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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. Two naturalness rating studies are conducted to support the predictions regarding the interpretations and felicity of the target sentences. 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 intonation 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-conditional interrogative. A new composition rule that instructs 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) John-ga kuru↑
John-NOM come
'John is coming?'

Address(es) of author(s) should be given

[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).

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. This study examines the interaction between the Japanese modal auxiliary *daroo*, sentence type and intonation, which sheds new light on the influence of sentence types and intonational contours on the interpretation of sentences. I propose that *daroo* marks an assertion of a modalized statement which involves a deictic element pointing to the speaker's knowledge. The semantics of *daroo* is defined in the framework of inquisitive epistemic logic (IEL) (Ciardelli & Roelofsen 2015), which provides a model in which modal operators can embed both declarative and interrogative sentences.[2] As for the contribution of rising intonation, I propose that Final Rise is a prosodic question operator that is paratacticaly associated to the main sentence and renders a truth-conditional declarative into a use-conditional (Gutzmann 2015) interrogative. A detailed investigation of *daroo* reveals an interesting paradigm with respect to parameters such as clause type, intonation, tier of meaning, pragmatic context.

The paper is structured as follows. Section 2 summarizes introspection-based data relating to the distribution of *daroo*-sentences in different clause types and with different boundary tones. It will be observed that *daroo* cannot occur in a rising interrogative and that other acceptable combinations give rise to different interpretations. To account for the distributional patterns shown in Section 2, I make two proposals in Section 3. First, *daroo* is a speech act operator the content of which contains a modal operator E, which expresses the epistemic knowledge of the speaker SPKR. Syntactically, *daroo* moves to C_{ROOT} to check its uninterpretable feature, [uROOT]. Semantically, the assertional content of *daroo* as E_{SPKR_c} is defined in the framework of inquisitive epistemic logic (Ciardelli & Roelofsen 2015). Second, I propose that there are three question operators in Japanese, *ka*, *ka*↑ and ↑ that are in contrastive distribution. These three morphemes are similar in that they all take truth-conditional declarative clauses and yield interrogative clauses, while they are different structurally and type-theoretically. *Ka* and *ka*↑ are syntactically integrated in the sentence while ↑ is only paratactically associated with the host sentence. *Ka* projects a truth-conditional interrogative sentence while *ka*↑ and ↑ project a use-conditional item (UCI) (Gutzmann 2015). I also introduce a new composition system, $\mathcal{L}_{\otimes}$ which is obtained by adding a rule that instructs how to interpret paratactically associated use-conditional morphemes to McCready's (2010) type system for conventional implicatures, $\mathcal{L}_{CI}^{+S}$. 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 presents two rating experiments which empirically support the observations in Section 2. Section 7 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 (3), it conveys that the speaker has a bias toward the prejacent clause *Marie-wa wain-o nomu* 'Marie drinks wine'.

[2] Uegaki & Roelofsen (2018) also employ IEL to analyze the semantics of *daroo*. See Appendix E for comparison.

(3) 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 (4), while low-probability adverbs such as *moshikasuruto* 'maybe' cannot as in (5).[3]

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

(5) *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 (5).[4]

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[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.
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 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 evidenceless 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

The asymmetry between (6) and (7) suggests that the holder of the bias indicated by *daroo* has to be the speaker.

(6) 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.'

(7) #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 (6), the speaker's assessment of the likelihood of rain caused his bringing an umbrella with him. The infelicity of (7) 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.

Contrasts like those in (6) and (7) 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 (8) uttered with the pitch profile in Figure 1.

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

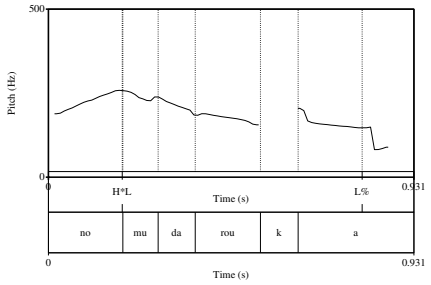

Fig. 1 Falling Interrogative

include *kanarazu* 'certainly', and *kanoosei-ga aru/hikui* 'the possibility exists/is low'. See Section 3.3.2 and Appendix D.

[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 Section 3.3.2.

In other words, by producing a construction like (8), the speaker is interrogating into 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:

(9) 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.'

(8) cannot be a matrix question, thus *daroo* has to take the widest scope. First, in terms of prosody, if (8) were a matrix question, it should be able to end with final rise. However, as we will see below in Section 2.4 and also in the experiment presented in Section 6.1, rising *daroo-ka* is ungrammatical:

(10) *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), (8) cannot be a matrix question because it cannot be responded by "why do you ask me such a thing?":

(11) 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?"

(12) 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 (13). In other words, the *wh*-word *nani* 'what' alone can mark the construction as an interrogative.

(13) Tsugi-wa nani-ga okoru (ka)↑
next-TOP what-NOM happen Q

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[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.

'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 (14):[7]

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

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 (15) pronounced with the pitch profile in Figure 2.

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

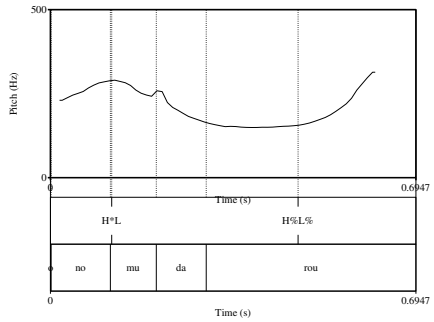


Fig. 2 Rising Declarative

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 rising contour, the speaker's bias does not disappear. When the context is such that the speaker is epistemically neutral, a rising *daroo*-declaratives is infelicitous:[8]

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

[8] I owe this example to an anonymous reviewer.

(16) 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".[9]

2.4 Rising Interrogatives: *daroo ka*↑

Finally, Final Rise appears to be incompatible with *daroo* interrogatives. Examples like (17), 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[10]

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

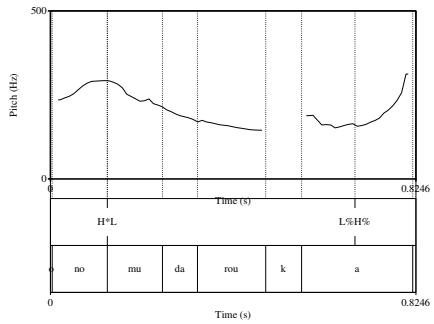


Fig. 3 Rising Interrogative

[9] 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.

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

[10] *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 37.

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.

(18) 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. Furthermore, Section 6 reports two rating experiments that were conducted to confirm the introspection-based observation objectively (see Schütze 1996).

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 (18), I make the following proposals.

(19) a. Proposal 1
Daroo is a use-conditional assertion act operator and its assertional content includes entertain modal E_{SPKR_c} in inquisitive epistemic logic (IEL), which expresses epistemic issues associated to the speaker in context c, SPKR_c.[11]

b. Proposal 2
There are three kinds of question operators in Japanese that take an at-issue declarative and render it to an interrogative, $C_{[Q]}$, $C_{[Q]}\uparrow$ and $\uparrow$. The question feature [Q] is realized by the particle *ka*, the *wh* word in Spec CP or both. The three operators $C_{[Q]}$, $C_{[Q]}\uparrow$ and $\uparrow$ are in contrastive distribution. That is, they occur in the same environment but have different functions/meanings. They are different in the following respects:
(i) $C_{[Q]}$ and $C_{[Q]}\uparrow$ are morpho-syntactically integrated with the main sentence, while $\uparrow$ is paratactically associated to it.
(ii) $C_{[Q]}$ returns a truth-conditional interrogative while $C_{[Q]}\uparrow$ and $\uparrow$ return an use-condition of interrogative.

The following sections are organized as follows: Section 3.1 first introduces IEL, which will be employed to determine the semantics of *daroo*. To prepare to account for the semantic composition of *daroo* and the three interrogative operators, Section 3.2 presents Gutzmann's (2015) notion of use-conditions of sentential moods and McCready's (2010) language for

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

conventional implicatures with shunting types, $\mathcal{L}_{CI}^{+S}$. Section 3.3 spells out the main proposal of the paper: *Daroo* is a root-level/use-conditional entertain modal E_{SPKR}. Section 3.4 argues that there are three interrogative operators in Japanese and shows how simple declarative/interrogative clauses without *daroo* interact with Final Rise ↑. I also introduce a new composition system, $\mathcal{L}_{\otimes}$, that includes a combinatoric rule that instructs 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 (Ciardelli & Roelofsen 2015). Inquisitive epistemic logic (IEL) offers a framework that can model the process of raising and resolving issues and defines an entertain modality that deals with the issues that the agents entertain.[12] The current paper claims that *daroo* is a linguistic realization of a modalized assertion. That is, by uttering *α-daroo*, ths speaker asserts that she entertains α. The following section briefly goes over the relevant technicalities of IEL. A more detailed review of IEL is given in Appendix B.

IEL is an extension of epistemic logic where the framework is enriched with an inquisitive component. Epistemic logic models how the information is associated with a set of agents. Let $\mathcal{W}$ be the set of all possible worlds. As with standard epistemic logic and possible world semantics, an information state and a proposition are both identified with a set of possible worlds. Inquisitive epistemic logic introduces another dimension which can characterize the issues that are entertained by the agents. An issue is defined as a set of propositions/states:

(20) 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)

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 like standard epistemic logic, while E encodes an agent's inquisitive state, which encapsulates the issues that the agent entertain. In Section 3.3.1 below, I argue that the modal auxiliary *daroo* translates to the assertion of the modality operator E associated with the speaker's inquisitive state in context c, i.e., $[\![\varphi\text{-daroo}]\!] = \textsc{assert}(E_{\text{SPKR}_c}\alpha)$.

In what follows, I review the semantics of the entertain modality E as well as the knowledge operator K in IEL and provide some motivations for adopting IEL to analyze *daroo*.

3.1.1 Model

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. Now, 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

[12] I would like to thank an anonymous reviewer for introducing this framework to me.

against information states. An inquisitive epistemic model M is defined as in (21). $\mathcal{A}$ is a finite set of agents, such as a, SPKR (the speaker), ADDR (the addressee), etc.

(21) 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 $\Sigma_a(w)$[13]

(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 a union of the inquisitive state:

(22) (*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.

3.1.2 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, that is, a downward-closed set of propositions p such that p support φ, i.e., "*established* or *true everywhere* in $[p]$" (Ciardelli & Roelofsen 2015, 1653) in case the sentence is informative and resolve the issue represented by φ in case the sentence is inquisitive. Put another way, both declarative and interogative sentences denote a set of propositions, which are sets of possible worlds. In terms of the type-theoretic semantics, so 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 (23) 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 (23-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 (23-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 (23-c).

(23) Let M be an inquisitive epistemic model, and s an information 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. $[\![?\{\alpha_1, ...\alpha_n\}]\!] := \{p | p \in [\![\alpha_i]\!] \text{ for some index } 1 \leq i \leq n\}$

[13] $\Sigma_a(w)$ observes factivity and introspection conditions. See Definition 2 in Appendix B.

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:

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

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, $|\textsc{possibility}(\varphi)| = 1$, $\langle ? \rangle$ constructs a polar interrogative. If φ is already an interrogative sentence, i.e., contains multiple possibilities, it returns the same interrogative sentence.

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

Let us now look at the modal operators, K and E, which are the most important to the current paper. First, just like E, the knowledge operator K 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 concurrent with the knowledge modality in standard epistemic logic.

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

Let us look at the information state (proposition) p depicted in Figure 4 as an illustration. 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 $V(\beta) = \{w_{11}, w_{01}\}$. In Figure 4, $p = \{w_{11}, w_{10}\} = \sigma_a(w_{11}) = \sigma_a(w_{10})$. Thus, $\sigma_a(w_{11}) \in [\![\alpha]\!]$ and $\sigma_a(w_{10}) \in [\![\alpha]\!]$. Since for any $w \in p$, $\sigma_a(w) \in [\![\alpha]\!]$, $p \in [\![K_a\alpha]\!]$.[14]

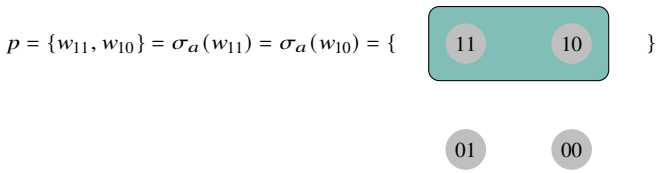


Fig. 4 $p \in [\![K_a\alpha]\!]$, $p \in [\![K_a?\alpha]\!]$

Let us also illustrate how $K_a\alpha$ is interpreted at the information state depicted in Figure 4 with a natural language example. Let *Marie drinks* and *Bill dances* translate to α and β, respectively. Thus, $K_a\alpha$ is a translation of (27).

(27) Ali knows that Marie drinks.

Ali's information state is $\{w_{11}, w_{10}\} = \sigma_a(w_{11}) = \sigma_a(w_{10}) = p$. Since both states $\sigma_a(w_{11})$ and $\sigma_a(w_{10})$, which are identical, support α, i.e., α is true everywhere in each of Ali's information states, the state/proposition p supports $K_a\alpha$.

[14] The same state depicted in Figure 4 supports $K_a?\alpha$. See Appendix B.2.1 for an illustration.

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 (28).

(28) Ali knows whether Marie drinks.

Intuitively speaking, the state p' does not support $K_a?\alpha$ because Ali's information states do not support 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 $w_{01} \notin V(\alpha)$, $\sigma_a(w_{01}) \notin [\![\alpha]\!]$. Since $\{w_{11}\} \subseteq \sigma_a(w_{01})$ and $\sigma_a(w_{11}) \in [\![\alpha]\!]$, $\sigma_a(w_{01}) \notin [\![\neg\alpha]\!]$. Therefore, $p' \notin [\![K_a?\alpha]\!]$. As we will see below, the same state 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 $p' \notin [\![K_a?\alpha]\!]$, $p' \in [\![E_a?\alpha]\!]$

Finally, we are ready to define the entertain modality E, to which the Japanese modal particle *daroo* translates.[15] 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 the issues entertained by a are resolved, φ will be supported:

(29) $[\![E_a\varphi]\!] := \{p | \Sigma_a(w) \subseteq [\![\varphi]\!]$ 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 (30) and consider the sentence (31).

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

(31) Ali wonders whether Marie drinks.

We already know $p' \notin [\![K_a?\alpha]\!]$, so $p' \in [\![\neg K_a?\alpha]\!]$. Thus, we only need to check whether $p' \in [\![E_a?\alpha]\!]$. 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) 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, $p' \in [\![E_a?\alpha]\!]$.

[15] 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 $K_a\alpha$.[16] Since $K_a\alpha$ entails $E_a\alpha$ (see Fact 14 in Appendix B.2.2), $E_a\alpha$ is equivalent to $K_a\alpha$.[17]

(32) (Fact)
For any declarative α and $a \in \mathcal{A}$, $K_a\alpha \equiv E_a\alpha$
(modified from Ciardelli & Roelofsen 2015, 1659)

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).

3.1.3 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 like 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 $w \in p$. That is, each 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 $K_a\alpha$.

Before proceeding to the application of IEL to analyze the linguistic data, it is worthwhile to clarify the motivations for adopting the IEL framework to analyze *daroo*. 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 since the modal operator E can embed both a declarative α and an interrogative $?\alpha$ since both denote the same semantic object, a set of propositions (information states).

Second, *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

[16] 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)

[17] 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)

state. In terms of IEL, thus, α-*daroo* translates to $K_{\text{SPKR}}\alpha$ while ?α-*daroo* translates to $E_{\text{SPKR}}?\alpha$. Thanks to the semantics of IEL, however, *daroo* does not have to be ambiguously defined. We can maintain the uniform semantics of *daroo* as an assertion of E_{SPKR} and correctly derive K_{SPKR} using the equivalence discussed above in (32). (See also Fact 15 in Appendix B.2.2.)

Third, the seat of knowledge of the proposition embedded under *daroo* is the speaker by default but it can be shifted to another agent when it is embedded under attitude predicates as in (59) below. 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.

3.2 Background 2: Shunting-type Use-conditional Items

3.2.1 Speech Act Operators as Use-conditional Items

As spelled out in (19), *daroo*, $\text{C}_{[\text{Q}]}\uparrow$ and $\uparrow$ are use-conditional items (UCIs) in the sense of Gutzmann (2015). Since Potts' (2005) seminal work on multidimensional semantics of conventional implicatures, a wide range of literature has been discussing formal properties of secondary meanings that arise independently from at-issue/truth-conditional meanings in various languages. These secondary meanings are called under different names such as *conventional implicature* (Grice 1975; Potts 2005), *expressive* (Kaplan 1999; Potts 2007), *emotive* (Stevenson 1937; Jakobson 1960), *evaluative* (Hare 1952), and do on.[18] 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*, $\text{C}_{[\text{Q}]}\uparrow$ and $\uparrow$ 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 (33):

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

In Gutzmann's (2015) language $\mathcal{L}_{\text{TU}}$, use-conditional propositions like (33) are assigned a basic type u.

Gutzmann (2015) then applies his $\mathcal{L}_{\text{TU}}$ to sentential moods, which are use-conditional items according to Gutzmann (2015). For example, the use-condition of a declarative "Homer is bald" is a set of contexts specified as in (34):

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

In formalizing the discourse moves such as assertions and questions in the denotation of (34), I adopt recent work by Farkas & Bruce (2010) on the 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:[19]

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

[19] Farkas & Bruce's (2010) original structure has another component, projected set *ps* which represents possible common grounds, which I do not include in (35) as it does not play a role in characterizing the use conditions of speech acts.

(35) 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 are functions from contexts to contexts (Heim 1982).[20] 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:

(36) $\textsc{assert}(\varphi, a, c_i) = c_o$

a. $DC_{a,o} = DC_{a,i} \cup [\![\varphi]\!]$

b. $T_o = \text{push}([\![\varphi]\!], T_i)$

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

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

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

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

(39) 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 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 canonical non-at-issue items discussed in Potts (2005) in several respects.[21] For instance, *daroo* only projects the 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

[20] Here, I depart from Gutzmann (2015), who has a strict distinction between sentence mood and illocutionary force or speech act. According to Gutzmann (2015), thus, 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.

[21] 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), thus many of the type specifications and combinatoric rules are unnecessary for the purpose of the paper. Furthermore, a new basic type u and a new rule PARATACTIC ASSOCIATION are added to $\mathcal{L}_{\otimes}$. See Appendix C for the complete type specifications and combinatoric rules of $\mathcal{L}_{\otimes}$.

implicatures/use-conditional contents, involves two functional applications as depicted in (40), one which returns a CI meaning $\alpha(\beta) : \tau^c$ and the other which is an identity function that returns truth-conditional content $\beta : \sigma^a$.

(40) CI APPLICATION

$$\beta : \sigma^a \bullet \alpha(\beta) : \tau^c$$

$$\alpha : \langle \sigma^a, \tau^c \rangle \quad \beta : \sigma^a$$

This rule is necessary for analyzing prototypical expressive items such as *damn*, which gives rise to two independent meanings as in (41).

(41) 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 (42).

(42)

$$\textbf{republican} : \langle e^a, t^a \rangle \bullet \textbf{damn}(\textbf{republican}) : t^c$$

$$\textbf{damn} : \langle \langle e^a, t^a \rangle, t^c \rangle \quad \textbf{republican} : \langle e^a, t^a \rangle$$

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'.[22]

Thus, the formal system that the current paper adopts does not include CI APPLICATION in its set of combinatoric rules, but employs SHUNTING APPLICATION from McCready's (2010) $\mathcal{L}_{CI}^{+S}$. $\mathcal{L}_{CI}^{+S}$ 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 generate use-conditional contents only 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.

(43) SHUNTING APPLICATION

$$\alpha(\beta) : u$$

$$\alpha : \langle \sigma, u \rangle \quad \beta : \sigma$$

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.

[22] See Hara (2006) and Section 5.2.1 for more discussions.

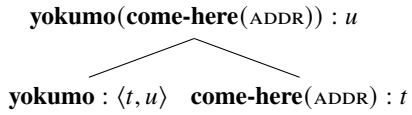
(44) Yokumo koko ni kita na!
YOKUMO here to came PRT
Use-conditional: 'You have a lot of guts to come here!" (adapted from McCready 2010, 37)

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.

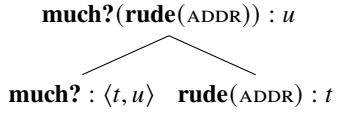
(45) Gramps: (Slamming the door just in front of Gavin) Well, Scott isn't here, so scram.
Gavin: Wow. Rude, much?
Use-conditional: Don't you agree that you're really rude and it's ridiculous? (adapted from Gutzmann & Henderson 2019, 107)

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

(46)



(47)



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 (48).

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

I treat both $\mathrm{C}_{[\mathrm{Q}]}$↑ 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:[23]

(49) a. $[\![\mathrm{C}_{[\mathrm{Q}]}\uparrow]\!] \in D_{\langle T,u\rangle}$

[23] Gutzmann (2015) does not treat use-conditional items such as sentence moods as shunting-type, thus they project both truth-conditional and use-conditional meanings. Gutzmann & Henderson (2019), in contrast, analyze the English *x-much?* question like (45) as a shunting-type UCI, which projects only a use-conditional meaning.

b. $[\![\mathrm{C}_{[\mathrm{Q}]}\uparrow]\!] = \lambda\varphi.\textsc{quest}(\langle ?\rangle\varphi)$

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

Turning to *daroo*, it is also of type $\langle T, u\rangle$, 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.

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

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

3.3 Proposal 1: syntax and semantics of *daroo*

3.3.1 Daroo as entertain modal

As mentioned several times already, my main proposal is that *daroo* is a linguistic realization of assertion of entertain modal in IEL, $\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$. As can be seen, the lexical semantics of *daroo* includes the ASSERT operator defined in (38). 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.

(52) 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 issues raised by interrogatives as well as information brought by declaratives. As we have seen in Section 3.1, IEL assigns the same semantic types, 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* as $\lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$.

Also, recall that although *daroo* in a falling declarative indicates the speaker's bias toward the embedded sentence, the bias meaning disappears in falling interrogatives, as seen in (9), repeated here as (53).

(53) 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 (32), $E_{\textsc{spkr}_c}\varphi$ 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, i.e., without Final Rise $\uparrow$, *daroo*-sentences.

(54) 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 its LF, $\textsc{assert}(E_{\textsc{spkr}}\langle ? \rangle \alpha)$. The next section proposes a syntax of *daroo* and show how this discrepancy is reconciled.

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 meaning. Under this analysis, *daroo* asserts epistemic knowledge associated with the speaker. The following contrast supports the treatment of *daroo* as a root-level modal operator. While the "normal" truth-conditional modals *nichigainai* 'must' and *kamoshirenai* 'may' can occur inside embedded questions (55-a), *daroo* cannot (55-b).

(55) 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 (55-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).[24] That is, the combination is only possible in the highest matrix clause (see Hara (2006) for more arguments).

Similarly, *nichigainai* 'must' and *kamoshirenai* 'may' can be embedded under a sentential negation. *wakedewanai*, while *daroo* cannot:[25]

(56) a. kare-ga kuru nichigainai/kamoshirenai wakedewanai.
he-NOM come must/may NEG
'It is not the case that he must/may come.'

b. *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." (Hara 2006, 141)

---

[24] 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).

[25] The sentential negation is used here since the following is "ill-formed morpho-syntactically" (Hara 2006, 140):

(i) *John-wa ko-daroo-nai.
John-TOP come-DAROO-NEG

Furthermore, as discussed in Section 2, the contrast between (6) and (7), repeated here as (57-a) and (57-b), shows that *daroo* in a falling declarative indicates *the speaker's* bias.[26]

(57) 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 (57-b) with cases where "normal" modals are embedded under *because*. The felicity of (58) shows that the knowledge holder of the "normal" modals can be shifted. That is, the truth-conditional modals in (58) expresses *John*'s assessment of the likelihood of rain, so it can felicitously cause John to bring an umbrella.

(58) 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.'

Moreover, the fact that *daroo* cannot occur inside embedded questions (55-b) nor below negation (73) suggests that *daroo* contributes to the non-truth-conditional (Potts 2005; McCready 2010; Gutzmann 2015) tier of meaning, as argued by Hara (2006) and Hara & Davis (2013).

Second, the non-truth-conditional meaning engendered by *daroo* can be attributed to some attitude holder other than the speaker of the sentence. In (59-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 (59-b):

(59) 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 (59) and just assume that attitude predicates can embed expressive/use-conditional contents and shift the holder of the bias expressed by *daroo*.[27]

To recapitulate, the empirical data show that *daroo* is a root-level use-conditional modal which takes wider scope than the "normal" truth-conditional modals. Furthermore, the agent

[26] Following Tenny (2006); Hara (2008), I assume that *kara* 'because' is an evidential/sentience marker which can embed speech act operators. See also Section 5.2.1.

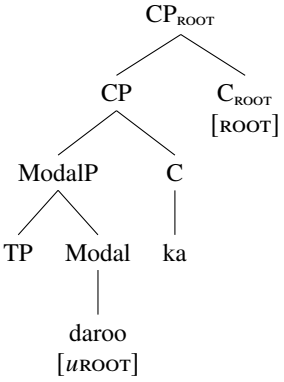
[27] The infelicity of (57-b) also shows that *kara* 'because' can also embed the use-conditional content of *daroo*, although unlike attitude predicates, it cannot shift the bias holder.

of the knowledge must be the speaker. 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 $\langle T, u\rangle$.

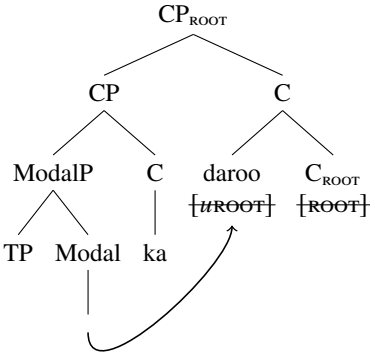
(60) a. $[\![\textbf{daroo}]\!] \in D_{\langle T,u\rangle}$
b. $[\![\textbf{daroo}]\!] = \lambda\varphi.\textsc{assert}(E_{\textsc{spkr}_c}\varphi)$
$= \lambda\varphi.\{c : [\![E_{\textsc{spkr}_c}\varphi]\!] \in DC_{\textsc{spkr}_c,c} \& [\![E_{\textsc{spkr}_c}\varphi]\!] = top(T_c)\}$

The root-oriented-ness of *daroo* is syntactically realized using the uninterpretable feature [*u*ROOT], which needs to be checked off by the matching feature [ROOT] at C_{root}.

(61) a.



b.



This LF configuration (61-b) predicts that *daroo* embeds either the sentence-radical α or the combination of α and the interrogative marker *ka*, which translate to $\textsc{assert}(E_{\textsc{spkr}_c}\alpha)$ or $\textsc{assert}(E_{\textsc{spkr}_c}\langle ?\rangle\alpha)$, respectively.[28] As seen above in Section 3.1, IEL indeed provides a system in which modal operators can embed both declarative and interrogative sentences. The following table summarizes how each combination translates to the logical form:

[28] The configuration given in (61-b) may seem unconventional in Japanese linguistics as the semantic composition of Japanese sentences are relatively faithful to the surface linear order as pointed out by an anonymous reviewer. Furthermore, (61-b) apparently violates Head Movement Constraint. See Appendices A.1 and A.2 for other Japanese constructions in which the linear order of lexical items do not reflect the order of interpretation and for English constructions that involve head movement which violates Head Movement Constraint.

(62) 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* $\textsc{assert}(E_{\textsc{spkr}_C}\langle ? \rangle \alpha)$

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

Let us now consider the three interrogative operators, $\text{C}_{[\text{Q}]}$ (*ka*), $\text{C}_{[\text{Q}]}\uparrow$ (*ka*↑) and ↑. These three morphemes are in contrastive distribution, that is, they occur in the CP layer. They are similar in that they all take truth-conditional declarative clauses and yield interrogative clauses, while they are different structurally and type-theoretically. First, $\text{C}_{[\text{Q}]}$ (*ka*) is a truth-conditional interrogativizer which is syntactically integrated in the sentence composition and yields an truth-conditional interrogative sentence of type T.

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

Turning to *ka*↑ and ↑, I propose that they are both use-conditional interrogativizers that include the QUEST operator in its semantics. Thus, they are of type $\langle T, u \rangle$ and occur at the root CP. It takes a declarative sentence φ as its arguments, renders it into an interrogative sentence $\langle ? \rangle\varphi$ and yields a use-condition of questioning the interrogative sentence.[29]

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

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

---

[29] The Final Rise with/without the particle *ka* (*-ka*)↑ 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)↑?
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 a common knowledge that Hanako does not know about Marie's current smoking habit. On the other hand, (i-b) is an appropriate utterance given the previous discourse. Thus, φ(-ka) ↑ 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 condition of (-ka) ↑ as in (ii):

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

Alternatively, the presupposition could be part of the QUEST operator in general. Since the data at hand cannot distinguish the two options, I do not include this presupposition in the use condition of (-ka)↑.

Although $C_{[Q]}\uparrow$ and $\uparrow$ are similar in that they occur in the same root-level CP, have the same semantic type and denote the same use condition, they are different in their morpho-syntactic makeups and how they are composed with the rest of the syntactic structure. $C_{[Q]}\uparrow$ (*ka*$\uparrow$) is a complex morpheme which is composed of phonetic segments /ka/ and tonal segments L%H%. Since it has a morpho-syntactic component, *ka*$\uparrow$ is also syntactically integrated. It is different from the tonally unmarked *ka* in that it yields a use-condition of an interrogative sentence instead of a (truth-conditional) sentence.

Finally, I consider $\uparrow$ as a residual morpheme obtained by stripping off the morpho-syntactic part $C_{[Q]}$ (*ka*) from $C_{[Q]}\uparrow$ (*ka*$\uparrow$). Thus, the composition of $\uparrow$ is not syntactically integrated but is paratactically associated (Bartels 1999) to its host sentence. In the literature on the interpretation of prosodic morphemes (Bartels 1999; 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 sentence. Here I offer a more concrete system that includes the syntactic and composition rules of paratactic association. Syntactically, the prosodic morpheme β is paratactically associated (indicated by '$\otimes$') to the head of the root clause, C_{ROOT} as in (66-a). When there is no syntactic object in the position with which the prosodic morpheme is associated, the morpheme simply projects unmodified as in (66-b).

(66) Syntactic rules of paratactic association

a. Paratactic Association

$$\begin{array}{c} C_{ROOT} \\ | \\ \alpha \otimes \beta \end{array}$$

b. Paratactic Association with a null head

$$\begin{array}{c} C_{ROOT} \\ | \\ \varnothing \otimes \beta \end{array} \quad \rightarrow \quad \begin{array}{c} C_{ROOT} \\ | \\ \beta \end{array}$$

When the prosodic morpheme β is the only object as in (66-b) it simply combines with its sister by shunting-type functional application (43). 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 (67) to the syntax of McCready's (2010) $\mathcal{L}^{+S}_{CI}$.[30] Paratactic Association merges two functions into one by abstracting over the argument type of the two functions. The resulting function is combined with an truth-conditional expression by shunting-type functional application (43) and outputs a pair of expressions separated by a metalogical operator, $\blacklozenge$.

(67) Paratactic Association

$$\begin{array}{c} \lambda\chi.\alpha(\chi)\blacklozenge\beta(\chi) : \langle\sigma, u \times u\rangle \\ \diagup \quad \diagdown \\ \lambda\chi.\alpha(\chi) : \langle\sigma, u\rangle \quad \lambda\chi.\beta(\chi) : \langle\sigma, u\rangle \end{array}$$

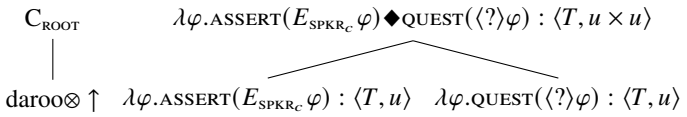
To see how (67) works, let us see how *daroo*$\otimes\uparrow$ works in composition. The lexical entry of $\uparrow$ is given in (68). $\uparrow$ takes a truth-conditional sentence and yields an use-condition of type u;

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

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

Both *daroo* and ↑ 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 (67) yields a function that takes a truth-conditional sentence and returns a pair of use-conditions.[31]

(69)



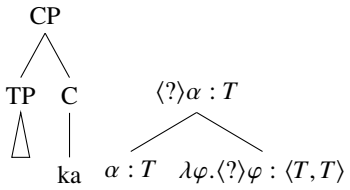
We now have the three interrogative operators, *ka*, *ka*↑ and ↑. To see how each operator works, let us derive the interpretations of sentences that contain them. Suppose a simple declarative without particle nor ↑ like (70) is mapped to a declarative sentence α.

(70) 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 (72).

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

(72)

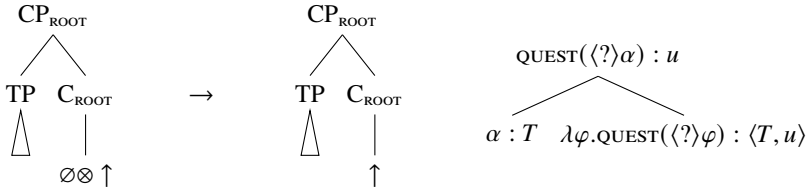


Turning to ↑, it is paratactically associated to the root C. Since there is no syntactic object, ↑ occupies the position. Compositionally, it combines with its sister by shunting-type functional application (43) and yields an use condition, $\textsc{quest}(\langle ?\rangle\alpha) = \{c : [\![\langle ?\rangle\alpha]\!] = top(T_c)\}$.

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

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

(74)

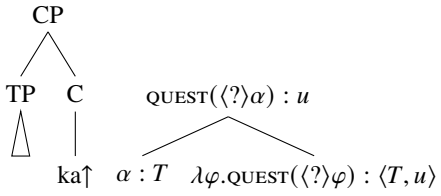


Finally, a rising interrogative is marked with the complex morpheme *ka*↑:

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

The operator *ka*↑ has morpho-syntactic content, so it is syntactically integrated in the main text. It takes its sister node, which denotes a truth-conditional declarative α, as its argument and renders it to an use-condition of questioning an interrogative sentence.

(76)



Thus, *α-ka*, *α*↑ and *α-ka*↑ all yield $\langle ? \rangle \alpha$ but they are different in that the latter two denote use-conditions of $\textsc{quest}(\langle ? \rangle \alpha)$. This theoretical implication is supported by the following contrast in (77). The interrogative *α-ka* without ↑ can be embedded under *shitteru* 'know' while *α* ↑ and *α-ka*↑ cannot.

(77) 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↑.'
c. *Marie-ga wain-o nomu ka↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q↑ Takeshi-TOP know
'Takeshi knows whether Marie drinks wine↑.'

Given that *shitteru* 'know' is of type $\langle T, \langle e, T \rangle \rangle$, (77-b) and (77-c) are ruled out as ungrammatical due to type-mismatch.[32]

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

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

One may wonder whether the rising declarative construction $\alpha\uparrow$ like (73) 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 $\alpha \uparrow$ and α-*ka*$\uparrow$ as synonymous since in English, root-level interrogatives and rising declaratives receive different semantics. Uttering English rising declaratives $\alpha \uparrow$ requires a context that is characterized by evidence that supports α. It is infelicitous when there is no contextual evidence as in (78).

(78) 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 (79), the speaker can utter $\alpha \uparrow$.

(79) 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 $\alpha \uparrow$ and α-*ka*$\uparrow$ can be used in both contexts:

(80) 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?'

(81) 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 $\textsc{quest}(\langle ? \rangle \alpha)$.

The interpretations and typings of the four constructions are summarized below:[33]

[33] 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 a rising *daroo* interrogative discussed below in Section 4.4.

(82)

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

4 Deriving the interpretations

Equipped with the syntax and semantics of (*ka*)↑ and *daroo*, we are ready to derive the intricate interpretations of the Japanese modal *daroo* summarized above in (18), repeated here as (83).

(83) 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, $\textsc{assert}(E_{\text{SPKR}_c}\varphi)$:

(84) 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*), $\text{C}_{[\text{Q}]}\uparrow$ (*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.

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

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

(87) 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 the main text but paratactically associated to the root C.

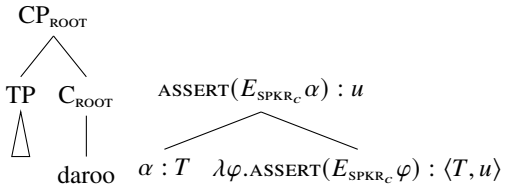
4.1 Falling *daroo*-declaratives

Let us see how these proposals derive the paradigm in (83), starting from a falling declarative like (3) repeated here as (88).

(88) 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 (88) as in (89). Compositionally, thus, *daroo* takes its sister declarative α and returns an assertion of the modalized sentence, $\textsc{assert}(E_{\textsc{spkr}_c}\alpha)$.

(89)



Given Fact (32) when the embedded sentence is a declarative (i.e., $|\textsc{possibility}(\alpha)| = 1$ (see (24))), $E_{\textsc{spkr}_c}\alpha$ and $K_{\textsc{spkr}_c}\alpha$ are equivalent. Therefore, (88) gives rise to a use-condition for asserting a modalized declarative $K_{\textsc{spkr}_c}\alpha$, where α ='Marie drinks wine'.

Now, as anonymous reviewers rightly pointed out, the content of the assertion $K_{\textsc{spkr}_c}\alpha$ seems too strong for the intuition reported in Sections 2 and 6, 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 weaker than the logical necessity: In the standard modal logic, $\Box\alpha$ entails α, while 'It must be raining' does not seem to entail 'It is raining'. To account for this weakness intuition, Kratzer (1991) treats *must* as a universal quantifier over a modal base which contains maximally normal possible worlds. Since how to derive this weakness intuition of the necessity modal word 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 the current purpose, I adopt the proposal in line with Karttunen (1972) and Kratzer (1991). The bare assertion α and the modalized $K_{\textsc{spkr}_c}\alpha$ 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 $K_{\textsc{spkr}_c}\alpha$, the speaker is implicating that he or she is not in the position to assert α.

4.2 Falling *daroo*-interrogatives

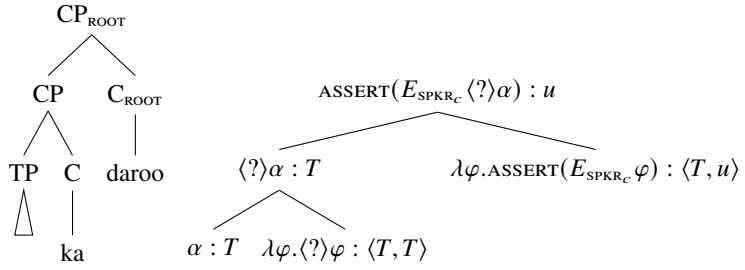
Let us turn to falling *daroo*-interrogative sentences like (8) repeated here as (90).

(90) 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 $\text{C}_{\textsc{root}}$ at LF to check off its uninterpretable $[u\textsc{root}]$ feature. The LF and the composition of (90) are depicted below:[34]

[34] Following Matyiku (2017), I assume that the trace of head movement is deleted. See Appendix A.2 for the motivation for this assumption.

(91)



Thus, (90) denotes a use condition of asserting the declarative sentence, $[\![E_a\langle ?\rangle\alpha]\!] = \{p|\Sigma_{\text{SPKR}_c}(w) \subseteq [\![?\{\alpha, \neg\alpha\}]\!]$. That is, '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 other words, 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*↓:

(92) 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*↓:

(93) Marie-wa wain-o nomu daroo ka↓. Iya, noma-nai daroo↓.
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.[35]

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 $\neg K_{\text{SPKR}}\alpha$ is cancelled in (92) Likewise, $\neg K_{\text{SPKR}}\neg\alpha$ is cancelled in (93).

4.3 Rising *daroo*-declaratives

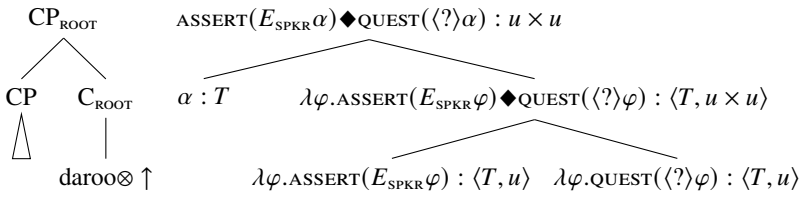
Recall that a rising *daroo*-declarative seems to express a meaning similar to a tag question, repeated here as (94).

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

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

Section 3.3.2 proposed that *daroo* occupies the C_{ROOT} position. Section 3.4 proposed that the tonal morpheme ↑ is paratactically associated with C_{ROOT}. The two shunting-type morphemes are combined by the composition rule of PARATACTIC ASSOCIATION (67), which yields a function that takes an at-issue sentence and returns a pair of use-conditions.

(95)



Thus, (94) gives rise to a pair of use conditions, $\textsc{assert}(E_{SPKR}\alpha)$ ($\equiv \textsc{assert}(K_{SPKR}\alpha)$) and $\textsc{quest}(\langle ?\rangle\alpha)$. 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.[36]

4.4 Rising *daroo*-interrogatives

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

(96) *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 position c-commanded by *daroo*. Both *ka*↑ and *daroo* are syntactically integrated in the same composition tree, thus *daroo* needs to take its sister $\textsc{quest}(\langle ?\rangle\alpha)$ of type u as its argument. Since the argument of *daroo* needs to be a truth-conditional sentence of type T, the derivation crashes due to type mismatch: hence (96) is ungrammatical.[37]

---

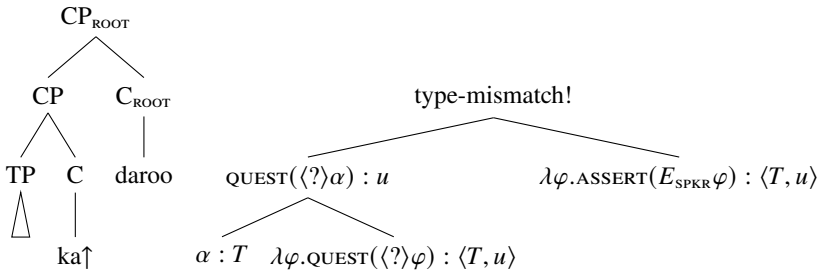
[36] An anonymous reviewer report their intuition that the bias expressed by falling *α-daroo* is somewhat weaker than the one expressed by rising *α-daroo*. This intuition can be explained by a pragmatic competition between α and *α-daroo*. In my analysis, falling *α-daroo* is an assertion of $K_{SPKR}\alpha$, thus 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 of $?\alpha$. The question acts pushes the issue $?\{\alpha, \neg\alpha\}$ as well as $K_{SPKR}\alpha$ onto the Table, thus when the addressee responds with 'yes', α will enter the common ground.

[37] 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?'

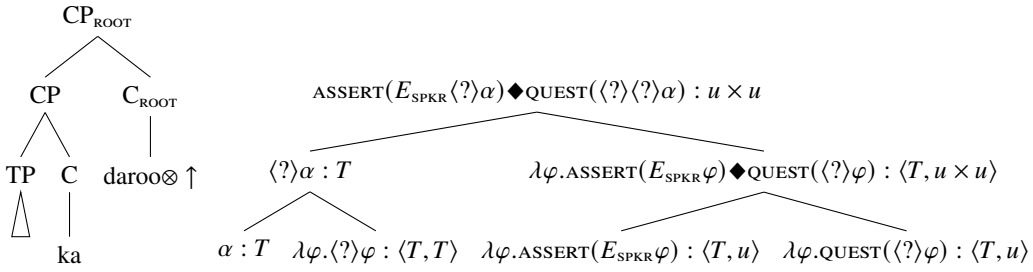
(ii) 9431-wa sosuu deshou ka?
9431-TOP prime.number DAROO.POLITE Q
'Is 9431 a prime number?'

(97)



As mentioned in footnote 33, it is a reasonable question to ask why (96) is not composed of the morpheme *ka* and the paratactically associated ↑ instead of *ka*↑. As stated in (19-b), I claim that *ka*, *ka*↑ and ↑ are in contrastive distribution. That is, there can be at most one interrogativizer in the layered matrix CP . Thus, the configuration in (98) is ill-formed since there are two interrogatives in the matrix CP. Furthermore, not only it is structurally ill-formed, but also it derives a wrong interpretation. To see how this line of analysis makes a wrong prediction, let us relax the structural constraint and try to compose (96) from *ka* and ↑. As can be seen in the LF structure in (98), *ka* is merged with the TP and ↑ is paratactically associated with *daroo* at C$_{\text{ROOT}}$.

(98)



The composition yields a pair of use-conditions, $E_{\text{SPKR}}\langle ?\rangle\alpha\blacklozenge\langle ?\rangle\langle ?\rangle\alpha$. 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 (96). 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 making 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 with a Final High, there is a shifting 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.

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

(99) 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

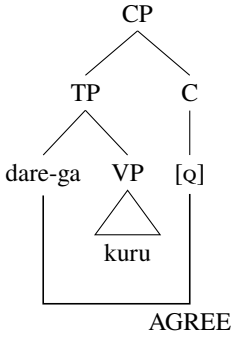
4.5 *Wh* interrogatives

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*:

(100) 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 surfaced by the particle *ka* or an agreement relation between the *wh*-pronoun and C as depicted in (101). As for polar interrogatives, in contrast, an interrogative operator, either *ka*, *ka*↑ or ↑, needs to be attached to a declarative.

(101)



As for the semantics of the *wh*-clause, I treat it as a Hamblin (1973) set, i.e., a downward closed set of propositions.[38] In other words, the *wh*-clause denotes an issue, thus 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 (see also definition 9 in Appendix B). 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).

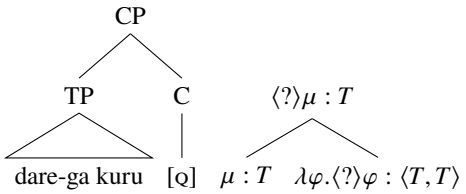
(102) a. $[\![\text{Dare-ga kuru}]\!] \in D_{\langle\langle s,t\rangle,t\rangle}$
b. $[\![\text{Dare-ga kuru}]\!] = \{p|\exists x \in D.x \text{ is human}\&p = |x \text{ is coming}|\} = [\![\mu]\!]$

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

In the following illustrations, I use μ for a 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 (25), since $|\textsc{poissibility}(\mu)| \geq 2$, $\langle ? \rangle \mu = \mu$. Thus, μ-*ka*↓ denotes a Hamblin-set of truth-conditional type T:

(103)



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

(104) 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 interpreted as a rhetorical question.[39]

(105) 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:

(106) 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:

---

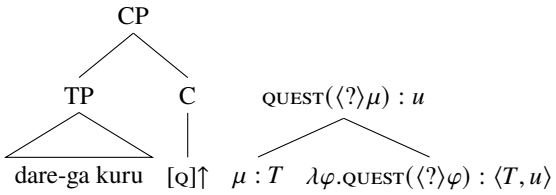
[39] An anonymous reviewer noted that the following sentence can be used as an information-seeking question:

(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?'

(107)



Indeed, it cannot be embedded as in (108).

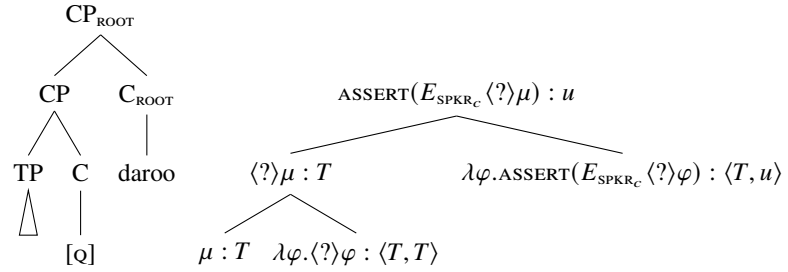
(108) *Dare-ga kuru (ka)↑ sira-nai/siri-tai.
who-NOM come Q know-not/know-want
'I don't know/I want to know who is coming.'

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

(109) 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 ASSERT($E_{\text{SPKR}_c}\langle ?\rangle\mu$), i.e., the speaker is asserting that she is entertaining the issue μ.

(110)

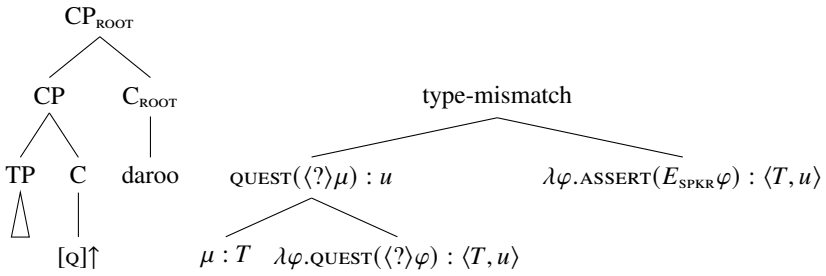


Finally, rising *daroo wh*-interrogatives with or without *ka* are ungrammatical:

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

This is also as predicted. (111) is marked as an interrogative with [Q]↑, which is syntactically integrated operator that returns a use condition of type u. *Daroo* needs its argument to be of type T, thus it causes the type mismatch.

(112)



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 to the speaker, E_{SPKR}. Syntactically, *daroo* moves to the head of root C$_{\text{ROOT}}$ to check off its uninterpretable feature, [uROOT], resulting in the logical form ASSERT($E_{\text{SPKR}_c}\varphi$), in which the modal operator E_{SPKR_c} embeds the declarative or interrogative sentence. The semantics of *daroo* is assigned in the framework of inquisitive epistemic logic. In particular, the semantics of *daroo* contains an entertain modality E_{SPKR_c} and $E_{\text{SPKR}_c}\varphi$ denotes that the speaker is entertaining an issue denoted by φ. When the embedded sentence is a declarative α, $E_{\text{SPKR}_c}\alpha$ is equivalent to $K_{\text{SPKR}_c}\alpha$. Thus, a *daroo*-declarative describes an epistemic state of the speaker. As can be seen, this equivalence allows us to maintain the uniform semantics for *daroo* as an assertion of entertain modality.

This paper also proposed that there are three interrogative operators, truth-conditional C$_{[\text{Q}]}$ (*ka*), and use-conditional C$_{[\text{Q}]}\uparrow$ (*ka*↑) and ↑, which are in contrastive distribution. 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 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:

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

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

Section 6 presents the results of two rating experiments that confirm the distribution and interpretations summarized in (113).

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 reconsiders two approaches alternative to this. The first approach is a one-dimensional approach in which the semantic contributions of *daroo*, *ka*↑ and ↑ are integrated into the single semantic representation. The second approach is to analyze them as contributing to both at-issue and non-at-issue meanings.

5.1 One-dimensional approach

5.1.1 One-dmensional daroo

In the one-dimensional approach, there is only a single dimension, thus a single sentence denotes a single truth-conditional proposition. Thus, under this approach, the meaning of *daroo* should be integrated into the truth-conditional dimension. Hara (2006, ch. 6) presents a number of arguments that the contribution of *daroo* is different from the ordinary descriptive/truth-conditional expression. The first argument comes from the unembeddability of *daroo*. According to Potts (2005), truth-conditional contents (at-issue contents in Potts' term) can be in the scope of presupposition holes, i.e., question, negation, modal, conditional. We already know that *daroo* outscopes a question operator, so 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.

(114) *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 we have seen in (56), repeated here as (115), *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.

(115) a. kare-ga kuru nichigainai wakedewanai.
he-NOM certainly 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 (116), *daroo* cannot be embedded under *wakedewanai*.

(116) *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, *daroo* cannot be embedded under another modal as in (117).

(117) 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, *daroo* sentences cannot be conditionalized.

(118) *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.'

In sum, *daroo* resists being embedding under all the presupposition holes, which supports the idea that *daroo* is not a descriptive/truth-conditional item.

Hara's (2006) second argument comes from the co-occurrence with other modals. As already seen in Section 2.1, high probability adverbs can co-occur with *daroo* as in (119) while a low probability adverb *moshikasuruto* 'maybe' cannot as in (120).

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

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

(Sugimura 2004)

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

(121) 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 both *daroo* and *moshikasuruto* contribute to the expressive/non-truth-conditional dimension, while *kamoshirenai* contributes to the truth-conditional dimension. Thus, in (121), 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 (120), if *daroo* and *moshikasuruto* were truth-conditional items, *daroo* should be able to embed *moshikasuruto* and have an interpretation parallel to (121). Then a question arises as to: how is (119) 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 D.

5.1.2 One-dimensional (ka)↑

Turning to *ka*↑ and ↑, they also resist being embedded under presupposition holes. It may be obvious, but *(ka)*↑ cannot be embedded under another question particle:

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

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

(123) *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 ↑:[40]

(124) 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:

(125) 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.'

Furthermore, as we already have seen in (77), repeated here as (126), (*ka*)↑-interrogatives cannot be embedded questions.

(126) 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↑.'
c. *Marie-ga wain-o nomu ka↑ Takeshi-wa shitteru.
Marie-NOM wine-ACC drink Q↑ Takeshi-TOP know
'Takeshi knows whether Marie drinks wine↑.'

In short, there is a wide range of evidence that a question particle with Final Rise, (*ka*)↑, cannot be in the scope of other operators. The one-dimensional approach wrongly predicts that (*ka*)↑-sentences could be arguments of other functors.

However, one may argue that all the ungrammatical examples in (122)-(126) could be ruled out by some syntactic constraint on (*ka*)↑. For instance, one could propose that the syntactic feature [*u*ROOT] on (*ka*)↑ prevents the morpheme from appearing at non-root positions. This proposal does explain the data, but as it is, it lacks a conceptual motivation behind the syntactic constraint arising from [*u*ROOT]. My proposal that *ka* and *ka*↑ are shunting-type use-conditional items that output question speech acts fills this gap. Syntactically, they need to appear at the root position since semantically, they are combined with a sentence radical and yield a use condition of a question act.

Before moving on to the other alternative, let us consider a variant of the one-dimensional approaches in which the semantics of speech acts or [ROOT] are integrated into the truth-

[40] Etymologically, *ka* in *kamoshirenai* 'might' is arguably derived from the question particle *ka*. In any way, neither *moshirenai* nor *kamoshirenai* can follow *ka*↑ or ↑.

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 that it is true iff it is open whether φ. Thus, an interrogative sentence *Does Peter snore?* have the following truth-condition:

(127) "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 (127) is problematic. In (128), B1 should be interpreted as 'Peter does not snore', not as 'it is not open whether Peter snores'. Similarly, the truth-condition (127) wrongly predicts that the responses in B2-4 are felicitous.

(128) 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 act should not be integrated into the truth-conditional dimension.

5.2 Non-shunting UCI

5.2.1 Non-shunting daroo

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, that is, 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 ↑ project at-issue and non-at-issue meanings.[41] 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 assumes 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 (6), repeated here as (129), where *daroo* is embedded under *because*.

(129) 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* (159) in Appendix E, *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

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

unexplained why *kara* in (129) 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, thus φ-*daroo* only projects $\textsc{assert}(E_{\textsc{spkr}}\varphi)$. 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 (129), 'The fact that the speaker asserts that it will rain causally explains the speaker to take an umbrella with her.'[42]

Furthermorem there is a conceptual problem in U&R's analysis that 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 no doubt the main effect of the *daroo*-utterances.

5.2.2 Non-shunting (ka)↑

Similarly, the compositional framework that U&R employ wrongly predicts that rising declaratives/interrogatives (α-*(ka)*↑) and rising *wh*-interrogatives (μ-*(ka)*↑) could be embedded questions. In U&R's system, ↑ projects both at-issue and non-at-issue meanings as in (161) in Appendix E, thus α-*(ka)*↑ and μ-*(ka)*↑ would yield the same at-issue objects, i.e., $\langle ?\rangle\alpha$ and $\langle ?\rangle\mu$, as interrogatives without final pitch contour, α-*ka* and μ-*ka*. As we have seen in (122)-(126-c), however, these constructions with Final Rise cannot be embedded questions. The analysis of the current paper correctly rules them out since both ↑ and *ka*↑ are shunting-type question operators that only yield interrogative sentences of type u, which cannot be embedded.[43]

6 Experiments

The following table summarizes the distribution and interpretations of *daroo* sentences.

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

	Falling	Rising
Declarative	α-*daroo*↓ statement ('I bet') $\textsc{assert}(K_{\textsc{spkr}}\alpha) : u$	α-*daroo*↑ tag/confirmation Q ('... right?') $\textsc{assert}(K_{\textsc{spkr}}\alpha)$ $\blacklozenge\textsc{quest}(\langle ?\rangle\alpha) : u \times u$
Polar Interrogative	α-*daroo ka*↓ self-addressing Q ('I wonder') $\textsc{assert}(E_{\textsc{spkr}}\langle ?\rangle\alpha) : u$	$^{*}\alpha$-*daroo ka*↑ $*$ (Type-mismatch)

This section reports two experiments that confirm the observation summarized in (130). In the first experiment, native speakers of Japanese judged the naturalness of different combinations of clause types and with intonation indicated via auditory means. In the second experiment, they judged the naturalness of combinations of contexts and clause types with visually-indicated intonation.

[42] Evidential/sentience markers are different from attitude predicates in that they cannot shift the attitude holder the bias of *daroo* (7) while attitude predicates can (59). See Hara (2006, ch. 6) for more discussions.

[43] See Appendix E for other problems of U&R's analysis.

6.1 Experiment I

Section 2 introspectively observed that an interrogative with *daroo* is not compatible with rising intonation. Thus, it is predicted that native speakers will disprefer an interrogative with *daroo* when it is pronounced with a rising contour.

6.1.1 Method

Stimuli The stimuli had two fully-crossed factors—sentence types (declarative/interrogative) and final prosodies (falling/rising), which resulted in the appearance of *daroo* in four conditions. Each condition had 16 items, resulting in 64 target sentences (16 items * 4 conditions). 64 fillers were included.

Recording A native female speaker of Japanese, who was naive to the purpose of the experiment, pronounced the stimuli in a sound-attenuated room at the Research Laboratory for Phonetics and Cognitive Studies of City University of Hong Kong. The pitch profiles of Final Rise were made sure to be approximately comparable across items. She produced all the stimuli in isolation, and the stimuli were presented in Japanese orthography. For each sentence, the speaker was asked to pronounce it with a rising and falling contour.

Procedure The rating experiment was conducted in a sound-attenuated room in the Sound Lab at the University of Tokyo. The stimuli were presented by the assessment management software program, Perception.[44] The participants were asked to wear headphones. The first page of the test showed the instructions.

In the main section, the participants were asked to listen to each stimulus, and then judge its naturalness on a 5-point scale (provided in Japanese): very natural, somewhat natural, undecidable, somewhat unnatural, very unnatural. They were also reminded not to rate the naturalness in terms of the social appropriateness of the speech.

The test started with a practice session where the participants ran through five practice items, which were unique to the practice block. The main experiment was organized into four blocks separated by three break signs. Each block contained 16 items. None of the stimuli were repeated and the order of the stimuli within each block was randomized by the Perception software. No minimal pair sentences appeared next to each other.

Participants Fourteen native speakers of Tokyo Japanese participated in the rating experiment. They were undergraduate students recruited from the University of Tokyo and received 1000 Japanese yen as compensation.

Statistics The responses were converted to ordinal values as follows: very natural=5; somewhat natural=4; undecidable=3; somewhat unnatural=2; very unnatural=1. To analyze the results, a mixed-effect ordinal logistic regression model was fit using the `ordinal` package (Christensen 2019) implemented in R (R Core Team 2021). Sentence types and final prosodies were the fixed factors. The model also included random intercepts for participants and items.

If the availability of the rising contour depends on the type of the sentence, then the dependency is expected to result in a significant interaction between sentence types and boundary tones.

[44] ©2015 Questionmark Computing Limited. `https://www.questionmark.com/`

6.1.2 Result

Figure 6 shows the average naturalness rating for each condition. Regardless of syntactic constructions, rising intonations were dispreferred in general ($\beta = -5.38$, `Std.Error` $= 0.33$, $z = -16.41$, $p < 0.001$). There was no significant interaction between falling declarative and interrogative constructions. On the other hand, with a rising intonation, the speakers judged interrogative constructions least natural. Because of this asymmetry, the interaction between syntax and intonation was significant in the ordinal mixed model analysis ($\beta = -3.41$, `Std.Error` $= 0.36$, $z = -9.38$, $p < 0.001$).

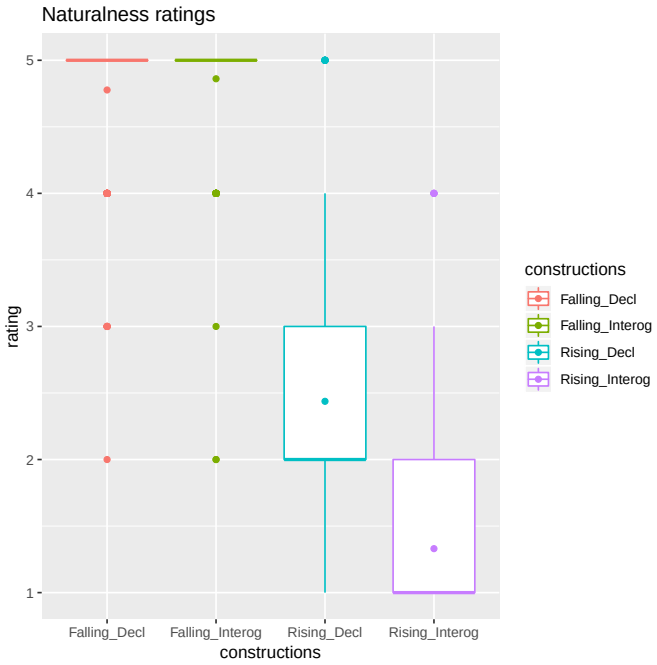


Fig. 6 Average Naturalness Ratings of Experiment I

6.1.3 Discussion

The results show that native speakers judge *daroo ka*↑ unacceptable. Note also that native speakers disprefer rising *daroo* in general. There are at least two possible explanations for this main effect. One is that native speakers prefer to shorten the final vowel in *daroo* in rising declaratives, i.e., *daro*.[45] Another speculation is that this main effect is due to the fact that in Experiment I, stimuli were presented without context. As I proposed in Section 3, Final Rise is (part of) question operator, which requires a presence of an addressee. Without explicit context, the participants were forced to accommodate an addressee, and this extra cost of accommodation caused the rising *daroo*-sentences to degrade.

[45] For instance, Sudo (2013) uses *desho* instead of *deshoo* as the polite form of rising *daroo*.

6.2 Experiment II

Experiment I shows that native speakers judge the combination of *daroo ka*↑ unacceptable. Section 2 also discussed the fact that the other combinations, although acceptable, are used in different contexts. The purpose of Experiment II is to verify the intuition that the acceptability of each combination depends on the context. Thus, in Experiment II, three kinds of contexts were prepared, ANSWER, AGREE-SEEK and SELF-ADDRESS as in (131). In the ANSWER context, A, the speaker of the target sentence was asked a question, so the following utterance of A should be regarded as a straightforward description of A's own knowledge. The SELF-ADDRESS(ING) context describes the situation in which A is wondering about a certain issue. Finally, the AGREE(MENT)-SEEK(ING) context describes the situation in which A wants to check his/her discourse partner's knowledge:

(131) Contexts:

a. ANSWER context
A wa yuujin ni dare ga paatii ni kuru to omouka kikarete kotaeta:
'A was asked by a friend who he thinks will come to the party and answered:'

b. SELF-ADDRESS context
A wa dare ga paatii ni kuru ka hitoride kangae te iru:
'A is wondering by himself who is going to come to the party:'

c. AGREE-SEEK context
A wa yuujin ga "dare mo paatii ni konai" to itteiru no o kiite itta:
'A's friend said "No one will come to the party" and A said:'

Given the observations made in Section 2, the predictions for the distribution of sentence type and context are as follows:

(132) a. Falling *daroo*-declaratives are rated more natural in ANSWER contexts than in other contexts, and other sentence types are rated less natural than falling declaratives in this context.

b. Rising *daroo*-declaratives are rated more natural in AGREE-SEEK contexts than in other contexts, and other sentence types are rated less natural than rising declaratives in this context.

c. Falling *daroo*-interrogatives are rated more natural in SELF-ADDRESS contexts than in other contexts, and other sentence types are rated less natural than falling interrogatives in this context.

The purpose of Experiment II is thus to verify these predictions.

6.2.1 Method

Stimuli The stimuli had two fully-crossed factors—contexts (ANSWER/AGREE-SEEK/SELF-ADDRESS) and sentence-contour types (falling declarative/ rising declarative/falling interrogative), which resulted in the appearance of *daroo* in nine conditions. The sentence final intonation of the target sentences were indicated visually with arrows ↓/↑ and verbally in parenthesis with *Kakoo/Jooshoo intonesshon* 'Falling/Rising intonation' as exemplified in (133). Each of the nine conditions had 16 items, resulting in 144 target sentences (16 items * 9 conditions). 36 sentences from another experiment were also included.

(133) Target Sentences:

a. Falling *daroo*-declarative

Yamashita-san ga kuru daroo↓ (Kakoo intoneeshon)
Yamashita.MR NOM come DAROO (Falling intonation)
'Mr. Yamashita will come.'

b. Rising *daroo*-declarative

Yamashita-san ga kuru daroo↑ (Jooshoo intoneeshon)
Yamashita.MR NOM come DAROO (Rising intonation)
'Mr. Yamashita will come, right?'

c. Falling *daroo*-interrogative

Yamashita-san ga kuru daroo ka↓ (Kakoo inonesshon)
Yamashita.MR NOM come DAROO Q (Falling intonation)
'I wonder if Mr. Yamashita will come.'

Procedure The rating experiment was conducted in a quiet meeting room at Waseda University. The stimuli were presented in Japanese orthography by Qualtrics.[46] The first page of the test showed the instructions.

In the main section, the participants were asked to read each stimulus, and then judge the naturalness of the target sentence against the context of the stimuli on a 7-point scale (provided in Japanese): from "7: very natural" to "1: very unnatural". The scale was changed from 5-point to 7-point because Experiment II was conducted together with another experiment which employed a 7-point scale.

The main experiment was organized into four blocks separated by three break signs. Each block contained 36 items. None of the stimuli were repeated and the order of the stimuli within each block was randomized by the Qualtrics software. No minimal pair sentences appeared next to each other.

Participants Fourteen native speakers of Japanese participated in the rating experiment. They were undergraduate students recruited from Waseda University and received 1000 Japanese yen as compensation.

Statistics The responses were recorded as ordinal values: from very natural=7 to very unnatural=1. Context types and sentence types were fixed factors. The other aspects were the same as Experiment I.

If the naturalness of sentence-contour combination depends on the type of context, then the dependency is expected to result in a significant interaction between contexts and sentence-contour combinations.

6.2.2 Result

Figure 7 shows the average naturalness ratings in each condition. The discussion above leads to the prediction that falling *daroo*-declaratives are more natural in ANSWER contexts than in SELF-ADDRESS and AGREE-SEEK contexts. This prediction was confirmed; ANSWER contexts were rated most natural for falling *daroo*-declaratives (compared with SELF-ADDRESS: $\beta = -0.93, \texttt{Std.Error} = 0.18, z = -5.12, p < 0.001$; with AGREE-SEEK: $\beta =$

[46] Qualtrics is a web-based system that conducts online surveys. Version 45634 of the Qualtrics Research Suite. Copyright©2013 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. `http://www.qualtrics.com`.

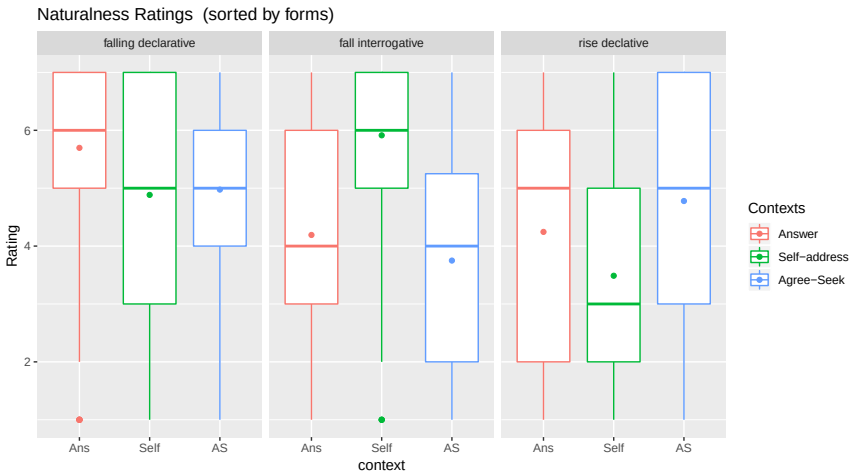


Fig. 7 Average Naturalness Ratings of Experiment II

-0.92, `Std.Error` $= 0.18$, $z = -5.09$, $p < 0.001$). SELF-ADDRESS contexts made falling *daroo*-interrogatives most natural (compared with ANSWER: $\beta = -1.95$, `Std.Error` $= 0.19$, $z = -10.24$, $p < 0.001$; with AGREE-SEEK: $\beta = -2.44$, `Std.Error` $= 0.20$, $z = -12.32$, $p < 0.001$). AGREE-SEEK contexts made rising *daroo*-declaratives most natural (compared with ANSWER: $\beta = -0.59$, `Std.Error` $= 0.18$, $z = -3.33$, $p < 0.001$; with SELF-ADDRESS: $\beta = -1.31$, `Std.Error` $= 0.18$, $z = -7.25$, $p < 0.001$).

Note also that in AGREE-SEEK contexts, there was no significant difference between falling and rising *daroo*-declaratives ($\beta = -0.09$, `Std.Error` $= 0.17$, $z = -0.51$, $p = 0.61$). That is, falling *daroo*-declaratives (mean = 4.97) were judged as natural as rising *daroo*-declaratives (mean = 4.77).[47]

6.2.3 Discussion

The results confirmed the predictions given in (132) repeated here as (134):

(134) a. Falling *daroo*-declaratives are rated more natural in ANSWER contexts than in other contexts, and other sentence types are rated less natural than falling declaratives in this context.
b. Rising *daroo*-declaratives are rated more natural in AGREE-SEEK contexts than in other contexts, and other sentence types are rated less natural than rising declaratives in this context.
c. Falling *daroo*-interrogatives are rated more natural in SELF-ADDRESS contexts than in other contexts, and other sentence types are rated less natural than falling interrogatives in this context.

Note also that native speakers accept falling *daroo*-declaratives in AGREE-SEEK contexts as much as rising *daroo*-declaratives in the same AGREE-SEEK contexts. This is because the AGREE-SEEK contexts in Experiment II are also compatible with situations where the speaker

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

expresses his or her own knowledge; by doing so, the speaker is proposing to update the common knowledge of speaker and interlocutor (Stalnaker 1978).[48] What is more crucial to the current paper is that the AGREE-SEEK contexts make rising *daroo*-declaratives most natural among the three kinds of contexts.

7 Conclusion

This paper investigated the use of *daroo* with different clause types, prosodic patterns, tiers of meaning and pragmatic contexts. 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 explain the distribution and interpretation of the four construction patterns plus two *wh*-interrogative constructions, 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 root C to check off its uninterpretable feature, [uROOT]. 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 $?\{\alpha, \neg\alpha\}$.

The current paper also proposed that Japanese has three interrogative operators, at-issue $C_{[Q]}$ (*ka*), and use-conditional $C_{[Q]}\uparrow$ (*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 cominatoric rule PARATACTIC ASSOCIATION that merges two functions denoted by two paratactically associated items into a single function.

The introspection-based data and theoretical analysis are further supported by two rating experiments. Experiment I showed that rising *daroo*-interrogatives are seriously degraded. Experiment II showed that the other acceptable combinations are used in different contexts, and so have different usages. The data-driven investigation revealed the intricacy of the interplay between clause types, modality, boundary tones and tiers of meaning.

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[48] An anonymous reviewer pointed out that the ratings of rising *daroo*-declaratives in the AGREE-SEEK contexts seem to vary more than those of falling *daroo*-declaratives and *daroo*-interrogatives in their best contexts. I have two possible explanations for this result. One is to attribute the low ratings of rising *daroo*-declaratives to the strong epistemic bias arising from the pragmatic competition between α and $E_{\text{SPKR}_c}\,\alpha$ (see footnote 36). Another is to treat utterances with Final Rise ↑ as marked in the sense of optimality theory thus any utterances with ↑ violate some economy constraint.

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A Movement of *daroo*

A.1 Interpretation unfaithful to the linear order

The current paper proposes that *daroo*, which is syntactically below the question particle *ka* in the surface structure, takes wider scope than *ka* in the interpretation, which seems to go against the general trend that in Japanese, that is, the semantic composition is in line with the surface linear order. In fact, Japanese does have other constructions the interpretations of which do not reflect their linear order. First, as discussed by Kikuchi (2001) and Nakanishi (2007), (135) is ambiguous between two readings. One is that John dug too many holes which are all deep. The other is that John dug a whole that is too deep. In the second reading, the excessive verbal suffix *sugi* is syntactically adjacent to the verb but semantically the excessive is associated with the adjective *fukai* 'deep':

(135) John-ga fukai ana-o hori-sugi-ta.
John-NOM deep hole-ACC dig-EXCESSIVE-PAST
'(lit.) John dug a deep hole(s) too much.' (Nakanishi 2007, 223)

Second, 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 (136), the polite form precedes the past tense.

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

In contrast, when the root is an adjective as in (137), the past tense precedes the polite form.

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

The difference in their orders does not affect how their meanings are composed, since both mean "It was pretty/interesting" and are politely uttered.

A.2 Head movement and the interpretation of its trace

In the current paper, the movement of *daroo* skips over the question particle *ka*, which apparently violates Head Movement Constraint (HMC). In fact, English has a similar construction, where a modal below a functional

head undergoes covert raising, hence violates HMC, resulting in a wide-scope interpretation for the modal over the functional head. More concretely, the verb *seem* in (138) raises over *can* and negation as indicated in the paraphrase (Langendoen 1970; Jacobson 2006; Homer 2011):

(138) 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 base-generated under negation and covertly moves out of the scope of negation and the modal. In a nutshell, *seem* is a mobile PPI (positive polarity item), thus it has to outscope negation (or downward-entailing expressions), which results in the wide scope interpretation in (138). The analysis is motivated by the fact that the scope reversal happens only when *seem* is base-generated under negation. In (139), without negation, there is no reason for *seem* to move, thus the scope reversal is not available, since the movement is a last resort.

(139) #John can seem to run very fast. (*seem > can)

Therefore, in (138) *seem* is base-generated and raises over the negation head, which apparently violates Head Movement Constraint.

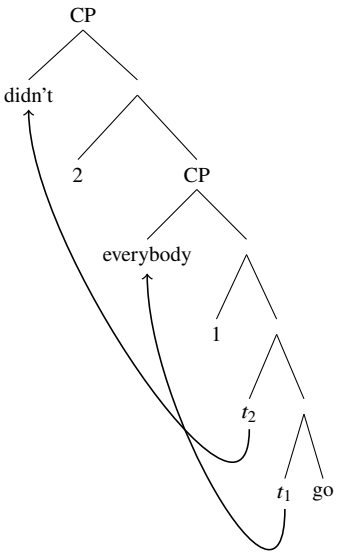
Homer (2011) does not provide further syntactic or semantic details of the movement such as where it moves to and whether it leaves a trace or not. To the author's knowledge, the first work which studies the semantic effects of head movement in detail is done by Matyiku (2017). Matyiku (2017) investigates negative auxiliary inversion in West Texas English. In this variety of English, a negated auxiliary can precede a quantified subject as in (140). (140) is uttered with falling intonation and is not an interrogative but a declarative. The negation in the inverted form unambiguously takes wider scope over the quantifier, while the non-inverted form in (141) is ambiguous between the surface scope and the inverted scope.

(140) Don't many people like you. (unambiguous: not > many; *many > not)

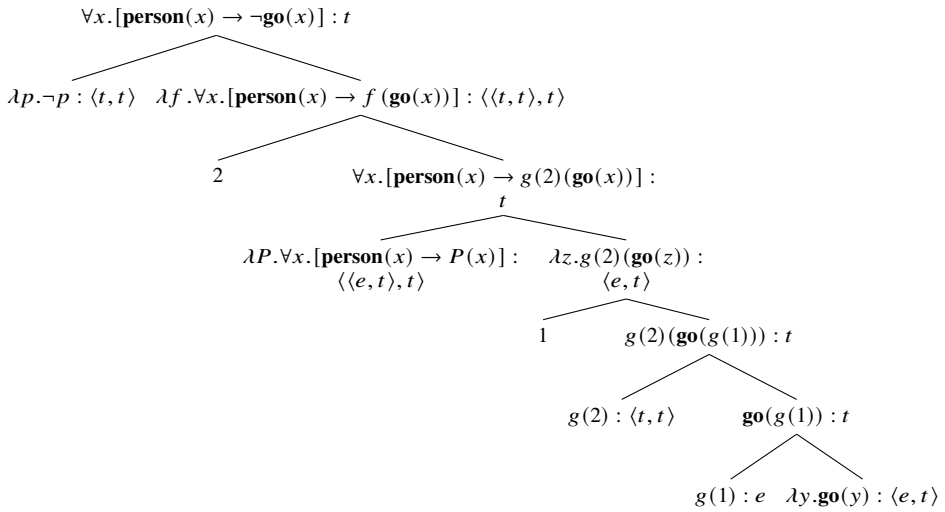
(141) Many people don't like you. (ambiguous: not > many; many > not)

Matyiku (2017) argues that the inverted form (140) and the negation-wide-scope reading of the non-inverted form (141) 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 QR-ed as shown in (142-b), thus the composition would end up in having the subject outscoping negation, i.e., $\forall > \neg$.

(142) a.

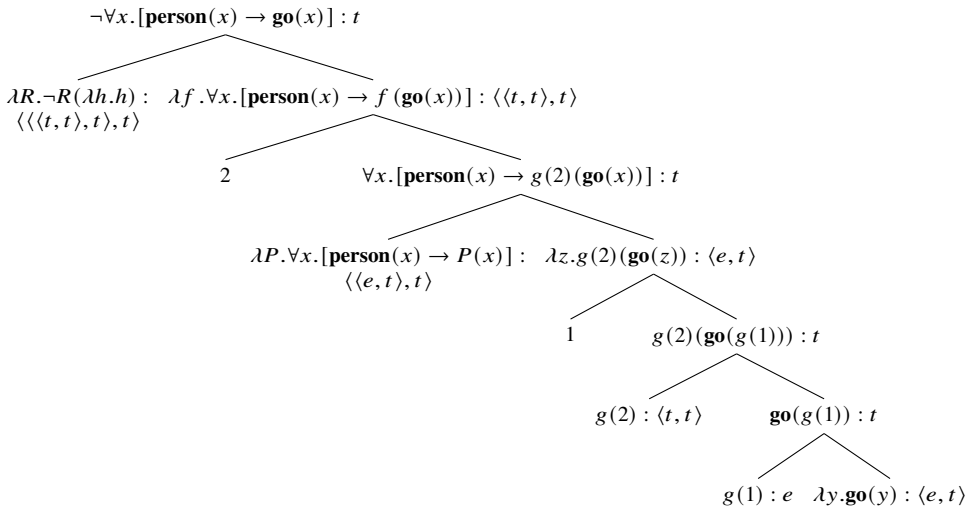


b.



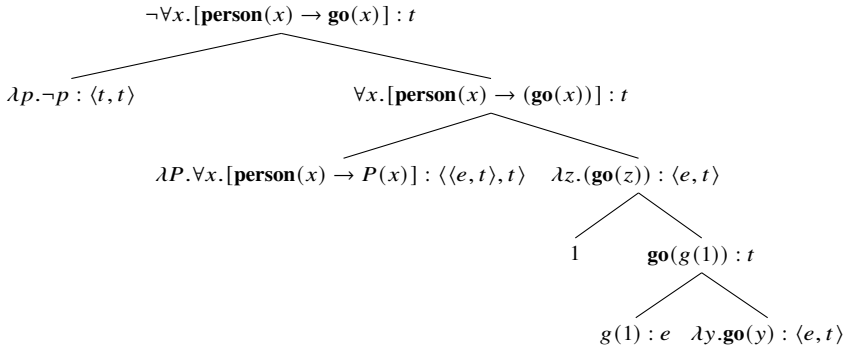
Thus, Matyiku (2017) offers two options to obtain the desired reading. One is to raise the type of negation. The other is to delete the trace of negation. Let us look at the first option. As depicted in (143), negation is of type $\langle\langle\langle t,t\rangle,t\rangle,t\rangle$ and it successfully yields the $\neg > \forall$ reading.

(143)



The second option keeps the meaning and type of negation simple but stipulates that the trace of movement of negation is deleted or the movement of negation does not leave a trace. As can be seen in (144), this also derives the desired ¬ > ∀ reading.

(144)



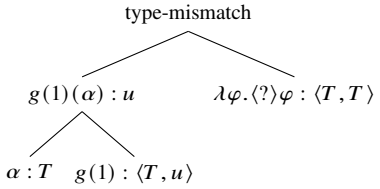
Matyiku (2017) states that there is no preference between the two options.

Turning to the raising of *daroo* in a falling *daroo*-interrogative like (90), repeated here as (145), we will face the same problem as the raising of the negated auxiliary.

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

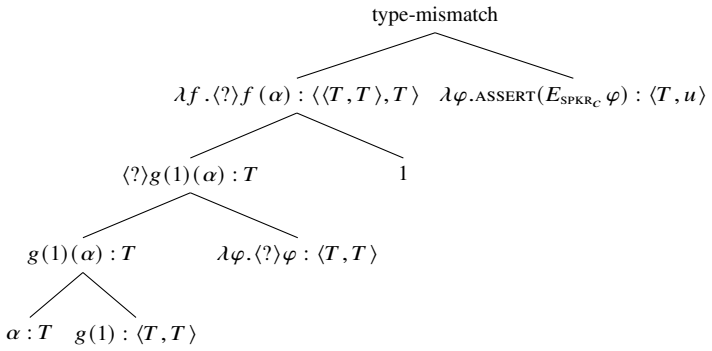
That is, the interpretation of *daroo* would be reconstructed into the base-generated position. Before seeing how the derivation runs into a problem, we first assume that the trace of *daroo* is of truth-conditional type $\langle T, T \rangle$, which I believe is a reasonable assumption. If it were of type $\langle T, u \rangle$, it would cause a type mismatch before merging with raised *daroo* as in (146).

(146)



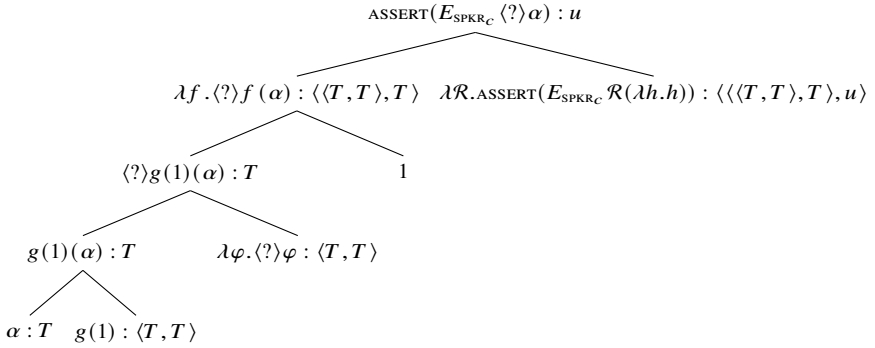
However, even with that assumption, the derivation would result in a type-mismatch since the interpretation of *daroo* is forced to be reconstructed into the base-generated position.

(147)



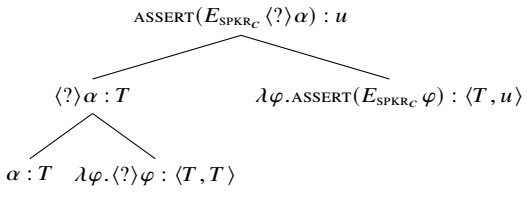
Now let us try Matyiku's (2017) two options. First, we raise the type of *daroo* to $\langle \langle \langle T, T \rangle, T \rangle, u \rangle$. Together with the assumption that the trace is of type $\langle T, T \rangle$, we obtain the desired interpretation $\textsc{assert}(E_{\textsc{spkr}_C}\langle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

(148)



Second, we delete the trace or assume that the movement of head does not leave a trace. As can be seen in (149), it correctly derives the desired interpretation.

(149)



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, the trace is deleted or there is no trace for head movement. Thus, the current manuscript adopts Matyiku's (2017) second option and assumes that movement of head does not leave a trace or the trace is deleted.

B Inquisitive Epistemic Logic

Inquisitive epistemic logic describes the inquisitive state of each agent. An issue is defined as a set of states, $I \subseteq \wp(W)$. An issue comprises the states that enclose sufficient information to resolve it. It is assumed that any issue is resolvable in at least one way, so an issue cannot be the empty set. Furthermore, if $t \in I$ includes sufficient information to resolve I, then any $u \subseteq t$ should include sufficient information to resolve I. Thus, an issue must be a downward closed set of information states: $t \in I \& u \subseteq t \Rightarrow u \in I$. These conditions yield the following definition:

Definition 1. An *issue* I is a non-empty, downward closed set of information states. We say that an information state t *settles* an issue I in case $t \in I$.

(adapted from Ciardelli & Roelofsen 2015, 1649)

Figure 8 illustrates four issues over the state $s = \{w_{11}, w_{10}, w_{01}, w_{00}\}$. Following Ciardelli & Roelofsen (2015), only the maximal element of each issue is represented in the diagrams. In order to settle the issue in (a), we have to pick exactly one world as the actual world. In the issue represented by (b), identifying the actual world as being in $\{w_{11}, w_{10}\}$ or in $\{w_{01}, w_{00}\}$ will settle the issue. In (c), identifying the actual world as being in $\{w_{11}, w_{01}, w_{00}\}$ or in $\{w_{10}, w_{01}, w_{00}\}$ will settle the issue. In (d), s already settles the issue, hence it is the trivial issue over s.

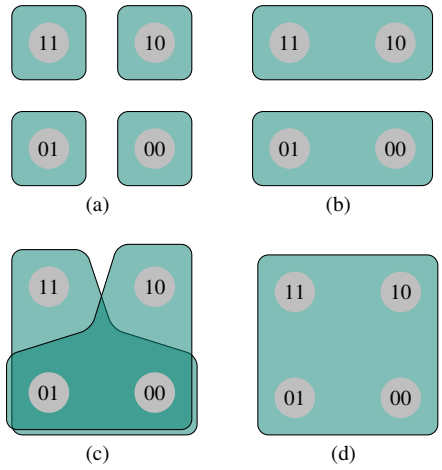


Fig. 8 Issues over the state $s = \{w_{11}, w_{10}, w_{01}, w_{00}\}$ (adapted from Ciardelli & Roelofsen 2015, 1650)

Note that the *information state* of the agent a at w is defined as the union of the inquisitive states of a at w, i.e., $\sigma_a(w) := \bigcup \Sigma_a(w)$. In 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 inquisitive epistemic logic, each agent is also associated with an inquisitive state $\Sigma_a(w)$ that encodes the issues that are entertained by a at w. Since $\Sigma_a(w)$ is an issue over $\sigma_a(w)$, $\sigma_a(w) = \bigcup \Sigma_a(w)$. Thus, $\Sigma_a(w)$ 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. Now, let $\mathcal{A}$ be a finite set of agents, such as SPKR, ADDR etc. An inquisitive epistemic model is defined as follows:

Definition 2. (Inquisitive epistemic models) An inquisitive epistemic model for a set $\mathcal{P}$ 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:

- $\mathcal{A}$ is a finite set of agents.
- $\mathcal{W}$ is a set, whose elements are called *possible worlds*, such that $\mathcal{A}$ and $\mathcal{W}$ are disjoint.
- $V : \mathsf{P} \to \wp(\mathcal{W})$ is a *valuation function* that specifies for every atomic sentence in P, which set of the worlds make the sentence true.
- $(\Sigma_a)_{a\in\mathcal{A}}$ is a set of *state maps* $\Sigma_a : \mathcal{W} \to \Pi$, each of which assigns to any world w an issue $\Sigma_a(w)$, in accordance with:
  Factivity: for any $w \in \mathcal{W}$, $w \in \sigma_a(w)$
  Introspection: for any $w, v \in \mathcal{W}$, if $v \in \sigma_a(w)$, then $\Sigma_a(v) = \Sigma_a(w)$
  where $\sigma_a(w) := \bigcup \Sigma_a(w)$ represents the *information state* of agent a in w.

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

The factivity condition states that the information stored in the information state is true, so it is knowledge rather than a belief. The introspection condition states that agents are aware what information is known and what issues are entertained. Put another way, if $\Sigma_a(v)$ is different from $\Sigma_a(w)$, the agent a should be aware of the difference between v and w.

Let us look at the model in Figure 9 as an illustration. Our language only has two atomic sentences, p and q and our model consists of four worlds, $\mathcal{W} = \{w_{11}, w_{10}, w_{01}, w_{00}\}$ such that $V(w_{11}) = \{p\}$, $V(w_{10}) = \{p\}$, $V(w_{01}) = \{q\}$, and $V(w_{00}) = \{q\}$. Factivity and Introspection together result in a partition as can be seen in the diagram. As for the information states, $\sigma_a(w_{11}) = \sigma_a(w_{10}) = \{w_{01}, w_{00}\}$ and $\sigma_a(w_{01}) = \sigma_a(w_{00}) = \{w_{01}, w_{00}\}$. Similarly, for the inquisitive states, $\Sigma_a(w_{11}) = \Sigma_a(w_{10}) = \{\{w_{11}, w_{10}\}, \{w_{11}\}, \{w_{10}\}\}$ and $\Sigma_a(w_{01}) = \Sigma_a(w_{00}) = \{\{w_{01}, w_{00}\}, \{w_{01}\}, \{w_{00}\}\}$. Thus, a cannot distinguish w_{11} from w_{10}, but a can tell w_{11} and w_{01} apart.

Note also that information states can be obtained by taking the union of inquisitive states, e.g., $\sigma_a(w_{11}) = \sigma_a(w_{10}) = \bigcup \Sigma_a(w_{11}) = \bigcup \Sigma_a(w_{10}) = \{w_{01}, w_{00}\}$.

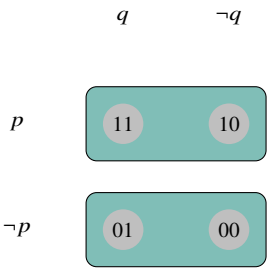


Fig. 9 Σ_a and σ_a

B.1 Syntax

The following are the well-formed logical expressions of inquisitive epistemic logic. $\mathcal{S}_!$ is the set of declaratives while $\mathcal{S}_?$ is the set of interrogatives:

Definition 3. (Syntax)
Let $\mathcal{P}$ be a set of atomic sentences and $\mathcal{A}$ a finite set of agents.

1. For any $p \in \mathcal{P}$, $p \in \mathcal{S}_!$
2. If $\varphi \in \mathcal{L}_\circ$ for $\circ \in \{!, ?\}$, then $\neg\varphi \in \mathcal{S}_!$
3. If $\alpha_1, \ldots \alpha_n \in \mathcal{S}_!$, then $?\{\alpha_1, \ldots \alpha_n\} \in \mathcal{S}_?$
4. If $\varphi \in \mathcal{L}_\circ$ for $\circ \in \{!, ?\}$ and $a \in \mathcal{A}$, then $K_a\varphi \in \mathcal{S}_!$
5. If $\varphi \in \mathcal{L}_\circ$ for $\circ \in \{!, ?\}$ and $a \in \mathcal{A}$, then $E_a\varphi \in \mathcal{S}_!$
6. Nothing else belongs to either $\mathcal{S}_!$ or $\mathcal{S}_?$

(modified from Ciardelli & Roelofsen 2015, 1652)[49]

The most relevant to the current paper are the modal operators, the knowledge modality K_a and the entertain modality E_a. Both can embed declaratives and interrogatives and the entire constructions, i.e., $K_a\varphi$ and $E_a\varphi$, are declaratives as a whole.

B.2 Semantics

Let us turn to the interpretation of inquisitive epistemic logic. 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. Now, the meaning of an interrogative sentence is to understood as a condition on information states that resolve the issue expressed by the sentence. In the current framework, then, both declaratives and interrogatives are evaluated against information states. Definition 4 defines the conditions when a state s supports (notation: $\models$) a sentence. A state s supports a declarative when it is "*established* or *true everywhere* in s" while s supports an interrogative when it is "*resolved* in s" (Ciardelli & Roelofsen 2015, 1653).

Definition 4. (Semantics) Let M be an inquisitive epistemic model and s an information state in M.

1. $\langle M, s\rangle \models p \iff w \in V(p)$ for all worlds $w \in s$
2. $\langle M, s\rangle \models \neg\varphi \iff$ for all non-empty $t \subseteq s$, $\langle M, t\rangle \not\models \varphi$
3. $\langle M, s\rangle \models ?\{\alpha_1, \ldots \alpha_n\} \iff \langle M, s\rangle \models \alpha_i$ for some index $1 \leq i \leq n$
4. $\langle M, s\rangle \models K_a\varphi \iff$ for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models \varphi$
5. $\langle M, s\rangle \models E_a\varphi \iff$ for any $w \in s$ and for any $t \in \Sigma_a(w)$, $\langle M, t\rangle \models \varphi$

(modified from Ciardelli & Roelofsen 2015, 1653-1654)

Note that the notion of support is persistent:

Fact 5. (Persistency of support)
If $\langle M, s\rangle \models \varphi$ and $t \subseteq s$, then $\langle M, t\rangle \models \varphi$

(modified from Ciardelli & Roelofsen 2015, 1654)

Note also that for declarative sentences we can recover the notion of truth from the support-based semantics. As far as declarative sentences are concerned, $\langle M, s\rangle$ supports α when every world in s makes α true, i.e., the singleton set $\{w\}$ supports α:

Fact 6. For a declarative α, $\langle M, s\rangle \models \alpha \iff \langle M, \{w\}\rangle \models \alpha$ for all $w \in s$

For declarative sentences, thus, the notion of truth with respect to a world can be retrieved from the support condition. A sentence φ is true at a world w in M if and only if the singleton state $\{w\}$ supports φ in M:

Definition 7. (Truth)
$\langle M, w\rangle \models \varphi \iff \langle M, \{w\}\rangle \models \varphi$

(modified from Ciardelli & Roelofsen 2015, 1654)

Definition 7 provides us with the following truth conditions.

Fact 8. (Truth-conditions)

1. $\langle M, w\rangle \models p \iff w \in V(p)$
2. $\langle M, w\rangle \models \alpha \vee \beta \iff \langle M, w\rangle \models \alpha$ or $\langle M, w\rangle \models \beta$
3. $\langle M, w\rangle \models \neg\alpha \iff \langle M, w\rangle \not\models \neg\alpha$
4. $\langle M, w\rangle \models K_a\varphi \iff \langle M, \sigma_a(w)\rangle \models \varphi$
5. $\langle M, w\rangle \models E_a\varphi \iff$ for any $t \in \Sigma_a(w)$, $\langle M, t\rangle \models \varphi$

(modified from Ciardelli & Roelofsen 2015, 1654)

Using the truth-conditions in Fact 8, we can obtain the proposition, namely, the set of possible worlds where φ is true:

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[49] In Ciardelli & Roelofsen (2015), '$\bot$' is used to define negation. '?' introduces interrogative sentences and '$\vee$' is used as a classic non-inquisitive disjunction. '$\rightarrow$' and '$\wedge$' are omitted in the current paper but defined in Ciardelli & Roelofsen (2015).

Definition 9. (Proposition)
$|\varphi|_M := \{w \in \mathcal{W} | \langle M, w\rangle \models \varphi\}$

(modified from Ciardelli & Roelofsen 2015, 1655)

The proposition is the classical meaning of a sentence φ. In the current framework, however, a sentence is evaluated against states rather than possible worlds. Therefore, the semantic value of a sentence φ is defined as an issue, i.e., a set of all states that support φ:[50]

Definition 10. (Issue)
$[\varphi]_M := \{s \subseteq \mathcal{W} | s \models \varphi\}$

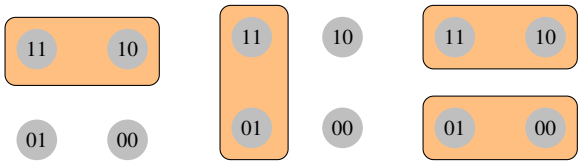
(modified from Ciardelli & Roelofsen 2015, 1656)

The proposition of a sentence can be retrieved by taking the union of the issue expressed by the sentence:

Fact 11. (Issues and propositions)
For any sentence φ and any model M, $|\varphi|_M = \bigcup[\varphi]_M$

(modified from Ciardelli & Roelofsen 2015, 1656)

To illustrate, given the models depicted in Figure 10, the issues of p, q and $?p$ are $[p]_M = \{\{w_{11}\}, \{w_{10}\}, \{w_{11}, w_{10}\}\}$, $[q]_M = \{\{w_{11}\}, \{w_{01}\}, \{w_{11}, w_{01}\}\}$ and $[?p]_M = \{\{w_{11}, w_{10}\}, \{w_{01}, w_{00}\}, \{w_{11}\}, \{w_{10}\}, \{w_{01}\}, \{w_{00}\}\}$.
The propositions of p, q and $?p$ are $|p|_M = \bigcup[p]_M = \{w_{11}, w_{10}\}$, $|q|_M = \bigcup[q]_M = \{w_{11}, w_{01}\}$ and $|?p|_M = \bigcup[?p]_M = \{w_{11}, w_{10}, w_{01}, w_{01}\}$, respectively. As can be seen, the proposition $|?p|_M$ cannot represent the internal structure of the interrogative sentence, $?p$.



(a) p (b) q (c) $?p$

Fig. 10 Propositions and issues

B.2.1 Example: K_a is applied to an interrogative μ

If K_a is applied to an interrogative μ, $K_a\mu$ is supported in s iff μ is resolved in $\sigma_a(w)$ for any $w \in s$. That is, the agent a has enough information to resolve μ at any $w \in s$. Consider $K_a?p$ as an example. The state depicted in Figure 4 above supports $K_a?p$. $\langle M, s\rangle \models K_a?p \Longleftrightarrow$ for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models ?p \Longleftrightarrow$ for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models p$ or $\langle M, \sigma_a(w)\rangle \models \neg p \Longleftrightarrow$ for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models p$ or for any non-empty $t \subseteq \sigma_a(w)$, $\langle M, t\rangle \not\models p$. Now, in Figure 4, $\langle M, \sigma_a(w_{11})\rangle \models p$ and $\langle M, \sigma_a(w_{10})\rangle \models p$. Since for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models p$, $\langle M, s\rangle \models K_a?p$.

B.2.2 Two crucial facts

There are two facts about the relation between K_a and E_a which are important to the current paper. First, let us define the notions of entailment and equivalence:

Definition 12. (Entailment)
We say that a sentence φ entails another sentence ψ (notation $\varphi \models \psi$) just in case for all models M and states s, if $\langle M, s\rangle \models \varphi$ then $\langle M, s\rangle \models \psi$.

(Ciardelli & Roelofsen 2015, 1657)

[50] Ciardelli & Roelofsen (2015) call Definition 9 "truth set" and Definition 10 "proposition".

Definition 13. (Equivalence)
We say that two sentences φ and ψ are equivalent (notation $\varphi \equiv \psi$) just in case for all models M and states s, $\langle M, s\rangle \models \varphi \Longleftrightarrow \langle M, s\rangle \models \psi$.

(Ciardelli & Roelofsen 2015, 1657)

Now, for any sentence φ, $K_a\varphi$ entails $E_a\varphi$ because if it is the case that $\langle M, \sigma_a(w)\rangle \models \varphi$ for any $w \in s$, then by persistence of support (Fact 5), it must be the case that $\langle M, t\rangle \models \varphi$ for any $t \in \Sigma_a(w)$:

Fact 14. For any sentence φ, $K_a\varphi \models E_a\varphi$

(Ciardelli & Roelofsen 2015, 1659)

Moreover, if the embedded sentence is a declarative α, $E_a\alpha$ entails $K_a\alpha$, so $E_a\alpha$ is equivalent to $K_a\alpha$:

Fact 15. For any declarative α, $K_a\alpha \equiv E_a\alpha$

(Ciardelli & Roelofsen 2015, 1659)

Suppose that $\langle M, s\rangle \models \alpha$ for any $w \in s$ and for any $t \in \Sigma_a(w)$. Since α is a declarative, it is supported by a state iff it is true everywhere in the state. Thus, it must be true in any $w \in \sigma_a(w) = \bigcup \Sigma_a(w)$. Therefore, for any $w \in s$, $\langle M, \sigma_a(w)\rangle \models \alpha$.

C 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, thus a new basic shunting use-conditional type u is added to the system. Furthermore, a use-conditional product type ($u \times u$), which yields 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) and mixed types since the current paper only deals with the shunting-type UCIs (*daroo*, *ka*↑ and ↑) as well as the descriptive contents and do not discuss prototypical expressives such as *damn* discussed in Potts (2005) (except for the ones mentioned in Section 5.1.1 and Appendix D) nor mixed-type expressives discussed in McCready (2010).

(150) 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.

(151) 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

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

D Modal Adverbs as Non-shunting UCIs

In Section 5.1.1, I propose that modal adverbs such as *kitto* 'certainly', *tabun* 'probably', and *moshikasuruto* 'maybe' are non-shunting UCIs, i.e., more like 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 $\mathcal{L}^{+}_{\otimes}$, (150-b) is replaced by (152) and all the u's in (151) are replaced by u^{s}.

(152) 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 $\mathcal{L}^{+}_{\otimes}$.

(153) CI APPLICATION

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

Now, let us see how the sentences with *daroo* and modal adverbs like (154) are composed in $\mathcal{L}^{+}_{\otimes}$.

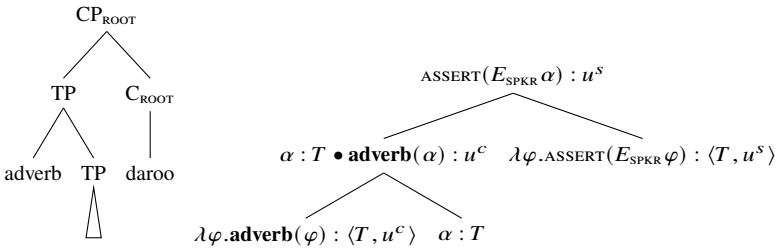
(154) a. John-wa tabun kuru daroo.
John-TOP probably come DAROO
'Probably, John will come.'
b. *John-wa moshikasuruto kuru daroo.
John-TOP maybe come DAROO
'Maybe, John will come-*daroo*.'

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

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

Thus, when they are combined with their prejacent propositions, the rule of CI application (153) applies and projects a pair of expressions, the truth-conditional prejacent proposition α and the use condition $\textbf{adverb}(\varphi)$, as depicted in (156). Then *daroo* takes α as its argument and outputs a shunting-type use condition.

(156)



Thus, as far as the composition is concerned, the derivations of *tabun*-α-*daroo* and *moshikasuruto*-α-*daroo* should both converge. The ungrammaticality of (154-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:

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

The use condition of *tabun* is compatible with that of *daroo*, which says that $K_{\textsc{spkr}_c}\,\varphi$ is in the speaker's discourse commitments $DC_{\textsc{spkr},c}$. The speaker finds φ more likely 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 yet adds φ to her commitment set.[51]

The analysis just sketched here is based on Hara (2006, ch. 5), who categorizes the modal expressions into two groups, *propositional* and *expressive*. I refine Hara's taxonomy and add more items as in (158):

(158) 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 'proably/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 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, thus the semantic cores of the utterances.

E 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, Author (2018) and Uegaki & Roelofsen (2018). Author (2018) is a precursor of the current paper. Uegaki & Roelofsen (2018) use the observations reported in Hara (2006); Hara & Davis (2013) to argue against the assumption that modals only embed declarative clauses and for the inquisitive semantics that treat declarative and interrogative clauses uniformly.

This section critically reviews Uegaki & Roelofsen (2018) (U&R, henceforth) and points out its problems. Not only their analysis of *daroo* is 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'.[52]

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[51] As readers may notice, treating *moshikasuruto* as a non-shunting UCI will go back to the original problem. That is, when it does not co-occur with *daroo* as in (i), the use-conditional meaning would weaken the truth-conditional one, 'α and maybe α'.

(i) 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 (i), *moshikasuruto* becomes one. Thus, the only use condition of (i) is $[\![\textsc{assert}(\textbf{maybe}(\alpha))]\!]$. Alternatively, in (i), the default ASSERT operator only pushes α onto the Table and does not alter the speaker's discourse commitments $DC_{\textsc{spkr}_c}$. The latter proposal is motivated by the intuition that in uttering (i), 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.

[52] 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

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

U&R treat both ↓ and ↑ are intonational morphemes and project the following semantics:

(160) a. $[\![\varphi \downarrow]\!] = [\![!\varphi]\!]$
b. $[\![\varphi \downarrow]\!]^{\bullet} = [\![\varphi]\!]^{\bullet}$

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

(162) 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 (163): α-*daroo*↓ projects a tautologous at-issue meaning $[\![!\langle ? \rangle \alpha]\!] = \wp(\bigcup([\![\alpha]\!] \cup [\![\neg\alpha]\!]))$ and non-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 non-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 the speaker entertains an issue $\langle ? \rangle \alpha$, i.e., $E_{\text{SPKR}}\langle ? \rangle \alpha$ at non-at-issue. A rising interrogative α-*daroo ka*↑ is ruled out by blocking effect: It has exactly the same effect as the falling interrogative α-*daroo ka*↓ but is more marked since it involves ↑.

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

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

Turning to *wh* interrogatives, μ-*daroo*↓ projects a tautologous proposition $!\langle ? \rangle !\mu$ at 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, hence adding $\langle ? \rangle$ has no effect. In contrast, 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, i.e., 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 (70), (71), (73) and (75) for example sentences). The derivations that U&R's analysis would derive are summarized in (164). 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, thus 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.

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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 the paper.

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

	Falling	Rising
Declarative	$\alpha\downarrow$	$\alpha\uparrow$
at-issue	$!\alpha$	$\langle ? \rangle \alpha$
non-at-issue	$[\![\alpha]\!]^{\bullet}$	$[\![\alpha]\!]^{\bullet}$
Interrogative	α-*ka*$\downarrow$	α-*ka*$\uparrow$
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 $\alpha\uparrow$ and α-*ka*$\uparrow$ are grammatical and give rise to the same interpretations. The ungrammaticality of rising polar and *wh daroo*-interrogatives, α-*daroo (ka)*$\uparrow$ and $^{*}\mu$-*daroo (ka)*$\uparrow$, 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*$\downarrow$ ends up having an exclamative interpretation. In the current paper, unlike Final Rise $\uparrow$, Final Fall $\downarrow$ is not an intonational morpheme, but considered default sentential prosody. Thus, under the current analysis, α-*ka* simply denotes an at-issue interrogative clause, which is analogous to a set of alternative propositions in alternative semantics (Rooth 1985). Since it is an at-issue type, it can be an argument of another functor such as Zannuttini & Portner's (2003) Exclamative operator.

(165) Taro-wa utai-masu ka$\downarrow$
Taro-TOP sing-POL Q
'It is surprising that Taro will sing!' (exclamative)

Third, as discussed in Section 5.2, 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. Furthermore, it does not derive the correct interpretations when *kara* 'because' embeds a *daroo*-declarative.

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

F Experimental Stimuli

(1) a. ANSWER context: A wa yuujin ni dare ga paatii ni kuru to omouka kikarete kotaeta:
'A was asked by a friend who he thinks will come to the party and answered:'
b. SELF-ADDRESS context: A wa dare ga paatii ni kuru ka hitoride kangae te iru:
'A is wondering by himself who is going to come to the party:'
c. AGREE-SEEK context: A wa yuujin ga "dare mo paatii ni konai" to itteiru no o kiite itta:
'A's friend said "No one will come to the party" and A said:'
d. Yamashita-san ga kuru daroo (ka)
Yamashita.MR NOM come DAROO Q
'Probably, Mr. Yamashita will come'

(2) a. ANSWER context: A wa, tsuma ni kodomotachi ga nani o taberu ka kikarete, itta:
'A was asked by his wife what children eat, and said:'
b. SELF-ADDRESS context: A wa konban no sarada ni nani o ireru ka, hitori de kangaeteiru:
'A is wondering by himself what to put in this evening's salad:'
c. AGREE-SEEK context: A wa, ninjin o kaubeki ka mayotteiru tsuma ni itta:
'A said to his wife who was wondering whether to buy carrots:'
d. kodomotachi wa, ninjin o taberu daroo (ka)
children TOP carrot ACC eat DAROO Q
'Probably, the children will eat carrots'

(3) a. ANSWER context: itsumo syukudai o dasanai A sensei ga mezurashiku syukudai o dasi, ashisutanto ni gakusei ga syukudai o yattekuru to omouka tazunerarete A wa kotaeta:
'Teacher A, who never assigned homework before, surprisingly assigned some homework, then he was asked by his assistant if he thinks the students will do the homework, and said:'

b. SELF-ADDRESS context: A sensei wa gakusei ni totemo muzukashii syukudai o dashita node shinpaishite kangaeteiru:
'Since teacher A gave the students very difficult homework, so he is wondering:'

c. AGREE-SEEK context: A sensei wa, tesuto chuu ni gakusei ni syukudai o dasiteiinoka mayotteiru ashisutanto ni itta:
'Teacher A said to the assistant who was wondering whether she should give students some homework during the examination period:'

d. gakusei wa, syukudai o yattekuru daroo (ka)
students TOP homework ACC do DAROO Q
'Probably, the students will do the homework.'

(4) a. ANSWER context: A wa, hanzai no tayouka ni taishite kuni ga dou taiousurunoka kikarete, kotaeta:
'A was asked how the government handles the criminal diversification, and answered:'

b. SELF-ADDRESS context: A wa, syounenhou nitsuite genjou no houritsu dewa genkai ga aruto hitori de kangaeteiru:
'A is thinking by himself about juvenile law that there is a limitation in the current state law:'

c. AGREE-SEEK context: A wa, jibun no kenri bakari o syuchoushite, genjou no houritsu o hihanshiteiru shimin ni itta:
'A said to citizens who are only claiming their own rights, and criticizing the current state law:'

d. ichinen inaini, atarashii houritsu ga dekiru daroo (ka)
one-year within new law NOM enact DAROO Q
'Probably, a new law will be enacted within one year'

(5) a. ANSWER context: A wa, yuujin ni nihon no keiki ni tsuite kikarete kotaeta:
'A was asked by his friend about Japanese economic conditions, and answered:'

b. SELF-ADDRESS context: A wa, korekara no nihon no keiki ni tsuite hitori de kangaeteiru:
'A is thinking about future Japanese economic conditions:'

c. AGREE-SEEK context: A wa, nihon no kinyuuseisaku wa kouka ga arunoka to boyaiteiru yuujin ni itta:
'A said to his friend who is muttering about whether the Japanese monetary policy is effective:'

d. nihon no keiki wa, yoku naru daroo (ka)
Japan GEN economic-condition TOP good become DAROO Q
'Japanese economic conditions will become better.'

(6) a. ANSWER context: A wa, asu no tenki o kikarete kotaeta:
'A was asked about tomorrow's weather, and answered:'

b. SELF-ADDRESS context: hideri tsuzuki de mizubusoku nanode shinpaishi, A wa sora o miagete asu no tenki o kangaeteiru:
'A is worried about the water shortage due to a long spell of dry weather, and wondering about tomorrow's weather while looking up at the sky:'

c. AGREE-SEEK context: A wa, taihuu ga chikazuiteirunoni, asu baabekyuu no yoteidatoiu musuko ni itta:
'A said to his son who has a plan of barbecueing tomorrow even though a typhoon is approaching:'

d. asu wa, ame ga huru daroo (ka)
tomorrow TOP rain NOM fall DAROO Q
'It will rain tomorrow.'

(7) a. ANSWER context: tairyoku o tsukeru niwa doushitaraiika to tazuneru seito ni A wa kotaeta:
'A answered a student who asked how he should build up his physical strength:'

b. SELF-ADDRESS context: A wa, kisotairyoku o tsukeyouto hon o yominagara kangaeteiru:
'A is thinking of building up basic physical strength while reading a book:'

c. AGREE-SEEK context: A wa, hashirikomi wa tsukareru kara shitakunai to iu sakkaabu no seito ni mukatte itta:
'A said to a soccer club student who doesn't want to jog because it is tiring:'

d. hashirikomi ga kisotairyoku zukuri no kihonn daroo (ka)
run-training NOM basic-physical-strength build GEN basic DAROO Q
'Run-training should be a basis for building basic physical strength'

(8) a. ANSWER context: A wa, doushitara ji o utsukushiku kaku koto ga dekiruka to kikarete kotaeta:
'A was asked how to write beautiful characters, and answered:'

b. SELF-ADDRESS context: A wa, enpitsu no mochikata ga waruikara anata no ji wa hetananda to iwarete, hitori de kangaeteiru:
'A is thinking alone, because he was told that his way of holding a pencil is wrong:'

c. AGREE-SEEK context: enpitsu no mochikata o nando oshietemo kichinto shinai musume ni A wa itta:
'A said to his daughter who didn't do it correctly even though he taught her how to hold a pencil many times:'

d. enpitsu no mochikata wa, moji no utsukushisani kankeisuru daou (ka)
pencil GEN way-of-holding TOP character GEN beauty relate DAROO Q
'I think that the way of holding a pencil is related to the beauty of characters.'

(9) a. ANSWER context: A wa, kaigi no sukejuuru o kikarete kotaeta:
'A was asked about the meeting schedule, and answered:'

b. SELF-ADDRESS context: A wa, kaigishitsu no yoyaku o suru niatari kangaeteiru:
'A is wondering about booking a meeting room:'

c. AGREE-SEEK context: tsugi no kaigi no tocyuu ni kyuukei o irerubekika mayotteiru buka ni A wa itta:
'A said to his subordinate who is wondering whether to have a break in the middle of the next meeting:'

d. tugi no kaigi wa, san jikan kurai kakaru daroo (ka)
next GEN meeting TOP three hours about take DAROO Q
'The next meeting will take about 3 hours.'

(10) a. ANSWER context: A wa, kakusa ga syakai no hituyouaku dearu koto o minuki, itta:
'A realized that social inequality is a necessary evil of society, and said:'

b. SELF-ADDRESS context: A wa, kakusamondai taisakuan no subete ni ketten ga arukoto ni kizuki jimonsita:
'A found that all proposed measures for social inequality problems have mistakes, and asked himself:'

c. AGREE-SEEK context: A wa, [kakusamondai no kaiketsu wa kantan] to iu B ni, odoroite kiita:
'A was surprised and asked B who had said "the solution of social inequality problem is easy":'

d. donoyouna seisaku o tottemo kakusamondai wa, kaiketu dekinai daroo (ka)
whatever policy ACC make disparity-problem TOP settle can't maybe DAROO Q
'Whatever policy might be issued, we won't resolve the inequality problem.'

(11) a. ANSWER context: A wa, chianakka no genin nitsuite kikare, kotaeta:
'A was asked about the cause of the deterioration of public security, and answered:'

b. SELF-ADDRESS context: A wa, chianakka no gennin nitsuite kangaeteiru:
'A is thinking about the cause of the deterioration of public security:'

c. AGREE-SEEK context: A wa, [chian ga warukunatta nowa, seiji no sei dewanai] to iu yuujin ni, toitadashita:
'A interrogated his friend who said "The deterioration of public security is not due to politics":'

d. konoyouna syakai ni nattesimattano wa, seiji no sei daroo (ka)
such society DAT become TOP politics of because DAROO Q
'It is because of politics that we have this kind of society.'

(12) a. ANSWER context: A wa, enyasu ni naru jouken ga toubun tsuzuku deeta o mite itta:
'A saw data which indicates that the yen will continue to be weak for a while, and said:'

b. SELF-ADDRESS context: A wa, taezu jouge shiteiru ensouba o mite omotta:
'A saw the exchange rate of the yen always going up and down, and thought:'

c. AGREE-SEEK context: A wa, [enyasu wa mou owarida] to syucyousuru yuujin ni, odoroite shitsumonshita:
'A asked his friend in surprise who argues "The depression of the yen is over":'

d. enyasu wa, toubun tsuzuku daroo (ka)
weaker-yen TOP for-a-while continue DAROO Q
'The depression of the yen will continue for a while.'

(13) a. ANSWER context: A wa, basu no jikokuhyou to tokei o mikurabete, zannensouni itta:
'A compered the bus timetable with his watch, and said regretfully:'

b. SELF-ADDRESS context: A wa, basutei ni mukatte hashiri nagara omotta:
'A thought while running to the bus stop:'

c. AGREE-SEEK context: A wa, sudeni basu ga itteshimatta noni, basu ka densya kade mayotteiru yuujin ni itta:
'A said to his friend who is wondering whether to ride the bus or train when the bus already has gone:'

d. mou, basu wa detesimatta daroo (ka)
already bus TOP left DAROO Q
'Probably, the bus has already left.'

(14) a. ANSWER context: A wa, gaikoku no yuujin ni kotoshi no huyu no tenki o kikarete, kotaeta:
'A was asked by his foreign friend about the weather of this winter, and answered:'

b. SELF-ADDRESS context: A wa, koromogae no jikini huyuhuku no junbi o shinagara kangaeta:
'A thought while preparing winter clothes for updating his wardrobe:'

c. AGREE-SEEK context: A wa, taiwan kara kanada ni hikkosu yuujin ga, atsui kooto o motteinai koto o shitte itta:
'A realized that his friend who moved from Taiwan to Canada does not have a bulky coat, and said:'

d. kotoshi no huyu wa, kyonen yori samuku naru daroo (ka)
this-year GEN winter TOP last-year than cold be DAROO Q
'This winter will be colder than last year.'

(15) a. ANSWER context: A wa, saigai ichinengo, hobo hukkou o togeteiru hisaichi o mite omotta:
'A saw that the affected area after one year from the disaster had almost returned to normal, and thought:'

b. SELF-ADDRESS context: A wa, nanjuunen tattemo kaiketsushinai rachijiken no yousu omite omotta:
'A saw some news about an abduction case that has not been resolved even after ten years, and thought:'

c. AGREE-SEEK context: A wa, [seihu wa nanimo shitekurenai] to monku o iudakede doryoku o shinai higaisya o mite omotta:
'A saw a victim who just complains "the government does nothing for me" without any effort, and thought:'

d. higaisya kyusai notameni, seihu wa dekirudakenokoto o shitekita daroo (ka)
victim relief for government TOP as-much-as-possible ACC do DAROO Q
'For the relief of victims, the government must have done as much as possible.'

(16) a. ANSWER context: A wa, kokuren niyoru busshienjo keizoku no nyuusu o mite omotta:
'A saw some news that the commodity assistance by the United Nations continues, and thought:'

b. SELF-ADDRESS context: A wa, hisaikoku niwa doumeikoku ga sukunai node shinpai ni omotta:
'A wondered because the affected country has few allies:'

c. AGREE-SEEK context: A wa, enjobusshi o akirameteiru hitobito ni, naze sarani enjoshinsei o shinainoka o kiita:
'A asked people who gave up on aid supplies why they do not petition for more aid:'

d. yoriookuno enjobusshi o nozomukoto wa dekiru daroo (ka)
more aid-supply ACC wish TOP possible DAROO Q
'It should be possible to wish for more aid supplies.'