Japanese alternative questions and a unified in-situ semantics for *ka*[1]

Wataru UEGAKI — *Leiden University*

Abstract. In Japanese, the interpretation of a clause involving a *wh*-item and the Q-particle *ka* is conditioned by the syntactic position of *ka*. In a parallel fashion, we observe that the syntactic position of *ka* conditions the interpretation of a disjunctive construction of the form α-*ka* β-*ka*. We propose a two-tier alternative semantics for *wh*+*ka* and *ka*-disjunction that accounts for the parallel syntactic conditioning effect in a unified fashion.

Keywords: *ka*, Q-particle, *wh*-indefinites, *wh*-questions, disjunction, alternative semantics

1. Introduction

The goal of this paper is to provide a concrete semantics for the Japanese Q-particle *ka* that properly accounts for its use in questions, indefinites and disjunctions in a unified fashion. The Japanese particle *ka* is interesting in the context of the cross-linguistic compositional semantics of indefinites, *wh*-questions and disjunctions (Szabolcsi, 2015) since its interpretation is tightly connected with the syntactic environments in which it occurs, as will be discussed shortly below. A number of proposals have been proposed to capture this connection between the syntactic environment in which *ka* occurs and its interpretation (e.g., Hagstrom, 1998; Shimoyama, 2006; Slade, 2011). However, none of the current compositional semantic analysis of *ka* can successfully capture the fact that the semantic contribution of *ka* is conditioned by its syntactic position in its *disjunction use* in a way parallel to how its semantic contribution is conditioned in the *wh*+*ka* construction. This paper argues that this parallel pattern straightforwardly falls out from the combination of (a) an extension of the alternative-semantic analysis of in-situ *wh*-questions and Q-particles (Shimoyama, 2006; Beck, 2006; Kotek, 2014) and (b) the Junction-based analysis of disjunction following den Dikken (2006); Mitrovič and Sauerland (2014); Szabolcsi (2015).

2. The position of *ka* and its semantic contribution

2.1. *wh*+*ka*

The interpretation of a Japanese sentences involving a *wh*-item and *ka* depends on the syntactic position of *ka* (Kuroda, 1965; Hagstrom, 1998). When *ka* directly attaches to the *wh*-phrase, the *wh*-*ka* complex functions as an indefinite. On the other hand, when *ka* is in a sentence-final position, the sentence constitutes a *wh*-question. This can be seen in the following examples:

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(1) a. [$_{DP}$ Dare-**ka**] -ga hashitta.
who-KA -NOM ran
'Someone ran.' **(∃-statement)**

b. [$_{CP}$ Dare-ga hashitta-**ka**] (oshiete)
who-NOM ran-KA tell
'(Tell me) who ran.' **(Wh-Question)**

Here, the embedding verb *oshiete* 'tell me' is added in (1b) since the clause-final *ka* is most natural in embedded contexts for stylistic reasons. In an unembedded clause, *no* is used instead of *ka* in informal speech. In an unembedded formal speech, *ka* is attached to the polite form of the verbal complex.[2]

2.2. *ka*-disjunctions

Another empirical domain in which *ka* appears is disjunction. Example (2) shows that *ka* can attach to each disjunct in a disjunction (optionally to the second disjunct).[3] I will call this construction *ka*-DISJUNCTION.

(2) Taro-ga [$_{DP}$ Hanako-**ka** (matawa) Jiro-**ka**]-o mita.
Taro-NOM Hanako-KA or Jiro-KA-ACC saw.
'Taro saw Hanako or Jiro.' **(∨-statement)**

An additional coordinator (in this case *matawa*) can be inserted between the two disjuncts marked by *ka*, and there are several phonologically explicit disjunctive coordinators with different syntactic and semantic properties. In this paper, I will leave out discussion of *ka*-disjunctions involving an explicit coordinator for reasons of space.

One of the empirical contributions of this paper is to establish that the interpretation of a *ka*-disjunction is dependent on the syntactic position of *ka* in each disjunct, in a way parallel to how the interpretation of a *wh*+*ka* construction is dependent on the syntactic position of *ka*. The parallel is summarized in the following table.

[2]For some speakers, the *wh*-item and *ka* can be separated within a DP that functions as an indefinite. The following example from Yatsushiro (2009) illustrates this:

(1) [Dare-o hihanshita gakusei]-**ka**-ga taihosareta.
who-ACC criticized student -KA-NOM be.arrested.
'A student or other who had criticize someone was arrested'

In this example, *ka* is separated from the *wh*-item *dare* itself, and the who subject DP ending with *ka* receives an interpretation as an existential quantifier over students who criticized someone.

[3]I will assume that the presence and the absence of the second *ka* does not have a semantic consequence, unlike the contrast between simplex and complex disjunctions in French (e.g., Spector, 2014). This is confirmed by informal judgment reports by native speakers. Furthermore, a controlled experiment by Sauerland and Yatsushiro (2016) has not revealed any significant difference in judgment patterns between the single-*ka* and the double-*ka* disjunctions.

(3)

the *ka*-phrase is...	**smaller than a CP**	**CP**
wh+ka	existential quantifier	*wh*-question
α-*ka* β-*ka*	declarative disjunction	alternative question

Let me elaborate this empirical claim in some detail. First of all, the dependence of the interpretation of *wh+ka* on the syntactic position of *ka*, exemplified in (1) above, can be described as in the first row of table (3). The syntactic category of the *wh+ka* phrase is a *DP* in (1a), where *ka* attaches to the *wh*-phrase *dare* directly and *dare-ka* serves as the external argument of the verb *hashitta* 'ran'. This *wh-ka* phrase functions as an indefinite/existential quantifier. On the other hand, the *wh+ka* phrase in (1b) is a whole CP which by itself expresses a question (modulo stylistic anomaly) and can be embedded under clause-embedding predicates such as *oshiete* 'tell me'. In this case, the *wh*-phrase functions as a *wh*-word in a *wh*-question.

Turning now to *ka*-disjunctions, it is known that *ka*-disjunctions can coordinate (at least) DPs, TPs as well as CPs (Kishimoto, 2013; Uegaki, 2014; Miyama, 2015).[4]

(4) [$_{DP}$ Hanako-ka Jiro-ka]-ga hashitta.
Hanako-KA Jiro-KA-NOM ran.
'Either Hanako or Jiro ran'. **(✓∨-statement)**
*'Which is true: Hanako ran or Jiro ran?' **(*AltQ)**

(5) [$_{TP}$ [Hanako-ga hashitta-**ka**] [Jiro-ga hashitta-**ka**]] mitai-da.
Hanako-NOM ran-KA Jiro-NOM ran-KA MODAL-COP
'It seems that Hanako ran or Jiro ran.' **(✓∨-statement)**
*'Which seems to be true: Hanako ran or Jiro ran?' **(*AltQ)**

(6) [$_{CP}$ [Hanako-ga hashitta-mitai-**ka**] [Jiro-ga hashitta-mitai-**ka**]] (oshiete).
Hanako-NOM ran-MOOD-KA Jiro-NOM ran-MOOD-KA tell
'(Tell me) which is true: It seems that Hanako ran or it seems that Jiro ran?' **(✓AltQ)**
*'(Tell me) it seems that Hanako ran or it seems that Jiro ran.' **(*∨-statement)**

Following Kishimoto (2013), I take the positioning of a modal such as *mitai* 'seem', which is in a functional projection outside TP, as indicating the syntactic category of *ka*-disjunctions. When the modal is outside the *ka*-disjunction involving tensed predicates, as in (5), its syntactic category is TP. On the other hand, when the modal is inside the *ka*-disjunction, as in (6), or when there is no overt modal item in the sentence as in (7) below, its syntactic category is CP.

(7) [$_{CP}$ [Hanako-ga hashitta-**ka**] [Jiro-ga hashitta-**ka**]] oshiete.
Hanako-NOM ran-KA Jiro-NOM ran-KA tell
'Tell me which is true: Hanako ran or Jiro ran?' **(✓AltQ)**

[4] Kishimoto (2013) discusses cases where *ka*-disjunctions apparently coordinate vPs in the surface, but he concludes that they are in fact TP disjunctions based on evidence pertaining to scope with respect to negation.

What is crucial here is that the interpretation of a *ka*-disjunction is a disjunctive statement in both (4) and (5) whereas it is an AltQ in (6) and (7). In other words, α-*ka* β-*ka* becomes a question with α and β as alternatives only when it is a CP coordination (Uegaki, 2014).

In sum, *ka*-disjunctions are interpreted as disjunctions without the question force when they are sub-CP-coordinations while they are interpreted as AltQs with each disjunct as alternatives when they are CP-coordinations. This parallels the behavior of *wh+ka* constructions as summarized in the table in (3).

3. An analysis in a two-tier alternative semantics

Our proposal employs two-tier alternative semantics (Rooth, 1985) for in-situ *wh*-questions (Beck, 2006; Kotek, 2014). The gist of the analysis is the following: *ka* introduces *a set of alternatives* in its ordinary-semantic value, but only specific predicates—which I will call SET-COMPATIBLE PREDICATES—semantically combine with such a set. Set-compatible predicates include predicates embedding interrogative CPs, such as *oshier* 'tell', and the disjunctive coordinator. As a result, a semantic composition of a *ka*-phrase and a set-incompatible predicate requires that the set denoted by the former be 'flattened' into an *existential meaning*. This is what happens when *ka* is introduced below CPs. A predicate or operator embedding a *ka*-phrase below the CP level is always set-incompatible except for the disjunctive coordinator. Thus, when *ka*-phrases are smaller than CPs, they are 'trapped' inside a non-incompatible predicate and receive an existential meaning. Formally, the flattening effect is implemented with a cross-categorial existential closure $\exists$.

3.1. *wh+ka*

Below, I illustrate this system using a simple fragment that captures the basic data discussed in the previous section. First, let us consider the case of the *wh+ka* construction, repeated below.

(1) a. [$_{DP}$ dare-**ka**]-ga hashitta.
who-KA-NOM ran.
'Someone ran.' **(∃-statement)**

b. [$_{CP}$ dare-ga hashitta-**ka**]
who-NOM ran-KA
'(Tell me) who ran?' **(Wh-Question)**

In the two-tier alternative-semantic analysis of in-situ *wh*-questions developed by Beck (2006) and Kotek (2014), lexical items have ORDINARY and ALTERNATIVE-SEMANTIC VALUES (hereafter O-VALUES and ALT-VALUES). For instance, the semantic values of *ka*, *dare* 'who' and *hashitta* 'ran' each look like the following:

(8) a. $[\![\alpha \text{ ka}]\!]^o = [\![\alpha]\!]^{alt}$ b. $[\![\alpha \text{ ka}]\!]^{alt} = \{[\![\alpha]\!]^{alt}\}$

(9) a. $[\![\text{dare}]\!]^o$ = undefined b. $[\![\text{dare}]\!]^{alt} = \{x \mid x \in \textbf{human}\}$

(10) a. $[\![\text{hashitta}]\!]^o = \lambda x_{\mathtt{e}} \lambda w_{\mathtt{s}}.\mathbf{ran}(x,w)$ b. $[\![\text{hashitta}]\!]^{alt} = \{\lambda x_{\mathtt{e}} \lambda w_{\mathtt{s}}.\mathbf{ran}(x,w)\}$

Here, *ka* is defined as an operator that simply 'copies' the alt-value of its prejacent to the o-value. A *wh*-item like *dare* has an undefined o-value while it introduces a set of alternatives in the alt-value. A set-incompatible predicate like *hashitta* has a standard denotation as a function from individuals to truth values in the o-value while its alt-value is the singleton set consisting of the o-value.

Except for *ka*, which has a syncategorematic definition, semantic values are composed according to either one of the following two rules:

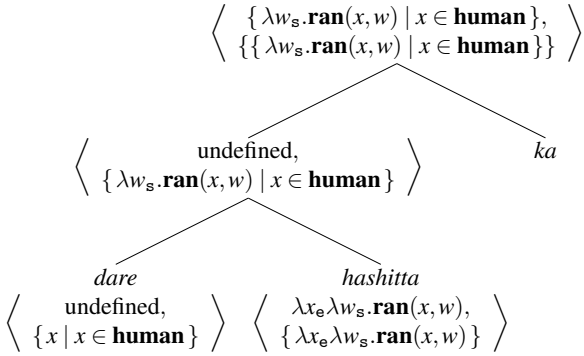
(11) a. **Functional Application (FA)**
If the node α has $\{\beta,\gamma\}$ as the set of its daughters and $[\![\beta]\!]^o \in D_\sigma$ and $[\![\gamma]\!]^o \in D_{\langle\sigma,\tau\rangle}$, then $[\![\alpha]\!]^o$ is defined only if both $[\![\alpha]\!]^o$ and $[\![\beta]\!]^o$ are. In this case, $[\![\alpha]\!]^o = [\![\gamma]\!]^o([\![\beta]\!]^o)$.

b. **Point-wise Functional Application (PWFA)** (Hamblin, 1973)
If the node α has $\{\beta,\gamma\}$ as the set of its daughters and $[\![\beta]\!]^{alt} \subseteq D_\sigma$ and $[\![\gamma]\!]^{alt} \subseteq D_{\langle\sigma,\tau\rangle}$, then $[\![\alpha]\!]^{alt} = \{\, a \mid \exists f \in [\![\gamma]\!]^{alt} \exists b \in [\![\beta]\!]^{alt}[a = f(b)] \,\}$.

3.1.1. *Wh*-questions

Given this setup adopted from Beck (2006) and Kotek (2014),[5] we can already account for the interpretation of the *wh*-question in (1b). Below is a simplified LF tree for (1b) with annotation of the two kinds of semantic values for each node. The notation $\langle a,b\rangle$ indicates that the node's o-value is a while its alt-value is b.

(12)



What is crucial above is that the alternatives introduced by *dare* is passed up via an application of PWFA in the alternative-semantic dimension, until the top-level *ka* returns it as the o-value (Beck, 2006). As a result, the sentence receives the standard proposition-set denotation for *wh*-questions (Hamblin, 1973; Karttunen, 1977) as its o-value.

[5] More precisely, I here adopt Kotek's (2014) definition of the Q-particle, instead of that by Beck (2006), who defines the alt-value of α *ka* as equivalent to its o-value. See Kotek (2014) for independent motivations for adopting this particular definition in relation to the treatment of multiple *wh*-questions in English. For the purpose of this paper, adopting Kotek's (2014) definition enables a simpler compositional system.

3.1.2. Excursus: Yes/No-questions and the semantics of complementizers

It is important to note at this point that *ka* defined in (8) is also the one that appears as the sentence-final particle in Yes/No-questions (YNQs), as exemplified in (13). The analysis predicts the following o-value for (13) in (14).

(13) Hanako-ga hashitta-ka?
Hanako-NOM ran-KA
'Did Hanako run?'

(14) $[\![(13)]\!]^o = \{\lambda w.\mathbf{ran}(\mathbf{h}, w)\}$

The singleton-set denotation for YNQs as exemplified above is different from the more standard bipolar denotation (Hamblin, 1973; Karttunen, 1977), which would be the following two-membered set in the case of (13).

(15) $\{\lambda w.\mathbf{ran}(\mathbf{h}, w), \lambda w.\neg\mathbf{ran}(\mathbf{h}, w)\}$

Versions of the singleton analysis of the semantics of YNQs are maintained by authors such as Roberts (2012); Pruitt and Roelofsen (2011); Biezma and Rawlins (2012); Roelofsen and Farkas (2015), and its empirical motivations come from biased polar questions, the interpretation of response particles and the selectional property of dubitative predicates, among others. In many of these analyses, the singleton denotation is mapped to the corresponding bipolar denotation by an extra operation in order to capture the fact that polar questions license negative responses. In this paper, I follow Roelofsen and Farkas (2015) in positing an interrogative operator $\langle ? \rangle$ on the top of *ka* in interrogative clauses, whose role is to *ensure* multiplicity of alternatives. Syntactically, I will assume that $\langle ? \rangle$ is in the complementizer position, above *ka*. The semantics of this operator looks like the following:

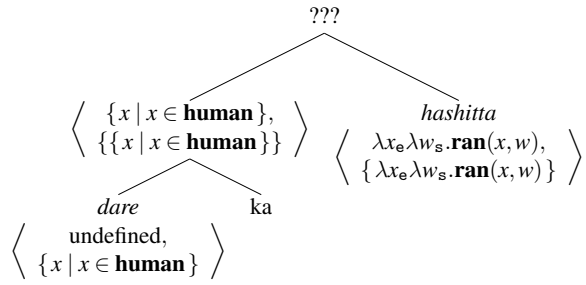
(16) $[\![\langle ? \rangle]\!]^o = [\![\mathrm{C}_{\mathrm{int}}]\!]^o = \lambda Q_{\{\mathtt{p}\}}. \begin{cases} Q & \text{if } |Q| > 1 \\ Q \cup \{\neg \bigcup Q\} & \text{if } |Q| = 1 \end{cases}$

Applying this operator to (13), we get the bipolar denotation: $\{\lambda w.\mathbf{ran}(\mathbf{h}, w), \lambda w.\neg\mathbf{ran}(\mathbf{h}, w)\}$ The operator does not have an effect when it applies to *wh*-questions that already involve multiple alternatives. Type-wise, $\langle ? \rangle$ can only combine with a set of propositions. On the other hand, when a complement clause is declarative, the declarative operator is in the complementizer position, which is semantically an identity function for propositions. The declarative complementizer is realized as *to* in an embedded clause while it is phonologically null in the matrix clause. That is, $[\![\mathrm{C}_{\mathrm{decl}}]\!]^o = \lambda p_{\mathtt{p}}.p$

3.1.3. Indefinites

Let us now turn to how we derive the existential statement in (1a). The first thing to note is that, without any additional mechanisms, the semantic composition does not go through due to type-mismatch. This is so since neither FA nor PWFA can combine the semantic values of *hashitta* with the semantic values of *dare-ka*. This is seen in the following uninterpretable LF.

(17)



Here, the operation of existential closure that I mentioned above comes into play. Specifically, I propose that there is a following operator that turns a set in the o-value dimension into the corresponding existential quantifier.[6]

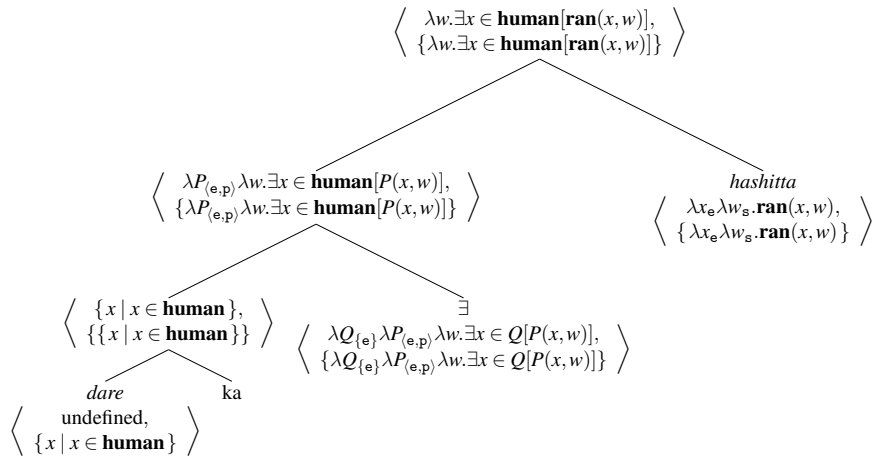
(18) a. $[\![\exists]\!]^o = \lambda Q_{\{\sigma\}} \begin{cases} \lambda w_{\mathtt{s}}.\exists p \in Q[p(w)] & \text{if } \sigma = \mathtt{p} \\ \lambda P_{\langle \sigma,\mathtt{p}\rangle} \lambda w_{\mathtt{s}}.\exists x \in Q[P(x)(w)] & \text{otherwise} \end{cases}$ $(\mathtt{p} := \langle \mathtt{s},\mathtt{t}\rangle)$

b. $[\![\exists]\!]^{alt} = \{[\![\exists]\!]^o\}$

c. σ is any type, and $\{\sigma\}$ is the type for the set of σ-type objects. I assume a formal distinction between sets and characteristic functions. Thus, $\{\sigma\}$ is a distinct type from $\langle \sigma, \mathtt{t}\rangle$.[7]

This operator can be applied to *dare-ka* in (17). As a result, we derive the existential statement as in the following LF:

(19)



Thus, we can capture the fact that (1a) is an existential statement rather than a *wh*-question. The only way in which the semantic composition of *dare-ka* 'who-KA' and *hashitta* 'ran' goes through is to turn the the o-value of the former into an existential quantifier by $\exists$. The same mechanism applies to other cases where a non-inquisitive predicate combine with a *ka*-phrase.

[6]The operation of existential closure is employed in alternative semantics by Kratzer and Shimoyama (2002) and Biezma and Rawlins (2012) (among others) although the operation always applies at the clausal level. Here, $\exists$ is defined as a cross-categorial operator which can apply clause-internally. In this sense, the operation is close to the non-inquisitive closure ! in Inquisitive Semantics (Ciardelli et al., 2013).

[7]Yatsushiro (2009) uses the notation $\langle \sigma \backslash t \rangle$ to denote the same type.

Note, however, that the introduction of $\exists$ creates a potential problem. The *wh*-question interpretation of (1b) itself could now be turned into an existential statement if $\exists$ is freely available and applied to the whole sentence. However, it is plausible to assume that an operator like $\exists$ is *not* freely available. I claim that the application of $\exists$ is allowed only when it is necessary for the semantic composition to go through, as stated in the following constraint:

(20) The application of $\exists$ is allowed only as a repair of a type-mismatch.

This constraint prohibits the application of $\exists$ to the whole sentence of (1b). Since LF (12) of (1b) does not suffer from any type-mismatch, the application of $\exists$ is disallowed. Hence, the sentence lacks an interpretation as the existential statement.

This is true also when (1b) is embedded under question-embedding predicates since there would be no type-mismatch between question-embedding predicates and (1b). I analyze all question-embedding predicates as a set-compatible predicate, i.e., as selecting for a set of propositions, both in the o-value and in the alt-value. For instance, the semantic values of *oshier(u)* 'tell/teach' look like the following:

(21) a. $[\![\text{oshier}]\!]^o = \lambda Q_{\{\mathtt{p}\}} \lambda x \lambda w.\mathbf{tell}(x, Q, w)$ b. $[\![\text{oshier}]\!]^{alt} = \{\lambda Q_{\{\mathtt{p}\}} \lambda x \lambda w.\mathbf{tell}(x, Q, w)\}$

Thus, the set of propositions in the o-value and the alt-value of an interrogative CP can be combined with the question-embedding predicate via FA and PWFA. Hence, there is no type-mismatch and the existential closure by $\exists$ does not occur. I claim that there is no set-compatible predicate in Japanese other than interrogative-CP-embedding predicates like (21), disjunctive coordinators such as the disjunctive coordinator and $\exists$ itself. Thus, any case in which a *ka*-phrase combines with items other than these operators at LF involves existential closure.

This system captures the fact that the position of *ka* conditions the interpretation of a *wh*+*ka* construction, as we saw in the previous section. When the *ka*-phrase together with C_{int} forms a whole CP, it would receive the interpretation as the set of propositions, i.e., a question, whether or not it is embedded by a question-embedding predicate. This is because there would be no type-mismatch in the semantic composition. On the other hand, when the *ka*-phrase forms a DP, the set of alternatives it denotes in the o-value cannot participate in the semantic composition unless it is flattened into a non-set. Because, as I claimed above, there is no set-compatible predicate that can syntactically combine with a DP, except for disjunctive coordinators, which I turn to in the next section.

3.2. *ka*-disjunctions

In this section, I will argue that the generalization about the effect of the position of *ka* on the interpretation of *ka*-disjunctions can be captured as a natural extension of the system outlined above, once we take into account an appropriate syntax for disjunctions. Following the structure of complex coordinations adopted in the literature on the cross-linguistic syntax and semantics of coordinations (den Dikken, 2006; Slade, 2011; Mitrovič and Sauerland, 2014; Szabolcsi,

2015), I assume that *ka*-disjunctions involve a Junction head (hereafter J) with *ka*-phrases both in its internal argument position and in the specifier. The structure is schematized as follows:

(22) $[_{\text{JP}}\ [_{\text{XP}}\ \alpha\ \text{ka}]\ [_{\text{J}'}\ \text{J}\ [_{\text{XP}}\ \alpha\ \text{ka}]]]$

The disjunctive J head is realized either as *matawa* or *soretomo*, or is phonologically null. I treat disjunctive J as denoting the set-union operation in the o-value, as given in (23a) below, while its alt-value is defined in terms of generalized disjunction (Partee and Rooth, 1983).

(23) a. $[\![\text{J}]\!]^o = \lambda X_{\{\sigma\}}\lambda Y_{\{\sigma\}}.X \cup Y$ b. $[\![\text{J}]\!]^{alt} = \{\lambda X_{\{\sigma\}}\lambda Y_{\{\sigma\}}.\{\iota X \sqcup \iota Y\}\}$[8]

b. ιX is defined only if X is a singleton set. If defined, ιX is the unique member of X.

c. $X \sqcup Y = \begin{cases} X \vee Y & \text{if } X \text{ and } Y \text{ are of type } \mathtt{t} \\ \lambda Z_\sigma.X(Z) \vee Y(Z) & \text{if } X \text{ and } Y \text{ are of type } \langle\sigma,\mathtt{t}\rangle \end{cases}$

As concrete examples, we have the following semantic derivations of two examples of *ka*-disjunctions: the DP disjunction *Hanako-ka Jiro-ka* and the clausal disjunction *Hanako-ga hashitta-ka Jiro-ga hashitta-ka*. As one can see from the following LFs, the analysis derives two-membered sets consisting of (the o-values of) its disjuncts (i.e., α and β in the schema in (22)) as the semantic values of a *ka*-disjunction as a whole.[9]

(24) a. $[\![[\text{Hanako-ka } [\varnothing \text{ Jiro-ka}]]]\!]^o = \{\lambda P.P(\mathbf{j}), \lambda P.P(\mathbf{h})\}$
$[\![[\text{Hanako-ka } [\varnothing \text{ Jiro-ka}]]]\!]^{alt} = \{\{\lambda P.P(\mathbf{j}) \vee P(\mathbf{h})\}\}$

b. $[\![[[\text{H.-ga hashitta] ka] } [\varnothing \text{ [[J.-ga hashitta] ka]}]]\!]^o = \{\lambda w.\mathbf{ran}(\mathbf{j},w), \lambda w.\mathbf{ran}(\mathbf{h},w)\}$
$[\![[[\text{H.-ga hashitta] ka] } [\varnothing \text{ [[J.-ga hashitta] ka]}]]\!]^{alt} = \{\{\lambda w.\mathbf{ran}(\mathbf{j},w) \vee \mathbf{ran}(\mathbf{h},w)\}\}$

We have now already accounted for the AltQ interpretation for clausal *ka*-disjunctions. As can be seen in (24b), a clausal *ka*-disjunction receives as its o-value a set of two propositions, each contributed by the clausal disjuncts. This is precisely the standard semantic denotation for AltQs (Karttunen, 1977; Biezma and Rawlins, 2012).[10] In other words, the AltQ interpretation is analyzed as the union of the singleton interpretations of the question nucleus of two YNQs (Uegaki, 2014). Similar analyses of AltQs are maintained by Pruitt and Roelofsen (2011) for English, Gračanin-Yuksek (2014) for Turkish and Mayr and Zuchewicz (2015) for Polish.

[8]The alt-value of J is defined this way so that the alternatives in the alt-value do not involve the same alternatives as in the o-value, but rather are 'reset' to a singleton. This is empirically necessary because clause-final *ka* above a *ka*-disjunction cannot project an alternative question, but rather an Y/N-question:

(i) [Hanako-**ka** Jiro-**ka**]-ga hashitta-**ka** oshiete.
Hanako-KA Jiro-KA -NOM ran-KA tell.
'Tell me whether or not either Hanako or Jiro ran' (Y/NQ)

[9]I assume that a type-lifting from type σ to type $\langle\langle\sigma,\mathtt{p}\rangle,\mathtt{p}\rangle$ is available. The type-lifting applies to the denotations of *Hanako* and *Jiro* in (24a) for them to be coordinated by $\varnothing$ (Partee and Rooth, 1983).

[10]I assume that the exclusivity presupposition of AltQs—the presupposition that only one of the alternatives is true—is guaranteed by an additional operator, following Pruitt and Roelofsen (2011) and Biezma and Rawlins (2012). In the current setup, it can be added to the contribution of $\langle ? \rangle$, introduced in (16).

Furthermore, given the mechanism of semantic composition and the repair of the type-mismatch in terms of $\exists$ described in the previous section, we can also account for the fact that *ka*-disjunctions syntactically smaller than the complement of C[11] end up receiving an existential/declarative disjunctive interpretation. The explanation is exactly parallel to that of the existential interpretation of *wh+ka*. When a *ka*-disjunction is smaller than the complement of C, it has to be semantically combined with a sub-CP predicate/operator. Given the assumption that any such sub-CP operator (other than the J head and $\exists$) is set-incompatible, the o-value of a *ka*-disjunction cannot be directly combined with them. It would result in a type-mismatch.

For example, when the DP-disjunction in (24a) appears in a sentence such as the following repeated from the previous section, $\exists$ repairs the type-mismatch between the disjunction and the verb *hashitta*, as shown in (25).

(4) [$_{DP}$ Hanako-ka Jiro-ka]-ga hashitta.
Hanako-KA Jiro-KA-NOM ran.
'Either Hanako or Jiro ran'.

(25) a. $[\![[\text{Hanako-ka} \varnothing \text{Jiro-ka}] \exists] \text{ hashitta}]\!]^o = \lambda w.\mathbf{ran}(\mathbf{j}, w) \vee \mathbf{ran}(\mathbf{h}, w)$
b. $[\![[\text{Hanako-ka} \varnothing \text{Jiro-ka}] \exists] \text{ hashitta}]\!]^{alt} = \{\lambda w.\mathbf{ran}(\mathbf{j}, w) \vee \mathbf{ran}(\mathbf{h}, w)\}$

4. Existential closure at the clausal level

One of the predictions of the analysis developed so far is that clauses ending with *ka* would receive an existential meaning under proposition-embedding predicates, as the existential closure would kick in to rescue the type-mismatch. In fact, this is not what we see empirically. Clauses ending with *ka* are generally ungrammatical under proposition-embedding predicates like *shinjiru* 'believe' and *mitai* 'seem'. In this section, I will detail the data of *ka*-ending clauses embedded under proposition-embedding predicates, and offer an explanation of the pattern based on independent reasons. I will also point out grammatical examples of embedded *ka*-clauses which have existential interpretations in the way predicted by the current analysis.

The analysis presented up to this point has problems with the following examples, where clauses (specifically CPs and TPs) ending with *ka* are embedded under the proposition-taking predicates *shinjiteiru* 'believe' and *mitai(-da)* 'seem'. The sentences are ungrammatical although the analysis predicts an existential interpretation of the complements.[12]

[11]Here, I say 'complement of C' instead of 'CP' because I assume the existence of the complementizer above a clausal JP (see Section 3.1.2). That is, a clausal JP would have the following structure in an interrogative CP.

(i) [$_{CP}$ [$_{JP}$ [α-ka] [J [β-ka]]] $\langle ? \rangle$]

[12]The exact location of the existential closure in (26a) would be different depending on the type of the complementizer. If the complementizer is the declarative complementizer *to*, it would be applied right below the complementizer since it denotes the identity function over propositions (see Section 3.1.2). On the other hand, if the complementizer is the interrogative complementizer $\langle ? \rangle$ defined in (16), the existential closure would be applied right above the complementizer. Either way, the predicted meaning would be equivalent to that of (27a), modulo the existential presupposition for the latter case, which will be discussed below.

(26) a. *Hanako-wa [dare-ga hashitta-**ka** (da) -to/⟨?⟩] shinjiteiru.
Hanako-TOP who-NOM ran-KA COP $\text{COMP}_{\text{DECL}}$/$\text{COMP}_{\text{INT}}$ believe
Intended: 'Hanako believes that someone ran.'

b. * [dare-ga hashitta-**ka**] mitai da.
who-NOM ran-KA seem COP
Intended: 'It seems that someone ran.'

What makes the problem puzzling is the fact that the following sentence is grammatical with the same existential interpretation as predicted for (26a).

(27) a. Hanako-wa [dare-**ka**-ga hashitta-to] shinjiteiru.
Hanako-TOP who-KA-NOM ran-$\text{COMP}_{\text{DECL}}$ believe
'Hanako believes that someone ran.'

b. [dare-**ka**-ga hashitta] mitai da.
who-NOM ran-KA seem COP
'It seems that someone ran.'

The only difference would be when the existential closure is applied. In (27a), it is at the DP level while in (26a), it is at the CP/TP level.

4.1. A blocking-based account

Despite the appearance of the problem, the ungrammaticality of existential closure at the clausal level in (26) receives a natural explanation in terms of BLOCKING (Aronoff, 1976). The notion of blocking in morphology is employed to account for a lack of certain form in a paradigm, when there is a more optimal competing synonymous form. For example, the form **badder* is ungrammatical insofar as it would mean the same thing as *worse*, because it is blocked by the more optimal competitor *worse* (Kiparsky, 2004). The notion of blocking is extended to syntax and semantics by Atlas and Levinson (1981); Horn (1984) and Blutner (2000), and applied to empirical domains such as the interpretation of lexical and periphrastic causation (McCawley, 1978), pronominal reference and presupposition projection. The general idea in these applications of blocking is the same as that of blocking in morphology: a form is blocked if there is another form with the equivalent interpretation that can be achieved more economically, either from rational pragmatic perspectives or processing perspectives. This idea is formulated in terms of neo-Gricean pragmatics by Atlas and Levinson (1981); Horn (1984) and in terms of bi-directional OT by Blutner (2000).

I propose that a similar account can be made for the badness of (26): they are blocked by the corresponding competitors in (27). The additional claim behind this proposal is that the forms in which *ka* locally attaches to a *wh*-item, such as (27), are more economical than the corresponding forms in which *ka* attaches to a clause, such as (26). The rationale for this claim is the following: when *ka* directly attaches to a *wh*-item, the syntactic and semantic features of the *ka*-ending DP itself guarantee that it has to be existentially closed since such forms cannot

be in an argument position of set-compatible predicates.[13] On the other hand, the features of a *ka*-ending clause itself do not determine if it has to be existentially closed or not. Whether it has to be existentially closed depends on the presence and absence of an embedding set-incompatible predicate. In this sense, a *ka*-ending DP is by itself essentially disambiguated into an existential interpretation while a *ka*-ending clause is itself ambiguous. Given that existence of local ambiguity in a sentence leads to processing cost and danger of miscommunication even when the form is ultimately disambiguated ('garden-path' effect; Bever 1970), we can conclude that the forms involving CP-*ka* count as more costly than the forms involving DP-*ka* for the purpose of blocking. Thus, theories of blocking extended to syntactic forms as mentioned above would account for the badness of (26) as a result of blocking from (27).

4.2. Clause-level existential quantification in CP adjuncts

This analysis makes a crucial prediction due to the fact that the mechanism of blocking relies on the existence of a semantically equivalent competitor. That is, the existential closure at the clausal level would be allowed if the resulting interpretation cannot be derived from a simpler competitor. In this section, I will provide data showing that this prediction is borne out. The relevant examples involve CP adjuncts, such as the following:

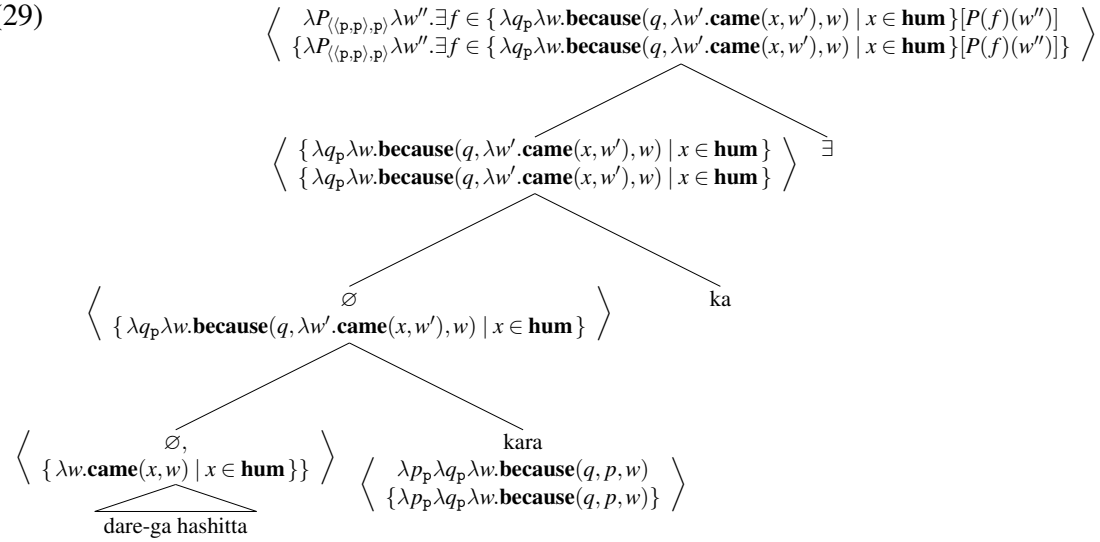
(28) a. [Dare-ga kita-kara-**ka**] Taro-wa yorokondeita.
who-NOM came-because-KA Taro-TOP was.happy
'For some person *x*, because *x* came, Taro was happy.' ('because'-clause)

b. [Dare-ni au-tame-**ka**] Taro-wa hayaku daigaku-ni kita.
who-DAT meet-in.order.to-KA Taro-TOP early university-GOAL came.
'For some person *x*, to meet *x*, Taro came.' (purpose-clause)

The interpretations of these examples are derived from the application of the existential closure to the whole adjunct CP. The existential closure is triggered by the fact that the coordinators *kara* 'because' and *tame* 'in order to' denote relations between two propositions (of type $\langle \mathtt{p}, \langle \mathtt{p}, \mathtt{p} \rangle \rangle$); the adjunct CPs ending with *ka* would denote a type $\{\langle \mathtt{p}, \mathtt{p} \rangle\}$ object, which is incompatible with the propositional main clause. This type-mismatch is resolved by applying the existential closure to the adjunct CPs. The following LF tree illustrates the derivation of the *ka*-ending *because*-clause in (28a), together with the existential closure.

[13] This can be further argued for as follows: Syntactically, since a *wh-ka* phrase has the distribution of DPs, it cannot appear as the clausal complement of CP-embedding predicates. Furthermore, since *wh-ka* denotes non-singletons, it cannot be combined with the disjunctive coordinators ∅. It is only CP-embedding predicates and disjunctive coordinators that are set-compatible. Hence, a *wh-ka* phrase can only combine with set-incompatible predicates. Moreover, although some set-compatible CP-embedding predicates can be combined with DPs under a Concealed Question interpretation (e.g., *wakaru*, 'figure out'; Baker 1968), a *wh-ka* phrase would merely denote a set of individuals in the domain of the *wh*-item, which would not warrant a concealed question interpretation under theories of concealed questions (Heim, 1979; Frana, 2010; Aloni and Roelofsen, 2011).

(29)



These meanings are combined with the type-lifted meaning of the main clause in the following:

(30) a. $[\![\text{Taro-wa yorokon-deita}]\!]^o = \lambda g_{\langle \mathrm{p},\mathrm{p}\rangle}\lambda w.g(\lambda w'.\mathbf{happy}(\mathbf{t},w'))(w)$

b. $[\![\text{Taro-wa yorokon-deita}]\!]^{alt} = \{\lambda g_{\langle \mathrm{p},\mathrm{p}\rangle}\lambda w.g(\lambda w'.\mathbf{happy}(\mathbf{t},w'))(w)\}$

(31) a. $[\![(28a)]\!]^o = \lambda w.\exists f \in$
$\{\lambda q_{\mathrm{p}}\lambda w.\mathbf{because}(\lambda w'.\mathbf{came}(x,w'),p,w) \mid x \in \mathbf{hum}\}[f(\lambda w''.\mathbf{happy}(\mathbf{t},w''))(w)]$
$= \lambda w.\exists x \in \mathbf{hum}[\mathbf{because}(\lambda w''.\mathbf{happy}(\mathbf{t},w''),\lambda w'.\mathbf{came}(x,w'),w)]$

b. $[\![(28a)]\!]^o = \{\lambda w.\exists x \in \mathbf{hum}[\mathbf{because}(\lambda w''.\mathbf{happy}(\mathbf{t},w''),\lambda w'.\mathbf{came}(x,w'),w)]\}$

Why is the existential closure at the CP-level in (28) allowed unlike the *ka*-ending *wh*-clauses under *believe*? In fact, the grammaticality of (28) is exactly what is predicted by the blocking account. Their variants with the alternative form *dare-ka*, as in (32), do *not* have the same interpretations as (28). The relevant coordinators 'believe' and 'in order to' take scope below the existential in (28) while they take scope above the existential in (32), given the surface position of *ka* and the relevant coordinators.

(32) a. [Dare-**ka**-ga kita-kara] Taro-wa yorokondeita.
who-KA-NOM came-because Taro-TOP was.happy
'Because someone came, Taro was happy.' ('because' $>\exists$)

b. [Dare-**ka**-ni au-tame] Taro-wa hayaku daigaku-ni kita.
who-KA-DAT meet-in.order.to Taro-TOP early university-GOAL came.
'Taro came early to the university to meet someone. ('in order to' $>\exists$)

Since a form is blocked only if the simpler competitor has the same interpretation, the blocking does not apply to (28), and hence they are grammatical.

On the other hand, the following examples where *ka* appears right below the relevant coordinators are ungrammatical.

(33) a. *[Dare-ga kita-**ka**-kara] Taro-wa yorokondeita.
who-NOM came-KA-because Taro-TOP was.happy
'Because someone came, Taro was happy.'

b. *[Dare-ni au-**ka**-tame] Taro-wa hayaku daigaku-ni kita.
who-DAT meet-KA-in.order.to Taro-TOP early university-GOAL came.
'To meet someone, Taro came.'

This is as expected since they have the same interpretations as the sentences in (32). The sentences in (32) block those in (33), making the latter ungrammatical.

4.3. *ka*-disjunction under proposition-taking predicates

The blocking account for the ungrammaticality of *ka*-ending CPs under proposition-embedding predicates discussed above also applies to *ka*-disjunctions. For example, the ungrammaticality of (34) is explained by blocking from the simpler competitor involving a DP-*ka*-disjunction in (35).

(34) *Taro-wa [Hanako-ga hashitta-ka ∅ Jiro-ga hashitta-ka ⟨?⟩] shinjiteiru.
Taro-TOP Hanako-NOM ran-KA Jiro-NOM ran-KA C_{int} believe
Intended: 'Taro believes that either Hanako ran or Jiro ran.'

(35) Taro-wa [[Hanako-ka ∅ Jiro-ka]-ga hashitta-to] shinjiteiru.
Taro-TOP Hanako-KA or Jiro-KA -NOM ran-C_{decl} believe
'Taro believes that either Hanako ran or Jiro ran.'

Furthermore, importantly, exactly the same prediction as in the *wh*-case holds in the disjunction case. That is, the blocking does not occur when there is no semantically equivalent alternative. Again, we can see this in examples involving CP adjuncts:

(36) Taro-wa [Hanako-ga kita-kara-**ka** ∅ Jiro-ga kita-kara-**ka**]
Taro-TOP Hanako-NOM came-because-KA Jiro-NOM came-because-KA
yorokondeita.
was.happy
'Taro was happy either because Hanako came or because Jiro came.' ($\vee >$ 'because')

Just as in the *wh* case, the crucial reason why (36) is not blocked is that it lacks a more economical alternative *with the equivalent interpretation*. An alternative with the DP-sized *ka*-disjunction below would lead to a distinct interpretation where the disjunction scopes below 'because'.

(37) Taro-wa [[Hanako-**ka** ∅ Jiro-**ka**]-ga kita-kara] yorokondeita.
Taro-TOP Hanako-KA or Jiro-KA -NOM came-because believe
'Taro was happy because either Hanako or Jiro came.' ('because' $> \vee$)

Thus, the parallelism between *wh+ka* and *ka*-disjunctions manifests itself here as well.

4.4. Summary

To summarize Section 4, the existential closure at the clausal level is in principle possible, but some *ka*-ending clauses where existential closure could be applied are made ungrammatical for an independent reason, i.e., blocking from the more optimal *wh-ka* local sequence. This account predicts that existential closure at the clausal level is possible if there is no competitor with the same interpretation. It was shown that this prediction is borne out in the domain of CP adjuncts. Existential closure above CP-adjuncts is possible since the sentences with lexical competitors would have different interpretations.

The possibility of analyzing sentences like (28) and (36) is another advantage of the current analysis over previous approaches. Previous approaches such as Hagstrom (1998) and Shimoyama (2006) make a binary distinction between the DP-internal existential *ka* and the question particle *ka* in the complementizer position. The empirical coverage of such accounts does not encompass the existential interpretation of *ka*-ending clauses discussed in this section, as well as the detailed patterns about when it is disallowed.

5. Conclusions

In this paper, I proposed a unified analysis of indefinites, *wh*-questions and disjunctions involving the particle *ka* in Japanese. According to the analysis, *ka* is analyzed as an operator that always projects a set of alternatives in the ordinary-semantic dimension. The crucial claim is that this set has to be turned into an existential quantifier by the operation of existential closure if and only if it cannot by itself enter the semantic composition with the rest of the sentence without a type-mismatch. This accounts for the fact that *wh+ka* is interpreted as an indefinite when it forms a sub-CP phrase while it is interpreted as a *wh*-question when it forms a matrix CP, or a CP embedded by a question-embedding predicate.

Furthermore, employing the Junction-based syntactic analysis of disjunctions (den Dikken, 2006; Mitrovič and Sauerland, 2014; Szabolcsi, 2015), this analysis can be extended to disjunctions of the form α-*ka* β-*ka*. According to this analysis, α-*ka* β-*ka* denotes the set $\{[\![\alpha]\!], [\![\beta]\!]\}$ in the ordinary-semantic dimension. This analysis offers a natural account of the fact that the interpretation of α-*ka* β-*ka* depends on the syntactic size of the *ka*-phrases, in a way parallel to how the interpretation of *wh+ka* depends on its syntactic size. When α-*ka* β-*ka* is of a sub-CP size, it is type-shifted into the disjunctive meaning. When α-*ka* β-*ka* is of a CP size, it is interpreted as an alternative question.

Note that this proposal is a conservative extension of existing proposals which have been argued for from independent grounds. The unified analysis of indefinites and questions in terms of the notion of alternatives has been extensively defended at least since Kratzer and Shimoyama (2002), and the extension of this program to the JP structure is undertaken by Mitrovič and Sauerland (2014) and Szabolcsi (2015). The role of Q-particle as an operator that brings the

alt-value of the prejacent to the o-value is proposed by Beck (2006) and Kotek (2014), and is shown to have further positive consequences for independent empirical problems such as the intervention effect and the interpretation of multiple *wh*-questions. Two things set the current proposal distinct from existing proposals: (i) the adoption of the above semantics for the Q-particle for its *clause-internal* use, not only for its *clause-final* use; and (ii) the employment of type-compatibility and existential closure in the account of the interpretations of *ka*-ending phrases. Throughout the body of the paper, I have argued that addition of these two claims have far-reaching consequences, including a unified analysis of indefinites and *wh*-questions, an account of the parallelism between *wh*+*ka* and *ka*-disjunctions, and an analysis of the existential interpretations of some *ka*-ending clauses.

References

Aloni, M. and F. Roelofsen (2011). Interpreting concealed questions. *Linguistics and Philosophy 34*(5), 443–478.

Aronoff, M. (1976). *Word formation in Generative Grammar*. Cambridge, MA: The MIT Press.

Atlas, J. and S. C. Levinson (1981). *It*-clefts, informativeness and logical form. In P. Cole (Ed.), *Radical Pragmatics*, pp. 1–61. New York: Academic Press.

Baker, C. (1968). *Indirect Questions in English*. Ph. D. thesis, University of Illinois at Urbana-Champaign.

Beck, S. (2006). Intervention effects follow from focus interpretation. *Natural Language Semantics 14*(1), 1–56.

Bever, T. (1970). The cognitive basis for linguistic structures. In J. Hayes (Ed.), *Cognition and the Development of Language*, pp. 279–352. New York: Wiley.

Biezma, M. and K. Rawlins (2012). Responding to alternative and polar questions. *Linguistics and Philosophy 35*(5), 361–406.

Blutner, R. (2000). Some aspects of optimality in natural language interpretation. *Journal of Semantics 17*(3), 189–216.

Ciardelli, I., J. Groenendijk, and F. Roelofsen (2013). Inquisitive semantics: A new notion of meaning. *Language and Linguistics Compass 7*(9), 459–476.

den Dikken, M. (2006). *Either*-float and the syntax of co-*or*-dination. *Natural Language and Linguistic Theory 24*(3), 689–749.

Frana, I. (2010). *Concealed Questions: In Search of Answers*. Ph. D. thesis, University of Massachusetts at Amherst.

Gračanin-Yuksek, M. (2014). Alternative questions in Turkish. Paper presented at Workshop in Altaic Formal Linguistics 10, May 2014, MIT.

Hagstrom, P. (1998). *Decomposing Questions*. Ph. D. thesis, Massachusetts Institute of Technology.

Hamblin, C. L. (1973). Questions in Montague English. *Foundations of Language 10*(1), 41–53.

Heim, I. (1979). Concealed questions. In R. Bäuerle, U. Egli, and A. von Stechow (Eds.), *Semantics from Different Points of View*. Berlin: Springer.

Horn, L. R. (1984). Towards a new taxonomy of pragmatic inference: Q-based and R-based implicatures. In D. Schiffrin (Ed.), *Meaning, Form, and Use in Context*, pp. 11–42. Wash-

ington, DC: Georgetown University Press.
Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy 1*(1), 3–44.
Kiparsky, P. (2004). Blocking and peripherals in inflectional paradigms. In G. Booij and J. van Maarle (Eds.), *Yearbook of Morphology 2004*, pp. 113–135. Dordrecht: Springer.
Kishimoto, H. (2013). Nihongo no toogo koozoo: Sookan tooisetu kara mita kaisoo [The syntactic structure of Japanese: The hierarchy from the point of view of correlative conjunctive clauses]. In Y. Endo (Ed.), *Sekai ni Muketa Nihongo Kenkyuu [Studies of Japanese to the World]*, pp. 15–43. Tokyo: Kaitaku-sha.
Kotek, H. (2014). *Composing Questions*. Ph. D. thesis, Massachusetts Institute of Technology.
Kratzer, A. and J. Shimoyama (2002). Indeterminate pronouns: The view from Japanese. In Y. Otsu (Ed.), *The Proceedings of the Third Tokyo Conference on Psycholinguistics*, pp. 1–25. Tokyo: Hituji Shobo.
Kuroda, S.-Y. (1965). *Generative Grammatical Studies in the Japanese Language*. Ph. D. thesis, Massachusetts Institute of Technology.
Mayr, C. and K. Zuchewicz (2015). Exhaustification of Polish disjunctive questions. In T. Bui and D. Özildiz (Eds.), *Proceedings of the 45th North Eastern Linguistic Society (NELS)*, pp. 179–192. Amherst, MA: GLSA.
McCawley, J. D. (1978). Conversational implicature and the lexicon. In P. Cole (Ed.), *Syntax and Semantics 9: Pragmatics*, pp. 245–59. New York: Academic Press.
Mitrovič, M. and U. Sauerland (2014). Decomposing coordination. In J. Iyer and L. Kusmer (Eds.), *Proceedings of North East Linguistic Society (NELS) 44*, pp. 39–52.
Miyama, M. (2015). On the "clausal-connective" and "nominal-connective" *ka* 'or' in Japanese. *Linguistic Research 30*, 23–40.
Partee, B. H. and M. Rooth (1983). Generalized conjunction and type ambiguity. In R. Bäuerle, C. Schwarze, and A. von Stechow (Eds.), *Meaning, Use, and Interpretation of Language*, pp. 361–383. Berlin: Walter de Gruyter.
Pruitt, K. and F. Roelofsen (2011). Disjunctive questions: Prosody, syntax, and semantics. Ms., University of Massachusetts, Amherst and ILLC, University of Amsterdam.
Roberts, C. (1996/2012). Information structure in discourse: Towards an integrated formal theory of pragmatics. In J.-H. Yoon and A. Kathol (Eds.), *OSU Working Papers in Linguistics, No. 49: Papers in Semantics*. The Ohio State University. Reprinted in *Semantics & Pragmatics* 5, 2012.
Roelofsen, F. and D. F. Farkas (2015). Polarity particle responses as a window onto the interpretation of questions and assertions. *Language 91*(2), 359–414.
Rooth, M. (1985). *Association with Focus*. Ph.D. dissertation, University of Massachusetts, Amherst.
Sauerland, U. and K. Yatsushiro (2016). Conjunctive disjunctions: Evidence for the ambiguity theory. Paper presented at the XPRAG workshop "Disjunction Days", June 2nd, 2016, ZAS Berlin.
Shimoyama, J. (2006). Indeterminate phrase quantification in Japanese. *Natural Language Semantics 14*(2), 139–173.
Slade, B. (2011). *Formal and Philological Inquiries into the Nature of Interrogatives, Indefinites, Disjunction, and Focus in Sinhala and Other Languages*. Ph. D. thesis, University of Illinois at Urbana-Champaign.

Spector, B. (2014). Global positive polarity items and obligatory exhaustivity. *Semantics and Pragmatics 7*(11), 1–61.

Szabolcsi, A. (2015). What do quantifier particles do? *Linguistics and Philosophy 38*(2), 159–204.

Uegaki, W. (2014). Japanese alternative questions are disjunctions of polar questions. In T. Snider (Ed.), *Proceedings of Semantics and Linguistic Theory (SALT) 24*. Ithaca, NY: CLC Publications.

Yatsushiro, K. (2009). The distribution of quantificational suffixes in Japanese. *Natural Language Semantics 17*(2), 141–173.