

Contrastive Function of Japanese Particle *wa*

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Abstract. The Japanese particle *wa* is of a great interest due to its complexity involving both the topic and contrastive functions. Although the particle *wa* with the contrastive function distributes cross-categorially, many previous analyses focus on simple NPs at the subject position, facing difficulty dealing with more complex cases. For example, few previous proposals account for the correct interpretation of a complex *wa*-marked phrase. In addition, the interaction between contrastive *wa* and the universal quantifier poses an interesting challenge. Generally speaking, previous analyses are not sufficiently precise nor accurate to deal with these problems. This paper presents an analysis of contrastive *wa* that can address these problems in a systematic way. We pursue this goal by observing the following two points. First, phonological prominence is explicitly associated with contrastive semantics. Second, the contrastive semantics of *wa* is analyzed as a form of contrast stronger than the contrast without *wa*. The analysis is formulated within the framework of alternative semantics of Rooth (1985).

1 Introduction

The Japanese ADVERBIAL PARTICLE *wa* is argued to have topic (or thematic) and contrastive functions (e.g. Kuno, 1972), as in the examples shown below. In these and later examples, SMALL CAPITALS are used to indicate PHONOLOGICAL PROMINENCE or grammatical labels: TOP (topic), CONT (contrastive), NOM (nominative), ACC (accusative), DAT (dative), and GEN (genitive).

- (1) Topic *wa* (following the utterance ‘The person who came here was Ken.’)

Ken-wa BANANA-O TABETA.
Ken-TOP banana-ACC ate

‘Ken ate a/the banana.’

- (2) Contrastive *wa* (in response to the question ‘Among those people, who ate the banana?’)

KEN-wa banana-o tabeta.
Ken-CONT banana-ACC ate

‘Ken ate the banana (but someone else didn’t eat the banana).’

In 1, the utterance continues to talk about Ken and provides new information about him. In 2, the response not only answers the question but also carries the presupposition shown in the parentheses. Note that although Kuno (1972) suggested that the thematic and the contrastive functions were exclusive, a more recent view is that there is an overlap (e.g. Noda, 1996).

In this paper, we mainly discuss two phenomena involving contrastive *wa*. The first is the case where contrastive *wa* is attached to a complex phrase as shown below.

- (3) a. Ken-wa [NAOMI-no banana] -wa tabeta.
Ken-TOP Naomi-GEN banana -CONT ate

‘Ken ate Naomi’s banana (but didn’t eat someone else’s banana).’

- b. Ken-wa [Naomi-no BANANA] -wa tabeta.
 Ken-TOP Naomi-GEN banana -CONT ate

‘Ken ate Naomi’s banana (but didn’t eat something else of Naomi).’

Depending on the position of phonological prominence, there is a clear distinction between the presuppositions in 3a and 3b. The problem with previous analyses is that they did not pay much attention to the case of *wa*-marking on complex phrases and overlooked the role of phonological prominence.

The second phenomenon is about the case of asymmetry involving the universal quantifier in relation to contrastive *wa* as shown below.

(4) In response to the question ‘Did Ken praise Naomi?’

- a. Ken-wa MINNA-o hometa.
 Ken-TOP everyone-ACC praised

‘Ken praised everyone.’

- b. * Ken-wa MINNA-wa hometa.
 Ken-TOP everyone-CONT praised

‘Ken praised everyone.’

In this example, while the accusative case marker *o* (at the object position) is possible, the contrastive *wa* is not. As we will see later, the asymmetry is independent of the grammatical relations, underlying case marking, and word order. Previous analyses fail to account for this asymmetry.

This paper begins with the idea that a phonological prominence is associated with the basic contrastive meaning, and analyzes that *wa* interacts with such a contrast, resulting in a stronger contrast. The idea can be formulated within the framework of ALTERNATIVE SEMANTICS (Rooth, 1985). This develops into a precise and accurate analysis of contrastive *wa*, leading to a solution to the two problems introduced above. Since Japanese *wa* is closely related to the Korean counterpart *n(un)*, we will also cite analyses for Korean.

This paper is organized as follows: The next section re-examines the problems more in detail. In section 33, we review previous analyses. Then, Section 44 introduces a new analysis of contrastive *wa* based on alternative semantics, leading to our solution to the problems.

2 The Problems Revisited

We now return to the problems and also review the background information needed for further discussion. The first problem is about *wa*-marking on complex phrases as shown in 3, repeated below.

- (5) a. Ken-wa NAOMI-no banana-wa tabeta.
 Ken-TOP Naomi-GEN banana-CONT ate

‘Ken ate Naomi’s banana.’

Presupposition: ‘Ken didn’t eat someone else’ banana.’

- b. Ken-wa Naomi-no BANANA-wa tabeta.
 Ken-TOP Naomi-GEN banana-CONT ate

‘Ken ate Naomi’s banana.’

Presupposition 1: ‘Ken didn’t eat something else of Naomi.’

Presupposition 2: ‘Ken didn’t eat something other than Naomi’s banana.’

Let us first clarify the term PRESUPPOSITION as used in this paper (Beaver, 1997, for more details); the presupposition ambiguity in 5b will be discussed shortly. Here, presupposition broadly refers to the meaning of an utterance (as spoken in a certain context) that is not TRUTH-CONDITIONAL (the glosses in the above examples correspond to the truth-conditional meanings of the sentences). In this paper, we are particularly interested in the presuppositions triggered by phonological prominence and the particle *wa*.

To distinguish the presupposition from the truth-conditional meaning, we can use the PROJECTION TEST across negation. The test is based on the idea that negation only affects the truth-conditional meaning. In other words, presuppositions survive negation. Let us now observe this point with respect to contrastive *wa* in the following example (a rather unusual form of negation is used here to avoid the interaction of *wa* with the matrix-level negative operator).

(6) Following the utterances ‘There were a banana and a mango on the table. Ken didn’t eat the mango.’

Sosite, [Ken-ga BANANA-wa tabeta] -to-iu koto-ga hiteisareta.
and Ken-NOM banana-CONT ate that fact-NOM was denied

‘The fact that [Ken ate the banana] was denied.’

Here, the embedded clause is negated and thus ‘Ken ate the banana’ is false. But the presupposition associated with contrastive *wa* (‘Ken didn’t eat something else’) survives the negation and is available as a part of the non-truth-conditional meaning of the utterance. This presupposition happens to be consistent with the context given in the above example, resulting in a felicitous utterance. On the contrary, the same utterance can be infelicitous in the following example with a slightly different context.

(7) Following the utterances ‘There were a banana and a mango on the table. Ken ate the mango.’

#Sosite, [Ken-ga BANANA-wa tabeta] -to-iu koto-ga hiteisareta.
and Ken-NOM banana-CONT ate that fact-NOM was denied

‘The fact that [Ken ate the banana] was denied.’

The above utterance is identical to 6 with respect to both the truth-conditional meaning and the presupposition. But in this case, the presupposition is inconsistent with the given context. We use ‘#’ to indicate that the utterance is infelicitous in the given context. In contrast, we use ‘*’ to indicate that the sentence is unacceptable in any context for grammatical, semantic, and/or pragmatic reasons.

In later sections, we will need to distinguish two types of presupposition: (i) CONVENTIONAL IMPLICATURE, which is a grammaticalized form of meaning and thus not cancellable, and (ii) CONVERSATIONAL IMPLICATURE, which is available as a result of inference and cancellable if explicitly done so (Grice, 1975; Karttunen and Peters, 1979). The contrastive force associated with *wa* is conventional because it is not cancellable as shown in the following example:

(8) Following the utterance ‘Ken ate all the fruits.’

#BANANA-wa tabeta.
banana-CONT ate

‘He ate banana.’

This utterance is infelicitous in the given context because there is no contrastive element such that Ken didn’t eat.

Although not central to this paper, let us briefly return to the presupposition ambiguity in 5b as we need some clarification. Such ambiguity is basically the same as the following phenomenon observed for English (adapted from Selkirk, 1984).

- (9) a. She only watched [KOJAK].
b. She only [watched KOJAK].

The utterance 9a can be a response to ‘Did Mary watch both M*A*S*H and Kojak?’. The utterance 9b can be a response to ‘Did Mary do the dishes and watch Kojak?’. But 9a and 9b are pronounced identically. Under the normal

condition, the presupposition ambiguity in 5b is resolved by the context. In the rest of this paper, we focus on the NARROW presupposition 1 in 5b. Since we adopt the alternative semantics approach (Rooth, 1985), which is used to account for this type of distinct contrast domains, our analysis can be extended to deal with this type of ambiguity.

We now turn to the second problem exemplified in 4, repeated below.

(10) In response to the question ‘Did Ken praise Naomi?’

Ken-wa MINNA-o/*wa hometa.
 Ken-TOP everyone-ACC/CONT praised

‘Ken praised everyone (in contrast to just Naomi).’

Note that the above use of *wa* is ‘*’-ed because it is unacceptable in any context, not only the context given above. This contrast for the object position has been observed by Han (1998) for the Korean counterpart of contrastive *wa*. But this phenomenon is not limited to the object position. Universal quantifier cannot coexist with contrastive *wa* independent of the grammatical relation, the underlying case of the *wa*-marked phrase, and the presence of scrambling as can be seen below:

(11) a. MINNA-ga/*wa Ken-o hometa.
 everyone-NOM/CONT Ken-ACC praised

‘Everyone praised Ken.’

b. MINNA-o/*wa Ken-wa hometa.
 everyone-ACC/CONT Ken-TOP praised

‘Ken praised everyone.’

Since the incompatibility between contrastive *wa* and the universal quantifier is independent of syntax as shown above and also independent of the context, the effect must come from the semantics of contrastive *wa*. Note that the following is possible (without prominence on the *wa*-marked phrase), but what is involved here is only the topic function, not the contrastive function of *wa*.

(12) Minna-wa KEN-o hometa.
 everyone-TOP Ken-ACC praised

‘Everyone praised Ken.’

As we have seen above, contrastive *wa* may interact with a quantifier as well as nouns. More generally, the distribution of contrastive *wa* is CROSS CATEGORIAL, including positions after nouns, quantifiers, other particles, verbs, adverbs, and complementizers (Aoki, 1992; Tateishi, 1994; Noda, 1996). Thus, the semantics of contrastive *wa* must be able to interact with a wide range of semantic types. The following examples show a few such possibilities.

(13) a. Ken-wa PERU-ni-wa ikanakatta.
 Ken-TOP Peru-DAT-CONT didn’t go

‘Ken didn’t go to Peru (but went somewhere else).’

b. Ken-wa KINO-u-wa nenakatta.
 Ken-TOP yesterday-CONT didn’t sleep

‘Ken didn’t sleep yesterday (but slept some other time).’

c. Ken-wa TABE-wa sita-ga, NOMI-wa sinakatta.
 Ken-TOP eat-CONT did-but drink-CONT didn’t

‘Ken ate (but didn’t do something else), but didn’t drink (did something else).’

With respect to the distribution, contrastive *wa* behaves very much like other adverbial particles such as *dake* ‘only’, *mo* ‘too’, *sae* ‘even’, and *koso* ‘in particular’. In addition, it is comparable to *only* in English. As we will see in later sections, this paper explores an analysis applicable to the cross-categorial distribution of contrastive *wa*.

3 Previous Analyses

Contrastive *wa* has been the focus of several works. But as we have mentioned in Section 11, none of the analyses reviewed here account for the two problems under discussion. The main shortcomings are the following: (i) that phonological prominence is ignored and (ii) that the analysis of presupposition associated with contrastive *wa* is inaccurate. Let us briefly discuss the first point and then review previous analyses more in conjunction with the second one.

Without analyzing the contrast associated with a phonological prominence, it is impossible to derive the correct presupposition for a complex phrase such as 3. For example, while Huruta (1982) analyzes the function of contrastive *wa* affixed to a complex NP, the distinct presuppositions corresponding to different phonological prominence are not discussed, and left as ambiguous.

As for the second point, none of the previous analyses explicitly discuss the distinction between the contrastive presuppositions with and without *wa*. Naturally, the asymmetry in 4 is not discussed in this regard either (except for the brief discussion in Han, 1998). Although the distribution of contrastive *wa* is cross-categorial as mentioned in the previous section, many previous analyses discuss only simple NPs at the subject position, often in contrast with NPs marked with the nominative case marker *ga* (e.g. Kuno, 1972). But although the *wa*-marking on the subject does not co-occur with the default *ga*-marking on the subject, we may still consider that there is an underlying nominative marker *ga*. Then, it is not the distinction between *wa* and *ga*. Instead, the distinction is about the presence or absence of contrastive *wa*. Another shortcoming in relation to this point is that the contrastive effect with other case particles (such as *o* ACC) is rarely discussed.

One analysis of the presupposition associated with contrastive *wa* is that there is another element in the context in contrast to the one marked with *wa* (Miyagawa, 1987; Shibatani, 1990; Han, 1998). We might call this approach the MERE CONTRAST analysis. This is problematic because it becomes difficult to distinguish between the contrasts with and without *wa*. In particular, mere contrast presupposition is too weak for the contrast with *wa* as shown in the following example:

- (14) Following the utterance ‘Here are a banana and a mango.’
 Ken-wa BANANA-o/#wa tabe, MANGO-mo tabeta
 Ken-TOP banana-ACC/CONT ate (and) mango-too ate
 ‘Ken ate the banana, and ate the mango too.’

Even though the mere contrast requirement is satisfied, the *wa*-marking is infelicitous in this context.

Choi (1997) (citing Szabolcsi) argues that contrastive focus has EXCLUSIVE force such that nothing else is true for the case. But this is too strong for contrastive *wa* as shown below.

- (15) Following the utterance ‘Here are a banana, a mango, and a tomato.’
 Ken-wa BANANA-wa tabenakatta-ga, MANGO-wa tabeta.
 Ken-TOP banana-CONT didn’t eat-but tomato-CONT ate
 ‘Ken didn’t eat a/the banana, but ate a/the mango.’
 Ken-wa motiron TOMATO-mo tabeta.
 Ken-TOP of course tomato-too ate
 ‘Of course, Ken ate tomato, too.’

The next group of analyses assumes a presupposition that considers contrasts with and without *wa* identically (Teramura, 1991; Noda, 1996; Choi, 1997 to some extent). Their analyses share the basic idea shown in the following example:

- (16) Ken-wa PERU-de-wa BANANA-o tabeta.
 Ken-TOP Peru-in-CONT banana-ACC ate
 ‘Ken ate bananas in Peru.’
 Presupposition: ‘Ken didn’t eat something else somewhere else.’

Crucially, the contrast relation between *Peru* and *somewhere else* and the relation between *banana* and *something else* are identical. We might call this PARALLEL CONTRAST analysis.

There are a few problems with this approach. First, the analysis assumes that there is a place where Ken didn’t eat something. But as we will observe in detail in the next section, the contrast without *wa* does not have this strong presupposition. Second, the analysis has an inherent difficulty dealing with the asymmetry involving the universal quantifier as shown in 4. It predicts that there is no asymmetry.

Most of the previous analyses do not distinguish between the cancellability of presupposition. Only Choi (1997) explicitly states that parallel contrast presupposition is a conversational (cancellable) implicature. But this statement is too weak. As we will discuss in the next section, the contrast with *wa* do have a conventional implicature, which needs to be distinguished from the contrast without *wa*. The parallel contrast analysis overlooks this aspect and loses the crucial distinctions between the contrasts with and without *wa*.

Huruta (1982) presents a very detailed analysis of the particle *wa*. Here, we observe some problems with his analysis. First, Huruta does not compare the presupposition of contrastive *wa* with the presupposition without *wa*. Thus the asymmetry in 4 remains to be explained. Next, let us apply Huruta’s analysis to the following example:

- (17) In response to the question ‘Did Ken eat a/the mango?’
 Ken-wa BANANA-wa tabeta.
 Ken-TOP Banana-CONT ate
 ‘Ken ate a/the banana.’
 Presupposition: ‘Ken didn’t eat a/the mango.’

For the semantic representation X for the *wa*-marked phrase (*banana*’ in this case), let us denote the corresponding semantic representation in the presupposition as X^c . Huruta’s intuition is that $X^c = (\text{something other than } banana')$. Huruta (1982) attempts to capture this relation by representing X^c as $\neg X$ (this point is shared by Teramura, 1991). But facing various phrase types, Huruta needed to assume different relations for them as shown in Table 1 (his formulas are translated into a standard logical language):

Phrase type	X	X^c
NP (proper noun)	ken'	$\lambda P.\exists Y [(Y \neq ken') \wedge P(Y)]$
NP (common noun)	$\lambda X.child'(X)$	$\lambda P.\exists Y [\neg child'(Y) \wedge P(Y)]$
NP (quantified noun)	$\lambda P.\forall Y [child'(Y) \Rightarrow P(Y)]$	$\lambda P.\neg \forall Y [child'(Y) \Rightarrow P(Y)]$ or $\lambda P.\forall Y [\neg child'(Y) \Rightarrow P(Y)]$
Predicative adjective	$\lambda X.pretty'(X)$	$\lambda X.\neg pretty'(X)$

Table 1: Huruta’s Analysis of the Contrastive Relation

But the proposed relation between X and X^c is rather idiosyncratic. The analysis $X^c = \neg X$ does not hold in general. In addition, Huruta (1982) proposes two separate formulas for the negative case, reflecting the negative scope ambiguity. We want to capture the relation in a more systematic manner.

As seen above, the previous approaches are insufficient as a solution to the two problems we have been focusing on. We need to integrate contrastive semantics associated with phonological prominence and a more precise and accurate way of representing the presupposition associated with contrastive *wa*.

4 Analysis of Contrastive *wa*

First, we assume that the basic component of contrastive semantics is associated with prominence (e.g. Ladd, 1996). Then, the problem of deriving the correct semantics becomes the process of composing the semantics associated with prominence and that of contrastive *wa*. Our main points for this section are the following: (i) contrast relation between X and X^c (as discussed in the previous section) can be characterized in terms of ALTERNATIVES (Rooth, 1985) and (ii) there are two types of contrast depending on the presence/absence of the contrastive *wa*.

In the first subsection below, we introduce the idea informally. The second subsection presents a formal treatment of the same idea. Then, in the subsequent two sections, each of the problems will be discussed in detail.

4.1 Different Types of Contrasts

In this subsection, we informally explore the function of contrasts with and without *wa*. Since we associate the basic contrastive semantics with phonological prominence, there can be a contrast regardless of the presence of *wa*. The main point is that the contrastive force is distinct depending on the presence of *wa*.

First, let us observe the case without *wa*, which involves both conventional (non-cancellable) and conversational (cancellable) implicatures as shown below. Both positive and negative sentences are shown to demonstrate the polarity of the presuppositions.

- (18) a. Ken-*wa* BANANA-O tabeta.
Ken-TOP banana-ACC ate

‘Ken ate a/the banana.’

Presupposition: (i) ‘Something else is involved.’ (conventional, non-cancellable)
(ii) ‘Ken didn’t eat something else.’ (conversational, cancellable)

- b. Ken-*wa* BANANA-O tabenakatta.
Ken-TOP banana-ACC didn’t eat

‘Ken didn’t eat a/the banana.’

Presupposition: (i) ‘Something else is involved.’ (conventional, non-cancellable)
(ii) ‘Ken ate something else.’ (conversational, cancellable)

The assumption here is that when a word is prominent, its semantics is in contrast with another referent. A formal representation will be introduced in the next subsection. The presupposition is actually identical to the mere contrast discussed in the previous section. But we must note that the mere contrast analysis is applied to the presupposition of contrastive *wa*. The other part of presupposition (ii) is possible only under the condition where the context allows it. But this part is cancellable, which will be discussed in contrast with the *wa*-marked case below.

We now turn to the case with contrastive *wa*.

- (19) a. Ken-*wa* BANANA-*wa* tabeta.
Ken-TOP banana-CONT ate

‘Ken ate a/the banana.’

Presupposition: ‘Ken didn’t eat something else.’ (conventional)

- b. Ken-*wa* BANANA-*wa* tabenakatta.
Ken-TOP banana-CONT didn’t eat

‘Ken didn’t eat a/the banana.’

Presupposition: ‘Ken ate something else.’ (conventional)

The presuppositions above is actually identical to 18ii for both a and b. But it is now conventionalized/grammaticalized. This distinction can be observed in 14. The utterance 14 cannot be felicitous if the contrast without *wa* has the same presupposition as the case with *wa*. The situation can be summarized as follows:

- (20) a. Contrast without *wa*: The presupposition (conventional) is that there is some distinct X^c (or, something else is involved).
 b. Contrast with *wa*: The presupposition is that there is some X^c which does not hold in the current situation (i.e. X^c is necessarily distinct from X).

Since 20b is more specific than 20a, we say that the contrast with *wa* is STRONGER than the contrast without *wa*.

In Section 33, we have observed that parallel contrast analysis is not accurate for examples like 16. We can derive the correct presuppositions for the same example (and its negative counterpart) by applying our analysis as follows:

- (21) a. Ken-wa PERU-de-wa BANANA-o tabeta.
 Ken-TOP Peru-in-CONT banana-ACC ate
 ‘Ken ate bananas in Peru.’
 Presupposition: (i) ‘Ken didn’t eat bananas somewhere else.’ (from PERU-de-wa)
 (ii) ‘Something other than banana is involved.’ (from BANANA-o)
- b. Ken-wa PERU-de-wa BANANA-o tabenakatta.
 Ken-TOP Peru-in-CONT banana-ACC didn’t eat
 ‘Ken didn’t eat bananas in Peru.’
 Presupposition: (i) ‘Ken ate bananas somewhere else.’ (from PERU-de-wa)
 (ii) ‘Something other than banana is involved.’ (from BANANA-o)

Here, distinct presuppositions coexist. It is also possible that, for example in 21a, there is a conversational (cancellable) implicature such as ‘Ken didn’t eat something else somewhere else’. This corresponds to the parallel contrast analysis, which is too strong as we have argued in the previous section. Although it is not easy to show that this type of parallel contrast is only conversational (cancellable), the following example seems to provide a support.

- (22) Following the utterance ‘Ken ate neither bananas nor mangoes in Indonesia.’
- a. Ken-wa PERU-de-wa BANANA-o tabeta.
 Ken-TOP Peru-in-CONT banana-ACC ate
 ‘Ken ate bananas in Peru.’
 Presupposition: (i) ‘Ken didn’t eat bananas somewhere else.’ (from PERU-de-wa)
 (ii) ‘Something other than banana is involved.’ (from BANANA-o)
- b. # Ken-wa PERU-de-wa BANANA-wa tabeta.
 Ken-TOP Peru-in-CONT banana-CONT ate
 ‘Ken ate bananas in Peru.’
 Presupposition: (i) ‘Ken didn’t eat bananas somewhere else.’ (from PERU-de-wa)
 (ii) ‘Ken didn’t eat something else in Peru.’ (from BANANA-wa)

If the combined presupposition in 22a was a parallel contrast ‘Ken didn’t eat something else somewhere else’, the utterance would be unacceptable. The combined presupposition in 22b actually corresponds to such a parallel contrast, and thus, it is unacceptable (assuming that the only things to eat under consideration are bananas and mangoes).

In summary, we have shown that the presupposition of an utterance can be derived from the presuppositions associated with phonological prominence and contrastive *wa*.

4.2 Alternative Semantics

In this section, we develop a formal representation of the analysis presented in the previous section, by adopting the ALTERNATIVE SEMANTICS framework (Rooth, 1985; Rooth, 1992; Rooth, 1996). The essence of this formulation is that contrastive semantics analyzed in the previous subsection can be derived from two semantic values, the ordinary meaning and the alternatives sets. Although alternative semantics has been applied to European languages to a great extent, e.g., the analysis of *only* in English, there have been few instances of application to contrastive *wa* (one exception is Wee (1995) who works on a different set of problems for the Korean counterpart of *wa*).

Let us first discuss the relation between some semantic component X in an utterance and a contrastive element X^c . This relation can be uniformly captured by the notion of alternatives regardless of the phrase type. This generalizes the case of Huruta (1982) where distinct relations are used for different phrase types. Now, let us observe the following example:

- (23) Ken-wa BANANA-wa tabeta.
 Ken-TOP banana-CONT ate
 ‘Ken ate a/the banana.’
 Presupposition: ‘Ken didn’t eat something else.’

First, the sentence can be denoted as $\varphi = [{}_S \text{Ken} [\text{banana}]_{C/wa} \text{ate}]$ where the contrast marked by the phonological prominence within the *wa*-marked phrase is represented as $[]_{C/wa}$. The particle *wa* is analyzed as an operator and not included in this representation as a lexical unit. The truth-conditional meaning of the utterance is the ordinary meaning $[\varphi]^o = \text{eat}'(\text{banana}')(\text{ken}')$ using the functor-argument representation $\text{functor}(Arg_1) \dots (Arg_k)$ and assuming a simplified semantics for *banana*.

The idea of alternatives set is that the contrast involving a certain element is represented by a set of alternatives. For the present example, the alternatives set with respect to the contrast C is represented as, say, $[\varphi]^{c/wa} = \{ \text{eat}'(\text{banana}')(\text{ken}'), \text{eat}'(\text{mango}')(\text{ken}') \}$. In general, we need a mechanism to properly fix the set, which is a focus of discussion in the literature (Rooth, 1992). But to avoid complications, we ignore this aspect in this paper.

The advantage of the present approach over Huruta’s (1982) is that the contrast can always be represented as an alternatives set regardless of the phrase type. In the above, the alternative component corresponds to the semantics of a noun phrase. But we can also consider alternatives sets corresponding to a quantifier, an adverb, or a verb.

Next, the semantics of particle *wa* can be represented as follows: $\exists p \in [\varphi]^{c/wa} [{}^{\vee}p = \text{false}]$ with ‘ ${}^{\vee}p$ ’ standing for the extension of p at the current world as in the Montague tradition (Montague, 1974). Informally, the notation ‘ ${}^{\vee}p$ ’ picks up an element from the set denoted by p and gives its truth condition. This corresponds to the informal description that there is some X^c that does not hold in the current situation.

For the case of contrast without *wa*, the utterance is represented as $\varphi = [{}_S \text{Ken} [\text{banana}]_C \text{ate}]$ where $[]_C$ indicates that the contrast is not within a *wa*-marked phrase. The only difference here is that we consider an operator to derive presupposition: $\exists p \in [\varphi]^c [p \nleftrightarrow [\varphi]^o]$, where ‘ \nleftrightarrow ’ means that neither side of the relation logically imply the other side. This operator applies to both the ordinary meaning and the alternatives set, and derives a presupposition that there is an alternative which is logically distinct from the ordinary meaning. This situation was glossed as ‘something else is involved’ in the previous subsection.

Let us now consider the negative case such as the following.

- (24) Ken-wa BANANA-wa tabenakatta.
 Ken-TOP banana-CONT didn’t eat
 ‘Ken didn’t eat a/the banana.’
 Presupposition: ‘Ken ate something else.’

We represent the utterance as follows: $\varphi = [{}_S \text{Ken} [\text{banana}]_{C/wa} \text{ate } neg]$ where negative morphology is represented in φ as in Buring (1997) (but unlike Rooth, 1996). The truth-conditional meaning and the presupposition can then be formulated in exactly the same way as the positive case. One aspect that introduce complication is the scope of negation. While this is an interesting topic, it is left for future work.

Finally, we consider the case with two types of contrasts.

- (25) Ken-wa PERU-de-wa BANANA-o tabeta.
Ken-TOP Peru-in-CONT banana-ACC ate

‘Ken ate bananas in Peru.’

- Presupposition: (i) ‘Ken didn’t eat bananas somewhere else.’ (from PERU-de-wa)
(ii) ‘Something other than banana is involved.’ (from BANANA-o)

The combined presupposition is the conjunction of the two presuppositions we have already seen. As argued earlier, a presupposition such as ‘Ken didn’t eat mangoes in Indonesia’ is considered a conversational implicature, i.e. a result of general inference. The presuppositions of contrastive *wa* and the other contrast operate simultaneously but not symmetrically (unlike the parallel contrast analysis).

4.3 Solution to Problem 1: Complex Phrase

As soon as we consider phonological prominence and alternative-semantics approach, we obtain a solution to the first problem. Let us consider the model case 3 repeated below.

- (26) a. Ken-wa [NAOMI-no banana] -wa tabeta.
Ken-TOP Naomi-GEN banana -CONT ate

‘Ken ate Naomi’s banana.’

Presupposition: ‘Ken didn’t eat someone else’ banana.’

- b. Ken-wa [Naomi-no BANANA] -wa tabeta.
Ken-TOP Naomi-GEN banana -CONT ate

‘Ken ate Naomi’s banana.’

Presupposition: ‘Ken didn’t eat something else of Naomi.’

Reflecting the phonological prominence, we represent the sentence structure as follows:

- (27) a. $\varphi_a = [{}_S \text{Ken} [\text{Naomi's}]_{C/wa} \text{banana ate}]$
b. $\varphi_b = [{}_S \text{Ken} \text{Naomi's} [\text{banana}]_{C/wa} \text{ate}]$

The ordinary meaning for 27a and 27b can be represented as follows:

$[\varphi_a]^o = [\varphi_b]^o = \text{eat}'(\text{banana}')(\text{ken}') \wedge \text{possess}'(\text{banana}')(\text{naomi}')$. The alternatives sets are as follows:

- (28) a. $[\varphi_a]^c = \left\{ \begin{array}{l} \text{eat}'(\text{banana}')(\text{ken}') \wedge \text{possess}'(\text{banana}')(\text{naomi}'), \\ \text{eat}'(\text{banana}')(\text{ken}') \wedge \text{possess}'(\text{banana}')(\text{erika}') \end{array} \right\}$
b. $[\varphi_b]^c = \left\{ \begin{array}{l} \text{eat}'(\text{banana}')(\text{ken}') \wedge \text{possess}'(\text{banana}')(\text{naomi}'), \\ \text{eat}'(\text{mango}')(\text{ken}') \wedge \text{possess}'(\text{mango}')(\text{naomi}') \end{array} \right\}$

As shown earlier, the semantics of *wa* is the operator $\exists p \in [\varphi]^c/wa \left[\forall p = \text{false} \right]$. The resulting presupposition can then be obtained as follows:

- (29) a. $\forall \left(\text{eat}'(\text{banana}')(\text{ken}') \wedge \text{possess}'(\text{banana}')(\text{erika}') \right) = \text{false}$

$$b. \vee \left(eat'(mango')(ken') \wedge possess'(mango')(naomi') \right) = false$$

These expressions correctly represent the presuppositions informally described earlier.

4.4 Solution to Problem 2: Universal Quantifier

We now tackle the asymmetry problem exemplified by 4, repeated below.

- (30) a. Ken-wa MINNA-o hometa.
Ken-TOP everyone-ACC praised
'Ken praised everyone.'
- b. * Ken-wa MINNA-wa hometa.
Ken-TOP everyone-CONT praised
'Ken praised everyone.'

First, the sentences for the above cases can be represented as follows:

- (31) a. $\phi_a = [{}_S \text{Ken} [{}_C \text{everyone}] \text{praised}]$
b. $\phi_b = [{}_S \text{Ken} [{}_{C/wa} \text{everyone}] \text{praised}]$

The ordinary meaning is $[[\phi_a]^o = [\phi_b]^o = \forall X [praise'(X)(ken')]$. The constraints on X to be the type of human being can be applied, but is omitted for presentation purposes. For the alternatives set, we consider alternative quantifiers in the spirit of Generalized Quantifier (Barwise and Cooper, 1981). Unlike Huruta's (1982) approach, we can directly apply alternative semantics to quantifiers.

$$(32) \quad [[\phi_a]^c = [\phi_b]^c/wa = \left\{ \begin{array}{l} \text{!}X_{=naomi'} [praise'(X)(ken')] = [praise'(naomi')(ken')], \\ \dots \text{Naomi} \\ \forall X [praise'(X)(ken')], \dots \text{everyone} \\ \neg \forall X [praise'(X)(ken')], \dots \text{not everyone} \\ \exists X [praise'(X)(ken')], \dots \text{someone} \\ \vdots \\ \neg \exists X [praise'(X)(ken')] \dots \text{nobody} \end{array} \right\}$$

Now, let us examine the case involving a contrast without *wa*. By applying the presupposition operator $\exists p \in [[\phi]^c [p \nleftrightarrow [\phi]^o]]$ (for contrast without *wa*) on the ordinary meaning and the alternatives set, we can obtain any of the alternatives distinct from the ordinary meaning.

For the case involving contrastive *wa*, the operator $\exists p \in [[\phi]^c/wa [p = false]]$ applies to the alternatives set. All alternatives but $\neg \exists X [praise'(X)(ken')]$ contradict the ordinary meaning that Ken praised everyone. Thus, there already is a significant asymmetry about the availability of generalized quantifiers. Now, let us focus on the only potential proposition, $\neg \exists X [praise'(X)(ken')]$. Logically speaking, it is consistent with the proposition of the sentence, $\forall X [praise'(X)(ken')]$. But $\neg \exists X [praise'(X)(ken')]$ is inconsistent with any context where at least one person is praised by Ken, where the sentence 'Ken praised everyone' is infelicitous in Japanese. In fact, the situation is analogous in English as shown below.

- (33) Ken praised everyone. #In fact, he praised nobody.

As a consequence, no alternatives set could derive the expected presupposition. This demonstrates the asymmetry between the cases with and without *wa*.

5 Conclusion

This paper presents an analysis of contrastive *wa* as the interaction of phonological prominence and the particle *wa* within the framework of alternative semantics. The analysis can be applied to account for the problematic cases involving complex NPs and the universal quantifiers. The proposed formalization provides a more explicit analysis of contrastive *wa* than previous ones, and brings the discussion to the level comparable to the analyses of focus for English and other languages.

One advantage of the present proposal is that it is an integration of fairly standard ideas including phonological prominence, non-truth conditional meaning, and alternative semantics, which are independently motivated for various phenomena in various languages. In addition, the proposed contrastive semantics does not depend on the phrase type as in the previous works, allowing a systematic analysis of various phrase types appropriate for the cross-categorical distribution of contrastive *wa*.

There are several future directions along the current approach. First, since the proposed contrastive analysis applies to an arbitrary phrase type, the whole range of contrastive *wa*, in addition to the ones shown here, can be explored. The present approach can also provide a basis for the analysis of interaction between contrastive *wa* and negation including negative scoping. Next, similar approaches could be developed for other adverbial particles, e.g. *mo* ‘too’. Finally, it would be interesting to see the connection to other languages. For example, Korean and Hindi have particles whose functions are similar to those of Japanese *wa*.

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