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*Daroo ka↑: The interplay of deictic modality, sentence type, prosody and tier of meaning

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Abstract This study examines the interaction of the Japanese modal auxiliary *daroo* with different sentence types and intonation. A detailed investigation of *daroo* reveals an interesting paradigm with respect to parameters such as clause type, boundary tone, tier of meaning and pragmatic context. I propose that *daroo* is a use-conditional speech act operator which asserts the epistemic knowledge of the speaker. The proposal is formally implemented in the framework of inquisitive epistemic logic. That is, *daroo* marks an assertion of an entertain modality. A rising intonational contour is analyzed as a prosodic morpheme that is paratactically associated to its host and functions as a use-conditional question operator that renders a truth-conditional declarative into a use-condition of question act. A new composition rule that indicates how to interpret paratactically associated use-conditional items is also proposed.

1 Introduction

Many languages express question meanings morpho-syntactically and prosodically. In Japanese, the question particle *ka* marks a sentence as interrogative (1) with or without rising prosody ('↑' henceforth; L%H% in J_ToBi (Venditti 2005a)).[1]

(1) John-ga kuru ka(↑)
John-NOM come Q
'Is John coming?'

A question-like meaning can also be expressed by a declarative sentence with rising intonation:[2]

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[1] Following the standard practice in the literature of formal semantics and philosophy of language, I use the term "interrogative" to refer to a type of syntactic clause and the term "question" to refer to its semantic content (see Cross & Roelofsen 2020).

[2] (2) is less marked than (1) with rising intonation ↑. Intuitively, the speaker of (1) seems to be male to be talking to his junior while (2) does not have such a connotation: The speaker could be either male or female and they are casually talking to their friends.

(2) John-ga kuru↑
John-NOM come
'John is coming?'

Although all of these utterance types express some kind of question meaning, previous analyses (Büring & Gunlogson 2000; Nilsenova 2002; Gunlogson 2003; Truckenbrodt 2006a; Westera 2013; Sudo 2013; Northrup 2014; Malamud & Stephenson 2015; Farkas & Roelofsen 2017) agree that they are not completely interchangeable. Two questions naturally arise as to:

(3) a. What are the differences between these utterance types that express question-like meanings?
b. What are the sources of the differences?
In particular, how can we compositionally derive the different meanings?

Tha goal of this paper is to answer these questions by invetigating the interaction between the Japanese sentence-final auxiliary *daroo*, sentence type and intonation. The paradigm of *daroo*-sentences helps us answer (3-a), since each item in the paradigm has a distinct meaning or grammatical judgement as in (4). (4-a) expresses the speaker's bias toward the prejacent, (4-b) is a self-addressing question, (4-c) functions as a tag-question, and (4-d) is ungrammatical:

(4) a. Marie-wa wain-o nomu daroo
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, I bet./Probably, Marie drinks wine.' (Falling declarative)
b. Marie-wa wain-o nomu daroo ka.
Marie-TOP wine-ACC drink DAROO Q
'I wonder if Marie drinks wine.' (Falling interrogative)
c. Marie-wa wain-o nomu daroo↑
'Marie drinks wine, right?' (Rising declarative)
d. *Marie-wa wain-o nomu daroo ka↑
'I'm wondering if Marie drinks wine, right?' (Rising interrogative)

By examining the grammaticality and interpretations of *daroo*-sentences, the current paper aims to answer (3-b). In other words, I offer an anlysis that answers the following questions:

(5) a. What is the syntax and semantics of the sentence-final modal *daroo*?
b. What is the syntax and semantics of ↑ (Final Rise)? In particular, how are intonational morphemes like ↑ associated to their host utterances?
c. How do the elements at the layered matrix CP syntactically and semantically interact with each other?

In answering Question (5-a), first I propose that *daroo* is a speech act operator that moves to the head position of Speech Act Phrase and yields an assertion of a modalized statement or issue. In definining its semantics, I employ the framework of inquisitive epistemic logic (IEL) (Ciardelli & Roelofsen 2015), since it provides a model in which modal operators can embed both declarative and interrogative sentences.

As for Question (5-b), I propose that ↑ is a prosodic question operator that is paratactically associated (Lyons 1977; Bartels 1999) to the host utterance. I also introduce a new composition system, $\mathcal{L}_{\otimes}$ which is obtained by adding a rule that indicates how to interpret

paratactically associated use-conditional morphemes to McCready's (2010) type system for conventional implicatures, $\mathcal{L}_{CI}^{+S}$. In the previous studies on the semantics of intonational items (Bartels 1999; Gunlogson 2003), it has been generally presumed that the intonational item is somehow connected to its host sentence and affects its semantics or projects an additional interpretation. The current paper offers a more concrete theory of the configurational and compositional association between the prosodic morpheme and its host utterance.

The lexical items in question, i.e., the sentence-final *daroo*, the question particle with ↑, and the stand-alone prosodic morpheme ↑, all appear at the layered matrix CP, which is claimed to be the potion where illocutionary forces are syntactically encoded (Rizzi 1997; Cinque 1999; Speas & Tenny 2003). In answering Question (5-c), I propose that these items are use-conditional items (UCIs) that engender use-conditions of speech acts like assertions and questions (Gutzmann 2015). Then, I show how these use-conditional meanings structurally and type-theoretically interact with each other and end up in the distributional pattern sketched in (4).

The paper is structured as follows. Section 2 summarizes introspection-based data relating to the distribution of *daroo*-sentences in the different clause types and with the different boundary tones sketched in (4). In Section 3, I propose a syntax and semantics for *daroo* and three question operators in Japanese: *ka*, *ka*↑ and ↑. Section 4 demonstrates how the proposals account for the paradigm presented in Section 2. In Section 5, I discuss two alternative approaches and show how they fail to account for the data. Section 6 concludes the paper.

2 Basic Paradigm

2.1 Falling Declaratives: *daroo*

When *daroo* follows a declarative sentence and the entire sentence is uttered with falling intonation as in (6), it conveys that the speaker has a bias toward the prejacent clause *Marie-wa wain-o nomu* 'Marie drinks wine'.

(6) Marie-wa wain-o nomu daroo
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, I bet./Probably, Marie drinks wine.'

The generalization that *daroo*-declaratives with falling intonation indicate "the speaker's bias" comes from the following observations: 1) their co-occurrence with probability adverbs is restricted, and 2) they have an obligatory wide-scope reading under *because*-clauses.

As observed by Sugimura (2004), high-probability adverbs can co-occur with *daroo* as in (7), while low-probability adverbs such as *moshikasuruto* 'maybe' cannot as in (8).[3]

[3] As observed by Hara (2006), *daroo* has an additional interesting semantic-pragmatic property. That is, α-*daroo* cannot be used when the speaker has direct/indirect evidence for the prejacent α, as can be seen in the translations of Izvorski's (1997) 'Wine bottle scenario' (i) and (ii), respectively.

(i) a. Direct Evidence: The speaker directly witnessed him drinking a lot.
b. Kinou John-wa wain-o takusan nonda ∅/#daroo/#yooda.
yesterday John-TOP wine-ACC many drank ∅/DAROO/YOODA
'John drank a lot of wine yesterday.'

(ii) a. Indirect Evidence: There are a lot of empty wine bottles in John's room.

(7) Kare-wa tabun/kitto kuru daroo.
he-TOP probably/certainly come DAROO
'Probably/Certainly, he will come.'

(8) *Kare-wa moshikasuruto kuru daroo.
he-TOP maybe come DAROO

(Sugimura 2004)

This contrast indicates that some minimal degree of bias toward the prejacent clause is required to utter a *daroo* sentence, and this requirement conflicts with the low degree of commitment encoded in the low probability adverb *moshikasuruto* 'maybe' in (8).[4]

The asymmetry between (9) and (10) suggests that the holder of the bias indicated by *daroo* has to be the speaker.

(9) Boku-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
I-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), I took an umbrella with me.'

(10) #John-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
John-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), John took an umbrella with him.'

In (9), the speaker's assessment of the likelihood of rain caused his bringing an umbrella with him. The infelicity of (10) comes from the fact that the agent of the bias expressed by *daroo* cannot be shifted to *John*. The sentence ends up meaning that the speaker's bias toward 'it will rain' has caused John to bring an umbrella, instead of the intended reading according to which *John*'s assessment of the likelihood of rain causes him to bring an umbrella.

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b. Kinou John-wa wain-o takusan nonda #∅/#daroo/yooda.
'It seems John drank a lot of wine yesterday.'

When can α-*daroo* be used? It is actually not very easy to characterize the exact range of felicitous situations. According to Hara (2006), α-*daroo* denotes the speaker's epistemic bias for α as derived from reasoning and not from observable (direct or indirect) evidence.

(iii) a. General Knowledge: John likes wine very much.
b. Kinou John-wa wain-o takusan nonda #∅/daroo/#yooda.
'Probably, John drank a lot of wine yesterday.'

I adopt Hara & Davis's (2013) explanation. Hara & Davis (2013) argue that Hara's (2006) characterization of *daroo* is not ideal because it is negatively defined. Instead, Hara & Davis (2013) employ Optimality Theoretic Pragmatics (Blutner & Zeevat 2004; Zeevat 2004) and show that the distribution of *daroo* can be explained as a result of pragmatic competition. In a nutshell, the definition of *daroo* does not lexically encode the evidencelessness condition, and it simply expresses the bias toward the prejacent proposition. Now, *daroo* is in competition with the bare assertion (indicated by ∅ in (i-b)-(iii-b)) and the evidential *yooda* 'it seems'. When the speaker has direct evidence, she should assert the bare form as in (i-b), since it is the most economical, hence optimal. When the speaker only has indirect evidence, the speaker should choose the *yooda* ending as in (ii-b), since it lexically encodes the evidential meaning (Hara 2017; Hara et al. 2020). Elsewhere, *daroo* is used as in (iii-b). Thus, following Hara & Davis (2013), I do not have any evidence-sensitivity condition in the lexical semantics of *daroo* presented in Section 3.3.

[4] Furthermore, Hara (2006) shows that *daroo* takes a higher scope than other "normal" modals and argues that there are two kinds of modalities in Japanese, root-level and proposition-level. The root-level modals include *daroo*, *tabun/kitto* 'probably/certainly' and *moshikasuruto* 'maybe', while the proposition-level modals include *kanarazu* 'certainly', and *kanoosei-ga aru/hikui* 'the possibility exists/is low'. See Section 3.3.2 and Appendix C.

Contrasts like those in (9) and (10) demonstrate that in falling declaratives, *daroo* expresses the *speaker's bias* toward the prejacent clause.[5]

2.2 Falling Interrogatives: *daroo ka*

Polar interrogatives in Japanese are indicated by the sentence final particle *ka*. When *daroo* occurs within such a falling interrogative, it is understood as a self-addressing question, as in (11) uttered with the pitch profile in Figure 1.

(11) Marie-wa wain-o nomu daroo ka.
Marie-TOP wine-ACC drink DAROO Q
'I wonder if Marie drinks wine.'

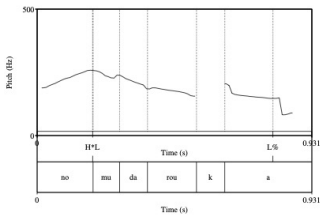

Fig. 1 Falling Interrogative

In other words, by producing a construction like (11), the speaker is interrogating her own knowledge state, i.e., entertaining an issue, namely the question of whether or not Marie drinks wine.[6]

Note also that unlike falling *daroo*-declaratives, falling *daroo*-interrogatives do not commit the speaker to the prejacent proposition:

(12) Ashita hareru daroo ka. Zenzen wakar-anai.
tomorrow sunny DAROO Q at.all understand-NEG
'I wonder if it will be sunny tomorrow. I have no idea.'

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[5] When *daroo* is embedded under an attitude predicate, the holder of the bias can be the subject of the attitude predicate as well. See Footnote 31.

[6] An anonymous reviewer questioned this self-addressing nature of the construction since in (i), a falling *daroo*-interrogative seems to be used to address the hearer:

(i) Nee, kono-hon Taroo-kun-wa yomu daroo ka.
Hey, this-book Taro-Mr.-TOP read DAROO Q
'Hey, I wonder if Taro will read this book.'

I argue that the utterance in (i) is interpreted as a question directed to the addressee at the pragmatic level. In other words, the construction semantically denotes a description of the speaker's epistemic state, i.e., it indicates that the speaker is entertaining an issue (see Section 4 for the formal implementation). Together with a discourse marker like *nee* 'hey', the utterance pragmatically functions as an indirect question act just as in the English translation 'I wonder ...', which can function as a question directed at the hearer.

(11) cannot be a matrix question, so *daroo* has to take widest scope. First, in terms of prosody, if (11) were a matrix question, it should be able to end with a final rise. However, as we will see below in Section 2.4, rising *daroo-ka* is ungrammatical:

(13) *Marie-wa wain-o nomu daroo ka↑
Marie-TOP wine-ACC drink DAROO Q
Intended: 'I'm wondering if Marie drinks wine, right?'

Second, in terms of interpretation, as shown by Uegaki & Roelofsen (2018), (11) cannot be a matrix question because it cannot be responded to with "why do you ask me such a thing?":

(14) A: Marie-wa wain-o nomu daroo ka.
Marie-TOP wine-ACC drink DAROO Q
B: #Nande watashi-ni sonnna koto kiku no?
why I-DAT such thing ask Q
'Why do you ask me such a thing?' (adopted from Uegaki & Roelofsen 2018)

Similarly, a falling *daroo-ka* cannot be an answer to "what do you want to know?"

(15) A: Nani-o siri-tagat-teiru no?
what-ACC know-want-ASP Q
'What do you want to know?'
B: Watasi-ga siri-tai-no-wa Marie-wa wain-o nomu (#daroo) ka desu.
I-NOM know-want-NML-TOP Marie-TOP wine-ACC drink daroo Q COP
Intended: 'What I want to know is whether (I believe) Marie drinks wine.'

The question particle *ka* is optional for *wh*-interrogatives as in (16). In other words, the *wh*-word *nani* 'what' alone can mark the construction as an interrogative.[7]

(16) Tsugi-wa nani-ga okoru (ka)↑
next-TOP what-NOM happen Q
'What will happen next?'

This optionality of *ka* in *wh*-interrogatives predicts that falling *wh*-interrogatives with *daroo* are always interpreted as self-addressing questions with or without *ka*. This prediction is indeed borne out, as shown in (17):[8]

(17) Tsugi-wa nani-ga okoru daroo (ka).
next-TOP what-NOM happen DAROO Q
'I wonder what happens next.'

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[7] Rising intonation (↑) is not optional in (16) since the interpretation would change if it is uttered without ↑, namely with falling intonation as in (i).

(i) Tsugi-wa nani-ga okoru (ka).
next-TOP what-NOM happen Q

Intuitively, (i) is a mere statement of an issue of what happens next, rather than a question addressed to someone. The semantics of tonally unmarked *ka* proposed in Section 3.4 explains this intuition.

[8] I owe this example to an anonymous reviewer. The interaction between *daroo* and *wh*-interrogatives is analyzed in Section 4.5.

To recapitulate, falling *daroo*-interrogatives seem to express self-addressing questions in which the speaker is entertaining a certain issue, so they naturally translate as "I wonder if ..." in English.

2.3 Rising Declaratives: *daroo*↑

Let us now turn to the rising counterparts of the above two types. *Daroo* declaratives can be uttered with Final Rise intonation (L%H% in the J_ToBI system (Venditti 2005b)). Such utterances seem to have a function similar to tag/confirmation questions, as seen in (18) pronounced with the pitch profile in Figure 2.

(18) Marie-wa wain-o nomu daroo↑
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, right?'

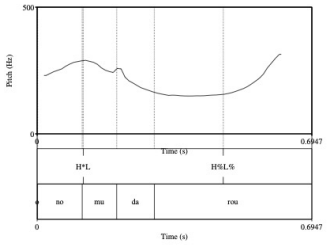


Fig. 2 Rising Declarative

Put another way, in uttering a *daroo*-declarative with Final Rise, the speaker expresses her bias toward the prejacent 'Marie drinks wine' and seeks agreement from the addressee by asking a question 'Does Marie drink wine?' at the same time.

Note that even with a rising contour, the speaker's bias does not disappear. When the context is such that the speaker is epistemically neutral, a rising *daroo*-declarative is infelicitous:[9]

(19) Context: A has no idea what Marie likes. A asks B if Marie drinks wine.
A: #Marie-wa wain-o nomu daroo↑
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, doesn't she?'

Sudo (2013, 18) also observes that rising *daroo*-declaratives "carry strong positive epistemic bias, but no evidential bias" and "imply that the speaker expects that the positive answer should be the case".[10]

[9] I owe example (19) to an anonymous reviewer.

[10] The sentences that Sudo (2013) examines end with *desho* as in (i). *Desho(o)* is a polite form of *daroo*. Sudo (2013) treats *desho* as a question particle and name the sentences like (i) as positive polarity questions (PPQs) with *-desho*. I consider them rising *daroo*-declaratives as *desho(o)*-sentences have exactly the same interpretational paradigm as *daroo*-sentences.

The following example also shows that the speaker is expressing their bias while seeking agreement from the addressee at the same time.[11] In (20-a), the presence of *daroo* allows the speaker to continue without giving up their turn. If *daroo* is dropped as in (20-b), the speaker indicates their ignorance regarding the issue, and so cannot continue without receiving the addressee's response.

(20) a. Marie-wa wain-o nomu daroo↑ Dakara omiyage-wa kore-de ii jan.
Marie-TOP wine-ACC drink DAROO↑ so souvenir-TOP this-with good PRT
'Marie drinks wine, right? So this should be okay as a souvenir (for her).'

b. #Marie-wa wain-o nomu↑ Dakara omiyage-wa kore-de ii jan.
Marie-TOP wine-ACC drink↑ so souvenir-TOP this-with good PRT
'#Does Marie drink? So this should be okay as a souvenir (for her).'

2.4 Rising Interrogatives: *daroo ka*↑

Finally, Final Rise appears to be incompatible with *daroo* interrogatives. Examples like (21), produced with a pitch profile like that in Figure 3, are judged as deviant or unacceptable in out of the blue contexts by native speakers[12]

(21) *Marie-wa wain-o nomu daroo ka↑
Marie-TOP wine-ACC drink DAROO Q
'I'm wondering if Marie drinks wine, right?'

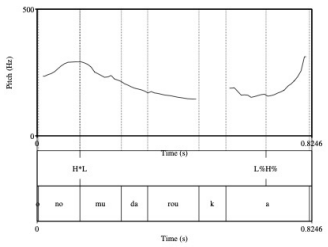


Fig. 3 Rising Interrogative

(i) John-wa hidarikiki desho?
John-TOP lefty Q
'Is John lefty? (Sudo 2013, 18)

[11] I owe example (20) to an anonymous reviewer.

[12] *Daroo*-interrogatives with a variant of Final Rise L%H%, namely Final High H% can be made felicitous in a very particular kind of context. See footnote 42.

2.5 Summary

Daroo indicates the speaker's bias in falling declaratives, but its interpretation varies as a function of both the clause type and the final prosody.[13]

(22) Meaning of *daroo* according to sentence type and intonation

	Falling	Rising
Declarative	*daroo* statement ('I bet')	*daroo*↑ tag/confirmation Q ('... right?')
Interrogative	*daroo ka* self-addressing Q ('I wonder')	*daroo ka*↑ *

Note that *daroo* can occur with either a declarative or an interrogative. The purpose of this paper is to account for this variation in the distribution and interpretation.

3 Proposals

The previous section gave an informal characterization of the distribution of *daroo* with respect to different clause types and sentence-final intonations. In order to derive the distribution and interpretations summarized in (22), I make the following proposals.

(23) Proposal 1
Daroo is a use-conditional assertion act operator:
Syntax: *Daroo* is a speech act head that contains an uninterpretable [uROOT] feature that needs to be checked off by [ROOT] at Speech Act (SA) head.
Semantics: The assertoric content of *daroo* includes an entertain modal E_{SPKR_c} in inquisitive epistemic logic (IEL), which expresses epistemic issues associated to the speaker in context c, SPKR_c.[14]

(24) Proposal 2
There are three kinds of question operators in Japanese that take an at-issue declarative and render it to an interrogative: $\text{C}_{[\text{Q}]}$, $\text{Utter}_{[\text{Q}]}$↑ and ↑. The question feature [Q] is realized by the particle *ka*, the *wh* word in Spec CP or both. The three operators $\text{C}_{[\text{Q}]}$, $\text{Utter}_{[\text{Q}]}$↑ and ↑ all occur in the matrix CP layer, but they are different in the following respects:
a. $\text{C}_{[\text{Q}]}$ and $\text{Utter}_{[\text{Q}]}$↑ are morpho-syntactically integrated within the utterance, while ↑ is paratactically associated to the entire utterance.
b. $\text{C}_{[\text{Q}]}$ is a complementizer that returns a truth-conditional interrogative while $\text{Utter}_{[\text{Q}]}$↑ and ↑ are utterance operators that return a use-condition of question acts.

Note that *daroo* and $\text{Utter}_{[\text{Q}]}$↑ and ↑ are all use-conditional operators that return use-conditional items, but they are syntactically heterogeneous. *Daroo* is a speech act operator that occupies the head position of Speech Act Phrase. $\text{Utter}_{[\text{Q}]}$↑ occupies the head position

[13] The judgements are empirically justified by two experimental tasks with fourteen participants each.

[14] Hara (2018), a precursor of the current paper, and Uegaki & Roelofsen (2018) also analyze *daroo* as an entertain modal in IEL. See Appendix D for a comparison between the current proposal and Uegaki & Roelofsen (2018).

of Utterance Phrase. ↑ is only paratactically associated to the entire utterance, and thus does not project its own phrase.

The following sections are organized as follows: Section 3.1 first introduces IEL, which will be employed to define the semantics of *daroo* and the three interrogative operators. To prepare to account for the semantic composition of these items, Section 3.2 presents Gutzmann's (2015) notion of use-conditions of sentential moods and McCready's (2010) language for conventional implicatures with shunting types, $\mathcal{L}_{CI}^{+S}$. Sections 3.3 and 3.4 provide arguments for the proposals in (23) and (24), respectively. I also introduce a new composition system, $\mathcal{L}_{\otimes}$, that includes a combinatoric rule that indicates how to interpret paratactically associated morphemes.

3.1 Background 1: IEL

My analysis of the semantics of *daroo*, the question particles *ka*, *ka*↑ and Final Rise ↑ without morphosyntactic content is situated within the framework of inquisitive epistemic logic (IEL) (Ciardelli & Roelofsen 2015). IEL offers a framework that models modal operators which embed both declarative and interrogative sentences. To illustrate, the English attitude predicate *know* takes a declarative clause as its complement in (25) but takes an interrogative clause in (26).

(25) Ali knows that Marie drinks wine.

(26) Ali knows who drinks wine.

In traditional approaches (Karttunen 1977; Heim 1994; Lahiri 2000; Spector & Egré 2015), where a declarative denotes a set of possible worlds and an interrogative denotes a set of sets of possible worlds, an interrogative clause that is embedded under predicates like *know* are analyzed as coerced into its declarative counterpart. That is, (26) is paraphrased as in (27).

(27) There is a proposition p such that Ali knows p and p is an answer to the question *who drinks wine*.

Recent work in inquisitive semantics (Ciardelli & Roelofsen 2015, 2018; Uegaki 2015; Theiler et al. 2018; Uegaki & Roelofsen 2018), on the other hand, argues that both declarative and interrogative clauses denote sets of sets of possible worlds, i.e., sets of propositions. Thus, the predicate *know* always embeds sets of propositions, and it is not necessary to coerce the semantics of an interrogative to that of its declarative counterpart.

In IEL, there are two modal operators, a knowledge modality K and an entertain modality E. The operator K encodes an agent's information state just as in standard epistemic logic, and it takes both a declarative and an interrogative sentence as its argument just as Englsh *know* does. The operator E encodes an agent's inquisitive state, which encapsulates the issues that the agent entertains. The operator E is useful in formulating the meaning of English *wonder* as in (28).[15]

(28) Ali wonders whether Marie drinks.

[15] Note that E cannot be a translation of English *wonder* as it cannot embed declarative clauses. Thus, Ciardelli & Roelofsen (2015) defines the opeartor W as follows: "$W_a\varphi := \neg K_a\varphi \wedge E_a\varphi$" (Ciardelli & Roelofsen 2015, 1659). See also (40) below.

(28) is informally paraphrased as follows: Ali is entertaining the issue *whether Marie drinks*, so once Ali's issues are all resoved, either Ali knows Marie drinks or Ali knows Marie does not drink.

There are at least three reasons why I adopt the IEL framework to analyze *daroo*-sentences. First, as we have seen in Section 2, the hallmark of the Japanese modal particle *daroo* is that it can embed both declaratives and interrogatives. The semantics of IEL is readily applicable: The modal operator E embeds both a declarative and an interrogative since both denote the same semantic object, a set of propositions.

Second, the seat of knowledge of the proposition embedded under *daroo* is the speaker by default (see Section 2.1), but it can be shifted to another agent when it is embedded under attitude predicates as can be seen in (29).

(29) a. Mary-wa John-ga kuru daroo to omot-teiru.
Mary-TOP John-NOM come DAROO COMP think-PROG
'Mary thinks that probably, John will come.'
b. Boku-wa soo-wa omow-anai-kedo.
I-TOP so-TOP think-NEG-though
'I don't think so (that he will come), though.' (Hara 2006, 128-129)

It is straightforward to implement this shifting process of the default agent in IEL, since IEL, as with standard epistemic logic, models the knowledge and inquisitive states of an agent a.

The third motivation on adopting IEL relates to the logical properties of K and E, so we delay the discussion till Section 3.1.4. In a nutshell, when the embedded clause is a declarative α, $E_a\alpha$ is equivalent to $K_a\alpha$. Thus, *daroo* is unambiguously defined as E.

3.1.1 Issues

Let $\mathcal{W}$ be the set of all possible worlds. As with standard epistemic logic and possible worlds semantics, an information state and a proposition in IEL are both identified with a set of possible worlds. IEL introduces another dimension which can characterize the issues that are entertained by the agents. An issue is defined as a set of sets of possible worlds, i.e., a set of propositions/states:

(30) a. A proposition/state p is a set of possible worlds, i.e., $p \subseteq \mathcal{W}$.
b. An *issue* $I \subseteq \wp(\mathcal{W})$ is a non-empty, downward closed set of propositions/states.
Π is the set of all issues.
We say that a proposition/state p *settles* an issue I in case $p \in I$.
(adapted from Ciardelli & Roelofsen 2015, 1649)

3.1.2 Models

In standard epistemic logic, sentences are evaluated against a world in a model, since the meaning of a sentence is understood as a condition on worlds that make the sentence true. In IEL, the meaning of an interrogative sentence is understood as a condition on propositions (information states, i.e., sets of possible worlds) that resolve the issue expressed by the sentence. In the current framework, then, both declaratives and interrogatives are evaluated against information states. An inquisitive epistemic model M is defined as in (31). $\mathcal{A}$ is a finite set of agents, such as a, SPKR (the speaker), ADDR (the addressee), etc.

(31) An inquisitive epistemic model for a set P of atomic sentences and a set Π of issues is a tuple $M = \langle \mathcal{W}, V, (\Sigma_a)_{a \in \mathcal{A}} \rangle$ where:

a. $\mathcal{A}$ is a finite set of agents.
b. $\mathcal{W}$ is a set, whose elements are called *possible worlds*.
c. $V : \mathsf{P} \to \wp(W)$ is a *valuation function* that specifies for each atomic sentence in P, which set of the worlds make the sentence true.
d. $(\Sigma_a)_{a \in \mathcal{A}}$ is a set of *state maps* $\Sigma_a : \mathcal{W} \to \Pi$, each of which assigns to any world w an issue $\Sigma_a(w)$.[16]

(modified from Ciardelli & Roelofsen 2015, 1650-1651)

In standard epistemic logic, each agent is associated with an information state $\sigma_a(w)$ that encodes the information that is available to the agent a at w. In IEL, each agent is associated with an inquisitive state $\Sigma_a(w)$ that encodes the issues that are entertained by a at w, and the information state $\sigma_a(w)$ is obtained by taking the union of the inquisitive state:

(32) (*Information state* of agent a in w)
$\sigma_a(w) := \bigcup \Sigma_a(w)$.

In other words, $\Sigma_a(w)$ represents both the information and inquisitive states of the agent and we do not need $\sigma_a(w)$ as an independent notion in the logical model.

3.1.3 Semantics

The classical meaning of a sentence in possible world semantics is a proposition, i.e., a set of possible worlds. In IEL, the semantic value of a sentence φ is an issue, i.e., a downward-closed set of propositions p such that p supports φ, i.e., is "*established* or *true everywhere* in $[p]$" (Ciardelli & Roelofsen 2015, 1653) in case φ is informative. In case φ is inquisitive, the semantic value of φ is a set of propositions p such that p resolves the issue represented by φ. Put another way, both declarative and interogative sentences denote a set of propositions, which are sets of possible worlds. In terms of type-theoretic semantics, both declarative and interogative sentences are of type $\langle\langle s, t\rangle, t\rangle$, which is abbreviated as T (see also Ciardelli et al. 2017, for the type-theory for inquisitive semantics).

The following definition (33) defines the semantic values of an atomic declarative sentence, a negated sentence and an interrogative sentence. The semantic value of an atomic declarative α is a set of propositions p such that p supports α, namely α is true in all worlds in p, as in (33-a). The semantic value of a negative sentence $\neg\varphi$ is a set of propositions p such that no non-empty subset of p supports φ (33-b). Finally, the semantic value of an interrogative $?\{\alpha_1, ...\alpha_n\}$ is a set of propositions p such that at least one of the answers is supported by p, i.e., the question is "*resolved* in p" (Ciardelli & Roelofsen 2015, 1653) as in (33-c).

(33) Let M be an inquisitive epistemic model, and p a proposition/state in M.

a. $[\![\alpha]\!] := \{p | w \in V(\alpha) \text{ for all worlds } w \in p\}$
b. $[\![\neg\varphi]\!] := \{p | \text{ for all non-empty } q \subseteq p,\ q \notin [\![\varphi]\!]\}$
c. $[\![?\{\alpha_1, ...\alpha_n\}]\!] := \{p | p \in [\![\alpha_i]\!] \text{ for some index } 1 \leq i \leq n\}$

[16] $\Sigma_a(w)$ observes factivity and introspection conditions. See Definition 3 in Ciardelli & Roelofsen (2015, 1651).

We define the notion of possibilities to semantically distinguish declaratives and interrogatives. The possibilities for φ are the maximal propositions that support a sentence φ:

(34) $\textsc{possibility}(\varphi) := \{p | p \in [\![\varphi]\!] \text{ and there is no } q \supset p \text{ such that } q \in [\![\varphi]\!]\}$.

To handle polar and *wh* interrogatives, I follow Roelofsen & Farkas (2015) (see also Uegaki & Roelofsen 2018) and introduce the $\langle ? \rangle$ operator. If φ is a declarative, that is, if $|\textsc{possibility}(\varphi)| = 1$, $\langle ? \rangle$ constructs a polar interrogative. If φ is already an interrogative sentence, i.e., contains multiple possibilities, it returns the same interrogative sentence.

(35) $$\langle ? \rangle \varphi := \begin{cases} ?\{\varphi, \neg\varphi\}, & \text{if } |\textsc{possibility}(\varphi)| = 1 \\ \varphi, & \text{if } |\textsc{possibility}(\varphi)| \geq 2 \end{cases}$$

Let us now look at the modal operators, K and E, which are the most important to the current paper. First, both K and E can be syntactically applied to both declaratives and interrogatives. When K is applied to a declarative α, the semantic value of $K_a\alpha$ is a set of propositions p such that α is true everywhere in $\sigma_a(w)$ for any $w \in p$. That is, α is compatible with the information available to a at any $w \in p$, which is comparable to the knowledge modality in standard epistemic logic.

(36) $[\![K_a\varphi]\!] := \{p | \text{ for any } w \in p, \sigma_a(w) \in [\![\varphi]\!]\}$

Let us also illustrate how $K_a\alpha$ is interpreted at the information state p depicted in Figure 4 with a natural language example. Each circle represents a possible world. Following Ciardelli & Roelofsen (2015), only the maximal elements of issues, i.e., possibilities, are represented as green blocks in the diagrams. Our language only has two atomic sentences, α and β and our model consists of four worlds, $\mathcal{W} = \{w_{11}, w_{10}, w_{01}, w_{00}\}$ such that $V(\alpha) = \{w_{11}, w_{10}\}$ and $V(\beta) = \{w_{11}, w_{01}\}$. Let *Marie drinks* and *Bill dances* translate to α and β, respectively. Thus, Marie drinks in w_{11} and w_{10} and Bill dances in w_{11} and w_{01}. Now, $K_a\alpha$ is a translation of (37).

(37) Ali knows that Marie drinks.

In Figure 4, Ali's information states at w_{11}, written $\sigma_a(w_{11})$, and at w_{10}, written $\sigma_a(w_{10})$, are identical and both are represented by $p = \{w_{11}, w_{10}\} = \sigma_a(w_{11}) = \sigma_a(w_{10})$. Marie drinks in w_{11} and w_{10}. Thus, α is supported by Ali's information states, i.e., true everywhere at each of Ali's information states ($\sigma_a(w_{11}) \in [\![\alpha]\!]$ and $\sigma_a(w_{10}) \in [\![\alpha]\!]$). Therefore, the information state p supports $K_a\alpha$.[17]

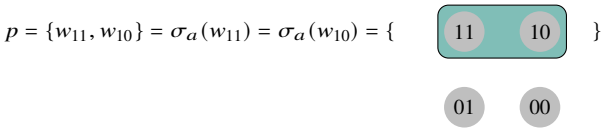


Fig. 4 $p \in [\![K_a\alpha]\!]$

[17] The same state depicted in Figure 4 supports $K_a?\alpha$.

Consider another state, depicted in Figure 5, to prepare to see the difference between K and E. The state p' depicted in Figure 5 does not support $K_a?\alpha$, which is a translation of (38).

(38) Ali knows whether Marie drinks.

Intuitively speaking, Ali's information state p' does not support $K_a?\alpha$ because p' supports neither α nor $\neg\alpha$. More precisely, in Figure 5 we have $p' = \mathcal{W} = \{w_{11}, w_{10}, w_{01}, w_{00}\} = \sigma_a(w_{11}) = \sigma_a(w_{10}) = \sigma_a(w_{01}) = \sigma_a(w_{00})$. Since α ('Marie drinks') is not true in w_{01}, the information state $\sigma_a(w_{01})$ does not support α. Also, since α is true at w_{11} and $\{w_{11}\}$ is a subset of $\sigma_a(w_{01})$, $\neg\alpha$ is not supported by $\sigma_a(w_{01})$. Since neither α nor $\neg\alpha$ is supported by p', p' does not support $K_a?\alpha$. As we will see below, the same state p' does support $E_a?\alpha$ with an entertain modality E.

$p' = \sigma_a(w_{11}) = \sigma_a(w_{10}) = \sigma_a(w_{01}) = \sigma_a(w_{00}) =$ { 11 10 / 01 00 }

Fig. 5 $p' \notin [\![K_a?\alpha]\!]$, $p' \in [\![E_a?\alpha]\!]$

We are now ready to define the entertain modality E, to which the Japanese modal auxiliary *daroo* translates.[18] The semantic value of $E_a\varphi$ is a set of propositions p such that for any $w \in p$ and for any proposition $q \in \Sigma_a(w)$, $q \in [\![\varphi]\!]$. Intuitively, $E_a\varphi$ states that once all the issues entertained by a are resolved, φ will be supported:

(39) $[\![E_a\varphi]\!] := \{p | \Sigma_a(w) \subseteq [\![\varphi]\!] \text{ for any } w \in p\}$
(modified from Ciardelli & Roelofsen 2015, 1653-1654)

Recall that an inquisitive state $\Sigma_a(w)$ is the set of issues entertained by a at w, i.e., the set of enhancements of $\sigma_a(w)$ where the issues of a are resolved. The state p' depicted in Figure 5 supports $E_a?\alpha$ though it did not support $K_a?\alpha$. English does not seem to have a lexical item that corresponds to E, so let us take the wonder modality W defined in (40) and consider the sentence (41).

(40) $W_a\varphi := \neg K_a\varphi \wedge E_a\varphi$ (Ciardelli & Roelofsen 2015, 1659).

(41) Ali wonders whether Marie drinks.

We already know p' does not support $K_a?\alpha$, so p' supports $\neg K_a?\alpha$. Thus, we only need to check whether p' supports $E_a?\alpha$. Ali's inquisitive states in Figure 5 are: $\Sigma_a(w_{11}) = \Sigma_a(w_{10}) = \Sigma_a(w_{01}) = \Sigma_a(w_{00}) = \{\{w_{11}, w_{10}\}, \{w_{01}, w_{00}\}, \{w_{11}\}, \{w_{10}\}, \{w_{01}\}, \{w_{00}\}\}$. Now, all information states in the inquisitive states support either α or $\neg\alpha$: $\{w_{11}, w_{10}\} \in [\![\alpha]\!]$, $\{w_{01}, w_{00}\} \in [\![\neg\alpha]\!]$, $\{w_{11}\} \in [\![\alpha]\!]$, $\{w_{10}\} \in [\![\alpha]\!]$, $\{w_{01}\} \in [\![\neg\alpha]\!]$, and $\{w_{00}\} \in [\![\neg\alpha]\!]$. That is, in the states where Ali's issues are resolved, either α or $\neg\alpha$ is supported. Thus, Ali is entertaining (wondering about) the issue $?\alpha$. Formally, for any $w \in p$ and any $q \in \Sigma_a(w)$, $q \in [\![?\{\alpha, \neg\alpha\}]\!]$, i.e., $\Sigma_a(w) \subseteq [\![?\{\alpha, \neg\alpha\}]\!]$. Therefore, p' supports $E_a?\alpha$.

[18] More precisely, *φ-daroo* translates to the assertion of $E\varphi$. See Section 3.3.1.

One fact about the relation between K and E is important to the current paper. If the embedded sentence is a declarative α, $E_a\alpha$ entails $K_a\alpha$.[19] Since $K_a\alpha$ entails $E_a\alpha$ (see also Fact 10 in Ciardelli & Roelofsen (2015, 1659), $E_a\alpha$ is equivalent to $K_a\alpha$.[20]

(42) (Fact)
For any declarative α and $a \in \mathcal{A}$, $K_a\alpha \equiv E_a\alpha$.

As we will see below, this equivalence is crucial to the semantics of *daroo*. When *daroo* embeds a declarative clause, it expresses the bias of the speaker rather than an issue. Thus, the modal appears to function as the knowledge operator K_a rather than the entertain operator E_a. Thanks to this equivalence, we can assign a uniform semantics to *daroo* as E while two modal meanings (i.e., K and E) arise from the category of the embedded sentence (i.e., declarative and interrogative).

3.1.4 Interim Summary

To summarize, IEL offers a framework that can model the agent's knowledge and issues. An issue is defined as a set of propositions (information states), which are sets of possible worlds. Both declarative and interrogative sentences denote issues of the same type, $\langle\langle s,t\rangle,t\rangle = T$. Each agent is tagged with an inquisitive state $\Sigma_a(w)$ that represents the issues that the agent a entertains at w. When the knowledge operator K applies to a declarative α, a state p supports $K_a\alpha$ just in case α is true everywhere in $\sigma_a(w)$ for all $w \in p$, just as in standard epistemic logic. When the entertain operator E applies to an interrogative $?\alpha$, a state p supports $E_a?\alpha$ just in case $?\alpha$ is supported by any $q \in \Sigma_a(w)$ for any $w \in p$. In other words, each such state q in which the issues that the agent a entertains at w are resolved supports α or $\neg\alpha$.

The crucial fact that is relevant to the current paper is that when E applies to a declarative α, $E_a\alpha$ is equivalent to $K_a\alpha$. This fact is one of the most important motivations for employing IEL to analyze *daroo*-sentences. *Daroo* appears to denote different modals depending on which clause type it embeds: When *daroo* embeds a declarative sentence α, *α-daroo* expresses the agent's bias; when it embeds an interrogative $?\alpha$, *$?\alpha$-daroo* expresses the agent's inquisitive epistemic state. In terms of IEL, therefore, *α-daroo* and *$?\alpha$-daroo* translate to $K_{\text{SPKR}}\alpha$ and $E_{\text{SPKR}}?\alpha$, respectively. Thanks to the semantics of IEL, however, *daroo* does not have to be ambiguously defined. We can maintain a uniform semantics for *daroo* as an assertion of E_{SPKR} and correctly derive K_{SPKR} using the equivalence discussed above in (42).

---

[19] Entailment is defined as follows:

(i) (Definition of Entailment)
We say that a sentence φ entails another sentence ψ (notation $\varphi \models \psi$) just in case for all states p, if $p \in [\![\varphi]\!]$, then $p \in [\![\psi]\!]$.
(Ciardelli & Roelofsen 2015, 1657)

[20] Equivalence is defined as follows:

(i) (Definition of Equivalence)
We say that two sentences φ and ψ are equivalent (notation $\varphi \equiv \psi$) just in case for all states p, $p \in [\![\varphi]\!] \Leftrightarrow p \in [\![\psi]\!]$.
(Ciardelli & Roelofsen 2015, 1657)

3.2 Background 2: Shunting-type Use-conditional Items

3.2.1 Speech Act Operators as Use-conditional Items

As spelled out in (23), *daroo*, $\text{Utter}_{[\text{Q}]}\uparrow$ (*ka*↑) and ↑ are use-conditional items (UCIs) in the sense of Gutzmann (2015). Since Potts' (2005) seminal work on the multidimensional semantics of conventional implicatures, a wide range of literature has discussed formal properties of secondary meanings that arise independently from at-issue/truth-conditional meanings in various languages. These secondary meanings are called by a variety of names: *conventional implicature* (Grice 1975; Potts 2005), *expressive* (Kaplan 1999; Potts 2007), *emotive* (Stevenson 1937; Jakobson 1960), *evaluative* (Hare 1952), and so on.[21] The current paper follows Gutzmann (2015) who adopts Recanati's (2004) *use-conditional* since the term is relatively neutral compared to *expressive* or *emotive* and it covers the meanings that arise from the category of speech act operator, to which I argue *daroo*, $\text{Utter}_{[\text{Q}]}\uparrow$ and ↑ belong.

Building on Kaplan (1999), Gutzmann (2015) models the semantic denotation of a use-conditional content as a set of contexts in which the construction is felicitously used. For example, the denotation of the use-conditional content of *oops* is given in (43):

(43) $[\![\text{Oops}]\!] = \{c : \text{SPKR}_c \text{ observed a minor mishap in } w_c\}$
(adapted from Gutzmann 2015, 19)

In Gutzmann's (2015) language $\mathcal{L}_{\text{TU}}$, use-conditional propositions like (43) are assigned a basic type u.

Gutzmann (2015) then applies his $\mathcal{L}_{\text{TU}}$ to sentential moods, which are use-conditional items. For example, the use-condition of a declarative "Homer is at home" is a set of contexts specified as in (44):

(44) $[\![\text{Homer is at home}]\!] = \{c : \text{SPKR}_C \text{ asserts that Homer is at home in } w_c\}$
(modified from Gutzmann 2015, 203)

In formalizing the discourse moves such as assertions and questions in the denotation of (44), I adopt work by Farkas & Bruce (2010) on discourse structure. Farkas & Bruce (2010) formalize speech acts as operations over the Table. The Table is one of the discourse components in the context structure and "records what is 'at issue' in the conversation" (p. 87). A context structure with two agents is represented as follows:[22]

(45) A context c is an ordered tuple $\langle cg, DC_a, DC_b, T\rangle$
- a. cg is the set of issues (sets of propositions) that all agents are jointly committed to.
- b. DC_x is the set of issues that are discourse commitments of x.
- c. T is a stack of issues. The topmost element of T, $top(T)$ represents the question under discussion.

Farkas & Bruce (2010) assume with Krifka (2001) that there are illocutionary operators that take sentence radicals and yield speech acts that act as context-change potentials, which

[21] This is by no means the exhaustive list. See Gutzmann (2015, 9) for a more extensive list, though probably it is not a fully exhaustive one, either.

[22] Farkas & Bruce's (2010) original structure has another component, the projected set *ps* which represents possible common grounds, which I do not include in (45) as it does not play a role in characterizing the use conditions of speech acts.

are functions from contexts to contexts (Heim 1982).[23] The ASSERT operator adds its argument declarative to $DC_{a,i}$, the input discourse commitments of agent a, and pushes it onto the input Table stack T_i:

(46) $\textsc{assert}(\varphi, a, c_i) = c_o$
a. $DC_{a,o} = DC_{a,i} \cup [\![\varphi]\!]$
b. $T_o = \text{push}([\![\varphi]\!], T_i)$

The QUEST operator, on the other hand, only pushes its argument interrogative onto the Table T_i:

(47) $\textsc{quest}(\varphi, a, c_i) = c_o$
$T_o = \text{push}([\![\varphi]\!], T_i)$

Based on the definitions of the ASSERT and QUEST operators, the use-conditions of ASSERT and QUEST are formulated as follows:

(48) Use condition of ASSERT
$\textsc{assert}(\varphi) = \lambda\varphi.\{c : [\![\varphi]\!] \in DC_{\text{SPKR}_c,c} \& [\![\varphi]\!] = top(T_c)\}$

(49) Use condition of QUEST
$\textsc{quest}(\varphi) = \lambda\varphi.\{c : [\![\varphi]\!] = top(T_c)\}$

I argue below that the lexical semantics of *daroo* and question particles with final rise (*-ka*↑ and ↑) incorporate the use conditions of ASSERT and QUEST, respectively.

3.2.2 Shunting-type

As for the combinatoric rules of UCIs, I adopt a modified version of McCready's (2010) $\mathcal{L}_{CI}^{+S}$, called $\mathcal{L}_{\otimes}$, since, as Hara (2006) shows, the behavior of *daroo* is different from the canonical not-at-issue items discussed in Potts (2005) in several respects.[24] For instance, *daroo* only projects use-conditional content and there is no at-issue (truth-conditional) content. In Potts' (2005) $\mathcal{L}_{CI}$, CI APPLICATION, the composition rule for expressives/conventional implicatures/use-conditional contents, involves two functional applications as depicted in (50), one which returns a CI meaning $\alpha(\beta) : \tau^c$ and the other which is an identity function that returns truth-conditional content $\beta : \sigma^a$.

(50) CI APPLICATION

$$\begin{array}{c} \beta : \sigma^a \bullet \alpha(\beta) : \tau^c \\ \diagup \quad \diagdown \\ \alpha : \langle \sigma^a, \tau^c \rangle \quad \beta : \sigma^a \end{array}$$

[23] Here, I depart from Gutzmann (2015), who draws a strict distinction between sentence mood and illocutionary force or speech act. According to Gutzmann (2015), syntactic sentence types only determine sentence moods, which in turn constrain what kind of illocutionary forces are possible. In analyzing an English expressive question construction, e.g., *Angry, much?* (Gutzmann & Henderson 2019), however, Gutzmann also analyzes a syntactic construction as a direct correlate of a context update in Gunlogson's (2008) model.

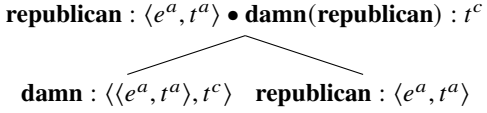
[24] I do not fully adopt $\mathcal{L}_{CI}^{+S}$ because the current paper does not deal with prototypical expressive items (Potts 2005) nor mixed contents (McCready 2010), so many of the type specifications and combinatoric rules presented there are unnecessary for the purposes of the current paper. Furthermore, a new basic type u and a new rule PARATACTIC ASSOCIATION are added to $\mathcal{L}_{\otimes}$. See Appendix B for the complete type specifications and combinatoric rules of $\mathcal{L}_{\otimes}$.

This rule is necessary for analyzing prototypical expressive items such as *damn*, which gives rise to two independent meanings as in (51).

(51) The damn Republicans are aggressively cutting taxes. (Potts 2005, 162)
Truth-conditional content: The Republicans are agressively cutting taxes.
Non-truth-conditional content: The speaker is feeling negatively toward the Republicans.

The identity function encapsulated in CI APPLICATION let the truth-conditional content project unmodified so that it can be an argument of another functor as depicted in (52).

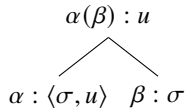
(52)



If we employed CI APPLICATION to *daroo* and a sentence it attaches to, it would yield an incongruent interpretation in which the use-conditional meaning weakens the truth-conditional meaning, i.e., 'α and probably α'.[25]

Thus, the formal system that the current paper proposes does not include CI APPLICATION in its set of combinatoric rules, but employs SHUNTING APPLICATION from McCready's (2010) $\mathcal{L}^{+S}_{CI}$. $\mathcal{L}^{+S}_{CI}$ is an extension of Potts' (2005) $\mathcal{L}_{CI}$ obtained by adding *shunting types* to the system. Expressions with shunting types shunt the meaning tier from truth-conditional to use-conditional, thereby generating use-conditional contents without yielding truth-conditional ones. Suppose that σ is a truth-conditional type and u is a basic shunting use-conditional type. When the function is of shunting type $\langle\sigma, u\rangle$, then the following rule is used instead of CI APPLICATION.

(53) SHUNTING APPLICATION



To illustrate, let us take a look at a Japanese adverb *yokumo* (McCready 2010) and a English *x-much?* question (Gutzmann & Henderson 2019), which are shunting-type expressive/use-conditional items. *Yokumo* expresses a negative speaker attitude toward its prejacent without projecting the prejacent proposition.

(54) Yokumo koko ni kita na!
YOKUMO here to came PRT
Use-conditional meaning: 'You have a lot of guts to come here!"
(adapted from McCready 2010, 37)

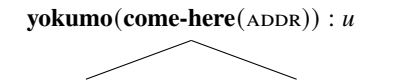
Gutzmann & Henderson (2019) analyze *x-much?* construction as an expressive question act. It expressively conveys that the speaker has an evaluative (positive or negative) attitude toward the fact that some individual has the property in question and expressively seeks an agreement on the attitude from the addressee without making a truth-conditional commitment.

[25] See Hara (2006) and Section 5.2 for more discussions.

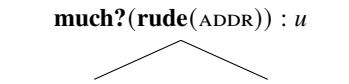
(55) Gramps: (Slamming the door just in front of Gavin) Well, Scott isn't here, so scram.
Gavin: Wow. Rude, much?
Use-conditional meaning: Don't you agree that you're really rude and it's ridiculous?
(adapted from Gutzmann & Henderson 2019, 107)

Since SHUNTING APPLICATION does not involve an identity function, it correctly derives use-conditional (expressive) contents only:

(56)



(57)



Thus, $\mathcal{L}_{\otimes}$, the formal language that the current paper adopts, employs SHUNTING APPLICATION rather than CI APPLICATION to analyze *daroo*, *ka*↑ and ↑.

Turning to the semantic types for *daroo*, *ka*↑ and ↑, recall from Section 3.1 that in IEL, both declarative and interrogative sentences denote issues which are sets of sets of possible worlds, thus both are of type $\langle\langle s,t\rangle,t\rangle$, which is abbreviated as T to avoid clutter. Let T and u be semantic types for truth-conditional sentences and shunting-type use-conditions, respectively. Then, the question particle $\mathrm{C}_{[\mathrm{Q}]}$, realized by *ka* in a polar interrogative, without Final Rise ↑ is an interrogativizer of type $\langle T,T\rangle$ as in (58).

(58) a. $[\![\mathrm{C}_{[\mathrm{Q}]}]\!] \in D_{\langle T,T\rangle}$
b. $[\![\mathrm{C}_{[\mathrm{Q}]}]\!] = \lambda\varphi.\langle ?\rangle\varphi$

I treat both $\mathrm{Utter}_{[\mathrm{Q}]}$↑ and ↑ as shunting-type use-conditional interrogativizers. That is, they take a truth-conditional declarative and return a use-condition of questioning the interrogativized one, though, as will be argued below in Section 3.4, they are structurally different:[26]

(59) a. $[\![\mathrm{Utter}_{[\mathrm{Q}]}\uparrow]\!] \in D_{\langle T,u\rangle}$
b. $[\![\mathrm{Utter}_{[\mathrm{Q}]}\uparrow]\!] = \lambda\varphi.\textsc{quest}(\langle ?\rangle\varphi)$

(60) a. $[\![\uparrow]\!] \in D_{\langle T,u\rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\textsc{quest}(\langle ?\rangle\varphi)$

Turning to *daroo*, this term is also of type $\langle T,u\rangle$, and thus is a shunting-type use-conditional item. It takes a truth-conditional sentence (either declarative or interrogative) as its argument and returns a use-condition for asserting a modalized declarative sentence.

(61) a. $[\![\textbf{daroo}]\!] \in D_{\langle T,u\rangle}$
b. $[\![\varphi\text{-}\textbf{daroo}]\!] = \lambda\varphi.\textsc{assert}(E_{\mathrm{SPKR}_c}\varphi)$

The following subsections motivate the syntax and semantics of $\mathrm{C}_{[\mathrm{Q}]}$, $\mathrm{Utter}_{[\mathrm{Q}]}$↑, ↑ and *daroo*.

[26] Gutzmann (2015) does not treat use-conditional items such as sentence moods as shunting-typed, so they project both truth-conditional and use-conditional meanings. Gutzmann & Henderson (2019), in contrast, analyze the English *x-much?* question like (55) as a shunting-typed UCI, which projects only a use-conditional meaning.

3.3 Proposal 1: syntax and semantics of *daroo*

3.3.1 Daroo as entertain modal

Recall the IEL modals K and E from Section 3.1.3. $K_a\varphi$ as defined in (36) and repeated here as (62) indicates that the information state of a supports the information encoded by φ, which parallels epistemic modality in standard epistemic logic. Intuitively speaking, φ is true everywhere in a's information state:

(62) $[\![K_a\varphi]\!] := \{p|$ for any $w \in p$, $\sigma_a(w) \in [\![\varphi]\!]\}$

$E_a\varphi$ as defined in (39) and repeated here as (63) indicates that the issue encoded by φ is included in the inquisitive state of a. That is, a is wondering about the issue φ, so once all the issues entertined by a are resolved, φ will also be resolved.

(63) $[\![E_a\varphi]\!] := \{p|\Sigma_a(w) \subseteq [\![\varphi]\!]$ for any $w \in p\}$

As mentioned several times already, my main proposal is that *daroo* is a linguistic realization of an assertion of an entertain modal, $\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$. As can be seen, the lexical semantics of *daroo* includes the ASSERT operator defined in (48). Thus, the use condition of *φ-daroo* is that *φ-daroo* is felicitously used in context c iff $E_{\textsc{spkr}_c}\varphi$ is added to the discourse commitments of $\textsc{spkr}_c$ and $E_{\textsc{spkr}_c}\varphi$ is pushed onto the Table in c.

(64) a. $[\![\textbf{daroo}]\!] \in D_{\langle T,u\rangle}$
b. $[\![\textbf{daroo}]\!] = \lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$
$= \lambda\varphi.\{c : [\![E_{\textsc{spkr}_c}\varphi]\!] \in DC_{\textsc{spkr}_c,c} \& [\![E_{\textsc{spkr}_c}\varphi]\!] = top(T_c)\}$

The proposal is motivated by the following properties of *daroo* sentences. First, an interesting feature of the syntax of *daroo* is that it can co-occur with both a declarative and interrogative as its argument. Thus, the semantics of *daroo* should be able to handle the issues raised by interrogatives as well as the information brought by declaratives. As we have seen in Section 3.1, IEL assigns the same semantic type, i.e., $\langle\langle s,t\rangle,t\rangle = T$, to declaratives and interrogatives, which can be arguments of $E_{\textsc{spkr}_c}$. Thus, we can keep a single denotation for *daroo*, namely $\lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$.

Also, recall that although *daroo* in a falling declarative indicates the speaker's bias toward the embedded sentence, the bias disappears in falling interrogatives, as seen in (12), repeated here as (65).

(65) Ashita hareru daroo ka. Zenzen wakar-anai.
tomorrow sunny DAROO Q at.all understand-NEG
'I wonder if it will be sunny tomorrow. I have no idea.'

The current proposal readily accounts for this shift of meaning since as shown by (42), $E_{\textsc{spkr}_c}\varphi$ expresses the speaker's bias toward φ (i.e., $K_{\textsc{spkr}_c}\varphi$) only when φ is a declarative.

The following table summarizes the logical forms of falling *daroo*-sentences, i.e. those without Final Rise ↑,.

(66) LFs of (falling) *daroo*-sentences

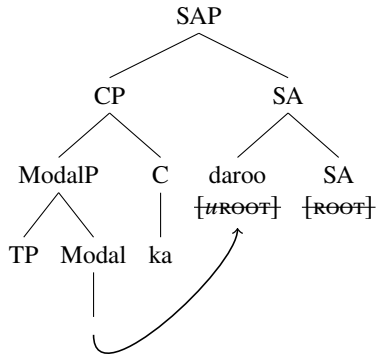
Declarative	*α-daroo* $\textsc{assert}(E_{\textsc{spkr}_c}\alpha) \equiv \textsc{assert}(K_{\textsc{spkr}_c}\alpha)$
Interrogative	*α-daroo ka* $\textsc{assert}(E_{\textsc{spkr}_c}\langle ?\rangle\alpha)$

Now there is an apparent discrepancy between the surface syntax of *daroo*-interrogatives, *α-daroo ka*, and their LF, $\textsc{assert}(E_{\textsc{spkr}}\langle ?\rangle\alpha)$. The next section proposes a syntax for *daroo* and shows how this discrepancy is resolved.

3.3.2 Daroo as a root-level use-conditional modal

Syntactically, I propose that *daroo* functions as a root-level (i.e., speech-act) modal operator (Zimmermann 2004; Davis 2009), which contributes to the use-conditional tier of the sentential meaning. I also hypothesize that the root-orientedness of *daroo* is realized by an uninterpretable feature [*u*ROOT], which needs to be checked off by the matching feature [ROOT] at the Speech Act (SA) head:

(67)



The LF configuration in (67) predicts that in (11), repeated here as (68), *daroo* embeds an interrogative clause *Marie-wa wain-o nomu ka* 'whether Marie drinks wine' yielding an

assertion that the speaker entertains this question, $\textsc{assert}(E_{\textsc{spkr}_c}\langle ? \rangle \alpha)$.[27] This is the correct prediction, since (68) indeed functions as a self-addressing question.

(68) Marie-wa wain-o nomu daroo ka.
Marie-TOP wine-ACC drink DAROO Q
'I wonder if Marie drinks wine.'

If the semantic composition was done in the surface linear order, (68) would be a question that asks whether the speaker believes that Marie drinks wine, which is not the interpratation of (68). In the following, I present a set of data that empirically support the treatment of *daroo* as a root-level speech act operator.

First, while the "normal" truth-conditional modals *nichigainai* 'must' and *kamoshirenai* 'may' can occur inside embedded questions (69-a), *daroo* cannot (69-b).

(69) a. Emi-ga igirisu-ni itta nichigainai/kamoshirenai ka (dooka) kiite
Emi-NOM England-DAT went must/may Q (or.not) to.ask
mita.
tried
'I asked whether Emi must/may have left for England or not.'
b. *Emi-ga igirisu-ni itta daroo ka (dooka) kiite mita.
Emi-NOM England-DAT went DAROO Q (or.not) to.ask tried
Intended: 'I asked whether Emi probably left for England or not.'

The ungrammaticality of (69-b) shows that the combination of *daroo* with interrogatives should be considered a root phenomenon in the sense of Emonds (1969) and Hooper & Thompson (1973).[28] That is, the combination is only possible in the highest matrix clause (see Hara (2006) for more arguments).

Similarly, *daroo* cannot be in the scope of presupposition holes, i.e., questions, negation, modals, and conditionals.[29] We already know that *daroo* outscopes the question operator, so

[27] The configuration given in (67) may seem unconventional in Japanese linguistics as the semantic composition of Japanese sentences is relatively faithful to the surface linear order as pointed out by an anonymous reviewer. In fact, Japanese does have some constructions the interpretations of which do not reflect their linear order. For example, there are cases where the linear order does not affect the meaning, although there are syntactic restrictions on the order between the past tense and the polite form depending on the category of the root predicate. Japanese has two syntactic categories for adjectives: one is *keiyoodoosi* 'adjectival noun' and the other is *keiyoosi* 'adjective'. When the root predicate is an adjectival noun as in (i), the polite form precedes the past tense.

(i) kirei-des-ita
pretty-POL-PAST
'(It) was pretty.' (adjectival.noun-polite-past)

In contrast, when the root is an adjective as in (ii), the past tense precedes the polite form.

(ii) omosirokat-ta-desu
interesting-PAST-POL
'(It) was interesting.' (adjective-past-polite)

This difference in linear order does not affect how their meanings are composed, since both mean "It was pretty/interesting" and are politely uttered. Furthermore, (67) apparently violates the Head Movement Constraint. See Appendix A for English constructions that involve head movement which also violate the Head Movement Constraint.

[28] Emonds (1969) defines a root sentence as "either the highest S in a tree, an S immediately dominated by the highest S or the reported S in direct discourse" (p. 6).

[29] This is also a property of non-truth-conditional content. See Section 5.1.

let us start with embedding under negation. Note first that the Japanese negation is a verbal suffix, so the following is morpho-syntactically ill-formed.

(70) *John-wa ko-daroo-nai.
John-TOP come-DAROO-NEG
(Hara 2006, 140)

Thus, following Sugimura (2004), Hara (2006) uses a sentential negation *wakedewanai* 'it is not the case that' to test whether *daroo* can be embedded under negation. As in (71), *wakedewanai* can embed canonical modal expressions, *nichigainai* 'must' and *kanoosee-ga takai* 'the possibility is high', which have meanings similar to *daroo*, i.e., a high probability of the prejacent proposition.

(71) a. kare-ga kuru nichigainai wakedewanai.
he-NOM come must NEG
'It is not the case that he must be coming.'
b. Kare-ga kuru kanoosee-ga takai wakedewanai.
he-NOM come possibility-NOM high NEG
'It is not the case that the possibility that he is coming is high.'

Now, as in (72), *daroo* cannot be embedded under *wakedewanai*.

(72) *kare-ga kuru daroo wakedewanai.
he-NOM come DAROO NEG
Intended: 'It is not the case that I have a bias toward 'he is coming.' (Sugimura 2004)

Next, while normal modals can embed each other as in (73), *daroo* cannot be embedded under another modal as in (74).

(73) a. kare-ga kuru nichigainai/kamoshirenai kanoosee-ga hikui/takai.
he-NOM come must/might possibility-NOM low/high
'There's a slight/high chance that he must/might come.'
b. kare-ga kuru kanoosee-ga hikui/takai kamoshirenai/nichigainai.
he-NOM come possibility-NOM low/high might/must
'There might/must be a slight/high chance that he will come.'

(74) a. *kare-ga kuru daroo kanoosee-ga hikui/takai.
he-NOM come DAROO possibility-NOM low/high
b. *kare-ga kuru daroo kamoshirenai/nichigainai.
he-NOM come DAROO might/must

Finally, "normal" modal sentences can be conditionalized, but *daroo* sentences cannot:

(75) moshi ame-ga furu kamoshirenai/nichigainai-nara, pikunikku-wa chuushi-da.
if rain-NOM fall might/must-COND picnic-TOP cancel-COP
'If it might/must be raining, the picnic will be canceled.'

(76) *moshi ame-ga furu daroo-nara, pikunikku-wa chuushi-da.
if rain-NOM fall DAROO-COND picnic-TOP cancel-COP
'If it's raining-*daroo*, the picnic will be canceled.'

The root-orientedness of *daroo* is also evident in the fact that the holder of the bias is always the speaker. As discussed in Section 2, the contrast between (9) and (10), repeated

here as (77-a) and (77-b), shows that *daroo* in a falling declarative indicates *the speaker's* bias.[30]

(77) a. Boku-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
I-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), I took an umbrella with me.'
b. #John-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
John-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), John took an umbrella with him.'

Compare (77-b) with cases where "normal" modals are embedded under *because*. The felicity of (78) shows that the knowledge holder of the "normal" modals can be shifted. That is, the truth-conditional modals in (78) expresses *John*'s assessment of the likelihood of rain, so it can felicitously cause John to bring an umbrella.

(78) John-wa ame-ga furu nichigainai/kamoshirenai kara kasa-o mot-te
John-TOP rain-NOM fall must/may because umbrella-ACC have-and
it-ta.
go-PAST
'Because it must/may rain, John took an umbrella with him.'

To recapitulate, the discrepancy between the surface syntax of *daroo*-interrogatives, α-*daroo ka*, and their LF, $\textsc{assert}(E_{\textsc{spkr}}\langle ?\rangle\alpha)$ observed in (66) is resolved by movement of *daroo* to Spec SAP. The empirical data show that *daroo* is a root-level use-conditional modal which moves to Spec SAP and so takes wider scope than "normal" truth-conditional modals. Furthermore, the agent of the knowledge must be the speaker.[31] Formally, φ-*daroo* translates to a use condition of asserting an entertain modality $\lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$ in IEL of type $\langle T, u\rangle$.

(79) a. $[\![\textbf{daroo}]\!] \in D_{\langle T,u\rangle}$
b. $[\![\textbf{daroo}]\!] = \lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$
$= \lambda\varphi.\{c : [\![E_{\textsc{spkr}_c}\varphi]\!] \in DC_{\textsc{spkr}_c,c} \& [\![E_{\textsc{spkr}_c}\varphi]\!] = top(T_c)\}$

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[30] Following Tenny (2006); Hara (2008), I assume that *kara* 'because' is an evidential/sentience marker which can embed speech act operators. See also Section 5.2.

[31] As seen in (29), the holder of the bias can be attributed to the agent of attitude predicates, i.e., the speaker of the embedded speech act. In (i-a), for instance, the bias expressed by *daroo* is attributed to Mary, since the speaker can felicitously challenge the content of the bias as in (i-b):

(i) a. Mary-wa John-ga kuru daroo to omot-teiru.
Mary-TOP John-NOM come DAROO COMP think-PROG
'Mary thinks that probably, John will come.'
b. Boku-wa soo-wa omow-anai-kedo.
I-TOP so-TOP think-NEG-though
'I don't think so (that he will come), though.' (Hara 2006, 128-129)

Potts (2005) claims that expressives and conventional implicatures are invariably speaker-oriented. This idea has been challenged by many scholars (Amaral et al. 2007, among others). In Harris & Potts (2009, 2011), Potts also concludes that the speaker-orientedness is not an essential feature of expressive meanings. Since it is beyond the scope of the current paper, I do not attempt to provide a fully compositional analysis of (i) and instead simply assume that attitude predicates can embed expressive/use-conditional content and shift the holder of the bias expressed by *daroo*.

3.4 Proposal 2: Three interrogative operators, paratactic association and $\mathcal{L}_{\otimes}$

Let us now consider the three interrogative operators, $C_{[Q]}$ (*ka*), $\text{Utter}_{[Q]}\uparrow$ (*ka*↑) and ↑. These three morphemes occur somewhere in the CP layer (Cinque 1999; Speas & Tenny 2003; Tenny 2006). They are similar in that they all take truth-conditional declarative clauses and yield interrogative clauses, but are different structurally and type-theoretically.

3.4.1 Ka as a truth-conditional complementizer

$C_{[Q]}$ (*ka*) is a truth-conditional interrogativizer which is syntactically integrated in the sentence composition and yields a truth-conditional interrogative sentence of type T.

(80) a. $[\![C_{[Q]}]\!] \in D_{\langle T,T\rangle}$
b. $[\![C_{[Q]}]\!] = \lambda\varphi.\langle ?\rangle\varphi$

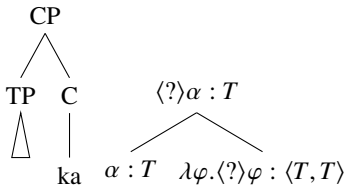
Suppose a simple declarative without particle or ↑ like (81) is mapped to a declarative sentence α.

(81) Marie-wa wain-o nomu.
Marie-TOP wine-ACC drink
'Marie drinks wine.'

Now, the particle *ka* is an at-issue interrogative operator. It syntactically attaches to a truth-conditional sentence and returns a truth-conditional interrogative sentence as shown in (83).

(82) Marie-wa wain-o nomu ka.
Marie-TOP wine-ACC drink Q
'whether Marie drink wine'

(83)



Since the clause headed by *ka* is a CP of type T, it is embeddable as in (84).

(84) Marie-ga wain-o nomu ka Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q Takeshi-TOP know
'Takeshi knows whether Marie drinks wine.'

3.4.2 Ka↑ as a use-conditional utterance operator

I propose that *ka*↑ and ↑ are both use-conditional interrogativizers that include the QUEST operator in their semantics. Thus, they are of type $\langle T, u\rangle$. They take a declarative sentence

φ as argument, render it into an interrogative sentence $\langle ? \rangle \varphi$ and yield a use-condition of questioning the interrogative sentence.[32]

(85) a. $[\![\text{Utter}_{[\text{Q}]} \uparrow]\!] \in D_{\langle T,u \rangle}$
b. $[\![\text{Utter}_{[\text{Q}]} \uparrow]\!] = \lambda\varphi.\text{QUEST}(\langle ? \rangle \varphi) = \lambda\varphi.\{c : [\![\langle ? \rangle \varphi]\!] = top(T_c)\}$

(86) a. $[\![\uparrow]\!] \in D_{\langle T,u \rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\text{QUEST}(\langle ? \rangle \varphi) = \lambda\varphi.\{c : [\![\langle ? \rangle \varphi]\!] = top(T_c)\}$

Although $\text{Utter}_{[\text{Q}]}\uparrow$ and $\uparrow$ are similar in that they have the same semantic type and denote the same use condition, they are different in their morpho-syntactic makeup and how they are composed with the rest of the syntactic structure. $\text{Utter}_{[\text{Q}]}\uparrow$ (*ka*$\uparrow$) in (87) is a complex morpheme which is composed of the phonetic segments /ka/ and the tonal segments L%H%.

(87) Marie-wa wain-o nomu ka$\uparrow$
Marie-TOP wine-ACC drink Q
'Does Marie drink wine?'

Since it has a morpho-syntactic component, *ka*$\uparrow$ is syntactically integrated within the utterance like the tonally unmarked *ka*. I propose that *ka*$\uparrow$ is an utterance operator that projects UtterP. Compositionally, it takes a truth-conditional declarative α as its argument and renders it into a use-condition of questioning an interrogative sentence.

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[32] The Final Rise with/without the particle *ka* (*-ka*)$\uparrow$ seems to have an addressee knowledge presupposition as can be seen in the translation of Truckenbrodt's (2006b, 274) "Cuban cigar scenario":

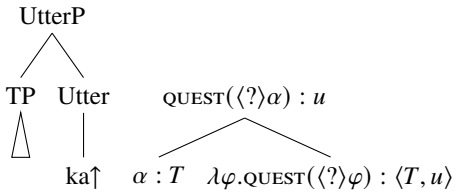
(i) Taro: Boku, Marie-to-wa nannen-mo renrakutotte nai yo
I Marie-with-TOP any.year-ADD contact NEG PRT
'I haven't been in touch with Marie for years.'
Hanako: Watashi-mo.
I-ADD
'Me, neither.'
a. Taro: #Mada kyuuba-hamaki sutteru (ka)$\uparrow$?
still Cuban-cigar smoke Q
'Does she still smoke Cuban cigars?'
b. Taro: Mada kyuuba-hamaki sutteru daroo ka.
still Cuban-cigar smoke daroo Q
'I wonder whether she still smokes Cuban cigars.'

Taro's question in (i-a) is strange because it is common knowledge that Hanako does not know about Marie's current smoking habits. On the other hand, (i-b) is an appropriate utterance given the previous discourse. Thus, φ(-ka) $\uparrow$ presupposes that the addressee knows the answer to $\langle ? \rangle \varphi$, i.e., $K_{\text{ADDR}_c} \langle ? \rangle \varphi$. We could incorporate this presupposition in the use conditions of (-ka) $\uparrow$ as in (ii):

(ii) Use-conditions of (-ka)$\uparrow$ with addressee knowledge presupposition
$[\![\varphi(\text{-ka}) \uparrow]\!] = [\![\text{QUEST}(\langle ? \rangle \varphi)]\!] = \{c : [\![\langle ? \rangle \varphi]\!] = top(T_c) \& [\![K_{\text{ADDR}_c} \langle ? \rangle \varphi]\!] \in cg_c\}$

Alternatively, the presupposition could be part of the QUEST operator in general. Since the data at hand do not provide a way to distinguish the two options, I do not include this presupposition in the use conditions of (-ka)$\uparrow$.

(88)



It is different from the tonally unmarked *ka* in that it is an utterance operator that projects UtterP, which denotes a use-condition of questioning an interrogative sentence.[33] Thus, unlike (84), (89) is ruled out as ungrammatical because the clause headed by *ka*↑ is an UtterP, which cannot be embedded under an attitude predicate.

(89) *Marie-ga wain-o nomu ka↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q↑ Takeshi-TOP know
'Takeshi knows whether Marie drinks wine↑.'

3.4.3 ↑ as a paratactically associated interrogativizer

Finally, I consider Final Rise ↑ as a residual morpheme obtained by stripping off the morpho-syntactic part *ka* from $\text{Utter}_{[Q]}$↑ (*ka*↑). Thus, although the semantic output of ↑ is the same as that of $\text{Utter}_{[Q]}$↑ as in (86), the composition of ↑ is not syntactically integrated.

Rather, ↑ is *paratactically associated* (Bartels 1999) to its host utterance.[34] As mentioned in Section 1, in the literature on the interpretation of prosodic morphemes (Bartels 1999;

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[33] Davis (2009, 2011) also treats the Japanese sentence-final-particle *yo* as an illocutionary head modifier that is higher than the force head. Similarly, Tomioka & Altinok (2021) proposes that *yo* as well as other sentence-final particles such as *ne* and *naa* project a Discourse Phrase (DiscP).

[34] The term "paratactic association" is adopted from Lyons (1977), who analyzes performative verbs that are tagged sentence-finally as in (i-a).

(i) a. I'll be there at two o'clock, I promise you. (Lyons 1977, 738)
b. I'll be there at two o'clock ⊗ I promise you.

According to Lyons (1977), the second clauses in (i-a) is attached as parenthetical modulation or is paratactically associated as schematically shown in (i-b), thus the whole utterance projects two speech acts, one that perfoms the act of promising and the other that "confirms, rather than establishes, the speaker's commitment" (738).
Thus, paratactic association is a relation between the main sentence and a sentence-final expression that projects an illocutionary force independent of the main sentence.
Bartels (1999) applies this idea to her analysis of the Final Fall in alternative questions like (ii-a). It has been observed in the literature that alternative questions must end with a Final Fall, H*L-(L%) (Bolinger 1958). When the same string of words is uttered without Final Fall as in (ii-b), it is unambiguously understood as a yes-no question.

(ii) a. Would you like mineral water, ice tea, or lemonade?
H* H- H* H- H*L-L%
b. Would you like mineral water, ice tea, or lemonade?
H* H* H*H-H%/L%
(Bartels 1999, 84-85)

Based on these observations, Bartels (1999) proposes that the final L- phrase accent in (ii-a) denotes the ASSERT morpheme and is paratactically associated with the utterance as in (iii).

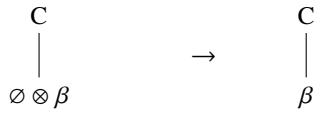
(iii) Would you like mineral water, ice tea, or lemonade ⊗ ASSERT

Gunlogson 2003), it has been tacitly assumed that the morpheme is somehow attached to the entire sentence and modifies its interpretation or projects a meaning independent of the meaning of the host utterance. Here I offer a more concrete system that includes a syntactic rule and a composition rule for paratactic association. Configurationally, the prosodic morpheme β is paratactically associated (indicated by '$\otimes$') to the head of the highest projection in the CP layer as in (90-a). When the prosodic morpheme β is the only object as in (90-b) it simply combines with its sister by shunting-type functional application (53).

(90) Syntactic rules of paratactic association

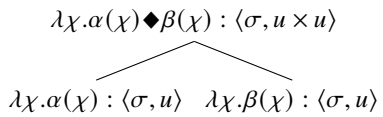
a. Paratactic Association

b. Paratactic Association with a null head



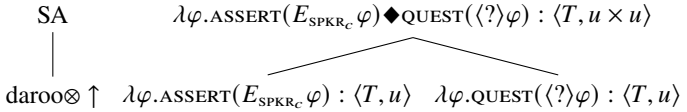
When there is a syntactic object with which β is associated, a new function is created. Thus, I propose a new system, $\mathcal{L}_{\otimes}$, which adds a new composition rule Paratactic Association (91) to the syntax of McCready's (2010) $\mathcal{L}^{+S}_{\mathrm{CI}}$.[35] Paratactic Association merges two functions into one by abstracting over the argument type of the two functions. The resulting function is combined with a truth-conditional expression by shunting-type functional application (53) and outputs a pair of expressions separated by a metalogical operator, $\blacklozenge$.

(91) Paratactic Association



To see how (91) works, let us see how *daroo*$\otimes\uparrow$ is composed. Both *daroo* and $\uparrow$ are of type $\langle T, u\rangle$, i.e., functions that take truth-conditional sentences and yield use-conditions. Since they are paratactically associated with each other, the rule (91) yields a function that takes a truth-conditional sentence and returns a pair of use-conditions.[36]

(92)



In effect, the alternative question like (ii-a) performs two speech acts: one is the question denoted by the main interrogative clause and the other is an assertion of the disjunctive statement, 'You would like mineral water, ice tea, or lemonade'.

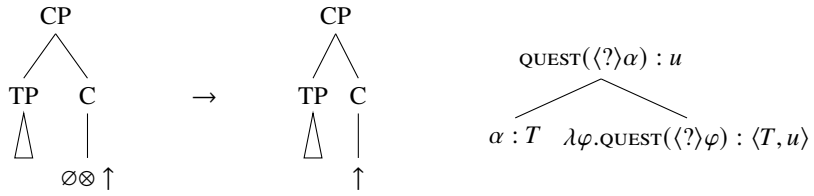
[35] See Appendix B for the full system of $\mathcal{L}_{\otimes}$.

[36] See Section 4.3 for a full composition of rising *daroo* declaratives.

↑ is paratactically associated to the entire utterance, i.e., the highest projection in the CP layer. Thus, if there is no syntactic object in the matrix CP, i.e., it is a plain declarative, ↑ occupies the matrix C. Compositionally, it combines with its sister by shunting-type functional application (53) and yields a use condition, $\textsc{quest}(\langle ?\rangle\alpha) = \{c : [\![\langle ?\rangle\alpha]\!] = top(T_c)\}$.

(93) Marie-wa wain-o nomu↑
Marie-TOP wine-ACC drink
'Does Marie drink wine?'

(94)



Now, since ↑ can only be associated to the whole utterance, (93) cannot be an embeeded question. Thus, (95) is ungrammatical as ↑ is inserted utterance-internally.

(95) *Marie-ga wain-o nomu ↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink ↑ Takeshi-TOP know
'Takeshi knows Marie drinks wine↑.'

One may wonder whether the rising declarative construction α↑ like (93) is analogous to the English rising declaratives discussed in Gunlogson (2003), Truckenbrodt (2006a) and Westera (2013) among others. If it were, it would be questionable to treat α ↑ and α-*ka*↑ as synonymous since in English root-level interrogatives and rising declaratives receive a different semantics. Uttering English rising declaratives α ↑ requires a context that is characterized by evidence that supports α. It is infelicitous when there is no contextual evidence as in (96).

(96) Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters. Robin says to the newcomer:
a. Is it raining?
b. #It's raining? (Gunlogson 2003, 95)

When the speaker considers it possible that the addressee has some evidence that supports α (so that they can add α to the common ground) as in (97), the speaker can utter α ↑.

(97) Robin is sitting, as before, in a windowless computer room when another person enters. The newcomer is wearing a wet raincoat and boots. Robin says:
a. Is it raining?
b. It's raining? (Gunlogson 2003, 96)

However, Japanese does not share this contrast. Both α ↑ and α-*ka*↑ can be used in both contexts:

(98) Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters. Robin says to the newcomer:
a. Ame-futte masu ka?
rain-fall POL Q

'Is it raining?'

b. Ame-futte masu?
rain-fall POL
'Is it raining?'

(99) Robin is sitting, as before, in a windowless computer room when another person enters. The newcomer is wearing a wet raincoat and boots. Robin says:

a. Ame-futte masu ka?
rain-fall POL Q
'Is it raining?'

b. Ame-futte masu?
rain-fall POL
'Is it raining?

Thus, I conclude that $\alpha\uparrow$ and α-*ka*$\uparrow$ have the same semantics $\textsc{quest}(\langle ? \rangle \alpha)$.

In short, α-*ka*, $\alpha\uparrow$ and α-*ka*$\uparrow$ all yield $\langle ? \rangle \alpha$, but they are different in their syntactic categories and tiers of meanings they contribute to.[37] The interpretations, syntactic projections and semantic types of the four constructions are summarized below:[38]

(100)

	Falling	Rising
Declarative	α	$\alpha\uparrow$
	TP	UtterP
	$\alpha : T$	$\textsc{quest}(\langle ? \rangle \alpha) : u$
Interrogative	α-*ka*	α-*ka*$\uparrow$
	CP	UtterP
	$\langle ? \rangle \alpha : T$	$\textsc{quest}(\langle ? \rangle \alpha) : u$

As can be seen, use-conditional items are heterogeneous in that they belong to different syntactic categories. This property of use-conditional items is in line with Potts (2005). Lexical items that induce conventional implicatures (CIs) are also heterogeneous. In Potts (2003, 2005), CIs are induced by syntactic constructions such as supplementary relatives and nominal appositives in English, adjectivess (e.g., *damn*), nouns (e.g., *bastard*), adverbs (e.g., *frankly*), discourse particles (e.g., German *ja*) and verbal affixes (e.g., Japanese honorifics).

4 Deriving the interpretations

Equipped with the syntax and semantics of *daroo* and *ka*/*ka*$\uparrow$/$\uparrow$, we are ready to derive the intricate interpretations of the Japanese modal *daroo* summarized above in (22), repeated here as (101).

[37] This line of analysis is compatible with Uegaki & Roelofsen's (2018) observation that a root-level interrogative without rising intonation tends to be interpreted as an exclamative as in (i) (Uegaki & Roelofsen's (14)). Since α-*ka* simply denotes a truth-conditional interrogative sentence, it can be an argument of another functor like an Exclamative Act Operator. See also Appendix D.

(i) Taro-wa utai-masu ka.
'It is surprising that Taro will sing!' (exclamative)

[38] One may wonder whether it is possible to remove *ka*$\uparrow$ from the lexicon by deriving its semantics from the semantics of *ka* and $\uparrow$. This line of analysis indeed does not make a difference to the simple rising interrogative discussed here but it makes a wrong prediction for the rising *daroo* interrogative discussed below in Section 4.4.

(101) Meaning of *daroo* according to sentence type and intonation

	Falling	Rising
Declarative	*daroo* statement ('I bet')	*daroo*↑ tag/confirmation Q ('... right?')
Interrogative	*daroo ka* self-addressing Q ('I wonder')	*daroo ka*↑ *

Recall the main proposal: that *daroo* takes an at-issue sentence φ and returns a use-condition of asserting a modalized sentence, $\textsc{assert}(E_{\text{SPKR}_c}\varphi)$:

(102) a. $[\![\textbf{daroo}]\!] \in D_{\langle T,u\rangle}$
b. $[\![\textbf{daroo}]\!] = \lambda\varphi.\textsc{assert}(E_{\text{SPKR}_c}\varphi)$
$= \lambda\varphi.\{c : [\![E_{\text{SPKR}_c}\varphi]\!] \in DC_{\text{SPKR}_c,c} \& [\![E_{\text{SPKR}_c}\varphi]\!] = top(T_c)\}$

Since in IEL, declarative and interrogative sentences are of the same type, $\langle\langle s,t\rangle,t\rangle = T$, *daroo* can embed both declarative and interrogative sentences.

Also, as proposed in Section 3.4, Japanese has three interrogative operators, $\text{C}_{[\text{Q}]}$ (*ka*), $\text{Utter}_{[\text{Q}]}\uparrow$ (*ka*↑) and ↑ . They all render declarative sentences into interrogative ones, but *ka* is different from ↑ and *ka*↑ in that *ka* returns a truth-conditional interrogative while the latter two yield a use condition of questioning an interrogative sentence.

(103) a. $[\![\text{C}_{[\text{Q}]}]\!] \in D_{\langle T,T\rangle}$
b. $[\![\text{C}_{[\text{Q}]}]\!] = \lambda\varphi.\langle ?\rangle\varphi$

(104) a. $[\![\text{Utter}_{[\text{Q}]}\uparrow]\!] \in D_{\langle T,u\rangle}$
b. $[\![\text{Utter}_{[\text{Q}]}\uparrow]\!] = \lambda\varphi.\textsc{quest}(\langle ?\rangle\varphi) = \lambda\varphi.\{c : [\![\langle ?\rangle\varphi]\!] = top(T_c)\}$

(105) a. $[\![\uparrow]\!] \in D_{\langle T,u\rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\textsc{quest}(\langle ?\rangle\varphi) = \lambda\varphi.\{c : [\![\langle ?\rangle\varphi]\!] = top(T_c)\}$

Furthermore, ↑ is different from *ka*↑ in that it is not syntactically integrated in its host utterance but rather is paratactically associated to the highest position in the layered matrix CP.

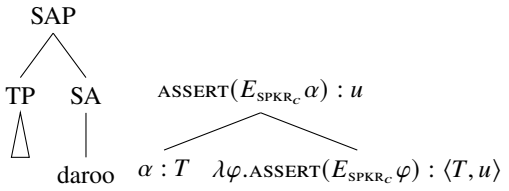
4.1 Falling *daroo*-declaratives

Let us see how these proposals derive the paradigm in (101), starting from the case of falling declaratives like (6), repeated here as (106).

(106) Marie-wa wain-o nomu daroo.
Marie-TOP wine-acc drink DAROO
'Marie drinks wine, I bet./Probably, Marie drinks wine.'

Daroo is an assertion operator of type $\langle T,u\rangle$. It takes a truth-conditional sentence and outputs a use condition. As discussed in Section 3.3.2 above, the syntax gives us the LF of (106) as in (107). Compositionally, then, *daroo* takes as input its sister declarative α and returns an assertion of the modalized sentence, $\textsc{assert}(E_{\text{SPKR}_c}\alpha)$.

(107)



Given Fact (42), when the embedded sentence is a declarative (i.e., |POSSIBILITY(α)| = 1 (see (34))), $E_{\text{SPKR}_c}\alpha$ and $K_{\text{SPKR}_c}\alpha$ are equivalent. Therefore, (106) gives rise to a use-condition of asserting a modalized declarative $K_{\text{SPKR}_c}\alpha$, where α ='Marie drinks wine'.

Now, as anonymous reviewers rightly pointed out, the content of the assertion $K_{\text{SPKR}_c}\alpha$ seems too strong for the intuition reported in Section 2, that is, 'the speaker has a bias toward α'. This has been a puzzle in linguistics. As Karttunen (1972) remarked, modal words like *must* are felt to be weaker than logical necessity: In standard modal logic, $\Box\alpha$ entails α, while 'It must be raining' does not seem to entail 'It is raining'. To account for this intuition of weakness, Kratzer (1991) treats *must* as a universal quantifier over a modal base which contains maximally normal possible worlds. Since how to derive the weakness intuition associated with words denoting necessity modals is beyond the scope of this paper, I defer detailed discussions to the existing literature (Karttunen 1972; Kratzer 1991; von Fintel & Gillies 2010; Lassiter 2014). For current purposes, I adopt a proposal in line with Karttunen (1972) and Kratzer (1991). The bare assertion α and the modalized $K_{\text{SPKR}_c}\alpha$ are in pragmatic competition. The modalized one expresses that α is established in the speaker's information state, while the bare assertion of α simply presents the truth of α in the actual world. Thus, by asserting $K_{\text{SPKR}_c}\alpha$, the speaker is implicating that he or she is not in the position to assert α.

4.2 Falling *daroo*-interrogatives

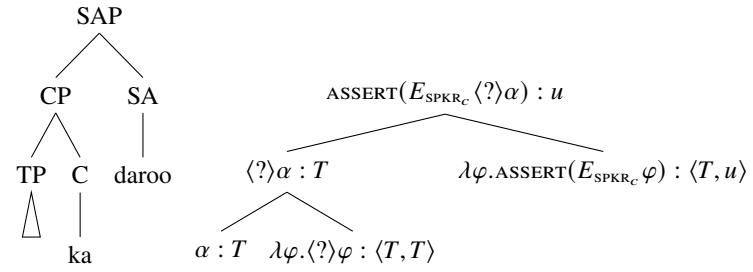
Let us turn to falling *daroo*-interrogative sentences like (11), repeated here as (108).

(108) Marie-wa wain-o nomu daroo ka.
Marie-TOP wine-ACC drink DAROO Q
'I wonder if Marie drinks wine.'

Recall that *daroo* moves to SA at LF to check off its uninterpretable [uROOT] feature. The LF and the composition of (108) are depicted below:[39]

[39] Following Matyiku (2017), I assume that the trace of head movement is deleted. See Appendix A for the motivation for this assumption.

(109)



Thus, (108) denotes a use condition of asserting the declarative sentence: $[\![E_a\langle ?\rangle\alpha]\!] = \{p|\Sigma_{SPKR_c}(w) \subseteq [\![?\{\alpha, \neg\alpha\}]\!]$. Thus, 'Marie drinks wine' or 'Marie does not drink wine' is supported as soon as the issues of $SPKR_c$ are resolved, which can be paraphrased as: the speaker wonders whether Marie drinks wine.

Note further that the entertain modality E_a does not exclude the case where the agent a has a bias towards a certain answer to the question. In this case, the intersection of $[\![E_a?\{\alpha, \neg\alpha\}]\!]$ and $[\![K_a\alpha]\!]$ is not empty, i.e., $[\![E_a?\{\alpha, \neg\alpha\}]\!] \cap [\![K_a\alpha]\!] \neq \emptyset$. Indeed it is possible for $\langle ?\rangle\alpha$-*daroo* to be felicitously followed by α-*daroo*:

(110) Marie-wa wain-o nomu daroo ka. Un, nomu daroo.
Marie-TOP wine-ACC drink DAROO Q yeah, drink DAROO
'I wonder if Marie drinks wine. Yeah, I think she does.'

Similarly, $\langle ?\rangle\alpha$-*daroo* can be felicitously followed by $\neg\alpha$-*daroo*:

(111) Marie-wa wain-o nomu daroo ka. Iya, noma-nai daro.
Marie-TOP wine-ACC drink DAROO Q no, drink-NEG DAROO
'I wonder if Marie drinks wine. No, I don't think she does.'

This contrasts with Ciardelli and Roelofsen's wonder modality W_a, defined as: "$W_a\varphi := \neg K_a\varphi \wedge E_a\varphi$" (Ciardelli & Roelofsen 2015, 1659). Thus, the Japanese *daroo* is a linguistic realization of the entertain modality E, rather than the wonder modality W.[40]

Put another way, α-*daroo ka* is translated into English as "I wonder whether α" because it denotes that the speaker either wonders whether α, knows α or knows $\neg\alpha$ in semantics, and implicates that the speaker does not know α or $\neg\alpha$ in pragmatics. If the speaker already knows α, the speaker should utter α-*daroo*. Since the speaker did not utter α-*daroo*, the addressee pragmatically infers that the speaker does not know α. This implicature $\neg K_{SPKR}\alpha$ is cancelled in (110) Likewise, $\neg K_{SPKR}\neg\alpha$ is cancelled in (111).

4.3 Rising *daroo*-declaratives

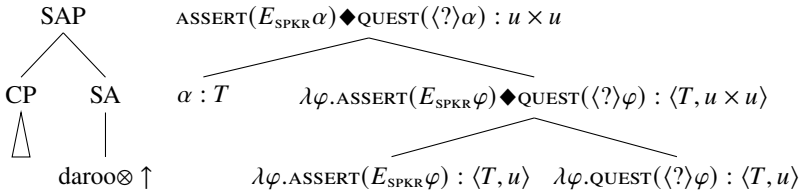
Recall that a rising *daroo*-declarative seems to express a meaning similar to a tag question, repeated here as (112).

(112) Marie-wa wain-o nomu daroo↑
Marie-TOP wine-ACC drink DAROO
'Marie drinks wine, right?'

[40] I would like to thank an anonymous reviewer for pointing this out.

Section 3.3.2 proposed that *daroo* occupies the SA position. Section 3.4 proposed that the tonal morpheme ↑ is paratactically associated with SA. The two shunting-type morphemes are combined by the composition rule of PARATACTIC ASSOCIATION (91), which yields a function that takes an at-issue sentence and returns a pair of use-conditions.

(113)



Thus, (112) gives rise to a pair of use conditions, ASSERT($E_{SPKR}\alpha$) (≡ ASSERT($K_{SPKR}\alpha$)) and QUEST($\langle ?\rangle\alpha$). That is, the speaker asserts her bias toward α, while raising a question $?\{\alpha, \neg\alpha\}$, resulting in an interpretation similar to English tag questions.[41]

4.4 Rising *daroo*-interrogatives

Finally, we address the ungrammaticality of rising *daroo*-interrogatives.

(114) *Marie-wa wain-o nomu daroo ka↑
Marie-TOP wine-ACC drink DAROO Q

Unlike the pure tonal morpheme ↑, the complex morpheme *ka*↑ has a morpho-syntactic component, so it is syntactically integrated and confined to the higest position in the layered matrix CP, UtterP, which c-commands *daroo*. *Daroo* has already moved out of ModalP to SAP, but it is still lower than UtterP. Both *ka*↑ and *daroo* are syntactically integrated in the same composition tree, so *ka*↑ needs to take its sister ASSERT($E_{SPKR}\alpha$) of type u as its argument. Since the argument of *ka*↑ needs to be a truth-conditional sentence of type T, the derivation crashes due to type mismatch: hence (114) is ungrammatical.[42]

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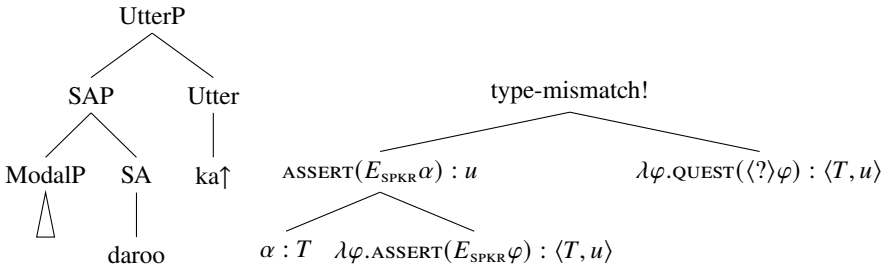
[41] An anonymous reviewer reports their intuition that the bias expressed by falling *α-daroo* is somewhat weaker than the one expressed by rising *α-daroo*. This intuition can be explained by observing the pragmatic competition between α and *α-daroo*. In my analysis, falling *α-daroo* is an assertion of $K_{SPKR}\,\alpha$, and so pushes the modalized sentence $K_{SPKR}\,\alpha$ onto the Table. When the addressee accepts the speaker's assertion, therefore, what enters the common ground will be $K_{SPKR}\,\alpha$, not α. On the other hand, rising *α-daroo* is a combination of two speech acts, an assertion of $K_{SPKR}\,\alpha$ and a question $?\alpha$. The question act pushes the issue $?\{\alpha, \neg\alpha\}$ as well as $K_{SPKR}\,\alpha$ onto the Table, so when the addressee responds with 'yes', α will enter the common ground.

[42] A variant of *α-daroo ka* ↑ with a Final High H% instead of Final Rise L%H% seems to become possible, if we have an appropriate context. For instance, in a quiz show or an instructive/Socratic questioning context, the questioner can felicitously utter a rising interrogative *α-daroo ka*↑ to the answerer (I owe (ii) to an anonymous reviewer):

(i) Doitsu-no shuto-wa doko deshoo ka↑
Germany-GEN capital-TOP where DAROO.POLITE Q
'Where is the capital of Germany?'

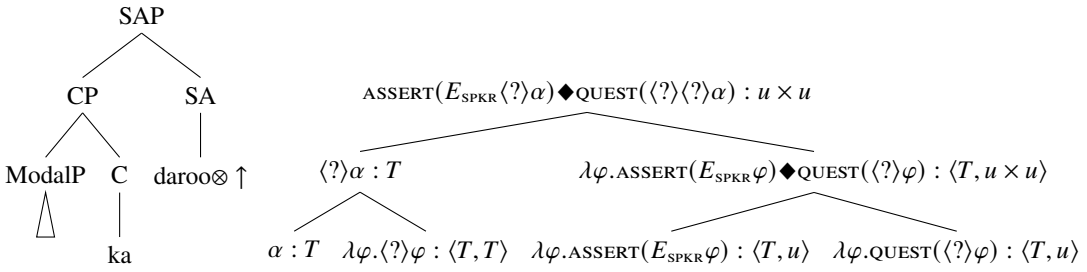
(ii) 9431-wa sosuu deshoo ka?
9431-TOP prime.number DAROO.POLITE Q
'Is 9431 a prime number?'

(115)



As mentioned in footnote 38, it is reasonable to ask why (114) is not composed of the morpheme *ka* and the paratactically associated ↑ instead of *ka*↑. This analysis is not tenable because it derives a wrong interpretation. To see this, let us relax the structural constraint and try to compose (114) from *ka* and ↑. As can be seen in the LF structure in (116), *ka* is merged with the ModalP and ↑ is paratactically associated with *daroo* at SA.

(116)



The composition yields a pair of use-conditions, ASSERT($E_{\text{SPKR}}\langle ?\rangle\alpha$)◆QUEST($\langle ?\rangle\langle ?\rangle\alpha$). Since in IEL the iteration of $\langle ?\rangle$ has no effect, i.e., $[\![\langle ?\rangle\langle ?\rangle\alpha]\!] = [\![\langle ?\rangle\alpha]\!]$, the resulting formula translates into a combination of a self-addressing question and a question, i.e., "I wonder whether Marie drinks wine and does she drink wine?". This is a sensible speech act to perform and is actually a true information-seeking question. Thus, it does not explain the ungrammaticality of (114). One may maintain that *α-daroo ka*↑ is blocked since it is unnecessarily complex given that an information-seeking question can be asked by *α*-(*ka*)↑. As suggested by Sven Lauer (p.c.), however, simple interrogatives like *α*-(*ka*)↑ do not necessarily indicate that the speaker is interested in knowing the answer to $?\alpha$. For example, they can be "exam questions, quiz questions, rhetorical questions, Socratic questions, discussion questions, combative questions," etc. Therefore, *α-daroo ka*↑ should not be blocked since it would be a useful way to convey that the speaker is asking a true information-seeking question.

To recapitulate, the use-conditional interrogative operator *ka*↑ cannot be composed of *ka* and ↑ but it is treated as a unit registered in the Japanese lexicon.

Deshoo is the polite form of *daroo*. I speculate that the Final High functions as a shifter of the epistemic agent from SPKR to ADDR. In a quiz show context like (ii), the speaker, i.e., the quizmaster, indeed has the power to impose a question on the addressee, i.e., the contestant. Thus, Final Rise is a modifier of *daroo* rather than an interrogativizer.

4.4.1 Interim Summary

The following table summarizes the interpretations and semantic types of the four *daroo*-sentences:

(117) Interpretations and types of *daroo*-sentences

	Falling	Rising
Declarative	*α-daroo* $\textsc{assert}(K_{\textsc{spkr}_c}\alpha) : u$	*α-daroo*↑ $\textsc{assert}(K_{\textsc{spkr}_c}\alpha)\blacklozenge\textsc{quest}(\langle ?\rangle\alpha) : u \times u$
Polar Interrogative	*α-daroo ka* $\textsc{assert}(E_{\textsc{spkr}_c}\langle ?\rangle\alpha) : u$	**α-daroo ka*↑ Type-mismatch

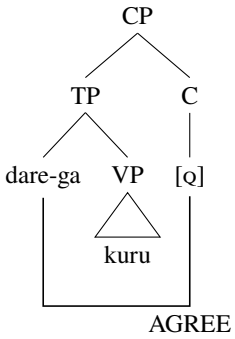
4.5 *Wh* interrogatives

The current proposal naturally extends to *wh*-interrogatives. Syntactically, in Japanese a *wh*-interrogative contains a *wh*-pronoun and is optionally marked with the question particle *ka*:

(118) Dare-ga kuru (ka)?
who-NOM come Q
'Who is coming?'

Put another way, a *wh*-pronoun alone can mark the clause as interrogative. Thus, the [Q] feature is either realized at the surface as the particle *ka* or via an agreement relation between the *wh*-pronoun and C as depicted in (119). As for polar interrogatives, in contrast, an interrogative operator, either *ka*, *ka*↑ or ↑, needs to be attached to a declarative.

(119)



As for the semantics of the *wh*-clause, I treat it as a Hamblin (1973) set, i.e., a downward closed set of propositions.[43] In other words, the *wh*-clause denotes an issue, so it is of type $\langle\langle s,t\rangle,t\rangle = T$ just as declaratives and polar interrogatives. Following Ciardelli et al. (2017), let $|\varphi|$ be the set of worlds where φ is true. A *wh*-clause, *Dare-ga kuru*, denotes a downward closed set of propositions which support that x is coming for some human x in the discourse (see also Uegaki & Roelofsen 2018).

(120) a. $[\![\text{Dare-ga kuru}]\!] \in D_{\langle\langle s,t\rangle,t\rangle}$

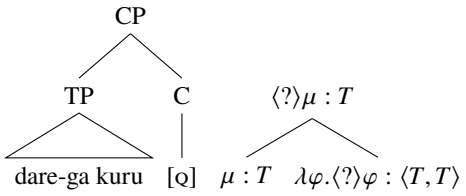
[43] See Ciardelli et al. (2017) for a full-fledged compositional system in inquisitive semantics.

b. $[\![$Dare-ga kuru$]\!] = \{p|\exists x \in D.x$ is human$\&p = |x$ is coming$|\} = [\![\mu]\!]$

In the following illustrations, I use μ for the denotation of *Dare-ga kuru*.

Let us see how the *wh*-interrogatives without *daroo* interact with Final Rise. The current proposal predicts that falling μ-*ka* denotes $\langle ? \rangle \mu$ of type T. According to the definition of $\langle ? \rangle$ in (35), since $|\textsc{possibility}(\mu)| \geq 2$, $\langle ? \rangle \mu = \mu$. Thus, μ-*ka* denotes a Hamblin-set of truth-conditional type T:

(121)



The prediction is indeed correct since it can be embedded under *know*:

(122) Dare-ga kuru ka sira-nai/siri-tai.
who-NOM come Q know-not/know-want
'I don't know/I want to know who is coming.'

Furthermore, an root-level/unembedded *wh*-clause without Final Rise is not an information-seeking question but is interpreted as a rhetorical question.[44]

(123) Dare-ga kuru (ka).
who-NOM come Q
"Who on earth would come! (No one will!)"

Thus, unlike ↑, which actualizes the question speech act, μ-(ka) simply denotes a truth-conditional Hamblin set and becomes an argument of another functor.

With Final Rise ↑, it functions as a genuine *wh*-question:

(124) Dare-ga kuru (ka)↑
who-nom come q
'Who is coming?'

Recall that [Q]↑ is a use-conditional interrogative operator yielding a use-condition of questioning a *wh*-interrogative $\textsc{quest}(\langle ? \rangle \mu)$ of type u:

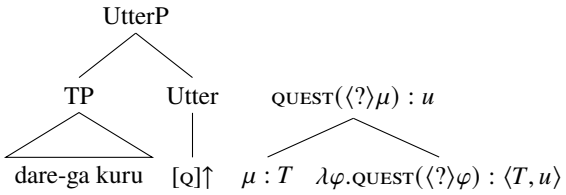
[44] An anonymous reviewer noted that the following sentence can be used as an information-seeking question:

(i) Dare-ga ki-masu ka.
who-nom come-polite Q
'Who will come?'

My intuition is that (i) with Final Fall is less natural than (ii) with Final Rise, though I agree that an information-seeking interpretation of (i) in some limited contexts is not impossible. I speculate that in (i), the addition of the polite morpheme *masu* invokes a presupposition of the presence of an addressee, which in turn invokes a covert QUEST operator.

(ii) Dare-ga ki-masu ka↑
who-Nom come-polite Q
'Who will come?'

(125)



Since the clause headed by [Q]↑ is UtterP, it cannot be embedded as in (126).

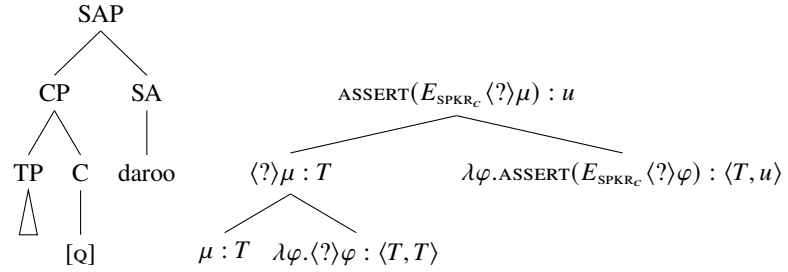
(126) *Dare-ga kuru (ka)↑ sira-nai/siri-tai.
who-NOM come Q know-not/know-want
'I don't know/I want to know who is coming.'

Turning to *daroo* sentences, falling *wh*-interrogatives with *daroo* have an interpretation parallel to falling polar interrogatives, i.e., 'I wonder ...':

(127) Dare-ga kuru daroo (ka).
who-NOM come DAROO Q
'I wonder who is coming.'

This is as predicted. *Daroo* embeds the at-issue *wh*-interrogative and the whole construction denotes $\textsc{assert}(E_{\textsc{spkr}_c}\langle ?\rangle\mu)$, i.e., that the speaker is asserting that she is entertaining the issue μ.

(128)

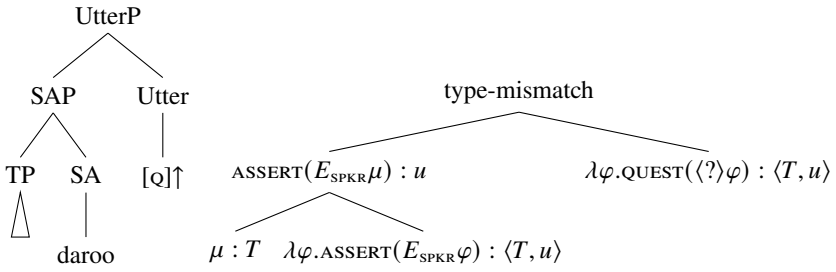


Finally, rising *daroo wh*-interrogatives with or without *ka* are ungrammatical:

(129) *Dare-ga kuru daroo (ka)↑
who-NOM come DAROO Q

This is also as predicted. (129) is marked as an interrogative with [Q]↑, which is a syntactically integrated operator that is located at the highest position of the CP layer, UtterP. *Daroo* takes its sister and returns a use-conditional object of type u, which causes a type mismatch.

(130)



4.6 Summary

To account for the paradigm presented in Section 2, I proposed that *daroo* is a root-level/assertive modal operator, which asserts epistemic knowledge associated with the speaker, E_{SPKR}. Syntactically, *daroo* moves to the head of SA to check off its uninterpretable feature, [uROOT], resulting in the logical form ASSERT($E_{SPKR_c}\varphi$), in which the modal operator E_{SPKR_c} embeds a declarative or interrogative sentence. The semantics of *daroo* is stated in the framework of inquisitive epistemic logic. In particular, the semantics of *daroo* contains an entertain modality E_{SPKR_c}, and $E_{SPKR_c}\varphi$ denotes that the speaker is entertaining an issue denoted by φ. When the embedded sentence is a declarative α, $E_{SPKR_c}\alpha$ is equivalent to $K_{SPKR_c}\alpha$. Thus, a *daroo*-declarative describes an epistemic state of the speaker. As can be seen, this equivalence allows us to maintain a uniform semantics for *daroo* as an assertion of entertain modality.

This paper also proposed that there are three interrogative operators, truth-conditional $C_{[Q]}$ (*ka*), and use-conditional Utter$_{[Q]}\uparrow$ (*ka*↑) and ↑. Their semantic functions are identical at the truth-conditional level: they all take a declarative sentence (of truth-conditional type) and render it into an interrogative. However, they are different with respect to the tier of meaning and structure. Prosodically unmarked *ka* yields a truth-conditional interrogative. The other two render it into a use-condition for questioning the interrogative sentence. *Ka* and *ka*↑ are syntactically integrated in the sentence, while ↑ is only paratactically associated to its host sentence.

The following table summarizes the interpretations and semantic types of the *daroo*-sentences:

(131) Interpretations and types of *daroo*-sentences

	Falling	Rising
Declarative	*α-daroo* ASSERT($K_{SPKR}\alpha$) : u	*α-daroo*↑ ASSERT($K_{SPKR}\alpha$)◆QUEST($\langle ?\rangle\alpha$) : $u \times u$
Polar Interrogative	*α-daroo ka* ASSERT($E_{SPKR}\langle ?\rangle\alpha$) : u	*α-daroo ka*↑ Type-mismatch
Wh-interrogative	*μ-daroo (ka)* ASSERT($E_{SPKR}\langle ?\rangle\mu$) : u	*μ-daroo (ka)*↑ Type-mismatch

5 Alternative approaches

One of the core proposals of the current paper is that *daroo*, *ka*↑ and ↑ only project use-conditional contents. Before concluding the theoretical discussion, this section considers

two alternatives to this approach. The first alternative is a one-dimensional approach in which the semantic contributions of *daroo*, *ka*↑ and ↑ are integrated into a single semantic representation. The second approach analyzes them as contributing to both at-issue and not-at-issue meanings.

5.1 One-dimensional approach

In the one-dimensional approach, there is only a single dimension, so a single sentence denotes a single truth-conditional proposition. Under this approach, the meaning of *daroo* must be integrated into the truth-conditional dimension. Hara (2006, ch. 6) presents a number of arguments that the contribution of *daroo* is different from that of ordinary descriptive/truth-conditional expressions. In Section 3.3.2, we already discussed the first argument based on the unembeddability of *daroo*. That is, *daroo* resists being inside embedded questions or embedded under presupposition holes, which supports the idea that *daroo* is not a descriptive/truth-conditional item.

Hara's (2006) second argument comes from co-occurrence with modal adverbs. As already seen in Section 2.1, high probability adverbs can co-occur with *daroo* as in (132) while a low probability adverb *moshikasuruto* 'maybe' cannot as in (133).

(132) Kare-wa tabun/kitto kuru daroo.
he-TOP probably/certainly come DAROO
'Probably/Certainly, he will come.'

(133) *Kare-wa moshikasuruto kuru daroo.
he-TOP maybe come DAROO

(Sugimura 2004)

However, it is puzzling that *daroo* can co-occur with the modal auxiliary *kamoshirenai* 'might', which also expresses a low probability of the prejacent proposition.

(134) Kare-wa kuru kamoshirenai daroo.
he-TOP come might DAROO
'Probably, he might be coming./He might be coming, I bet.'

Hara (2006) explains this puzzle by proposing that both *daroo* and *moshikasuruto* contribute to the expressive/non-truth-conditional dimension, while *kamoshirenai* contributes to the truth-conditional dimension. Thus, in (134), the expressive *daroo* can embed the truth-conditional *kamoshirenai*. In terms of the current paper, *daroo* is of type $\langle T, u\rangle$ and α-*kamoshirenai* is of type T. Going back to (133), if *daroo* and *moshikasuruto* were truth-conditional items, *daroo* should be able to embed *moshikasuruto* and have an interpretation parallel to (134). Then a question arises as to how (132) is composed, assuming that *tabun* 'probably' and *kitto* 'certainly' are also non-truth-conditional adverbs. Following Hara (2006), I argue that modal adverbs such as *kamoshirenai*, *tabun* and *kitto* are more like canonical expressive items in the sense of Potts (2005). That is, unlike *daroo*, which is a shunting-type UCI, these adverbs project both truth-conditional and use-conditional meanings. Since the implementation of this analysis requires an extension of $\mathcal{L}_{\otimes}$ and is beyond the scope of the main purpose of the paper, I defer the discussion to Appendix C.

ka↑ and ↑ also resist being embedded under presupposition holes.[45] However, unlike *da-roo*, (*ka*)↑-interrogatives cannot be embedded under attitude predicates either, as we already have seen in (89) and (95), repeated here as (135).

(135) a. *Marie-ga wain-o nomu ka↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q↑ Takeshi-TOP know
'Takeshi knows whether Marie drinks wine↑.'
b. *Marie-ga wain-o nomu ↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink ↑ Takeshi-TOP know
'Takeshi knows Marie drinks wine↑.'

As discussed above, all the ungrammatical examples are ruled out by syntactic/configurational constraints on (*ka*)↑, rather than type-theoretical ones.

Before moving on to the other alternative, let us consider a variant of the one-dimensional approach in which the semantics of speech acts or [ROOT] are integrated into the truth-conditional dimension. Reviewing the one-dimensional account offered by Brandt et al. (1992), Gutzmann (2015) already shows how such an approach makes the wrong predictions. In a nutshell, according to Brandt et al. (1992), an interrogative sentence contains an interrogative operator, $\lambda\varphi.\mathbf{open}(\varphi)$, which takes a sentence radical φ and outputs a truth-condition which is valued as true iff it is open whether φ. Thus, an interrogative sentence *Does Peter snore?* have the following truth-condition:

(136) "Does Peter snore?" is true iff it is open whether there is a fact *e* such that *e* instantiates the proposition that Peter snores. (Gutzmann 2015, 175)

It is not difficult to see how the truth-condition in (136) is problematic. In (137), B1 should be interpreted as 'Peter does not snore', not as 'it is not open whether Peter snores'. Similarly, the truth-condition (136) wrongly predicts that the responses in B2-4 are felicitous.

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[45] (Ka)↑ cannot be embedded under another question particle:

(i) *Ame-ga furu (ka)↑ ka(↑).
rain-NOM fall Q Q

Neither the affixal nor the sentential negation can embed *ka*↑ or ↑:

(ii) *Ame-ga furu (ka)↑ (wakedewa)-nai.
rain-NOM fall Q NEG
Literal translation: '*It is not the case whether it rains.'

Modal expressions cannot follow *ka*↑ or ↑ (Etymologically, *ka* in *kamoshirenai* 'might' is arguably derived from the question particle *ka*. In any case, neither *moshirenai* nor *kamoshirenai* can follow *ka*↑ or ↑.):

(iii) a. *Ame-ga furu (ka)↑ kanoosee-ga aru.
rain-NOM fall Q possibility-NOM exist
Literal translation: '*There is a possibility whether it rains.'
b. *Ame-ga furu (ka)↑ nichigainai/(ka)moshirenai.
rain-NOM fall Q must/might
Literal translation: '*It's certain/possible whether it rains.'

Finally, (ka)↑ cannot be in the scope of a conditional antecedent:

(iv) Ame-ga furu (ka)↑-nara, pikunikku-wa chuushi-da.
rain-NOM fall Q-COND picnic-TOP cancel-COP
Literal translation: '*If whether it rains, the picnic is canceled.'

(137) A: Does Peter snore?
B1: No.
B2:#That's not true.
B3:#You're mistaken.
B4:#No, I know that she isn't. (modified from Gutzmann 2015, 175-176)

Therefore, the semantics of question acts should not be integrated into the truth-conditional dimension.

5.2 Non-shunting UCIs

As discussed in Section 3.2.2, one of the primary reasons why *daroo* does not project both use-conditional and truth-conditional meanings à la Potts (2005), is that the use-conditional meaning would weaken the truth-conditional meaning. That is, the construction would have an incongruous interpretation "α and probably α".

Uegaki & Roelofsen (2018) (henceforth, U&R) offer an analysis similar to the current paper. U&R also employ the entertain modality of IEL for the semantics of *daroo*, but U&R's analysis is different from the current paper in that they assume *daroo*, *ka*↑ and ↑ all project at-issue and non-at-issue meanings.[46] However, U&R's analysis can circumvent the problem of reaching the incongruous at-issue and non-at-issue meanings of α-*daroo* declarative, since U&R assume that Final Fall ↓ is a non-inquisitive operator ↓ which yields an at-issue tautological meaning. Because the at-issue meaning is tautologous and uninformative, it does not interfere with the non-at-issue meaning $E_{\text{SPKR}}\varphi$. Although U&R's analysis cleverly circumvents the problem, treating *daroo* as contributing to two dimensions is still problematic. For example, it cannot derive the correct interpretation of (9), repeated here as (138), where *daroo* is embedded under *because*.

(138) Boku-wa ame-ga furu daroo kara kasa-o mot-te it-ta.
I-TOP rain-NOM fall DAROO because umbrella-ACC have-and go-PAST
'Because it will rain (I bet), I took an umbrella with me.'

According to U&R's definition of *daroo* (see (155) in Appendix D), φ-*daroo* projects an at-issue question meaning, $\langle ? \rangle ! \varphi$ as well as its non-at-issue meaning $E_{\text{SPKR}}\varphi$. It remains unexplained why *kara* in (138) appears to take the non-at-issue meaning of the embedded clause as its argument rather than the at-issue one. According to my analysis, in contrast, *daroo* is a shunting-type operator, so φ-*daroo* only projects $\textsc{assert}(E_{\text{SPKR}}\varphi)$. Assuming with Tenny (2006); Hara (2008) that *kara* 'because' is an evidential/sentience marker which, like attitude predicates, can embed use-conditional meanings (Harris & Potts 2009, 2011), the current analysis can derive the correct interpretation of (138), 'The fact that the speaker asserts that it will rain causally explains the speaker to take an umbrella with her.'[47]

Furthermorem there is a conceptual problem in U&R's analysis in that it treats the main semantics of *daroo* as a contribution to the "non-at-issue" dimension. In Potts (2005, 11), "[CIs or non-at-issue meanings] are comments on a semantic core (at-issue entailments)." In Barker's (2009) term, they are side-effects. The core contribution of *daroo* as a modalized statement is clearly the main effect of the *daroo*-utterances.[48]

[46] See Appendix D for a more detailed review of Uegaki & Roelofsen (2018).

[47] Evidential/sentience markers are different from attitude predicates in that they cannot shift the attitude holder of the bias of *daroo* (10) while attitude predicates can (i). See Hara (2006, ch. 6) for more discussion.

[48] See Appendix D for other problems of U&R's analysis.

6 Conclusion

In many languages, a question meaning can be syntactially and/or prosodically marked. The literature on the semantics of questions and the roles of intonatonation center around the following questions:

(139) a. What are the differences between these utterance types that express question-like meanings?
b. What are the sources of the differencses?
In particular, how can we compositionally derive the different meanings?

The paradigm of *daroo*-sentences allows us to easily answer (139-a): Falling *daroo*-declaratives are used to describe the speaker's own epistemic state. Rising *daroo*-declaratives are used to perform two speech acts at the same time, an assertion of the speaker's bias and a question. Finally, falling *daroo*-interrogatives are used when the speaker is inquiring into his/her own epistemic state, i.e., entertaining an issue.

In order to answer (139-b), this paper raised the following research questions:

(140) a. What is the syntax and semantics of the sentence-final modal *daroo*?
b. What is the syntax and semantics of ↑ (Final Rise)? In particular, how is the intonational morpheme like ↑ associated to its host utterance?
c. How do the elements at the layered matrix CP syntactically and semantically interact with each other?

In order to answer (140-a), this paper proposed that *daroo* is an ASSERT operator that includes a linguistic realization of the entertain modality in inquisitive epistemic logic IEL, which describes the information state in which the speaker is entertaining certain issues. Syntactically, *daroo* moves to the SA head to check off its uninterpretable feature, $[u\textsc{root}]$. The movement derives a logical form in which the modal operator embeds the entire interrogative construction when the sentence is marked with *ka*. The semantics of *daroo* is uniformly defined as a use condition of asserting the entertain modal in IEL. The machinery provided by IEL successfully derives the variations of the interpretations: For a declarative, α-*daroo* asserts that the agent has a bias toward the truth of the sentence α, while for an interrogative, $\langle ? \rangle \alpha$-*daroo* asserts that the agent is entertaining the issue $?\{\alpha, \neg\alpha\}$.

To answer (140-b) and (140-c), the current paper also proposed that Japanese has three interrogative operators, truth-conditional $\mathrm{C}_{[\mathrm{Q}]}$ (*ka*), and use-conditional $\mathrm{Utter}_{[\mathrm{Q}]}\uparrow$ (*ka*↑) and ↑. They all take a truth-conditional sentence and render it into an interrogative. While *ka* yields a truth-conditional interrogative, the other two render it into a use-condition of questioning the interrogative sentence. While *ka* and *ka*↑ are syntactically integrated in the sentence, ↑ is only paratactically associated to its host sentence. The paper thus offers an extension of McCready's (2010) $\mathcal{L}^{+S}_{CI}$, $\mathcal{L}_{\otimes}$, which contains a new combinatoric rule PARATACTIC ASSOCIATION that merges two functions denoted by two paratactically associated items into a single function.

This investigation into the paradigm of *daroo* has revealed the intricacy of the interplay between clause types, modality, boundary tones and tiers of meaning.

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References

Amaral, Patricia, Craige Roberts & E. Allyn Smith. 2007. Review of the logic of conventional implicatures by chris potts. *Linguistics and Philosophy* 30(6). 707–749.

Barker, Chris. 2009. Clarity and the grammar of skepticism. *Mind & Language* 24. 253ñ–273. doi:10.1111/j.1468-0017.2009.01362.x.

Bartels, Christine. 1999. *The intonations of English statements and questions*. Garland Publishing.

Blutner, Reinhard & Henk Zeevat (eds.). 2004. *Optimality Theory and Pragmatics*. New York: Palgrave Macmillan.

Bolinger, D. 1958. *Interrogative Structures of American English: the Direct Question* American Dialect Society. Society.

Brandt, Margareta, Marga Reis, Inger Rosengren & Ilse Zimmermann. 1992. Satztyp, satzmodus und illokution. In Inger Rosengren (ed.), *Satz und Illokution*, vol. i, 1–90. Max Niemeyer Verlag.

Büring, Daniel & Christine Gunlogson. 2000. Aren't positive and negative polar questions the same? USCS/UCLA.

Ciardelli, Ivano & Floris Roelofsen. 2018. An inquisitive perspective on modals and quantifiers. *Annual Review of Linguistics* 4. 129–149. doi:10.1146/annurevlinguistics-011817-045626.

Ciardelli, Ivano, Floris Roelofsen & Nadine Theiler. 2017. Composing alternatives. *Linguistics and Philossophy* 40. 1–36.

Ciardelli, Ivano A. & Floris Roelofsen. 2015. Inquisitive dynamic epistemic logic. *Synthese* 192(6). 1643–1687.

Cinque, G. 1999. *Adverbs and Functional Heads: A cross-linguistic perspective*. Oxford University Press.

Cross, Charles & Floris Roelofsen. 2020. Questions. In Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University fall 2020 edn.

Davis, Christopher. 2009. Decisions, dynamics and the Japanese particle *yo*. *Journal of Semantics* 26. 329–366.

Davis, Christopher. 2011. *Constraining Interpretation: Sentence Final Particles in Japanese*: University of Massachusetts, Amherst dissertation.

Emonds, Joe. 1969. *Root and Structure-Preserving Transformations*. Cambridge: MIT dissertation.

Farkas, Donka. F. & Kim. B. Bruce. 2010. On reacting to assertions and polar questions. *Journal of Semantics* 27(1). 81–118.

Farkas, Donka F. & Floris Roelofsen. 2017. Division of labor in the interpretation of declaratives and interrogatives. *Journal of Semantics* doi:10.1093/jos/w012.

von Fintel, Kai & Anthony S. Gillies. 2010. Must . . . stay . . . strong! *Natural Language Semantics* 18(4). 351–383. doi:10.1007/s11050-010-9058-2.

Grice, H. Paul. 1975. Logic and conversation. In Peter Cole & Jerry Morgan (eds.), *Syntax and Semantics*, vol. 3: Speech Acts, 43–58. New York: Academic Press.

Gunlogson, Christine. 2003. *True to Form: Rising and Falling Declaratives as Questions in English*. New York: Routledge.
Gunlogson, Christine. 2008. A question of commitment. *Belgian Journal of Linguistics* 22. 101–36. doi:10.1075/bjl.22.06gun.
Gutzmann, Daniel. 2015. *Use-Conditional Meaning: Studies in Multidimensional Semantics*. Oxford University Press.
Gutzmann, Daniel & Robert Henderson. 2019. Expressive updates, much? *Language* 95(1). 107–135. doi:10.1353/lan.2019.0014. Publisher Copyright: © 2019, Linguistic Society of America. All rights reserved. Copyright: Copyright 2019 Elsevier B.V., All rights reserved.
Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10. 41–53.
Hara, Yurie. 2006. *Japanese Discourse Items at Interfaces*. Newark, DE: University of Delaware dissertation.
Hara, Yurie. 2008. Evidentiality of discourse items and *because*-clauses. *Journal of Semantics* 25(3). 229–268.
Hara, Yurie. 2017. Causality and evidentiality. In Alexandre Cremers, Thom van Gessel & Floris Roelofsen (eds.), *Proceedings of the 21st Amsterdam Colloquium*, 295–304.
Hara, Yurie. 2018. *Daroo* as an entertain modal: an inquisitive approach. In Shinichiro Fukuda, Mary Shin Kim, Mee-Jeong Park & Haruko Minegishi Cook (eds.), *Japanese/Korean Linguistics*, vol. 25, CSLI Publications.
Hara, Yurie & Christopher Davis. 2013. *Darou* as a deictic context shifter. In Kazuko Yatsushiro & Uli Sauerland (eds.), *Proceedings of Formal Approaches to Japanese Linguistics 6 (FAJL 6)* MIT Working Papers in Linguistics 66, 41–56.
Hara, Yurie, Naho Orita, Deng Ying, Takeshi Koshizuka & Hiromu Sakai. 2020. A neurolinguistic investigation into semantic differences of evidentiality and modality. In *Procceedings of Sinn und Bedeutung 24*, .
Hare, Richard Mervyn. 1952. *The Language of Morals*. Oxford: Oxford University Press.
Harris, Jesse A. & Christopher Potts. 2009. Perspective-shifting with appositives and expressives. *Linguistics and Philosophy* 36(2). 523–552.
Harris, Jesse A. & Christopher Potts. 2011. Predicting perspectival orientation for appositives. In *Proceedings from the 45th Annual Meeting of the Chicago Linguistic Society*, vol. 45, 207–221. Chicago, IL: Chicago Linguistic Society.
Heim, Irene. 1982. *The Semantics of Definite and Indefinite Noun Phrases*: University of Massachussets, Amherst dissertation. [Distributed by GLSA].
Heim, Irene. 1994. Interrogative semantics and karttunen's semantics for *know*. In R. Buchalla & A. Mittwoch (eds.), *The proceedings of the ninth annual conference and the workshop on discourse of the Israel Association for Theoretical Linguistics*, Jerusalem: Academon.
Homer, Vincent. 2011. As simple as it seems. In Maria Aloni, Vadim Kimmelman, Floris Roelofsen, Galit Weidman Sassoon, Katrin Schulz & Matthijs Westera (eds.), *Proceedings of the 18th Amsterdam Colloquium*, 351–360.
Hooper, Joan & Sandra Thompson. 1973. On the applicability of root transformations. *Linguistic Inquiry* 4. 465–497.
Izvorski, Roumyana. 1997. The present perfect as an epistemic modal. *The proceedings of SALT* 7. 222–239.
Jacobson, Pauline. 2006. I can't seem to figure this out. In B.J. Birner & G. Ward (eds.), *Drawing the BoundariesofMeaning: Neo-Gricean Studies in Pragmatics and Semantics in Honor of Laurence R.Horn*, vol. 80 Studies in Language Companion Series, John Benjamins Publishing Company.

Jakobson, Roman. 1960. Linguistik und poetik. In Ronan Jakobsen (ed.), *Poetik*, 83–121. Frankfurt: Suhrkamp.
Kaplan, David. 1999. The meaning of *ouch* and *oops*: Explorations in the theory of meaning as use. 2004 version. MS, University of California.
Karttunen, L. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1. 3–44.
Karttunen, Lauri. 1972. Possible and must. In John Kimball (ed.), *Syntax and semantics*, vol. 1, Seminar Press.
Kratzer, Angelika. 1991. Modality. In A. von Stechow & D. Wunderlich (eds.), *Semantics: An International Handbook of Contemporary Research*, 639–650. Berlin: de Gruyter.
Krifka, Manfred. 2001. Quantifying into question acts. *Natural Language Semantics* 9. 1–40.
Lahiri, Utpal. 2000. Lexical selection and quantificational variability in embedded interrogatives. *Linguistics and Philosophy* 23(4). 325–389.
Langendoen, D. Terence. 1970. The 'can't seem to' construction. *Linguistic Inquiry* 1(1). 25–35.
Lassiter, Daniel. 2014. The weakness of must: In defense of a mantra. In *Proceedings of SALT 24*, 597–618.
Lyons, John. 1977. *Semantics*. Cambridge University Press.
Malamud, Sophia & Tamina Stephenson. 2015. Three ways to avoid commitments: Declarative force modiers in the conversational scoreboard. *Journal of Semantics* 32. 275–311.
Matyiku, Sabina Maria. 2017. *Semantic Effects of Head Movement: Evidence from Negative Auxiliary Inversion*: Yale University dissertation.
McCready, Elin. 2010. Varieties of conventional implicature. *Semantics and Pragmatics* 3(8). 1–57. doi:10.3765/sp.3.8.
Nilsenova, Marie. 2002. A game-theoretical approach to the meaning of intonation in rising declarativesand negative polar questions. In B. Bel & I. Marlien (eds.), *Proceedings of Speech Prosody 2002*, Aix-en-Provence, France.
Northrup, Oliver. 2014. *Grounds for Commitment*: UCSC dissertation.
Potts, Christopher. 2003. *The Logic of Conventional Implicatures.*: UC Santa Cruz dissertation.
Potts, Christopher. 2005. *The Logic of Conventional Implicatures* Oxford Studies in Theoretical Linguistics. Oxford: Oxford University Press. [Revised 2003 UC Santa Cruz PhD thesis].
Potts, Christopher. 2007. The expressive dimension. *Theoretical Linguistics* 33(2). 165–97. doi:https://doi.org/10.1515/TL.2007.011.
Recanati, François. 2004. Pragmatics and semantics. In Larry Horn & Gregory Ward (eds.), *Handbook of Pragmatics*, 442–62. Oxford: Blackwell.
Rizzi, L. 1997. The fine structure of the left-periphery. In L. Haegeman (ed.), *Elements of Grammar*, 281–337. Dordrecht: Kluwer.
Roelofsen, Floris & Donka F. Farkas. 2015. Polarity particle responses as a window onto the interpretation of questions and assertions. *Language* 91(2). 359–414.
Rooth, Matts. 1985. *Association with Focus*: University of Massachusetts at Amherst dissertation.
Speas, Magaret & Carol Tenny. 2003. Configurational properties of point of view roles. In *Asymmetry in Grammar*, 315–344. Amsterdam:: John Benjamins.
Spector, Benjamin & Paul Egré. 2015. A uniform semantics for embedded interrogatives: An answer, not necessarily the answer. *Synthese* 192(6). 1729–1784.
Stevenson, Charles Leslie. 1937. The emotive meaning of ethical terms. *Mind* 46(181). 14–31. `http://www.jstor.org/stable/2250027`.

Sudo, Y. 2013. Biased polar questions in English and Japanese. In D. Gutzmann & H.-M. Gaertner (eds.), *Beyond Expressives: Explorations in Use-Conditional Meaning, Current Research in the Semantics/Pragmatics Interface (CRiSPI)*, vol. 28, Brill.

Sugimura, Yasushi. 2004. Gaizensei o arawasu fukushi to bunmatsu no modality keishiki 'adverbs ofprobability and sentence-final modality expressions'. *Gengo Bunka Ronshuu* 25(2).

Tenny, Carol. 2006. Evidentiality, Experiencers, and the Syntax of Sentience in Japanese. *Journal of East Asian Linguistics* 15(3). 245–288.

Theiler, Nadine, Maria Aloni & Floris Roelofsen. 2018. A uniform semantics fordeclarative and interrogative complements. *Journal of Semantics* 35(3). 409–466. doi:10.1093/jos/ffy003.

Tomioka, Satoshi & Dursun Altinok. 2021. Right dislocation at the grammar-discourse crossroads. A talk presented at ICU LINC.

Truckenbrodt, H. 2006a. On the semantic motivation of syntactic verb movement to c in german. *Theoretical Linguistics* 32(3). 257–306.

Truckenbrodt, Hubert. 2006b. Replies to the comments by gärtner, plunze and zimmermann, portner, potts, reis, and zaefferer. *Theoretical Linguistics* 32(3). 387–410. doi:https://doi.org/10.1515/TL.2006.025.

Uegaki, Wataru. 2015. *Interpreting questions under attitudes*: Massachusetts Instituteof Technology dissertation.

Uegaki, Wataru & Floris Roelofsen. 2018. Do modals take propositions or sets of propositions? evidence from japanese *darou*. In *Proceedings of SALT 28*, .

Venditti, Jennifer J. 2005a. The J_ToBI model of Japanese intonation. In Sun-Ah Jun (ed.), *Prosodic Typology: The Phonology of Intonation and Phrasing*, 172–200. Oxford Unviersity Press.

Venditti, Jennifer J. 2005b. The J_ToBI model of Japanese intonation. In Sun-Ah Jun (ed.), *Prosodic Typology: The Phonology of Intonation and Phrasing*, 172–200. Oxford Unviersity Press.

Westera, Matthijs. 2013. 'attention, i'm violating a maxim!' a unifying account of the nal rise. In *Proceedings of the 17th Workshop on the Semantics and Pragmatics of Dialogue (SemDial)*, .

Zanuttini, Raffaella & Paul Portner. 2003. Exclamative clauses: At the syntax-semantics interface. *Language* 79. 39–81. doi:10.1353/lan.2003.0105.

Zeevat, Henk. 2004. Particles: Presupposition triggers, context markers or speech act markers. In *Optimality Theory and Pragmatics*, 91–111. Palgrave McMillan.

Zimmermann, Malte. 2004. Discourse particles in the left periphery. In Benjamin Shaer, Werner Frey & Claudia Maienborn (eds.), *Proceedings of the Dislocated Elements Workshop, ZAS Berlin (ZAS Papers in Linguistics 35)*, 544–566. Berlin. ZAS.

A Head movement and the interpretation of its trace

The movement of *daroo* skips over the question particle *ka*, which apparently violates the Head Movement Constraint (HMC). In fact, English has a similar construction, where a modal below a functional head undergoes covert raising and hence violates the HMC, resulting in a wide-scope interpretation for the modal over the functional head. More concretely, the verb *seem* in (141) raises over *can* and negation as indicated in the paraphrase (Langendoen 1970; Jacobson 2006; Homer 2011):

(141) John can't seem to run very fast (Langendoen 1970, 25)
Paraphrasable as: It seems that John is not able to run very fast. (seem > not > can)

Homer (2011) argues that *seem* is a mobile PPI (positive polarity item), and so has to outscope negation (or downward-entailing expressions), which results in the wide scope interpretation in (141). The analysis is motivated by the fact that the scope reversal happens only with negation (see Homer 2011, for discussion).

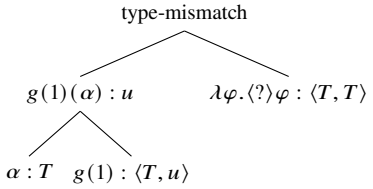
To the author's knowledge, the first work which studies the semantic effects of head movement is done by Matyiku (2017). Matyiku (2017) investigates negative auxiliary inversion in West Texas English. In this variety of English, a negated auxiliary can precede a quantified subject as in (142). (142) is uttered with falling intonation and is not an interrogative but a declarative. The negation in the inverted form unambiguously takes scope over the quantifier, while the non-inverted form in (142-b) is ambiguous between the surface scope and the inverted scope.

(142) a. Don't many people like you. (unambiguous: not > many; *many > not)
b. Many people don't like you. (ambiguous: not > many; many > not)

Matyiku (2017) argues that the inverted form (142-a) and the negation-wide-scope reading of the non-inverted form (142-b) are both derived by raising the negated auxiliary higher than the subject. However, Matyiku (2017) shows that raising the negation is not enough to obtain the desired reading. This is because negation is interpreted at the original position even after being QR-ed (See Tree (3.17) in Matyiku (2017, 82)), so the composition would end up with the subject outscoping negation, i.e., many> $\neg$. Matyiku (2017) offers two options to obtain the desired reading. One is to raise the type of negation to $\langle\langle\langle t,t\rangle,t\rangle,t\rangle$ (see Tree (3.18) in Matyiku (2017, 83)). The other is to delete the trace of negation (see Tree (3.19) in Matyiku (2017, 84)). Matyiku (2017) states that there is no preference between the two options.

Turning to the raising of *daroo* in a falling *daroo*-interrogative like (108), we will face the same problem as the raising of the negated auxiliary. That is, the interpretation of *daroo* would be reconstructed into the base-generated position. Before seeing how the derivation runs into a problem, we first assume that the trace of *daroo* is of truth-conditional type $\langle T,T\rangle$, which I believe is a reasonable assumption. If it were of type $\langle T,u\rangle$, it would cause a type mismatch before merging with raised *daroo* as in (143).

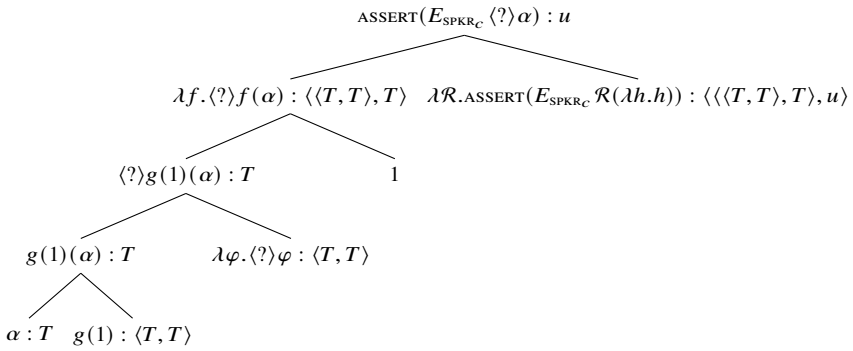
(143)



However, even with that assumption, the derivation would result in a type-mismatch since the interpretation of *daroo* is forced to be reconstructed into the base-generated position.

Now let us try Matyiku's (2017) two options. First, we raise the type of *daroo* to $\langle\langle\langle T,T\rangle,T\rangle,u\rangle$. Together with the assumption that the trace is of type $\langle T,T\rangle$, we obtain the desired interpretation $\textsc{assert}(E_{\textsc{spkr}_c}\langle ?\rangle\alpha)$.

(144)



Second, we delete the trace or assume that the movement of head does not leave a trace. As we have seen in (109), this also correctly derives the desired interpretation.

Now, do we have a preference for one over the other? I think we do. The first option requires two assumptions: 1. The trace of *daroo* is of at-issue type $\langle T, T\rangle$. 2. *Daroo* has a complex type $\langle\langle\langle T, T\rangle, T\rangle, u\rangle$, which is needed only for the falling interrogative-*daroo* construction. On the other hand, the second option only needs one assumption, that the trace is deleted or that there is no trace for head movement. Thus, the current manuscript adopts Matyiku's (2017) second option and assumes that movement of heads does not leave a trace or that the trace is deleted.

B Formal system of $\mathcal{L}_{\otimes}$

The formal system of $\mathcal{L}_{\otimes}$ is based on McCready's $\mathcal{L}_{CI}^{+S}$, which in turn is based on Potts' $\mathcal{L}_{CI}$. It also incorporates Gutzmann's notion of use-conditions, so a new basic shunting use-conditional type u is added to the system. Furthermore, a use-conditional product type ($u \times u$), which arises from the paratactic association rule, is added to the system. The system does not include other non-descriptive types such as CI types (e^c, t^c, s^c), shunting types (e^s, t^s, s^s) or mixed types since the current paper only deals with the shunting-type UCIs (*daroo*, *ka*↑ and ↑) as well as descriptive content and does not discuss prototypical expressives such as *damn* as discussed in Potts (2005) (except for the ones mentioned in Section 5.1 and Appendix C) nor the mixed-type expressives discussed in McCready (2010).

(145) Types for $\mathcal{L}_{\otimes}$

a. e, t, s are basic truth-conditional types for $\mathcal{L}_{\otimes}$.
b. u is a basic shunting use-conditional type for $\mathcal{L}_{\otimes}$.
c. If σ and τ are truth-conditional types for $\mathcal{L}_{\otimes}$, then $\langle\sigma, \tau\rangle$ is a truth-conditional type for $\mathcal{L}_{\otimes}$.
d. If σ is a truth-conditional type for $\mathcal{L}_{\otimes}$ and τ is a use-conditional type for $\mathcal{L}_{\otimes}$, then $\langle\sigma, \tau\rangle$ is a use-conditional type for $\mathcal{L}_{\otimes}$.
e. If σ and τ are use-conditional types for $\mathcal{L}_{\otimes}$, then $\sigma \times \tau$ is a use-conditional product type for $\mathcal{L}_{\otimes}$.
f. The full set of types for $\mathcal{L}_{\otimes}$ is the union of the truth-conditional types and the use-conditional types for $\mathcal{L}_{\otimes}$.

Similarly, $\mathcal{L}_{\otimes}$ is different from McCready's (2010) in that it does not include CI application nor rules for mixed types but contains the Paratactic Association rule.

(146) Rules of proof in $\mathcal{L}_{\otimes}$

a. Reflexivity Axiom

$$\frac{\alpha : \sigma}{\alpha : \sigma}$$

b. Functional Application

$$\frac{\alpha : \langle\sigma, \tau\rangle \quad \beta : \sigma}{\alpha(\beta) : \tau}$$

c. Predicate Modification

$$\frac{\alpha : \langle\sigma, \tau\rangle \quad \beta : \langle\sigma.\tau\rangle}{\lambda\chi.\alpha(\chi) \wedge \beta(\chi) : \langle\sigma.\tau\rangle}$$

d. Feature Semantics

$$\frac{\alpha : \sigma}{\beta(\alpha) : \tau}$$

(where β is a designated feature term)

e. Shunting-type Application

$$\frac{\alpha : \langle\sigma, u\rangle \quad \beta : \sigma}{\alpha(\beta) : u}$$

f. Paratactic Association

$$\frac{\lambda\chi.\alpha(\chi) : \langle\sigma, u\rangle \quad \lambda\chi.\beta(\chi) : \langle\sigma, u\rangle}{\lambda\chi.\alpha(\chi)\blacklozenge\beta(\chi) : \langle\sigma, u \times u\rangle}$$

C Modal Adverbs as Non-shunting UCIs

In Section 5.1, I propose that modal adverbs such as *kitto* 'certainly', *tabun* 'probably', and *moshikasuruto* 'maybe' are non-shunting UCIs, and so are similar to canonical expressive items that project both truth-conditional and use-conditional meanings à la Potts (2005). To implement this idea, we need to extend $\mathcal{L}_{\otimes}$ so that we can distinguish shunting and non-shunting use-conditional types. Thus, in the extended system $\mathcal{L}^{+}_{\otimes}$, (145-b) is replaced by (147) and all the u's in (146) are replaced by u^s.

(147) a. u^s is a basic shunting use-conditional type for $\mathcal{L}^{+}_{\otimes}$.
b. u^c is a basic non-shunting use-conditional type for $\mathcal{L}^{+}_{\otimes}$.

Furthermore, Potts' (2005) CI application is added back to the set of rules in $\mathcal{L}^{+}_{\otimes}$.

(148) CI APPLICATION

$$\frac{\alpha : \langle \sigma, \tau^c \rangle \quad \beta : \sigma}{\beta : \sigma \bullet \alpha(\beta) : \tau^c}$$

Now, let us see how sentences with *daroo* and modal adverbs like (149) are composed in $\mathcal{L}^{+}_{\otimes}$.

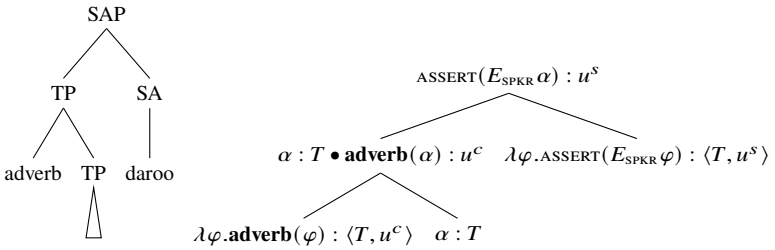
(149) a. John-wa tabun kuru daroo.
John-TOP probably come DAROO
'Probably, John will come.'
b. *John-wa moshikasuruto kuru daroo.
John-TOP maybe come DAROO
'Maybe, John will come-*daroo*.'

First, I propose that both *tabun* and *moshikasuruto* are non-shunting use-conditional items of type $\langle T, u^c \rangle$.

(150) $[\![\textbf{tabun}]\!], [\![\textbf{moshikasuruto}]\!] \in D_{\langle T, u^c \rangle}$

Thus, when they are combined with their prejacent propositions, the rule of CI application (148) applies and projects a pair of expressions, the truth-conditional prejacent proposition α and the use condition $\textbf{adverb}(\varphi)$, as depicted in (151). Then *daroo* takes α as its argument and outputs a shunting-type use condition.

(151)



Therefore, as far as the composition is concerned, the derivations of *tabun*-α-*daroo* and *moshikasuruto*-α-*daroo* should both converge. The ungrammaticality of (149-b) comes from the fact that the resulting pair of use conditions is incongruous. To see this, I propose the use conditions of *tabun* 'probably' and *moshikasuruto* 'maybe' as follows:

(152) a. $[\![\textbf{tabun}(\varphi)]\!] = \{c : \text{SPKR}_c \text{ believes } \varphi \text{ is more likely than } \neg\varphi\}$
b. $[\![\textbf{moshikasuruto}(\varphi)]\!] = \{c : \text{SPKR}_c \text{ believes } \varphi \text{ is less likely than } \neg\varphi\}$

The use condition of *tabun* is compatible with that of *daroo*, which says that $K_{\text{SPKR}_c}\,\varphi$ is in the speaker's discourse commitments $DC_{\text{SPKR},c}$. The speaker finds φ more likely than the alternative and adds φ to her commitment set. On the other hand, the use condition of *moshikasuruto* is incompatible with that of *daroo*. The speaker finds φ less likely than $\neg\varphi$ yet adds φ to her commitment set.

As readers may notice, treating *moshikasuruto* as a non-shunting UCI causes the original problemn to return. That is, when it does not co-occur with *daroo* as in (153), the use-conditional meaning would weaken the truth-conditional one, 'α and maybe α'.

(153) John-wa moshikasuruto kuru.
John-TOP maybe come
'Maybe, John will come.'

I see two ways to solve the problem. One is to propose that when there is no sentence-final auxiliary that acts as a speech act operator as in (153), *moshikasuruto* becomes one. Thus, the only use condition of (153) is $[\![\textsc{assert}(\textbf{maybe}(\alpha))]\!]$. Alternatively, in (153), the default ASSERT operator only pushes α onto the Table and does not alter the speaker's discourse commitments DC_{SPKR_c}. The latter proposal is motivated by the intuition that in uttering (153), the speaker merely presents a possibility of α without fully committing herself to it. Since we do not have further data to decide one over the other, I leave this issue for future research.

The analysis just sketched here is based on Hara (2006, ch. 5), who categorizes modal expressions into two groups, *propositional* and *expressive*. I refine Hara's taxonomy and add more items as in (154):

(154) Taxonomy of Japanese modal expressions
- a. truth-conditional items ($\langle T, T\rangle$)
  kanarazu 'certainly', *kanousei-ga aru/hikui/takai* 'The possibility exists/is low/is high', *nichigainai* 'must', *kamosirenai* 'might'
- b. use-conditional items
  - (i) shunting-type ($\langle T, u^s\rangle$)
    daroo 'probably/I bet'
  - (ii) non-shunting type ($\langle T, u^c\rangle$)
    kitto 'certainly', *tabun* 'probably', *moshikasuruto* 'maybe'

It is not accidental that all the non-shunting type UCIs are adverbs and the only shunting-type UCI is *daroo*, which is a sentence-final auxiliary. Modal adverbs are sentence-modifiers and just like the prototypical expressives discussed by Potts (2005, 11), they "[comment] on a semantic core". On the other hand, *daroo* and the other shunting-type UCIs, i.e, *ka*↑ and ↑, which are sentence-final particles, are speech act operators, and therefore act as the semantic core of the utterances.

D Comparison with Uegaki and Roelofsen (2018)

One of the core proposals of the current paper is that Japanese modal auxiliairy *daroo* is an entertain modality that can embed both declarative and interrogative clauses without reducing the latter to declarative ones. To the author's knowledge, the same claim is made by two works, Hara (2018) and Uegaki & Roelofsen (2018). Hara (2018) is a precursor of the current paper. Uegaki & Roelofsen (2018) use the observations reported in Hara (2006) and Hara & Davis (2013) to argue against the assumption that modals only embed declarative clauses and for an inquisitive semantics that treats declarative and interrogative clauses uniformly.

This section critically reviews Uegaki & Roelofsen (2018) (U&R, henceforth) and points out its problems. Not only is their analysis of *daroo* not novel in that the claim that *daroo* is an interrogative-embedding modal is already made by Hara (2018), but also their implementation makes wrong predictions for empirical data.

U&R situated their analysis in the framework of two-dimensional semantics, at-issue and non-at-issue (expressive). At the at-issue level, φ-*daroo* projects a question meaning $\langle ?\rangle!\varphi$ ($[\![!\varphi]\!] = \{p \mid p \subseteq |\varphi|_M\}$). At the same time, at non-at-issue level, it projects 'the speaker entertains φ' (According to Wataru Uegaki (p.c.), $\cap[\![\varphi]\!]^\bullet$ "is there to make sure that the non-at-issue meaning of φ-*daroo* inherits the non-at-issue meaning of φ. [...] [I]t can make a difference if for example φ contains an appositive" Since it does not make a difference for the data discussed in the current paper and U&R do not discuss how their at-issue and non-at-issue compositions work, following U&R, I ignore the $\cap[\![\varphi]\!]^\bullet$ part in the rest of this discussion.)

(155) a. $[\![\varphi \text{ daroo}]\!] = [\![\langle ?\rangle!\varphi]\!]$
b. $[\![\varphi \text{ daroo}]\!]^\bullet = [\![E_{\text{SPKR}}\,\varphi]\!] \cap [\![\varphi]\!]^\bullet$

U&R treat both ↓ and ↑ as intonational morphemes and propose the following semantics:

(156) a. $[\![\varphi\ \downarrow]\!] = [\![!\varphi]\!]$
b. $[\![\varphi\ \downarrow]\!]^\bullet = [\![\varphi]\!]^\bullet$

(157) a. $[\![\varphi\uparrow]\!] = [\![\langle ?\rangle\varphi]\!]$
b. $[\![\varphi\uparrow]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

(158) a. $[\![\varphi \text{ ka}]\!] = [\![\langle ?\rangle\varphi]\!]$
b. $[\![\varphi \text{ ka}]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

As can be seen, ↑ and *ka* are defined as synonymous. Given these denotations, U&R derive the interpretations for falling and rising declaratives, polar and *wh* interrogatives summarized in (159): α-*daroo*↓ projects a tautologous at-issue meaning $[\![!\langle ?\rangle\alpha]\!] = \wp(\bigcup([\![\alpha]\!] \cup [\![\neg\alpha]\!]))$ and not-at-issue bias $K_{\text{SPKR}}\,\alpha$. α-*daroo*↑ projects an at-issue question $[\![\langle ?\rangle\langle ?\rangle\alpha]\!] = [\![\langle ?\rangle\alpha]\!]$ (since the iteration of $\langle ?\rangle$ has no effect) and not-at-issue bias $K_{\text{SPKR}}\,\alpha$ which explains its tag-question-like interpretation. α-*daroo ka*↓ projects a tautologous proposition at at-issue and conveys that the speaker entertains an issue $\langle ?\rangle\alpha$, i.e., $E_{\text{SPKR}}\langle ?\rangle\alpha$ as not-at-issue content. A rising interrogative α-*daroo ka*↑ is ruled out by a blocking effect: It has exactly the same effect as the falling interrogative α-*daroo ka*↓ but is more marked since it involves ↑.

(159) U&R's Interpretations of *daroo*-sentences

	Falling	Rising
Declarative	α-*daroo*↓	α-*daroo*↑
at-issue	$!\langle ?\rangle\alpha$	$\langle ?\rangle\langle ?\rangle\alpha$
non-at-issue	$K_{\text{SPKR}}\,\alpha$	$K_{\text{SPKR}}\,\alpha$
Polar Interrogative	α-*daroo ka*↓	$^{*}\alpha$-*daroo ka*↑
at-issue	$!\langle ?\rangle!\langle ?\rangle\alpha$	~~$\langle ?\rangle\langle ?\rangle!\langle ?\rangle\alpha$~~
non-at-issue	$E_{\text{SPKR}}\langle ?\rangle\alpha$	~~$E_{\text{SPKR}}\langle ?\rangle\alpha$~~
Wh-interrogative	μ-*daroo (ka)*↓	$^{*}\mu$-*daroo (ka)*↑
at-issue	$!\langle ?\rangle!\mu$	~~$\langle ?\rangle\langle ?\rangle!\mu$~~
non-at-issue	$E_{\text{SPKR}}\mu$	~~$E_{\text{SPKR}}\mu$~~

Turning to *wh* interrogatives, μ-*daroo*↓ projects a tautologous proposition $!\langle ?\rangle!\mu$ as at-issue and indicates that the speaker entertains an issue μ, i.e., $E_{\text{SPKR}}\langle ?\rangle\mu$. μ-*daroo ka*↓ has exactly the same at-issue and non-at-issue meanings since μ is already inquisitive, so adding $\langle ?\rangle$ has no effect. In contrast, the falling *wh* interrogatives μ-*daroo*↑ and μ-*daroo ka*↑ project the tautologous $!\langle ?\rangle!\mu$ and $E_{\text{SPKR}}\mu$. These at-issue and non-at-issue meanings are identical to those derived from μ-*daroo (ka)*↓. Thus, μ-*daroo (ka)*↑, which contains the more costly ↑, is blocked by μ-*daroo (ka)*↓.

To explain why μ-*daroo ka*↓ is not blocked by μ-*daroo*↓, U&R speculate that μ-*daroo ka*↓ is not syntactically more complex than μ-*daroo*↓ since the *wh*-word such as *dare* 'who' in μ needs to be licensed by a question marker, which may or may not be overtly marked. In other words, U&R adopt a syntactic structure similar to the current proposal, in that μ-*daroo*↓ also contains a covert question marker.

Although U&R's analysis is elegant in that it maintains a simple and uniform semantics for *ka* and ↑ as $\langle ?\rangle$, it faces a number of empirical problems. First of all, the blocking-based account is too strict. Consider falling/rising declaratives and (polar) interrogatives without *daroo* (see (81), (82), (93) and (87) for example sentences). The derivations that U&R's analysis would derive are summarized in (160). As can be seen, α ↑ and α-*ka*↑ yield the same semantics, yet α-*ka*↑ is not blocked. Unlike the *wh* cases, the sentence α is a declarative which does not contain any *wh*-word, so α-*ka*↑ must be syntactically more complex than α ↑. Thus, U&R's analysis wrongly predicts that α-*ka*↑ would be ungrammatical due to the blocking by α ↑ under semantic equivalence.

(160) U&R's interpretations of sentences without *daroo*

	Falling	Rising
Declarative	α ↓	α ↑
at-issue	$!\alpha$	$\langle ?\rangle\alpha$
non-at-issue	$[\![\alpha]\!]^{\bullet}$	$[\![\alpha]\!]^{\bullet}$
Interrogative	α-*ka*↓	α-*ka*↑
at-issue	$!\langle ?\rangle\alpha$	$\langle ?\rangle\langle ?\rangle\alpha$
non-at-issue	$[\![\alpha]\!]^{\bullet}$	$[\![\alpha]\!]^{\bullet}$

As we have already seen in Section 3.4, my proposal correctly predicts that both α ↑ and α-*ka*↑ are grammatical and give rise to the same interpretations. The ungrammaticality of rising polar and *wh daroo*-interrogatives, α-*daroo (ka)*↑ and $^{*}\mu$-*daroo (ka)*↑, is explained by the type-mismatch.

Second, as U&R also admit, it is mysterious how the tautologous proposition derived from the falling interrogative α-*ka*↓ ends up having an exclamative interpretation. In the current paper, unlike Final Rise ↑, Final Fall ↓ is not an intonational morpheme, but considered to be the default sentential prosody. Thus, under

the current analysis, *α-ka* simply denotes a truth-conditional interrogative clause, which is analogous to a set of alternative propositions in alternative semantics (Rooth 1985). Since it is a truth-conditional type, it can be an argument of another functor such as Zannuttini & Portner's (2003) Exclamative operator.

(161) Taro-wa utai-masu ka↓
Taro-TOP sing-POL Q
'It is surprising that Taro will sing!' (exclamative)

Third, since U&R assume that Final Rise and *daroo* project both at-issue and non-at-issue contents, their analysis makes wrong predictions when these items are embedded. That is, it wrongly predicts that constructions with Final Rise can be embedded questions in the absence of extra syntactic constraints for constructions with Final Rise. Furthermore, it does not derive the correct interpretations when *kara* 'because' embeds a *daroo*-declarative as seen in (138) in Section 5.2.

In summary, U&R's analysis makes a number of wrong predictions. First, it incorrectly rules out rising polar interrogatives without *daroo*, *α-ka*↑. Second, it does not leave room to explain why falling interrogatives are interpreted as exclamatives. Third, it makes wrong predictions regarding embeddings of Final Rise and *daroo*. Finally, as also mentioned in Section 5.2, it is conceptually problematic to categorize the semantics of *daroo* as "not-at-issue" content since it is the main content of the sentence, and so it should actually be treated as "at-issue" content.