the subjunctive (20-b), both whether Luisa left and why Luca believes it are under discussion, and the reason the speaker wants to know the reason for Luca's belief is to help decide on whether to accept that Luisa left.

(20) a. Perché Luca crede che Luisa è partita?
Why Luca believes that Luisa be.IND.3SG left?
'Why does Luca believes that Luisa left?'

b. Perché Luca crede che Luisa sia partita?
Why Luca believes that Luisa be.SUBJ.3SG left?
'Why does Luca believes that Luisa left?'

A similar distinction is observed in *if*-clauses.

(21) a. Se Luca crede che Luisa è partita, è un idiota.
If Luca believes that Luisa be.IND.3SG left, is an idiot
'If Luca believes that Luisa left, he is an idiot.'

b. Se Luca crede che Luisa sia partita, sa più di noi.
If Luca believes that Luisa be.SUBJ.3SG left, knows more than us
'If Luca believes that Luisa left, he knows more than we do.'

With the indicative, the alternatives under consideration are whether Luca believes or doesn't believe that Luisa left; a connection is expressed between the alternative that he does believe this, and being an idiot. (While it may or may not be settled whether Luisa left, the sentence does not express a connection between this and whether Luca is an idiot.) With the subjunctive, the question of whether Luisa left is under consideration and is connected to whether the consequent is true (whether Luca knows something we don't).

The data reported in (19)–(21) concern the perceived relevance of a belief sentence in context, but in certain contexts, a particular mood choice can give rise to a judgment of infelicity. In particular, when the truth or falsity of the complement (i.e. ?*p*) cannot be raised as a question, the subjunctive is not felicitous. There are four types of cases where ?*p* cannot be raised as a question and the subjunctive is infelicitous. Descriptively, a question can be raised if the structure of the common ground allows identifying possible answers (we provide a formal analysis in section 3).

1. A striking case is offered by future orientation. These contexts often trigger an inference of unsettledness of *p* (e.g. Copley 2005; Kaufmann 2005; MacFarlane 2006; Giannakidou & Mari 2018b), and the subjunctive is ruled out because, if the truth value of *p* is not settled, the question of whether *p* is true or false is not raisable.

As background, note that Italian allows either indicative (future tense) or subjunctive (present tense)[10] in future oriented complements:

(22) Present perspective, future orientation.

a. Credo che verrà.
believe.PRES.1SG that come.FUT.IND.3SG
'I believe that he will come.'

b. Credo che venga.
believe.PRES.1SG that come.PRES.SUBJ.3SG
'I believe that he will come.'

The observation is that only the indicative (future) can describe a situation where truth value of the complement is not settled or planned at the time of utterance; so, (22-a) can be used if he is still deciding whether to come, but (22-b) implies that this trip is already scheduled. We can see the same effect in the following minimal pair from Mari (2016).

(23) Context: My son has a tendency to forget stuff at school. My husband wants to buy him an expensive scarf and asks me whether it is a good idea, or whether I believe that he will lose it.

a. Credo che la perderà.
Believe.PRES.1SG that it lose.FUT.IND.3SG
'I believe he will lose it.'

b. #Credo che la perda.
Believe.PRES.1SG that it lose.PRES.SUBJ.3SG
'I believe he will lose it.'

In (23) the indicative is the only possible choice, as it is not settled whether the son will lose his scarf, and losing a scarf is not an event that can be planned. In this case, the question ?*p* 'Will our son lose the scarf?' cannot be raised as the QUD.

A similar contrast is illustrated in (24). In (24-a) the truth value of the complement is settled by readily available information, and so one can ask 'Will the Olympics take place in Paris?' Hence, the subjunctive is felicitous. In contrast, in (24-b) the truth value of the complement 'France will lose tonight' is unsettled, and the subjunctive is ruled out. The infelicity of subjunctive correlates again with the fact that it would be extremely odd to ask flat-out 'Will France lose tonight?' (as opposed to 'Do you think France will lose tonight?') The subjunctive can be rescued if the speaker has sufficient knowledge that they could say with confidence that France will or will not lose.[11]

[10] 'Present tense' is the traditional term, but cases such as these show that it is really a non-past tense.

[11] For a related discussion see Copley (2005) on futurates.

(24) a. Credo che le Olimpiadi si svolgano a Parigi
believe.PRES.1SG that the Olympics REFL happen.PRES.SUBJ.3PL at Paris
nel 2024.
in-the 2024
'I believe that the Olympics will take place in Paris in 2024.'

b. #Credo che la Francia perda, questa sera.
believe.PRES.1SG that the France lose.PRES.SUBJ.3PL this night
'I believe that France will lose tonight.'

Another relevant contrast concerns *de se* interpretations, as seen in (25). Future orientation with *de se* is only possible with the indicative, as in (25-a); this combination is not possible with the subjunctive, as in (25-b).

(25) a. Gianni crede che sposerà una professoressa.
Gianni believes that marry.FUT.IND.3SG a professor
'Gianni believes that he will marry a professor.'

b. #Gianni crede che sposi una professoressa.
Gianni believes that marry.SUBJ.PRES.3SG a professor
'Gianni believes that he will marry a professor.'

While our formal analysis will not cover this case, intuitively it is closely related to the preceding ones. It is not possible to raise the truth or falsity of a *de se* proposition as the QUD, because of its relativization to the perspective holder. Hence subjunctive is ruled out.

2. A second set of data pertains to matters of religious faith. Belief sentences in prayers, declarations of faith, and the like normally involve the indicative.

(26) Apostolato della sofferenza (Apostolate of suffering):

a. Credo che il dolore distacca,
Believe.PRES.IND.1SG that the pain detach.PRES.IND.3SG,
disillude, purifica, migliora,
disilluse.PRES.IND.3SG, purify.PRES.IND.3SG, improve.PRES.IND.3SG,
anzi conduce l'anima alla più alta perfezione.
even guide.PRES.IND.3SG the soul to the most high perfection
'I believe that pain detaches, reveals truth, purifies, improves, and indeed guides the soul to the highest perfection.'

b. Credo che Dio è vicino a quelli che
Believe.PRES.IND.1SG that God be.PRES.IND.3SG close to those who
soffrono per Lui.
suffer.PRES.IND.3PL for Him
'I believe that God is close to those who suffer for Him.'

In a prayer, the question of the truth of the complement is not raisable, as there could not possibly be a discussion with God of whether faith detaches the soul or whether God is close to those who suffer for him, with the speaker suggesting answers in the affirmative. Rather, the speaker only portrays their internal mental state. Because ?*p* is not raisable, the indicative must be used. With the subjunctive, the texts are not interpreted as prayers, but rather convey hypotheses about the truth of *p*, as in a theological disputation.

3. As pointed to us by an anonymous reviewer, and echoing the observations in (20) and (21), when *p* is settled in the common ground, the subjunctive is degraded. The example that the reviewer provides is in (27).

(27) A. Is John upset with Mary?
B: Yes, he is.
A: I agree. What is your reason for believing this?
B:
Credo che è/#sia arrabbiato con lei perché li
believe.IND.PRES.1SG that be.IND/SUBJ.3SG mad with her because them
ho sentiti litigare.
have heard argue
'I believe that he is mad with her because I have heard them arguing.'

There are two factors here that legitimate the use of the indicative: first *p* is settled in the context, and second B is asked about his own reasons to believe that *p* is true, thus referring to his own mental state rather than to the reasons to add *p* to the common ground.

Conversely (as also suggested by the reviewer), the subjunctive leads to infelicity when the question of whether *p* is true is not raisable because the speaker has no relevant opinions at all. We see this in (28) when the sentence is followed by a a statement to this effect.[12]

(28) Non credo che Maria sia incinta. #Non ho nessuna
Not believe.IND.PRES.1SG that Mary be.SUBJ.3SG pregnant. Not have none
credenza a questo proposito.
belief to this matter
'I do not believe that Mary is pregnant. I do not have any belief about it at all in fact.'

Here one would assume that in a context where the speaker has no opinions about Maria at all, one could not raise the question of whether she is ill. This rules out the subjunctive; the indicative is acceptable as predicted, because it does not require raisability.

[12] The discourse in (28) becomes acceptable when 'credo' is focused and negation becomes metalinguistic. (Focus on 'believe' or 'is' likewise has the effect of making the English translation of (28) more felicitous.) Note that there is a complex interaction between the triggering of subjunctive by negation and the effect illustrated here; we cannot use indicative in the subordinate clause, except under a neg-raising interpretation. We leave this set of facts for future investigation.

4. A final case concerns judgments based on personal taste.[13] When expressing such judgments, interlocutors can sometimes agree and reach unanimity, but it is also possible for them to disagree with none of them being wrong (Lasersohn 2005; Stephenson 2007a, a.o.). In contexts where "faultless disagreement" is allowed, *?p* cannot be raised as a QUD.

   Consider now two different evidential conditions in relation with predicates of personal taste, beginning with the contrast (29).

   (29) Context: The soup has been tasted by Gianni. Speaker utters:

   a. Gianni crede che la zuppa è buona
      Gianni believes that the soup be.IND.3SG good
      'Gianni believes that the soup is good.'

   b. (#)Gianni crede che la zuppa sia buona.
      Gianni believes that the soup be.SUBJ.3SG good
      'Gianni believes that the soup is good.'

   The indicative (29-a) is natural here and describes Gianni's personal judgment of the soup. The subjunctive in (29-b) is only possible if the interlocutors are "soup experts" with (possibly explicit) shared standards for judging the quality of soup (similar to wine experts). In this case, the quality of the soup is not a matter of personal taste, and the QUD can be whether it is good according to the shared standards. Without these sorts of background assumptions, (29-b) is infelicitous.

   The judgments are different in a context where Gianni has not tasted the soup yet. In that case, the indicative describes a mere guess on Gianni's part. The use of subjunctive instead expresses Gianni's judgment based on clues that can be potentially shared by other participants, like how the soup looks, the texture, and so forth; in this case, *?p* can be the QUD because it can be answered according to those criteria.

   The contrast in (29) is similar to one discussed by Stephenson (2007b), p. 62–3, between *think* and *believe* in English. As pointed out by a reviewer, it seems that *believe* behaves like *credere* + subjunctive, suggesting that its lexical semantics should incorporate aspects of the contribution of subjunctive mood discussed in this paper.

So far, we have focused on cases where the indicative is required and subjunctive is ruled out. We can also find numerous contexts where the indicative is infelicitous. We have seen one example already, (6-a); another is (30):

(30) a. Credo che Jean Nicod sia un filosofo.
believe.PRES.1SG that Jean Nicod be.PRES.SUBJ.3SG a philosopher
'I believe that Jean Jicod is a philosopher.'

[13] The judgment on this example is somewhat subtle, but it has been confirmed via elicited judgments by more than a dozen native speakers.

b. #Credo che Jean Nicod è un filosofo.
believe.PRES.1SG that Jean Nicod be.PRES.IND.3SG a philosopher
'I believe that Jean Nicod is a philosopher.'

The subjunctive in (30-a) is natural because one can readily understand the belief statement as contributing to a conversation where the QUD is 'Is Jean Nicod a philosopher?' In contrast, the indicative in (30-b) is degraded because it is not obvious with what other intent it could be used. It is possible to accommodate a context where the speaker does not mean to be taken seriously (a guess or a strange declaration of faith; the meaning is something like 'I bet that Jean Nicod is a philosopher!', with no evidence), and in such contexts, the indicative is not ruled out. Nevertheless, since prescriptive grammar prefers the subjunctive and the meaning naturally fits with the kind of context that requires the subjunctive, indicative is perceived as quite unnatural.

2.3 Summary and preview

We have shown that the choice of indicative or subjunctive with 'believe' in Italian is not a matter of free variation. Indicative is preferred in some examples, subjunctive in others. Subjunctive is less felicitous in contexts that do not allow raising the question *?p*, as when personal judgments are at stake (29-a) or with future orientation when *p* is not settled (23-b)/(24-b). It is also less felicitous in prayers. Indicative, on the other hand, becomes less felicitous when *?p* is the QUD, as in (6-a) and (30-b). In most other situations, both moods are possible, with a subtle difference in meaning.

In French, the indicative is used to cover all these cases, including those that would require subjunctive in Italian. This fact is illustrated in the following:

(31) Context: The interlocutors are discussing where the next Olympics will be held.
Jean croit que les Olympiades auront/*aient
Jean believe.PRES.IND.3SG that the Olympics have.FUT.IND.3PL/have.PRES.SUBJ.3PL
lieu à Paris.
place at Paris
'John believes that the Olympics will take place in Paris.'

Despite these differences between languages, we will give a uniform semantics for 'believe' and mood in both languages. When faced with the difference between Italian and French, existing theories of mood selection must say either that 'believe' means something different in the two languages, or that the subjunctive marks something different about its semantic context. We avoid this dilemma by proposing that the difference between Italian and French is not due to any of the elements which theories of mood tend to focus on, namely the embedding verbs and mood morphemes; rather, they differ because an additional ingredient can be added to the semantic derivation in Italian. This additional ingredient makes the subjunctive possible, and in combination with the meaning of the mood markers, explains the patterns of felicity and infelicity we have observed.

3 Analysis

In this section, we present a theory of mood choice in French and Italian that explains why they differ under 'believe' (while being identical with 'want') and an analysis of the pragmatic effects of indicative or subjunctive under 'believe' in Italian. First we develop the analysis of mood marking (section 3.1), and then our ideas about the pragmatic effect (section 3.2). The two parts are closely linked through the idea that the subjunctive has a non-homogeneity presupposition like other modal operators (see Giannakidou and Mari 2021)[14], and in section 3.3, we show how the non-homogeneity condition explains the link between subjunctive and the raisability of a question. Finally, in section 3.4 we extend the proposal to some other predicates which show variation in mood choice in Italian. A more complete formalization of the key ideas developed in this section is given in the Appendix.

3.1 The contrast between French and Italian

Traditional semantic analyses of propositional attitude verbs like 'believe' treat them as modal operators, modeled as quantifiers over possible worlds. On this view, a complement clause is the scope of such a modal operator, and the content of the complement is a proposition. However, recently this orthodoxy has been challenged. We see in Portner (1997); Kratzer (2006); Moulton (2009) and Portner & Rubinstein (2020) the proposal that propositional attitude verbs are not modal operators, but rather affect the modality of the sentence by contributing the modal backgrounds over which the quantifier, which comes from within the complement clause itself, quantifies. Following Portner & Rubinstein, we argue that the modal quantifier originates with the embedded clause's mood, and we assume it raises to C, resulting in a Logical Form similar to the ones proposed by Kratzer and Moulton.[15]

Kratzer, Moulton, and Portner and Rubinstein assume that propositional attitude verbs are, like other verbs, predicates of events or situations (the difference between events and situations is not relevant here), and they follow a neo-Davidsonian approach to argument association, using thematic relations to connect subjects and objects to the verb. For simplicity, we do not follow the Davidsonian approach (though it would be compatible with our main ideas to do so). Instead we follow a traditional semantics where predicates take their arguments via function application. In combination with the idea that modal quantification is encoded in the complement clause, this implies that the complement takes the verb which syntactically embeds it as argument.

Our assumptions about verbal mood originate in the work of Giorgi & Pianesi (1997). As discussed above, they propose that the difference between indicative and subjunctive has to

[14] The notion of non-homogeneity is also known under the label *diversity* from Condoravdi (2002).

[15] The assumption of raising is convenient because of its simplicity, but our analysis is consistent with other ways of establishing a link between mood and C. For example, it could be that the modal operator in C correlates with mood via agreement or selection.

do with whether the semantics of the embedding predicate involves an ordering source. More precisely, they claim that indicative-selectors involve a single modal background (just a modal base) and have a simple necessity semantics, while subjunctive-selectors involve two modal backgrounds (ordering source and modal base), and have a necessity semantics that looks at the best-ranked worlds (i.e. Kratzerian human necessity). Their approach works well in many situations, as summarized in the following.

1. Indicative selectors in French (one modal background)
   (a) 'Believe' (Modal background: Doxastic *DOX*)
   (b) 'Say' (Modal background: Reported common ground *RPG*)
   (c) 'Dream' (Modal background: Content of the dream *DRM*)
2 Subjunctive selectors in French (two modal backgrounds)[16]
   (a) 'Want' (Modal backgrounds: Bouletic *BUL* and DOX^+)
   (b) 'Order' (Modal backgrounds: Deontic *DEON* and *RPG*)
   (c) 'Probable' (Modal backgrounds: Stereotypical *STER* and Circumstantial/Epistemic *CIRC*)

In this paper, we are trying to solve one of the major problems for this framework, namely why 'believe' does not take indicative consistently in all languages.

Giorgi & Pianesi (1997) state their theory in terms of selection by a language with a given verb (or in a given context, e.g. a belief context).[17] In these terms, their proposal for French is that the subjunctive is selected when the verb has a non-null ordering source, and the indicative is selected otherwise. Though Giorgi and Pianesi do not offer an analysis of the grammatical mechanisms by which this selection occurs, our assumptions allow us to derive it compositionally. Given that modal quantifiers are introduced by mood and take the backgrounds provided by the matrix verb as arguments, the relation between embedding predicates and moods follows from the following proposal:

(32) Indicative is a modal operator that takes a single modal background (a modal base) as argument.

(33) Subjunctive is a modal operator that takes two modal backgrounds (an ordering source and modal base) as arguments.

---

[16] We adopt the doxastic background DOX^+ for 'want' from Portner & Rubinstein (2020); it is derived from Heim's (1992) DOX^*, a modal background that identifies the set of propositions that the attitude holder believes to be true no matter what their own actions are. DOX^* is also used by von Fintel (1999) and is adapted by Portner & Rubinstein to an even more flexible DOX^+. The distinctions among *DOX*, DOX^* and DOX^+ are not crucial to our analysis; what's important is that some doxastic-like background serves as a modal base, together with a bouletic ordering source. We use DOX^+ because we think it is the best motivated by the prior literature.

[17] For example, they write 'the Romance languages select the indicative mood with *verba dicendi*', p. 216.

We then explain mood selection in terms of whether a given verb provides the right number of modal background arguments for each mood. We predict that 'believe' takes indicative because it provides a single modal background, which can saturate the single argument of indicative, but 'want' takes subjunctive because it provides two modal backgrounds, which can saturate the two arguments of subjunctive. **Table 1** summarizes the basic predictions of the approach, which are correct for French.

	B_1	B_2	**Grammatical?**
'want'	*BUL*	DOX^+	
'want' + subjunctive	$BUL = O$	$DOX^+ = M$	✓
'want' + indicative	$BUL = M$	$DOX^+ = ??$	*
'believe'	*DOX*	–	
'believe' + subjunctive	$DOX = O$	$?? = M$	*
'believe' + indicative	$DOX = M$		✓

Table 1: Predictions of the basic comparison-based theory.
(*O* stands for Ordering Source and *M* for Modal Base – note that the two backgrounds of 'want' are listed as $\langle BUL, DOX^+ \rangle$, with *O* first and *M* second.)

The problem we are focusing on in this paper is why the predicted ungrammaticality of 'believe' + subjunctive does not hold for Italian.[18] We propose that Italian allows the common ground to serve as the required second modal background because its grammar incorporates the rule (34).[19]

[18] Another problem is why the desire verb 'hope' sometimes selects indicative, as in French. This issue is the main focus of Portner & Rubinstein (2020); they propose that the two modal backgrounds with 'hope' can be merged into a single background in French, when certain pragmatic conditions are met. Relatedly, a reviewer points out that *très probable* and *fort possible* can also occur with indicative, as in (i), and we speculate that they can be analyzed in a similar way.

(i) Les parulines sont des oiseaux migrateurs, mais comme cette paruline a été testée positive
The warblers are some birds migrants, but as this warbler has been tested positive
à la fin de l'été, il est **très probable** qu'elle a **contracté** le VNO aux Pays-Bas.
at the end of the summer, it is very probable that she .IND.3sg contracted the VNO at-the Netherlands
'Warblers are migratory birds, but as these warblers have been tested positive at the end of the summer, it is very likely that they have contracted the VNO in the Netherlands.' medecinedesvoyages.net/medvoyages/news Accessed May 2021

[19] Because modal backgrounds are functions from worlds to sets of propositions, technically the function $\lambda w.\ CG$ serves as the second background. See the appendix for a sketch of a system which incorporates all of the proposals of Section 3.

(34) **Common Ground as Default with 'believe'**: In Italian, context can provide the common ground as a second modal background, when 'believe' (and certain other embedding predicates) only provide one modal background. This allows both of the subjunctive's arguments to be saturated.

How this explains the fact that Italian 'believe' allows subjunctive, while French 'believe' does not, is summarized in **Table 2**.

	B_1	B_2	**Grammatical?**
'believe'	*DOX*	–	
'believe' + subjunctive	$DOX = O$	$CG = M$	✓ (Italian)
	$DOX = O$	$?? = M$	* (French)

Table 2: Analysis of subjunctive with 'believe'.

We adopt a Kratzerian analysis of modality (Kratzer 1981; 2012), and associate distinct modal forces within this framework with the indicative and subjunctive. Specifically, the indicative is a simple necessity operator, as in (35), and the subjunctive is a human necessity operator, (36).[20] These operators take the right number of arguments according to (32)–(33).

(35) **Simple necessity**: $[\![indic]\!] = [\lambda p \lambda f \lambda w.\ \bigcap f(w) \subseteq p]$

(36) **Human necessity**: $[\![subj]\!] = [\lambda p \lambda g \lambda f \lambda w$:
a. $\bigcap f(w) \cap p \neq \emptyset$ and $\bigcap f(w) \backslash p \neq \emptyset$ (non-homogeneity presupposition)
b. $\text{BEST}(f, g, w) \subseteq p]$ (truth condition)

It is important to note the non-homogeneity presupposition of the human necessity operator (see Giannakidou and Mari 2021 for recent discussion): a modal operator with the force of human necessity presupposes that its modal base is compatible both with its prejacent p and with the negation of its prejacent $\neg p$. von Fintel (1999) (building on Heim 1992) argues that this presupposition is needed to account for the semantics of desire predicates like 'want'.[21] Our analysis as sketched here derives the same meaning as von Fintel's theory (apart from the

[20] Portner & Rubinstein (2020) argue that the modal force associated with the subjunctive is Kratzer's good possibility (which they label 'local necessity'). For our purposes, the difference between the two is not relevant, since both use two modal backgrounds.

[21] Smirnova (2012) argues that this precise presupposition is associated with the subjunctive in Bulgarian, but in her analysis the mood morpheme is not itself a modal operator. In a similar way, Giannakidou and Mari (2016a; 2016b; 2018a) and Giannakidou (2016) propose the subjunctive is a polarity item that is triggered by the nonveridicality of the main predicate, where this nonveridicality is guaranteed by the requirement that the modal base contains p and $\neg p$ worlds.

difference between DOX^* and DOX^+). When the subjunctive combines with 'want', it takes *BUL* and DOX^+ as arguments:

(37) a. $[\![subj]\!](p)(BUL)\ (DOX^+)$ presupposes that $DOX^+(w) \cap p \neq \emptyset$ and $DOX^+(w) \cap \neg p \neq \emptyset$
b. When defined, $[\![subj]\!](p)(BUL)(DOX^+)$ is true iff
$\textsc{best}(DOX^+, BUL, w) \subseteq p$

When the indicative combines with 'believe', it gives a standard Hintikkean semantics:

(38) $[\![indic]\!](p)(DOX)$ is true iff $\bigcap DOX\ (w) \subseteq p$

In other words, our assumptions derive the standard meanings for 'want' + subjunctive and 'believe' + indicative.

What about 'believe' + subjunctive? (34) states that this configuration is allowed in Italian because the common ground can be used as the second argument of the subjunctive. 'Believe' + subjunctive then expresses human necessity with the subject's doxastic state as the ordering source and the common ground as modal base; thus, in a simple non-negative sentence, it is true if the subject's beliefs, in combination with the common ground, provide a valid argument for the prejacent proposition *p*. Such a sentence relates *p* to the common ground, but crucially it is weaker than a simple assertion of *p*. In functional terms, what we propose is that subjunctive is used to specify a reason to accept *p* in the context, and it should be used unless it does not make sense to give such a reason. We show in Section 3.2 that bringing the common ground into the semantics in this way allows us to explain the interpretive difference between 'believe' with an indicative or a subjunctive complement.

As stated in rule (34), the difference between French and Italian is encapsulated in a rule that targets specific predicates ('believe' and certain other embedding predicates), and we should ask whether it is possible either to give this class an independent characterization, or to let the rule apply freely to all sentences, subject only to the general constraint that the resulting sentence should be semantically coherent and pragmatically viable in some contexts. We would like to suggest that the latter is the case: in Italian, the common ground serve as default second modal background whenever it is needed, as on (39):

(39) **Common Ground as Default**: In Italian, context can provide the common ground as a second modal background whenever a subjunctive clause identifies only one modal background in its syntactic domain.

A general rule like this predicts that effects similar to those seen with 'believe' can be identified with other predicates as well, and we give evidence that this is the case in Section 3.4. This process of using the common ground as a default would only apply, of course, when the matrix predicate provides only one background in lexical meaning; in other words, any predicate from

Bolinger's (1968) 'representational' class, those which "convey a mental picture" and normally select indicative in languages like French, can gain access to the common ground as a second modal background, leading to subjunctive in the complement. In contrast, bouletics and emotives like 'want' and 'regret' already have two backgrounds by virtue of their lexical meaning, and accordingly take the subjunctive in both French and Italian without recourse to this rule.[22]

An important advantage of a general pragmatic rule like (39) is that it allows us to avoid proposing that each predicate which allows both moods is lexically ambiguous. Moreover, it allows us to give the same semantics for corresponding verbs in French and Italian.

It is tempting to ask at this point why Italian allows the common ground to help saturate the argument structure of the subjunctive, while French does not, but this way of phrasing the issue is too narrow. We have seen that Italian, English and Yucatec mark a similar difference in meaning in different ways, and in fact French is also able to indicate that someone's beliefs are being used as a reason to accept the truth of the complement. French does this with intonation, as shown by Beyssade & Marandin (2006).[23,24] Therefore, the real issue for our analysis is why French does not use subjunctive in the same way as Italian, for which it would require rule (39), but uses intonation instead. This is a question we cannot answer, but we assume the reason is historical. (It is plausible that the difference has to do with the gradual loss of the subjunctive in French across several constructions; see Gosselin, 2015.)

---

[22] The choice of mood even seems to have a similar effect in certain embedded interrogative clauses, but we set these aside because of the issues that would need to be addressed to integrate interrogatives into our analysis:

(i) Mi chiedo dov' è la macchina.
REFL.1sg ask.PRES.1sg where be.IND.3sg the car
'I am wondering where the car is.'

(ii) Mi chiedo dove sia la macchina.
REFL.1sg ask.PRES.1sg where be.SUBJ.3sg the car
'I am wondering where the car is.'

(iii) Non so dov' è la macchina.
Note know.PRES.1sg where be.IND.3sg the car
'I do not know where the car is.'

(iv) Non so dove sia la macchina.
Note know.PRES.1sg where be.SUBJ.3sg the car
'I do not know where the car is.'

[23] French also uses *bien* for a similar function:

(i) Je crois bien qu'il est arrivé.
I believe *bien* that he has arrived
'I believe that he has arrived.'

[24] According to Cornelia Endriss, the German dialect Rheinländisch marks the same pragmatic difference as Italian through mood choice. The language has two verbs for 'believe', *meinen* and *glauben*: *meinen* only takes subjunctive and is used when the question of the truth or falsity of the complement is raisable; *glauben* takes indicative and expresses either a personal opinion or a belief relevant to the QUD.

One question raised by a reviewer concerns whether we would expect to be able to use the subjunctive in root clauses in Italian to make make an assertion about the speaker's belief. In fact, we do not predict this to be possible, simply because the doxastic modal background is not available in such cases. However, we speculate that in some cases the discourse component associated with imperatives (e.g. the to-do list, Portner 2004) can be used as a second discourse-provided modal background, giving rise to optative or imperative-like uses.

(40) Che venga a Milano!
that come.SUBJ.PRES.3SG to Milan
'For her to come to Milan!'/'She must come to Milan!'

A deeper analysis of this type of structure would need to explain the initial *che*, and we leave this for future research.

3.2 Mood choice and the pragmatics of belief sentences in Italian

Our analysis of mood variation with 'believe' in Italian states that the subjunctive is allowed when *?p* (the issue of the truth or falsity of the complement) can be raised as a question. We therefore need an understanding of what it is for a question to be 'raisable' in a context. As we see it, there are several dimensions to the concept of raisability. One of them has received some attention in the literature in terms of the relevance of a question. Roberts (2012) offers a definition of the relevance of a conversational move that applies to both assertions and question moves. For Roberts, a question is relevant iff it is part of a strategy for answering an already accepted question, the QUD. (The concept of a strategy builds on the ideas of Groenendijk & Stokhof 1984 and is further developed in such works as Büring 2003.) However, while these ideas are certainly important, our analysis depends on a less restrictive notion than relevance.

We need a notion of raisability which picks out those questions for which answers can even be formulated (given a doxastic state or a context), regardless of how relevant they are. For example, we are aiming to capture the sense in which 'Will France lose tonight's match?' is a strange question to ask because the speaker's interlocutor cannot possibly have an answer.

Our notion of raisability is based on Lewis's (1988) concept of a SUBJECT MATTER. We would like to say that whether France will lose the match is not normally an appropriate subject matter prior to the start of the match. For Lewis, a subject matter is a partition of the set of possible worlds, such that each cell of the partition is a "maximally specific way things might be with respect to the subject matter" (Lewis 1988: 162). Thus, according to partition semantics, a subject matter can be identified with a question.

While Lewis gives a useful formal analysis of what a subject matter is, we need to go one step further and model what subject matters are possible or available in a given context. To this end, we build on an idea of Seth Yalcin's about belief (emphasis added):

> The response I want to consider begins with the recognition that, for realistic believers, the possible states that belief is an attitude towards are not maximally specific. They are coarse possibilities, *possibilities reflecting answers to only so many questions*. This coarseness betrays a trace of our computational limitations, and of the notion of availability that we need. So a natural idea is that, insofar as we want a model of content that interfaces with these notions, information about this coarseness should somehow be included or reflected in the model. That is to say, the model should include information about the richness, or lack thereof, of the possible alternatives that an agent's state of belief distinguishes, about what questions these alternatives speak to and fail to speak to. (Yalcin 2016b: p. 8)

Here Yalcin connects the recognition that belief states are coarse, in that not every superset of an individual's doxastic state is accessible to that individual as a possible belief, with the analysis of questions as partitions of a set of possible worlds.

Yalcin proposes that we capture this connection between coarseness and question-sensitivity by modeling beliefs as a 'resolution sensitive state', a kind of function from partitions to partitions:[25] In Yalcin's presentation, a RESOLUTION SENSITIVE STATE is a function from partitions to subsets of that partition. A DOXASTIC STATE is a kind of resolution sensitive state where the domain represents the issues that the individual belief-holder can recognize and the range represents what the individual actually believes about that issue. However, in order to simplify the discussion, we are going to define a resolution sensitive state (and specifically a doxastic state) as a pair of a partition and a subpartition thereof. That is, we have a single pair, not a set of pairs.[26]

Figure 1 represents a resolution sensitive state $S = \langle P, R \rangle$: the small squares represent the partition P, and the grey squares represent the subpartition R.

Figure 1: Resolution sensitive state.

[25] This definition of doxastic state follows a simplifying assumption "that, given any particular resolution of logical space, a doxastic state maps it to at most one belief partition. Thus we can, somewhat more intuitively, model a doxastic state as a (partial) function from resolutions of logical space to a set of cells taken from that resolution" (Yalcin 2016a, p.16).

[26] The empirical consequence of this simplifying assumption is that a single resolution sensitive state cannot encode the relevance of incompatible sets of questions to different "subject matters". Rather, it implies closure on accessible propositions (if p is accessible in S and q is accessible in S, then $p \wedge q$ is accessible in S) and recognizable questions.

As illustrated in **Figure 2**, a proposition is an ACCESSIBLE PROPOSITION relative to a resolution sensitive state if it is the union of a subset of the cells, and it is an ACCESSIBLE POSSIBILITY if some of those cells are in *R* (in the figure, if some of them are grey).

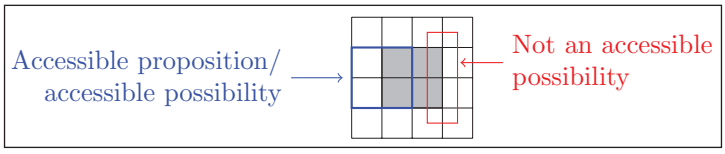

Figure 2: Accessible proposition.

A proposition is ACCESSIBLE INFORMATION (**Figure 3**) if it is the union of a subset of the partition that happens to include all of the grey cells. We call the accessible information in a doxastic state the ACCESSIBLE BELIEFS.

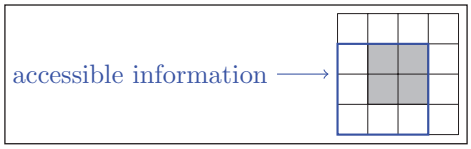

Figure 3: Accessible information (accessible belief).

If **Figure 1** is a doxastic state, then **Figure 2** highlights a proposition that the attitude holder can conceive of in that state, and **Figure 3** highlights an accessible belief in that state. (41) gives the formal definitions of the concept we have been describing.

(41)
a. A **resolution sensitive state** is a pair $\langle P, R\rangle$, where P is a partition of the set of possible worlds W and R is a subset of that partition.
b. A **doxastic state** is a resolution sensitive state representing an individual's beliefs.
c. A proposition is p is an **accessible proposition**, given a resolution sensitive state $S = \langle P, R\rangle$, iff $\exists P'_{\subseteq P}\ [p = \cup P']$
   - We write $Ap(S, p)$ to say that p is an accessible proposition given S
d. A proposition is p is **accessible information**, given a resolution sensitive state $S = \langle P, R\rangle$, iff $\exists P'_{\subseteq P}\ [p = \cup P' \wedge R \subseteq P']$
   - We write $Ai(S, p)$ to say that p is accessible information given S
e. A proposition p is an **accessible possibility**, given a resolution sensitive state $S = \langle P, R\rangle$, iff $\exists P'_{\subseteq P}\ [p = \cup P' \wedge R \cap P' \neq \emptyset]$
   - We write $Aposs\ (S, p)$ to say that p is an accessible possibility given S
f. A question Q is **recognizable**, given a resolution sensitive state $S = \langle P, R\rangle$, iff every proposition in Q is an accessible proposition in that state.
   - We write $Rec(Q, S)$ to say that Q is recognizable given S

Our analysis extends Yalcin's ideas about the belief state to the discourse-oriented belief expressed with the subjunctive. In order to do this, we treat the common ground as a resolution sensitive state as well.[27]

- A **common ground** of a context c is a resolution sensitive state $\langle P_{cg}, R_{cg} \rangle$.

This concept of the common ground is illustrated in **Figure 4**. The partition P_{cg} represents the issues that can be recognized in the context or, in Lewisian terms, the possible subject matters. These possible subject matters are mutually agreed upon in a way parallel to the information in the common ground on traditional views.[28] The grey subpartition R_{cg} represents the mutually presupposed (possibly partial) answers to those questions. From this, we can define a question as raisable if it conforms to a possible subject matter.

- A question Q is RAISABLE in a context c iff Q is recognizable in the common ground of c.

A more concrete example is given in **Figure 5**. In this conversation, the question 'Who won the World Cup in 2019?' can be recognized, as the partition 'France won', 'The US won', 'The Netherlands won' can be formed by unioning members of P_{cg}. The proposition 'France did not win' is accessible information, because the interlocutors are well informed about who played in final that year; this is represented by the fact that R_{cg} (they grey area) does not intersect the subpartition in which France won. The proposition that the US won and the proposition that the Netherlands won are both accessible possibilities, but neither is yet accessible information. That is, it is still a recognizable open question whether the US or the Netherlands won the 2019 Women's World Cup.

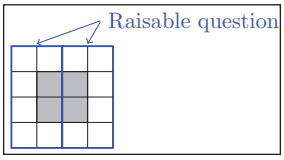

Figure 4: Common ground as a resolution sensitive state.

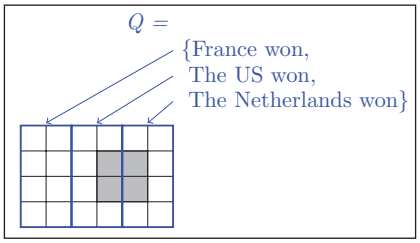

Figure 5: Example common ground and a recognizable question.

[27] Yalcin himself endorses this extension (fn.8, p.10).

[28] If one were to adopt a model of the discourse context which tracks the interlocutors' individual discourse commitments, we might represent those commitments as resolution sensitive states, and then (as suggested by a reviewer) define the possible subject matters in the conversation in terms of individuals' commitments. However, we build from a simpler model with only a common ground and QUD, enhancing the former into a resolution sensitive state.

Our use of the partition in the common ground is different from its use in analyses of questions within dynamic semantics (Aloni et al. 2007). As we've mentioned, for us the partition in the common ground represents the possible subject matters, not the questions that the interlocutors actually have raised or that they actively seek to answer. This latter function, the current question under discussion in the context, is encoded as a separate component of the context, the QUD:

- A CONTEXT c is a pair $\langle cg_c, Q_c \rangle$, where:
  - cg_c is the common ground, a resolution sensitive state, and
  - Q_c is the QUD, a question recognizable in cg_c

If a raisable question is one that partitions the common ground in a way that conforms to P_{cg}, what does a question that is *not* raisable look like? It is one whose answers cut across some of the cells in P_{cg}. For example, suppose a fair soccer match between roughly equal teams, France and the Netherlands, is about to start. At this moment, not only does no one know whether France will win or lose, but it is not even determined yet which outcome will come to pass. As a result, it is not legitimate to ask (in a literal information-seeking way) whether France will lose or to assert that France will lose (nor that France will win). In other words, the question of whether France will lose is not raisable. In formal terms, this means that the the question 'Will France lose?' does not divide the common ground in a way that follows the established partition of the common ground P_{cg}. In our model, this is the case because each cell in P_{cg} contains worlds in which France wins and worlds in which France loses.

The idea that one cannot assert the proposition that France will lose may seem implausible at first, but note how strange it would be for a normal person to say (42-a); (42-b) is much more natural.

(42) a. France will lose.
b. I think/in my opinion, France will lose.

Someone who asserts (42-a) presumes expert knowledge or foresight, which is to say they act as if the future is not unsettled.[29] Likewise, it would be odd to ask someone 'Will France lose?' — asking this question implies an implausible level of expert knowledge or perhaps that the game is rigged.

Building on idea that the common ground is a resolution sensitive state in which some questions are raisable and some are not, we can explain the pragmatic effects of mood choice with 'believe' in Italian with the following principle:

(43) A sentence of the form *X believes that* φ_{subj}, where φ_{subj} is subjunctive and $[\![\varphi]\!] = p$, presupposes that the question *?p* is raisable in the context.

This principle (merely stated for now, but to be derived from the non-homogeneity condition on human necessity in combination with the model of subject matters as resolution sensitive states)

[29] See discussion in Copley (2002).

allows us to explain the data presented in Section 2.2 concerning mood choice under 'believe' in Italian as follows:

1. **Obligatory subjunctive**. When *?p* is the QUD in the context, the subjunctive is required: (6-a), (24-a).

   Intuition: If *?p* is the QUD, it is raisable. Hence the presupposition of the subjunctive is satisfied. Given that it is satisfied, by maximize presupposition it is infelicitous not to mark it.

2. **Obligatory indicative**. Two kinds of cases:
   - When *?p* is not raisable in the context because the future is unsettled and there is no plan: (23), (24-b).
   - When *?p* is not raisable in the context because it is a matter of personal taste or personal faith: (29-b), (26).[30]

   Intuition: When *?p* is not raisable, the presupposition of the subjunctive is not satisfied, and the indicative is favored.[31]

3. **Both moods possible**. When it is unclear in the context whether *?p* is raisable, both moods are possible: (6-b), (29).

   Intuition: In contexts where both indicative and subjunctive are possible under 'believe', the difference between them is subtle. We attribute these differences to whether or not the speaker has chosen to indicate that *?p* is raisable. For example, with (6-b) the use of subjunctive is possible because *?p* (whether St. Peter's soul is in heaven) is raisable, but the use of indicative would highlight the fact that it cannot be raised productively, since the interlocutors are already committed to oppositive answers to *?p*.

   In other cases, there is an indeterminacy concerning what exactly the context is. For example, (29) allows subjunctive if an objective standard can be applied to judging the soup (its texture, ingredients, etc.), while the indicative indicates the lack of such standards (i.e. it's just a matter of personal taste).[32]

---

[30] There is another way of looking at example (26) that is compatible with our approach. It is plausible that *?p* cannot be raised because this type of context (the declaration of faith) does not allow for questions at all (only the trivial partition is in the domain of the common ground).

[31] We do not say that the subjunctive is completely ruled out. Because the subjunctive is prescriptively required under 'believe', speakers do not describe this combination as ungrammatical. Rather, what we see is a pattern of naturalness in context, where the indicative is acceptable (contrary to prescriptive rule) and the subjunctive is unnatural. Speakers who choose to follow the prescriptive rule will of course be understood; in terms of grammar, we could capture this within a ranked-constraint formalism by assuming a variant of the subjunctive mood which has the same simple necessity semantics as the indicative but which is dispreferred due to a high-ranked constraint ($*subj_{sn}$); it will not be grammatical unless the prescriptive (sociolinguistic) constraint $*believe + indic$ is higher ranked.

[32] There is not a consensus on the correct analysis of predicates of personal taste, and so we refrain from offering a formal analysis of the interaction among 'believe', mood, and PPTs in the prejacent. However, we would like to point out that Kennedy & Willer's (2016, 2020) interesting recent approach to subjective predicates and subjective attitude verbs like 'find' gives an analysis of subjectivity based on contextually relevant partitions of alternatives to

In sum, they key concept of our analysis of 'believe' + subjunctive is raisability. If the complement corresponds to the QUD, *?p* is raisable, and this requires subjunctive. If it is not raisable, indicative is required. And there are intermediate cases where the marking of *?p* as raisable reflects subtle contextual factors.

3.3 Bringing mood selection and raisability together

In the preceding two subsections, we developed an explanation of the difference in the grammaticality of subjunctive with 'believe' between French and Italian, and an explanation of the semantic/pragmatic effects of mood choice in Italian. Next we show how these two explanations are linked. Our central proposal is that the non-homogeneity condition which applies to human necessity operators, including the subjunctive, gives rise to the felicity condition for 'believe' + subjunctive (43).

The original version of the non-homogeneity condition within (36) assumes that modal backgrounds are functions from worlds to sets of propositions, and that a doxastic modal background $f_{dox}(a)$ defines a set of doxastically accessible worlds $\bigcap f_{dox}(a)(w)$, for each world w in its domain. These assumptions do not take into account Yalcin's idea that beliefs should be modeled as resolution sensitive states. We propose that once we "upgrade" the Kratzerian modal backgrounds to include the question-sensitivity of resolution sensitive states, the natural way to formalize the non-homogeneity condition turns non-homogeneity into recognizability. From this, (43) follows as a corollary.

The idea of treating a doxastic state as a resolution sensitive state $\langle P, R\rangle$ is that P summarizes the distinctions among worlds that the attitude holder can conceive of, and R identifies the subset of P which exactly covers the doxastically accessible worlds. While such an object does more than a regular accessibility relation in distinguishing accessible from inaccessible propositions, it does not have sufficient structure to order worlds like a Kratzerian modal background. That is to say, it can do the job of a modal base (identifying relevant worlds) but not the job of an ordering source (ranking those worlds). In order to function as an ordering source, the resolution sensitive states must include multiple subpartitions. In other words, we need a concept of RESOLUTION SENSITIVE MODAL BACKGROUND:

(44) A **resolution sensitive modal background** is a function F from worlds w to pairs $\langle P_{F,w}, R_{F,w}\rangle$, where
  a. $P_{F,w}$ is a partition of the set of possible worlds W, and
  b. $R_{F,w}$ is a set of subsets of $P_{F,w}$

---

the context set. In future work, we hope to draw a connection between their analysis and ours by showing that the contexts where PPTs can be used in a subjunctive clause under 'believe' are ones in which the contextually relevant partition represents them as non-subjective and the question of their truth as raisable.

Now the set of subpartitions $R_{F,w}$ is like the premise set $f(w)$ (a set of propositions) in the traditional Kratzerian modal background. Hence, we can use $R_{F,w}$ as an ordering source to order the cells in $P_{F,w}$ and define a new 'BEST' modal background with the same partition $P_{F,w}$ and a singleton second component R_{best} that includes the set of cells best-ranked by $R_{F,w}$:

(45) For any resolution sensitive modal background $G = \langle P_G, R_G \rangle$ and $A, B \in P_G$:
$A \sqsupseteq_G B$ iff $\{X \in R_G : B \in X\} \subseteq \{X \in R_G : A \in X\}$

(46) BEST (F, G, w) is only defined when $P_{F,w} = P_{G,w}$;
- When defined, BEST$(F, G, w) =$
$\langle P_{F,w}, \{\{A \in \bigcap R_{F,w} : \neg \exists B \in \bigcap R_{F,w} [B \prec_{G,w} A]\}\}\rangle$

These definitions are just like the standard ones, except that they are ranking cells of the partition P, rather than individual worlds. This reflects the idea that the worlds in a given cell cannot be distinguished from one another relative to the information in the state.

We illustrate how these definitions work when F is the *DOX* and G is *BUL*. In the case depicted in **Figure 6**, $DOX \cup BUL$ is not consistent. We see that the cells that *BUL* ranks as best in $\bigcap R_{DOX}$ are 9,7,8 and that these do not overlap.

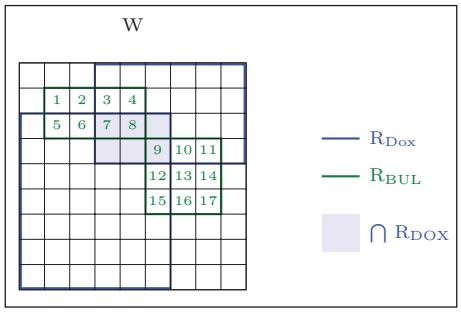

Figure 6: Ordering of *DOX* by *BUL*, without consistency.

In the case depicted in **Figure 7** $F \cup G$ is consistent, as cell 1 is contained in all the beliefs and desires of the attitude holder. This is the best cell in *DOX*, ranked by *BUL*.

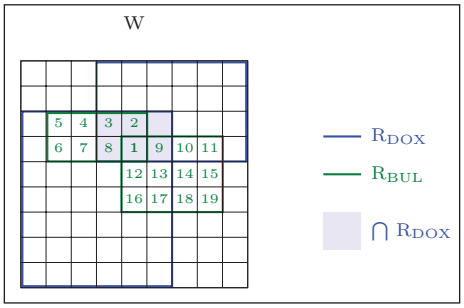

Figure 7: Ordering of *DOX* by *BUL*, with consistency.

The definition in (46) requires that the two backgrounds G and F have the same partition part P; this makes the formalization relatively simple. It corresponds to the plausible assumption, for example, that a desire state can be modeled as a pair of a bouletic background and doxastic background in which G_{bul} and F_{dox} carve up the space of possible worlds in the same way. But it is important to note that the assumption is not plausible when it comes to interactions between agents. In particular, in the case under study here, we are proposing that the subjunctive under 'believe' leads to the use of a doxastic state to order the common ground. To be more specific, the set of subpartitions R_{dox} functions as an ordering source to identify the cells of the common ground which best fit the subject's beliefs. In general, one would assume that doxastic states are more fine-grained than the common ground, since a proposition may be conceivable to one interlocutor (p is accessible in that individual's doxastic state) but not the other interlocutor.

Our official definition of BEST, given in the Appendix, takes account of the fact that a doxastic background may make more fine-grained distinctions within the space of possible worlds than the common ground, but because the definition is relatively complex, here we will only explain it informally. The idea is that a subpartition A in $R_{DOX(x),\ w}$ is used to order the the cells of the partition P_{cg} if A exactly covers some subset of P_{cg}. That is to say, if $\cup A$ is an accessible proposition in CG it can order the cells of P_{cg}. In other words, the premises from an ordering source can only order the cells compatible with the modal base if they fit the way that the modal base carves up the space of possible worlds. This instantiates the intuition that an individual's beliefs can only contribute to updating the common ground to the extent that they address questions that are recognizable within the common ground.

Now that we have a working concept of modal background that incorporates resolution sensitivity, we can give appropriate definitions of modal operators.[33]

(47) **Simple necessity** (resolution sensitive version):
$[\![indic]\!] = [\lambda p \lambda F \lambda w.Ai(F(w), p)]$

(48) **Human necessity** (resolution sensitive version):
$[\![subj]\!] = [\lambda p \lambda G \lambda F \lambda w$:
a. $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$ (non-homogeneity presupposition)
b. $Ai(\text{BEST}(F, G, w), p)]$ (truth condition)

The simple necessity operator associated with the indicative says that the complement proposition is accessible information in the modal background; when that background comes from 'believe',

[33] It is necessary to revise the definitions of accessible information and accessible possibility to account for the switch to resolution sensitive modal backgrounds:
• A proposition p is an **accessible possibility**, given a resolution sensitive state $S = \langle P, R\rangle$, iff $\exists\ P'_{\subseteq P}\ [p = \cup P' \wedge \cap R \cap P' \neq \emptyset]$
• A proposition is p is **accessible information**, given a resolution sensitive state $S = \langle P, R\rangle$, iff $\exists\ P'_{\subseteq P}\ [p = \cup P' \wedge \cap R \subseteq P']$

it is a resolution sensitive doxastic state, and the result is the meaning proposed by Yalcin (see **Figure 3**). Our analysis for 'believe' plus indicative is as follows (where $[\![\varphi]\!] = p$).[34]

(49) $[\![G \textit{ believes that } \varphi_{indic}]\!] = \lambda w[Ai(DOX(g, w), p)])]$

The human necessity operator associated with the subjunctive says that the complement proposition is accessible information in the subpartition of the modal base where each cell is among the BEST-ranked according to the ordering source. In **Figure 8**, we see that *F* is non-homogeneous with respect to *p* and that *G* ranks cell 1 as best. In all the worlds in cell 1, *p* is true, and thus is accessible information.

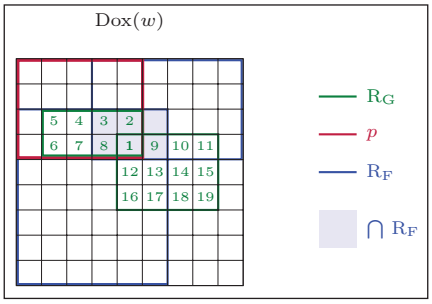

Figure 8: Human necessity: ordering of *F* by *G*.

When the modal base and ordering source come from 'want', this meaning is very close to standard one in ordering semantics:

(50) $[\![G \textit{ wants that } p_{subj}]\!] =$
  a. $Aposs(DOX(g, w), p) \wedge Aposs(DOX(g, w), \neg p)$ (non-homogeneity presupposition)
  b. $\lambda w.Ai(\text{BEST}(DOX(g), BUL(g), w), p)]$ (truth condition)

The non-homogeneity presupposition requires that both *p* and ¬*p* be accessible possibilities, i.e. possibilities that are conceivable by the attitude holder.

Finally, we turn to what happens when 'believe' combines with the subjunctive. When 'believe' takes a subjunctive clause as complement, the subjunctive operator takes the doxastic background and common ground as its arguments; the common ground functions as modal base, and the doxastic background as ordering source.

(51) $[\![G \textit{ believes that } p_{subj}]\!] =$
  a. $Aposs(\lambda w.CG, p) \wedge Aposs(\lambda\, w.CG, \neg p)$ (non-homogeneity presupposition)
  b. $\lambda w[Ai(\text{BEST}(\lambda w.CG, DOX(g), w), p)]$ (truth condition)

[34] For simplicity, the denotation in (49) leaves out the contribution of the matrix clause's indicative mood. See the Appendix for the complete analysis and compositional details.

Let us explore this step by step. **Figure 9** represents the common ground. Note that p is an accessible possibility, but not accessible information; this means that the subpartition of the common ground that represents the mutually assumed beliefs can be partitioned in p vs. $\neg p$ worlds.

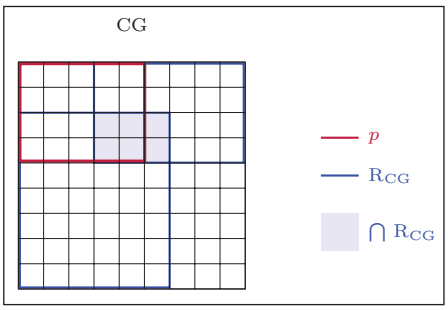

Figure 9: Non-homogeneity of $\cap R_{cg}$ with respect to p.

Another way to put this is that $\{p, \neg p\}$ is recognizable in the common ground. In other words, the question $?p$ is raisable in the context.

In **Figure 10**, we see how *DOX* ranks the cells in R_{cg}. Cell 1 is the only cell compatible with all of the members of R_{DOX}, and therefore cell 1 is best-ranked. Hence, *BEST*(*CG, DOX, w*) is as illustrated in **Figure 11**. The sentence asserts that p is available information relative to *BEST*(*CG, DOX, w*), so according to the figure, it is true.

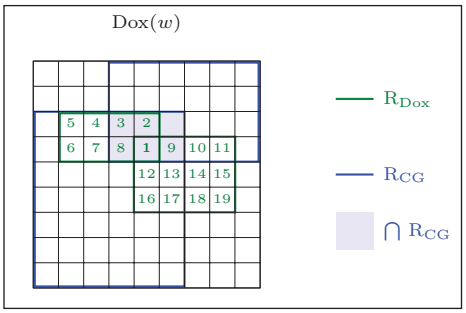

Figure 10: Ordering of $\cap R_{cg}$ by *DOX*.

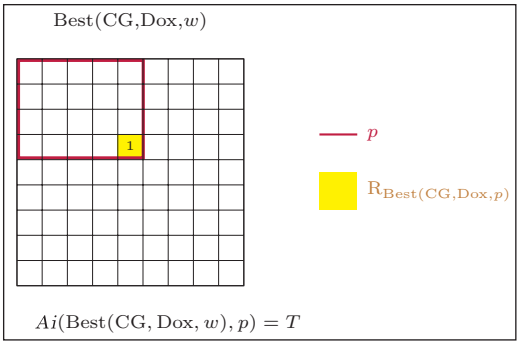

Figure 11: Best-ranked worlds are accessible information.

3.4 Other predicates

Predicates of certainty Recall that predicates of certainty like *convinto* and *certo* can take the subjunctive, as in (4-a), repeated here:

(52) Gianni è convinto che Maria sia malata.
Gianni is convinced that Mary be.PRES.SUBJ.3SG ill.
'Gianni is convinced that Mary is ill.'

We assume that these predicates refer to a single background, *CERT*, based on *DOX*. Specifically, *CERT*(*x, w*) has the same first component P_{DOX} as *DOX*(*x, w*), and its second component is the subset of the set of subpartitions R_{DOX} which correspond to the those propositions which the attitude holder believes most strongly:

(53) $[\![$ *'convinced'/'certain'* $]\!] = CERT =$
$\lambda x \lambda w.\langle P_{DOX(x,\,w)}, \{A \in R_{DOX(x,\,w)} : A$ is not below any other subpartition in $R_{DOX(x,\,w)}$ in the strength with which they are held by x in $w\}\rangle$

This says that 'certain' means 'believes to the highest degree', which is a simplification; see Barker & Taranto (2003), Taranto (2006), Krawczyk (2012), Klecha (2014), and Portner & Rubinstein (2016) for discussion relevant to 'certain'. All that's essential for the purpose of explaining its mood selection in our framework is the assumption that 'convinced'/'certain' introduce a single modal background.

This single modal background is now treated as a resolution sensitive state, and, when indicative operates over it, it simply says that the complement proposition is accessible information in *CERT*. The information that *p* is an accessible information in *CERT* is then added to the common ground.

(54) *Essere convinto* + indicative: $\lambda w[Ai(CERT(g, w), p)])]$

The subjunctive can be used with *essere convinto/certo* when *?p* is a raisable question. The denotation of the sentence is that *p* is accessible information given *CERT* as an ordering source and the common ground as modal base.

(55) *Essere convinto* + subjunctive:
a. $Aposs(\lambda w.CG, p) \wedge Aposs(\lambda w.CG, \neg p)$ (non-homogeneity presupposition)
b. $\lambda w[Ai(\text{BEST}(\lambda w.CG, CERT(g), w), p)])$ (truth condition)

According to this analysis, (52) presupposes that whether Maria is ill is a question that can be raised in the context. It is true iff the best ranked cells that are available information in *CG* according to Gianni's certain beliefs are those in which Maria is ill. Pragmatically, an assertion of this naturally can amount to an endorsement of adding 'Maria is ill' to the common ground — and all the more so if *Gianni* is replaced by the first person subject.

The following attested example (with *essere sicuro* ('be certain') rather than *essere convinto* ('be convinced')) further illustrates our point. In (56), the speaker puts forward a hypothesis for why she has been dumped by her boyfriend. She asserts that her certain beliefs, i.e. *CERT*, BEST-rank cells where it is because of her obesity; this may be taken as an indication that that she thinks this hypothesis should be accepted as common ground.[35]

(56) Il mio ragazzo mi ha tradito due mesi fa e sono sicura che
the my boyfriend me has dumped two months-ago and be.1SG.IND certain that
sia da attribuire tutto alla mia obesità.
be.PRES.SUBJ.3SG from attribute.INF all to-the my obesity
'My boyfriend dumped me two months ago, and I am certain that this is to be attributed to my obesity.'

Reportative 'Say' and cases with evidential function. With the data repeated below, we showed that 'say' allows both indicative and subjunctive in Italian:

(57) a. Gianni dice a tutti che Maria è malata.
Gianni says to everyone that Mary be.PRES.IND.3SG ill
'Gianni tells everyone that Mary is ill.'

b. Gianni dice che Maria sia malata
Gianni says that Mary be.PRES.SUBJ.3SG ill.
'According to Gianni, Mary is ill.'

The compositional analysis of these cases is the same as with 'believe'. The verbs refer to a single modal background *RPG* ('reported common ground') which can unproblematically be taken as argument by an indicative complement. When 'say' combines with the subjunctive, there is ranking of the worlds in the common ground, given the ordering imposed by the content of the saying.

(58) *Dire* + subjunctive:
a. $Aposs(\lambda w.CG, p) \wedge Aposs(\lambda w.CG, \neg p)$ (non-homogeneity presupposition)
b. $\lambda w[Ai(\text{BEST}(\lambda w.CG, RPG(g), w), p)]$ (truth condition)

Thus, (57-b) presupposes that whether Maria is ill is a question that can be raised in the context, and it means that, across the common ground, the cells which best match what Gianni says are those where she is ill. An assertion of this proposition in such a context evaluates the common ground on the basis of what Gianni said, and so it naturally is taken as a move leading towards it becoming common ground that Maria is ill.[36] The meaning is similar in its pragmatics to a reportative-evidential statement.

[35] Source: https://it.answers.yahoo.com/question/, accessed May 2017.

[36] On the idea that reportatives present *p* as eligible for becoming common ground, see also Faller (2019). We add here the idea that reportatives can provide good evidence for *p* to potentially become common ground.

As pointed to us by an anonymous reviewer, according to rule (39), the account predicts that other evidential attitudes, which mark the manner whereby information is acquired, are also eligible for combining with subjunctive. Two such cases are 'hear' (*sentire* in Italian) and 'read' (*leggere*), and the prediction is indeed borne out.

(59) Ho sentito che sia stata apprezzata da più di una
have.pres.ind.1sg heard that be.SUBJ.3sg been appreciated from more that one
giuria ed è destinata a raccogliere più di un metallo, stasera.
jury and is deemed to receive more than one metal, tonight
'I have heard that it has been appreciated by more than one jury and that it is deemed to receive more than one metal, tonight.'
https://blog.adci.it/ accessed May 2021.

(60) ho letto che abbia posseduto più di 100 moto.
have.prs.ind.1sg read that have.SUBJ.3sg possessed more than 100 motorbikes
'I have read that he has possessed more than a 100 motorbikes.'
http://www.forumtriumphchepassione.com accessed May 2021.

Fiction verbs. Some fiction verbs in Italian allow the subjunctive. *Immaginare* ('imagine') is one. As often noted (Giorgi & Pianesi 1997; Portner, 1997; Farkas, 2003; Mari, 2016; Giannakidou & Mari, 2021), the pure imagination reading, where the subject pictures a mental scene, requires the indicative, (61). In this case, a single modal background *IMG* is needed.

(61) Immaginava che andava in Italia.
Imagine.IND.IMPF.3SG that go.IND.IMPF.3SG in Italy
'He was imagining that he was going to Italy.'

(62) *Imagine* + indicative: $\lambda w[Ai(IMG(g, w), p)])]$

However, subjunctive is possible in examples like the following:

(63) Immagino che tu sia arrivato in ritardo oggi, visto il traffico.
imagine.pres.indic.1sg that you be.SUBJ.3SG arrived in late today, seen the traffic.
'Given the traffic, I imagine you were late today.'

Here the speaker intends to make a contribution to the common ground, based on his own understanding of how the world works. The interpretation according to our analysis is (64). The presupposition of the subjunctive is satisfied by the common ground being partitioned in such a way that *?p* is a raisable question. *IMG* order the worlds in *CG* in such a way that *p* worlds are ranked as best.

(64) *Imagine* + subjunctive:
a. $Aposs(\lambda w.CG, p) \wedge Aposs(\lambda w.CG, \neg p)$ (non-homogeneity presupposition)
b. $\lambda w[Ai(\text{BEST}(\lambda w.CG, IMG(g), w), p)]$ (truth condition)

In addition to this discourse-oriented use, fiction verbs can be used with the subjunctive in another type of case. These involve a shift towards a bouletic interpretation. We see an example of this with *sognare* ('dream'). When it takes indicative, *sognare* has a purely oniric interpretation. In (65), a sleeping dream is described with indicative.

(65) Ha sognato che il suo cane era un leone.
have.IND.PRES.3SG dreamt that the his dog be.IND.IMPF.3SG a lion
'He dreams that his dog was a lion.'

Here the verb refers to a single modal background *DRM*, and the output is as follows:

(66) *Dream* + indicative: $\lambda w[Ai(DRM(g, w), p)])]$

With the subjunctive, a different interpretation can arise, in which *sognare* acquires a bouletic interpretation akin to *volere* 'want'.[37]

(67) Sogna che il suo cane diventi un leone.
dream.IND.PRES.3SG that the his dog become.SUBJ.3SG a lion
'He dreams that his dog becomes a lion.'

We analyze the meaning of (67) by assuming that *sognare* can refer to the pair of background $\langle BUL, DOX^{+}\rangle$. This is a lexical ambiguity which corresponds to a shift in mood, and does not involve the special rule of interpretation for Italian (39).

As seen in (68), the same interpretation is attested in French, showing that the ambiguity is present across languages. The wish that Quebec becomes a country is grounded in the belief that it can become a country:

(68) Son Québec, il l'a dans la peau, et il rêve qu'il
His Quebec, he it has in the skin, and he dream.PRES.IND.3SG that it
devienne un pays.
become.PRES.SUBJ.3SG a country
'He has his Quebec in his skin, and he dreams that it becomes a country.'
https://www.lavoixdelest.ca/actualites/ accessed July 2020.

The presence of this reading in French supports our contention that it is due to an ambiguity in Italian as well, not to the same process that applies to 'believe' in Italian.

[37] Note the preferred future orientation.

Another relevant use of the subjunctive was pointed out to us by Ivano Ciardelli (p.c.). *Immaginare* can be used with subjunctive in a context of play or pretending such as (69).

(69) [Context: Luca and his father are playing on his bed before he goes to sleep.]
Luca immagina che il suo letto sia un aereo.
Luca imagine.PRES.IND.3SG that the his bed be.SUBJ.3SG a airplane
'Luca is imagining that his bed is an airplane.'

As in the case of (67), we assume that this exemplifies a lexical ambiguity. We propose that (69) describes the situation from the perspective of two modal backgrounds. One represents the true facts involved in the situation of play: that Luca is a boy, that his father is his father, that it is nighttime in Italy; the other represents the contribution of imagination to the world of play, including the premises that the bed is an airplane, that the stuffed animals are passengers, and so forth. The first is the modal base *F* and the second the ordering source *G*; together, these describe the world of the play as BEST(*F, G, w*).

Though we treat the differences between senses of 'dream' and 'imagine' seen in (67) and (69) as lexical ambiguities, perhaps they can be explained in terms of general rule. With both, the difference we have observed involves a bouletic component similar to 'want' and 'hope' — Luca wants to be flying an airplane and for his dog to be a lion. In this paper, we do not attempt a deeper analysis of these meaning shifts; however, see Portner & Rubinstein (2020) for a theory of true bouletics verbs like 'want' in a framework similar to ours.

One may also ask why 'imagine' allows the same discourse-oriented use of subjunctive as 'believe' (in (63)), while 'dream' does not. We suggest that this difference has to do with the evidential value of imagination and dreaming. While it can be interesting to get to know someone else's dreams, dreams are not a sufficiently good evidential basis to rank worlds in the common ground, as they cannot contribute to creating consensus, let alone finding truth. In contrast, what we imagine can contribute to finding consensus or truth, since the process of 'picturing' alternative realities can serve a heuristic for finding true explanations.

Overall, then, the picture with fiction verbs is somewhat complex. 'Dream' allows subjunctive but in a distinct bouletic use different from our focus in this paper. 'Imagine' allows both the common ground-oriented use of subjunctive seen with 'believe' as well as a bouletic use connected to situation of pretending.

3.5 False beliefs

A challenge for the claim that subjunctive mood is used with certain predicates to rank the worlds compatible with the common ground is that we can find cases where the falsity of the complement clause is settled in the conversation. Typical cases of this involve an attitude holder who is a child or someone crazy. Consider the example (70).

(70) Quel pazzo di Gianni crede che Sofia Loren sia il papa.
that crazy of John believe that Sofia Loren be.PRES.SUBJ.3SG the Pope
'John is so crazy that he believes that Sofia Loren is the Pope.'

The communicative effect of asserting (70) is to show that, if we were to have a conversation with Gianni or take Gianni's world view seriously, we would end up having having to discuss things like whether Sofia Loren is Pope. If we compare (70) to the corresponding sentence with indicative, we can identify a clear difference in pragmatics.

(71) Quel pazzo di Gianni crede che Sofia Loren è il papa.
that crazy of John believe that Sofia Loren be.PRES.IND.3SG the Pope
'John is so crazy that he believes that Sofia Loren is the Pope.'

(71) is a clinical statement recording Gianni's delusion. It reports his belief without suggesting any particular connection to a conversation we might have with him.

To account for cases like (70), we suggest that the non-homogeneity condition triggered by the subjunctive forces an expansion of the set of relevant worlds to include ones where, in this case, Sofia Loren is the Pope. The speaker and addressee are *acting as though* Gianni's beliefs were part of the common ground and the common ground is such that it is not settled whether SL is the Pope. This enlargement of the modal base is similar to what happens with 'want' in cases like (72) discussed by Heim (1992), p. 199, and Fintel (1999).

(72) I want this weekend to last forever. (But I know, of course, that it will be over in a few hours.)

Like (72), the use of (70) causes a temporary suspension of disbelief as the interlocutors consider a wider range of possibilities than they really admit in the conversation. Since the expansion triggered by (70) leads to a common ground compatible with Gianni's beliefs, it has the effect making the interlocutors pretend that they could have a real conversation with him.

4 Conclusion

In this paper we have made a contribution towards understanding the nature of crosslinguistic variation in mood systems. Our analysis builds on previous work which ties the selection of subjunctive to contexts which involve an ordering or comparison of possibilities, and it focuses on one particularly difficult problem of variation, that found with belief sentences.

Our work has made both empirical and theoretical contributions. On the empirical side, we have made a careful study of the semantic and pragmatic difference between indicative and subjunctive with 'believe' in Italian. Our investigation supports the view that the use of subjunctive leads to a discourse-oriented meaning with similarities to English slifting and the

Yucatec Maya topic + clause construction. On the theoretical side, we propose that same meaning for the subjunctive which applies in more standard contexts (like under 'want') can derive the discourse belief meaning, on the assumption that Italian has a special rule which allows the common ground to function as a default modal background. If correct, our analysis points to the possibility that other types of semantic variation can be explained on the basis of a shared core system with pragmatically motivated, language-specific extensions. Our analysis can be applied to other predicates which allow variation in mood selection in Italian, such as 'certain', 'say', and 'imagine'.

From a broader perspective, our work has a number of consequences. First, our analysis suggests that mood markers are semantically meaningful, not mere "agreeing" elements or semantically empty forms that are assigned by syntactic selection. Second, we highlight the fact that studying variation between closely related languages can prove as productive in semantics as it has in syntax. Third, building on AnderBois' (2016) work cited above, we identify a new way in which a language can mark that an embedded clause contributes the main point of assertion. And fourth, we extend Yalcin's (2016a) work on doxastic states to give an analysis of what is means for a question to be 'raisable' in context.

Appendix: Formal system

Next we present a formal system which expresses our analysis of the verbs ‘believe’ and ‘want’ in Italian and French. Commonplace features of the formal system are left implicit, for example the referential semantics of names. We adopt the λ notation from Heim & Kratzer (1998), where the domain restrictions of functions are represented in the format [λ`variable : domain restriction . value`] (though the domain condition is often left implicit and unnecessary brackets are typically omitted).

1. Syntax

   We assume the following syntactic structure for simple propositional attitude sentences. Recall that we assume mood (M) raises to C from somewhere inside S.

   (73) $[_{CP}$ [C + M] $[_{S}$ DP $[_{VP}$ V CP]]]

2. Lexical semantics of attitude verbs

   BUL, *DOX* and DOX^{+} are functions from an individual x and a world w to a resolution sensitive modal backgrounds $BUL(x, w)$, $DOX(x, w)$ and $DOX^{+}(x, w)$.

   (74) a. $[\![believe]\!] = DOX$
   b. $[\![want]\!] = \langle BUL, DOX^{+}\rangle$

3. Lexical semantics of mood morphemes and the complementizer

   The indicative is a simple necessity operator and the subjunctive is a human necessity operator. The lexical entries (already presented in (47) and (48), and repeated here) differ from the standard ones in order to accommodate the resolution sensitivity of the modal backgrounds provided by attitude verbs.

   (75) **Definition of ⊑**. Given a resolution sensitive modal background G, and world w in its domain, and any $A, B \in P_{G, w}$:
   $A \sqsubseteq_{G(w)} B$ iff $\{X \in R_{G, w} : B \in \bigcup X\} \subseteq \{X \in R_{G, w} : A \in \bigcup X\}$

   (76) **Definition of BEST**. For any resolution sensitive modal backgrounds F, G and possible world w:
   - BEST(F, G, w) is only defined when $\forall x \in P_{F, w}[\exists Y[Y \subseteq P_{G, w} \wedge x = \bigcup Y]$;
   - When defined, BEST$(F, G, w) = \langle P_{F, w}, \{\{A \in \bigcap R_{F, w} : \neg\exists B \in \bigcap R_{F, w}[B \prec_{G, w} A]\}\}\rangle$

   (77) **Simple necessity** (resolution sensitive version):
   $[\![indic]\!] = [\lambda p \lambda F \lambda w. Ai(F(w), p)]$

   (78) **Human necessity** (resolution sensitive version):
   $[\![subj]\!] = [\lambda p \lambda G \lambda F \lambda w$:
   a. $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$. (non-homogeneity presupposition)
   b. $Ai(\text{BEST}(F, G, w), p)]$ (truth condition)

4. Compositional rules

We have a function application rule and a function composition rule. Both of them allow multiple arguments to be saturated at once, when a functor applies to a tuple of individuals of the right kind. Composition only composes over individual arguments. In the cases we will look at, composition is used when the complement clause takes attitude verb as argument; the complement's denotation composes over the individual argument of the modal background(s) denoted by the verb, which will be saturated by the matrix subject.

(FA) Function application (multiple): If $[\![\alpha]\!]=f$, a function of n arguments ($n \neq 1$), and $[\![\beta]\!] = \langle d_1, \cdots, d_m\rangle$ (an m-tuple where $1 \leq m \leq n$), and if for all i, d_i is in the domain of α's ith argument:
$[\![[\alpha\ \beta]]\!] = [\![[\beta\ \alpha]]\!] = f(d_1)\cdots(d_m)$

(FC) Function composition over individuals: If $[\![\alpha]\!]=f$, a function of n arguments ($n \geq 1$), and $[\![\beta]\!] = \langle d_1, \cdots, d_m\rangle$ (an m-tuple where $1 \leq m \leq n$), and if for all i ($1 \leq i \leq m$), d_i is a function from individuals to elements in the domain of f's ith argument:
$[\![[\alpha\ \beta]]\!] = [\![[\beta\ \alpha]]\!] = \lambda x[f(d_1(x))\cdots(d_m(x))]$

5. Common ground as default (Italian)

In Italian, the common ground can saturate a modal background argument of a subjunctive which has been left unsaturated in the compositional derivation. This idea can be formalized in various ways, such as coercion, pragmatic rule, or a special syntactic element. Here we propose a coercion rule that applies in Italian. This rule is triggered at the level of a matrix S to fully saturate the embedded clause's mood, just before the matrix clause's mood is introduced.[38]

(CGD) If φ is the S node of a root clause used in context c and $[\![\varphi]\!]$ is a function from resolution sensitive modal backgrounds to propositions, then apply the coercion cgd_c to $[\![\varphi]\!]$:
– $\mathrm{cgd}_c(f) = f(\lambda w.CG_c)$

Note that this coercion rule has some similarities with assertion, defined next.

6. Assertion

Root clauses have indicative mood, which is a modal necessity operator, just as it is in embedded clauses. When a root sentence is integrated into discourse, the indicative's modal background argument must be saturated. The rule of assertion saturates it with the common ground. Our analysis of assertion has essentially the same dynamic effect as the standard Stalnakerian mechanism, but acknowledges a role for the root clause's mood.

---

[38] A similar effect to the one we describe is sometimes found in embedded clauses, as in (i), and so the restriction in (CGD) to root clauses should be relaxed.

(i) Gianni ha detto che Maria crede che sia malata.
Gianni has said that Maria believes.IND that is.SUB sick
'Gianni said that Maria believes that she is sick.'

However, we have not studied the effects of mood with two layers of embedding in detail so far, and as a result we restrict our formal theory to the root case.

(AS) If Φ is a root CP used in context *c* in world w_0, and ⟦Φ⟧ is a function from resolution sensitive modal backgrounds to propositions, identify the context *c'* such that $P_{CG_{c'}} = P_{CG_c}$ and ⟦Φ⟧ $(\lambda w[CG_{c'}])(w_0) = 1$ which is as similar to *c* as possible. Let *c'* be the new context.

If it is not possible to find a *c'* which has the same partition as *c*[39] and meets the criterion of making ⟦Φ⟧ true, the assertion fails (giving rise to a perception of infelicity). Note that accommodation can sometimes occur prior to assertion formally taking effect to avoid such infelicity (e.g. by changing the partition in a way that renders additional questions as raisable).

7. Presupposition projection with necessity operators
We assume that when a proposition *p* with presupposition *P* is the argument of a necessity operator which quantifies over a subpartition *R* that covers the set of worlds W_R, presupposition *P* is projected onto every world in W_R.
   - $Ai(F, p)$ presupposes that $\forall v \in \bigcup\bigcap R_F[v$ is in the domain of $p]$

Derivations. Next we show derivations of some crucial sentences within the system just defined. Here *p* is the proposition that Mary is ill (the denotation of the subordinate clause's S node). The labels (FA), (FC), (CGD) and (AS) indicate which composition or special interpretation rule is used.

(79) 'believe' + indicative: *Gianni crede che Maria è malata.*
   a. (FA) ⟦*indic* Maria è malata⟧ =
   $\lambda F \lambda w[Ai(F(w), p)]$
   b. (FC) ⟦crede che Maria è malata⟧ =
   $\lambda x \lambda w[Ai(DOX(x, w), p)]$
   c. (FA) ⟦Gianni crede che Maria è malata⟧ =
   $\lambda w[Ai(DOX(g, w), p)]$
   d. (FA) ⟦*indic* Gianni crede che Maria è malata⟧ =
   $\lambda F \lambda w'.Ai(F(w'), \lambda w[Ai(DOX(g, w), p)])$
   e. (AS) Make the minimal change to *CG* so that
   $\lambda F \lambda w'.\mathrm{Ai}(\mathrm{F}(\mathrm{w}'), \lambda \mathrm{w}[Ai(DOX(g, w), p)])](\lambda v.CG)(w_0) =$
   $Ai(\lambda v.CG, \lambda w[Ai(DOX(g, w), p)]) = 1$
   (The minimal change may be to add $\lambda \mathrm{w}[Ai(DOX(g, w), p)]$ to *CG*.)

(80) 'want' + subjunctive: *Gianni vuole che Maria sia malata.*
   a. (FA) ⟦*subj* Maria sia malata⟧ =
   $\lambda G \lambda F \lambda w$:
      - $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$ (non-homogeneity presupposition)
      - $Ai(\mathrm{BEST}(F, G, w), p)$ (truth condition)

[39] Thanks to Wataru Uegaki for pointing out that, if the partition could change, we would not predict infelicity in the cases where the complement fails to be raisable. Of course, a change to the partition can be accommodated, but it does not happen as a matter of course in the act of assertion.

b. (FC) ⟦vuole che Maria sia malata⟧ =
$\lambda x \lambda w$:
- $Aposs(DOX^{+}(x, w), p) \wedge Aposs(DOX^{+}(x, w), \neg p)$ (non-homogeneity presupposition)
- $Ai(\text{BEST}\ (DOX^{+}(x), BUL(x), w), p)$ (truth condition)

c. (FA) ⟦Gianni vuole che Maria sia malata⟧ =
λw :
- $Aposs(DOX^{+}(g, w), p) \wedge Aposs(DOX^{+}(g, w), \neg p$ (non-homogeneity presupposition)
- $Ai(\text{BEST}(DOX^{+}(g), BUL(g), w), p)$ (truth condition)

d. (FA) ⟦*indic* Gianni vuole che Maria sia malata⟧ =
$\lambda F \lambda w$.
- $\forall v \in \bigcup\bigcap R_{F(w')}\ [Aposs(DOX^{+}(g, v), p) \wedge Aposs(DOX^{+}(g, v), \neg p)]$ (non-homogeneity presupposition)
- $Ai(F(w'), \lambda w[Ai(\text{BEST}(DOX^{+}(g), BUL(g), w), p)])$ (truth condition)

e. (AS) Make the minimal change to *CG* so that
$Ai(\lambda v.CG, \lambda w[Ai(\text{BEST}(DOX^{+}(g), BUL(g), w), p)]) = 1$
- Presupposition: $\forall v \in \bigcup\bigcap R_{CG}\ [Aposs(DOX^{+}(g, v), p) \wedge Aposs(DOX^{+}(g, v), \neg p)]$

The sentence presupposes that in every world compatible with the common ground, both p and $\neg p$ are accessible possibilities in Gianni's doxastic^{+} state in that world. It asserts that the most desirable worlds compatible with Gianni's doxastic^{+} state, Maria is ill.

(81) 'believe' + subjunctive: *Gianni crede che Maria sia malata.*

a. (FA) ⟦*subj* Maria sia malata⟧ =
$\lambda G \lambda F \lambda w$:
- $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$ (non-homogeneity presupposition)
- $Ai(\text{BEST}(F, G, w), p)$ (truth condition)

b. (FC) ⟦crede che Maria sia malata⟧ =
$\lambda x \lambda F \lambda w$:
- $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$ (non-homogeneity presupposition)
- $Ai(\text{BEST}(F, DOX(x), w), p)$ (truth condition)

c. (FA) ⟦Gianni crede che Maria sia malata⟧ =
$\lambda F \lambda w$:
- $Aposs(F(w), p) \wedge Aposs(F(w), \neg p)$ (non-homogeneity presupposition)
- $Ai(\text{BEST}(F, DOX(g), w), p)$ (truth condition)

d. (CGD) ⟦Gianni crede che Maria sia malata⟧ =
λw :
- $Aposs(\lambda u.CG, p) \wedge Aposs(\lambda u.CG, \neg p)$ (non-homogeneity presupposition)
- $Ai(\text{BEST}(\lambda u.CG, DOX(g), w), p)$ (truth condition)

e. (FA) ⟦*indic* Gianni crede che Maria sia malata⟧ =
$\lambda F \lambda w$.
- $\forall v \in \bigcup\bigcap R_{F(w')}$ [$Aposs(\lambda u.CG$, p) $\wedge$ $Aposs(\lambda u.CG, \neg p)$] (non-homogeneity presupposition)
- $Ai(F(w'), \lambda w.\ Ai(\text{BEST}(\lambda u.CG, DOX(g), w), p)])$ (truth condition)

f. (AS) Make the minimal change to *CG* so that
$Ai(\lambda u.CG, \lambda w[Ai(\text{BEST}(\lambda u.CG, DOX(g), w), p)]) = 1$
- Presupposition: $\forall v \in \bigcup\bigcap R_{CG}$ [$Aposs(\lambda u.CG, p) \wedge Aposs(\lambda u.CG, \neg p)$] = $Aposs(\lambda u.CG, p) \wedge Aposs(\lambda u.CG, \neg p)$

As a result of the non-homogeneity presupposition associated with the subjunctive, together with rule (CDG) which saturates the modal base argument of the subjunctive with the common ground, an assertion of (81-f) presupposes that both *p* (that Maria is ill) and ¬*p* are accessible possibilities in the common ground. This presupposition is equivalent to the condition that the question of whether Maria is ill is raisable in the context.

The sentence asserts that the proposition that Maria is ill is accessible information relative to the state BEST ($\lambda u.CG, DOX(g), w$), for every *w* compatible with the mutually presupposed information in the common ground. This amounts to the assertion that those cells in the partition of the common ground which are best described by Gianni's beliefs contain only worlds in which Maria is ill. Together with the presupposition that the question of whether Maria is ill is raisable in the context, this assertion invites the inference that Maria is in fact ill; in the case where the presupposition is satisfied because the question of whether Maria is ill is already the QUD, this inference may be taken as a relevance implicature (it establishes the relevance of what is said by answering the QUD).

It is to be noted that an assertion of 'believe' + indicative can in principle also establish its relevance through an inference that the complement proposition is to be added to the common ground because it answers the QUD, but in Italian this mechanism of relevance is only available when the complement is subjunctive. The reason that it is available with the subjunctive but not the indicative is that, when *?p* is the QUD, the fact that it is the QUD has to be marked via the subjunctive's non-homogeneity presupposition in the manner just outlined. In contrast, in a language like French where the option of subjunctive is not grammatically available, the implicature can arise with the indicative.

Abbreviations

A	Ergative/Nominative/Genitive
DEF	Definite Determiner
FUT	Future
IMP	Imperfective aspect
IND	Indicative
NEG	Negation

PL	Plural
PRES	Present
REFL	Reflexive
SG	Singular
SS	Status
SUBJ	Subjunctive
TOP	Topic Marker

Acknowledgements

The authors' collaboration on this paper began during Paul Portner's stay at Institut Jean Nicod in March-April 2018. We thank the ENS for financing his Invited Professorship and Institut Jean Nicod for hosting him.

The first author presented the central ideas about Italian in Chicago in May 2017. We are deeply grateful to Anastasia Giannakidou for her precious feedback and discussion there and on countless other occasions. We also warmly thank Chris Kennedy and Malte Willer for their comments. She has also presented at the SLD Conference (Geneva 2016), NAIS Workshop (Oslo 2017), Questioning Speech Acts Workshop (Konstanz 2017), and InqBnB2 (Amsterdam 2017). We are very grateful to the audiences of those venues for discussion and suggestions, and most particularly to Andrea Beltrama, Ivano Ciardelli, Jackub Dotlacil, Regine Eckardt, Yael Greenberg, Mafred Krifka, and Sven Lauer. We are also very grateful to Cornelia Endriss for data on German, which we hope we will be able to further explore future research. The first author thanks the ANR-17-EURE-0017 FrontCog.

The second author gratefully acknowledges a research leave from Georgetown University during Spring 2018. He has presented versions of the compositional system developed here or versions of previous attempts at the Cornell Workshop on Semantics and Pragmatics (2016), New Approaches to Semantics and Modeling in Paris (2016), Yale University (2017), the Institut Jean Nicod (2018), the University of Amsterdam (2018), and Georgetown University (2018). We would like to thank these audiences, and especially Nate Charlow, Bridget Copley, Philippe Schlenker, Nathan Schneider, and Frank Veltman, for feedback. We also express our appreciation to Aynat Rubinstein for her contributions to the theory developed here through her parallel collaborations with the second author.

Competing Interests

The authors have no competing interests to declare.

References

Aloni, Maria & Butler, Alaistair & Dekker, Paul (eds.). 2007. *Questions in dynamic semantics.* Elsevier. DOI: https://doi.org/10.1163/9780080470993

Anand, Pranav & Hacquard, Valentine. 2013. Epistemics and attitudes. *Semantics and Pragmatics* 6(8). 1–59. DOI: https://doi.org/10.3765/sp.6.8

AnderBois, Scott. 2016. Semantics and pragmatics of (not-)at-issueness in Yucatec Maya attitude reports. *Semantics and Pragmatics* 9(19). 1–55. DOI: https://doi.org/10.3765/sp.9.19

Barker, Chris & Taranto, Gina. 2003. The paradox of asserting clarity. In Koskinen, Paivi (ed.), *Proceedings of the Western Conference on Linguistics (wecol)*, 10–21. Department of Linguistics, California State University.

Beyssade, Claire & Marandin, Jean-Marie. 2006. The speech act assignment problem revisited: Disentagling speaker's commitment from speaker's call on addressee. In Bonami, Olivier & Cabredo Hofherr, Patricia (eds.), *Empirical issues in syntax and semantics 6.* http://www.cssp.cnrs.fr/eiss6

Beyssade, Claire & Marandin, Jean-Marie. 2007. French intonation and attitude attribution. *Texas Linguistics Society Conference: Issues at the Semantics-Pragmatics Interface.*

Bolinger, Dwight L. 1968. Post-posed main phrases: An English rule for the Romance subjunctive. *Canadian Journal of Linguistics* 14. 3–30. DOI: https://doi.org/10.1017/S0008413100019629

Büring, Daniel. 2003. On D-trees, beans, and B-accents. *Linguistics and Philosophy* 26. 511–545. DOI: https://doi.org/10.1023/A:1025887707652

Condoravdi, Cleo. 2002. Temporal interpretation of modals: Modals for the present and for the past. In Beaver, David & Kaufmann, Stefan & Clark, Brady & Casillas, Luis (eds.), *The construction of meaning.* CSLI.

Copley, Bridget. 2002. *The semantics of the future* (Doctoral dissertation). MIT.

Copley, Bridget. 2005. Ordering and reasoning. In Gajewski, Jon & Hacquard, Valentine & Nickel, Bernard & Yalcin, Seth (eds.), *New work on modality*. MITWPL.

Ducrot, Oswald. 1972. *Dire et ne pas dire*. Paris, Hermann.

Faller, Martina T. 2019. The discourse commitments of illocutionary reportatives. *Semantics and Pragmatics* 12. 8. DOI: https://doi.org/10.3765/sp.12.8

Farkas, Donka. 1985. *Intensional descriptions and the Romance subjunctive mood.* Garland.

Farkas, Donka. 1992a. On obviation. In Sag, Ivan & Szabolsci, Anna (eds.), *Lexical matters,* 85–109. CSLI Publications.

Farkas, Donka. 1992b. On the semantics of subjunctive complements. In Hirschbueler, Paul & Koerner, K. (eds.), *Romance languages and modern linguistic theory*, 69–104. Benjamins. DOI: https://doi.org/10.1075/cilt.91.07far

Farkas, Donka. 2003. *Assertion, belief, and mood choice* [Paper presented at the workshop on conditional and unconditional modality, Vienna].

von Fintel, Kai. 1999. NPI licensing, strawson entailment, and context dependency. *Journal of Semantics* 16(2). 97–148. DOI: https://doi.org/10.1093/jos/16.2.97

Giannakidou, Anastasia. 1998. *Polarity sensitivity as (non)veridical dependency*. John Benjamins. DOI: https://doi.org/10.1075/la.23

Giannakidou, Anastasia. 2009. The dependency of the subjunctive revisited: Temporal semantics and polarity. *Lingua* 119(12). 1883–1908. DOI: https://doi.org/10.1016/j.lingua.2008.11.007

Giannakidou, Anastasia. 2011. Nonveridicality and mood choice: Subjunctive, polarity, and time. In Musan, Renate & Rathert, Monika (eds.), *Tense across languages.* Niemeyer. DOI: https://doi.org/10.1515/9783110267020.59

Giannakidou, Anastasia. 2016. Evaluative subjunctive and nonveridicality. In Błaszczak, Joanna & Giannakidou, Anastasia & Klimek-Jankowska, Dorota & Migdalski, Krzysztof (eds.), *Mood, aspect, modality revisited: New answers to old questions,* 177–217. University of Chicago Press. DOI: https://doi.org/10.7208/chicago/9780226363660.003.0003

Giannakidou, Anastasia & Mari, Alda. 2016a. Emotive predicates and the subjunctive: A exible mood ot account based on (non)veridicality. *Proceedings of Sinn und Bedeutung 20,* 288–305.

Giannakidou, Anastasia & Mari, Alda. 2016b. Epistemic future and epistemic must: Nonveridicality, evidence, and partial knowledge. In Klimek-Jankowska, Dorota & Błaszczak, Joanna & Giannakidou, Anastasia & Migdalski, Krzysztof (eds.), *Mood, aspect, modality revisited: New answers to old questions*, 75–117. University of Chicago Press.

Giannakidou, Anastasia & Mari, Alda. 2018a. The semantic roots of positive polarity items: Epistemic verbs and adverbs in English, Greek and Italian. *Natural Language and Linguistic theory* 36. 85–129.

Giannakidou, Anastasia & Mari, Alda. 2018b. A unified analysis of the future as epistemic modality: The view from Greek and Italian. *Linguistics and Philosophy 41,* 623–664. DOI: https://doi.org/10.1007/s10988-018-9235-1

Giannakidou, Anastasia & Mari, Alda. 2021. *Veridicality in grammar and thought: Modality, propositional attitudes and negation.* The University of Chicago Press. DOI: https://doi.org/10.7208/chicago/9780226763484.001.0001

Giorgi, Alessandra & Pianesi, Fabio. 1997. *Tense and aspect: From semantics to morphosyntax*. Oxford University Press.

Gosselin, Laurent. 2015. Sémantisme modal du verbe recteur et choix du mode de la complétive. *Lexique* 22. 223–246.

Groenendijk, Jeroen & Stokhof, Martin. 1984. On the semantics of questions and the pragmatics of answers. In Landman, Fred & Veltman, Frank (eds.), *Varieties of formal semantics*, 143–170. University of Amsterdam.

Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9. 183–221. DOI: https://doi.org/10.1093/jos/9.3.183

Heim, Irene & Kratzer, Angelika. 1998. *Semantics in generative grammar.* Blackwell.

Homer, Vincent. 2007. *Intervention effects: The case of presuppositions* (Master's thesis). UCLA.

Kaufmann, Stefan. 2005. Conditional truth and future reference. *Journal of Semantics* 22(3). 231–280. DOI: https://doi.org/10.1093/jos/ffh025

Kennedy, Christopher & Willer, Malte. 2016. Subjective attitudes and counterstance contingency. In Moroney, Mary & Little, Carol-Rose & Collard, Jacob & Burgdorf, Dan (eds.), *The Proceedings of SALT 26*, 913–933. CLC Publications. DOI: https://doi.org/10.3765/salt.v26i0.3936

Kennedy, Christopher & Willer, Malte. 2020. *Acquaintance inferences, subjective attitudes, and counterstance contingency: Toward a pragmatic theory of subjective meaning* [Ms. University of Chicago].

Klecha, Peter. 2014. *Bridging the divide: Scalarity and modality* (Doctoral dissertation). University of Chicago.

Kratzer, Angelika. 1981. The notional category of modality. In Eikmeyer, Hans-Jurgen & Rieser, Hannes (eds.), *Words, worlds, and contexts*, 38–74. de Gruyter. DOI: https://doi.org/10.1515/9783110842524-004

Kratzer, Angelika. 2006. *Decomposing attitude verbs* [Talk at The Hebrew University of Jerusalem honoring Anita Mittwoch on her 80th birthday, available at semanticsarchive.net/Archive/DcwY2JkM/].

Kratzer, Angelika. 2012. *Modal and conditionals: New and revised perspectives.* Oxford University Press. DOI: https://doi.org/10.1093/acprof:oso/9780199234684.003.0004

Krawczyk, Lissa. 2012. *Inferred propositions and the expression of the evidence relation in natural language: Evidentiality in Central Alaskan Yup'ik Eskimo and English* (Doctoral dissertation). Georgetown University.

Lasersohn, Peter. 2005. Context dependence, disagreement, and predicates of personal taste. *Linguistics and Philosophy* 28. 643–686. DOI: https://doi.org/10.1007/s10988-005-0596-x

Lewis, David K. 1988. Relevant implication. *Theoria* 54. 162–174. DOI: https://doi.org/10.1111/j.1755-2567.1988.tb00716.x

MacFarlane, John. 2006. *Epistemic modals are assessment sensitive* [Ms., University of California at Berkeley. To appear in a collection edited by Brian Weatherson and Andy Egan].

Mari, Alda. 2016. Assertability conditions of epistemic (and fictional) attitudes and mood variation. *Proceedings of Semantics and Linguistic Theory 26,* 61–68. DOI: https://doi.org/10.3765/salt.v26i0.3782

Mari, Alda. 2017a. Believing and asserting. evidence from mood shift. [Amsterdam, December 18–19.]. DOI: https://doi.org/10.5334/jpl.20

Mari, Alda. 2017b. Mood variation and non at-issueness [Oslo, May 8–10].

Marques, Rui. 2004. On the system of mood in European and Brazilian Portuguese. *Journal of Portuguese Linguistics* 3. 89–109.

Moulton, Keir. 2009. Clausal complementation and the wager-class. In Schardl, Anisa & Walkow, Martin & Abdurrahman, Muhammad (eds.), *Proceedings of the thirty-eighth annual meeting of the North East Linguistic Society (NELS 38),* 165–178. GLSA.

Portner, Paul. 1997. The semantics of mood, complementation, and conversational force. *Natural Language Semantics* 5. 167–212. DOI: https://doi.org/10.1023/A:1008280630142

Portner, Paul. 2004. The semantics of imperatives within a theory of clause types. In Watanabe, Kazuha & Young, Robert B. (eds.), *Proceedings of semantics and linguistic theory 14*, 235–252. CLC Publications. http://semanticsarchive.net/Archive/mJlZGQ4N/. DOI: https://doi.org/10.3765/salt.v14i0.2907

Portner, Paul. 2018. *Mood*. Oxford University Press. DOI: https://doi.org/10.1093/oso/9780199547524.001.0001

Portner, Paul & Rubinstein, Aynat. 2013. Mood and contextual commitment. In Chereches, Anca (ed.), *The proceedings of SALT 22,* 461–487. CLC Publications. http://elanguage.net/journals/salt/article/view/22.461/3533. DOI: https://doi.org/10.3765/salt.v22i0.2642

Portner, Paul & Rubinstein, Aynat. 2016. Extreme and non-extreme deontic modals. In Charlow, Nate & Chrisman, Matthew (eds.), *Deontic modals.* Oxford University Press. DOI: https://doi.org/10.1093/acprof:oso/9780198717928.003.0010

Portner, Paul & Rubinstein, Aynat. 2020. Desire, belief, and semantic composition: Variation inmood selection with desire predicates. *Natural Language Semantics* 28(4). 343–393. DOI: https://doi.org/10.1007/s11050-020-09167-7

Quer, Josep. 1998. *Mood at the interface.* Holland Academic Graphics.

Quer, Josep. 2001. Interpreting mood. *Probus* 13. 81–111. DOI: https://doi.org/10.1515/prbs.13.1.81

Roberts, Craige. 2012. Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics and Pragmatics* 5(6). 1–69. DOI: https://doi.org/10.3765/sp.5.6

Ross, John R. 1973. Slifting. In Gross, Maurice & Halle, Morris & Schützenberger, Marcel P. (eds.), *The formal analysis of natural language,* 133–169. Mouton. DOI: https://doi.org/10.1515/9783110885248-009

Schlenker, Philippe. 2005. The lazy Frenchman's approach to the subjunctive (speculations on reference to worlds and semantic defaults in the analysis of mood). In Geerts, Twan & van Ginneken, Ivo & Jacobs, Haike (eds.), *Romance languages and linguistic theory 2003: Selected papers from "Going Romance",* 269–310. John Benjamins. DOI: https://doi.org/10.1075/cilt.270.15sch

Silk, Alex. 2018. Commitment and states of mind with mood and modality. *Natural Language Semantics.* DOI: https://doi.org/10.1007/s11050-018-9144-4

Simons, Mandy. 2007. Observations on embedding verbs, evidentiality, and presupposition. *Lingua* 117(6). 1034–1056. DOI: https://doi.org/10.1016/j.lingua.2006.05.006

Simons, Mandy & Tonhauser, Judith & Beaver, David & Roberts, Craige. 2011. What projects and why. In Li, Nan & Lutz, David (eds.), *The Proceedings of SALT 20.* CLC Publications. DOI: https://doi.org/10.3765/salt.v20i0.2584

Smirnova, Anastasia. 2012. The semantics of mood in Bulgarian. *Proceedings of the chicago linguistics society 48.* Chicago Linguistics Society.

Stephenson, Tamina. 2007a. A parallel account of epistemic modals and predicates of personal taste. In Puig-Waldmüller, Estela (ed.), *Proceedings of Sinn und Bedeutung,* 583–597. Universitat Pompeu Fabra. http://mutis.upf.es/glif/pub/sub11/individual/stephenson.pdf

Stephenson, Tamina. 2007b. *Towards and theory of subjective meaning* (Doctoral dissertation). Massachusetts Institute of Technology. http://semanticsarchive.net/Archive/2QxMjk0O

Taranto, Gina. 2006. *Discourse adjectives.* Routledge.

Vet, Co. 1994. 'Savoir' et 'Croire'. *Langue française*, 56–68. DOI: https://doi.org/10.3406/lfr.1994.5714

Villalta, Elisabeth. 2008. Mood and gradability: An investigation of the subjunctive mood in Spanish. *Linguistics and Philosophy* 31(4). 467–522. DOI: https://doi.org/10.1007/s10988-008-9046-x

Yalcin, Seth. 2016a. Belief as question-sensitive. *Philosophy and Phenomenological Research* 97(1). 23–47. DOI: https://doi.org/10.1111/phpr.12330

Yalcin, Seth. 2016b. Modalities of normality. In Charlow, Nate & Chrisman, Matthew (eds.), *Deontic modality*, 230–55. Oxford University Press. DOI: https://doi.org/10.1093/acprof:oso/9780198717928.003.0009