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**ASKING AND ANSWERING QUESTIONS:  
DISCOURSE STRATEGIES IN JAPANESE**

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by

**Hitomi Hirayama Tomida**

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The Dissertation of Hitomi Hirayama Tomida  
is approved:

---

Professor Adrian Brasoveanu, Chair

---

Professor Donka Farkas, Chair

---

Associate Professor Ivy Sichel

---

Lori Kletzer  
Vice Provost and Dean of Graduate Studies

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## Abstract

Asking and Answering Questions: Discourse Strategies in Japanese

Hitomi Hirayama Tomida

This dissertation explores a subset of lexical items in Japanese (contrastive *wa*, outer negation, and *no(da)*), which are strategically used in asking and answering questions in discourse. The results reveal what conventionalized discourse effects each of these items has and also how those effects work at the interface between semantics and pragmatics. Based on the discourse effects of a particle across sentence types (declarative/interrogative) and the discourse effects of questions with multiple particles, throughout the dissertation, I argue that the discourse effects of the whole sentence can be attained compositionally by putting together the discourse effects of each expression and those of sentence types.

This dissertation also aims at integrating experimental methods into semantic and pragmatic analyses of the language; Psycholinguistic experiments provide valuable clues to understanding how people use and understand utterances, with certain linguistic expressions. The formal account of contrastive *wa* is specifically based on the results of the experiments, which revealed that the lexical item is particularly sensitive to whether there could be contrastive questions to be pursued in the discourse. This aspect forms a part of the analysis of contrastive *wa*, as a language-specific conventional effect tied to this lexical item, and it interacts with its function as a contrastive topic. The analysis has broader empirical coverage than previous ones, in that it provides a way to unify the contribution of *wa* in declarative and interrogative sentences.

Overall, the behavior of these unique items in Japanese suggests that the discourse effects encoded into lexical items and sentence types can be compositionally derived. This is not trivial, given that not all languages allow to combine different sentence types and (multiple) discourse particles, to begin with. The exploration carried out in this dissertation implies also that this compositionality could be extended to cover other discourse management tools that languages are equipped with.



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# Chapter 1

## Introduction

### 1.1 General Introduction

People use natural languages mainly to communicate with one another. One of the main goals of such a conversation is to exchange the information that discourse participants have and to know more about the world. When people do such exchange of their information, not only do they use their language but also employ strategies which their language is equipped with so that the conversation would be carried out effectively without misinterpreting one another. For instance, one can explicitly signal that they are not confident about the answer or that their knowledge is somewhat limited. Such an action the speaker takes is cooperative since by doing so, it is possible for them to urge the addressee to check another information source, for example.

Since the goal of the conversation can be reduced to getting a better understanding of the world, such communication often has the form of asking questions and answering them; One can request the information they want by asking questions, and the addressee is expected to give some reaction to them regardless of whether they know an answer to the question or not.<sup>1</sup> This is why this dissertation focuses on the linguistic tools used in asking questions and answering them. Languages differ as to what kind of extra information can be conveyed and in what way by the use of certain strategy, and linguists have been trying to understand what commonalities and differences can be observed across languages.

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<sup>1</sup>It is true, however, that keeping silence can be considered as a way to answer the question in some fashion. Such an action can be considered as “reaction” to the question in a broader sense since it can convey that the person does not have an answer or cannot say anything about it. Such non-linguistic reactions are interesting but not going to be discussed in this dissertation.

The language explored in this dissertation is Japanese. Japanese is a very fascinating language to look at in terms of the ability to convey the contextual information besides the literal content; This language has a variety of small lexical items that do not have semantic contributions but play significant roles in the actual use, namely pragmatics. For instance, depending on whether a small particle *wa* is present or not, the sentence in (IIIb) is perceived differently as an answer to the question given in (IIIa).

- (1) a. How many people came?  
b. [<sub>F</sub>10-nin]-{wa/∅} kita.  
10-CL-WA came  
{‘At least 10 people came.’, / ‘10 people came.’}

Regardless of whether *wa* is there or not, the answer (IIIb) conveys the information that 10 people came. The presence of *wa* adds an extra flavor on top to the literal interpretation. With *wa*, it is possible to get an implication that the speaker is not sure whether more than 10 people came. In understanding the contribution of this kind of particle, the first task to be tackled is to apprehend what the extra flavor is and how it is conveyed.

Even though the first task itself is hard enough, there are still many jobs to be done even if we could characterize the extra flavor. Having many kinds of particles is merely part of unique and interesting aspects that this language has; Not only does Japanese have a rich variety of particles, but it allows us to combine some of them and use a series of particles at a time. However, it is not the case that every combination pattern is allowed. This brings us questions such as what the contributions of a cluster of particles are and why certain combinations are not allowed, etc. More interestingly, some particles can even appear across different sentence types; declaratives, interrogatives, imperatives, and so on. These remarkable linguistic properties in Japanese provoke inquiries given in (2).

- (2) a. Can we reduce the discourse effects of using a series of multiple particles to the result of combining effects obtained from its parts?  
b. Would it be possible to explain how a particle is used in an interrogative sentence from its contribution in a declarative sentence?

Answering the questions in (2) and having a better understanding of the contributions of particles themselves constitute the core of this dissertation.

Until now, it has been assumed that particles<sup>2</sup> do not have any semantic contributions but only offer rich information about the immediate context. However, it is not always evident whether adding a particle brings about some semantic effect or not. For instance, when *wa* is present in (III), *10-nin-wa* can be interpreted as meaning that the minimum number of people is ten, and it could be more. This interpretation can lead the addressee to infer that the speaker is ignorant about the exact number. It is also possible to get such an inference when a speaker used a lexical item such as *sukunakutomo* ‘at least’. Is using *wa* different from using *sukunakutomo*? If so, how? What we need to discuss here is exactly which part of a particular inference comes from the meaning of certain lexical items and what is derived pragmatically, namely, the addressee’s reasoning based on the assumption that the speaker is “cooperative” in the sense of what is discussed by Grice (1975).

In order to figure out the division of labor between semantics and pragmatics, it has become common to carry out experiments and observe how people interpret and use certain expressions differently depending on context. The results of such experiments tell us a lot that helps us understand the boundary between the semantic and pragmatic contribution of those expressions. In this dissertation, too, experiments play important roles so as to get a better understanding of subtle meanings conveyed by the presence of a particular particle or lexical expression. Integrating experimental methods with a formal approach to meanings, namely, doing experiments and elaborating the formalism of a language with the results, is also part of the goals that this dissertation aims to achieve.

## 1.2 Overview of the Dissertation

As mentioned earlier, this dissertation deals with the strategies used in answering and asking questions. Accordingly, this dissertation has two parts, each of which focuses on strategies adopted in different speech acts. We start with strategies used in answering, focusing on contrastive *wa* in Chapter 2 and 3. Then we change gears and discuss items that are used in questions (outer negation, *no(da)* and the combinations thereof) in Chapter 4. This chapter also plays a role to build up some background so that we can discuss contrastive *wa* used in questions in Chapter 5.

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<sup>2</sup>The particles that are explored in this dissertation, at least.

Chapter 2 starts with an illustration of the fact that ignorance or uncertainty of the speaker can be expressed explicitly by using expressions that literally convey it or by adopting some strategy that a particular language happens to have. In Japanese, besides saying something like “I am not sure, but”, using *sukunakutomo* ‘at least’ or contrastive *wa* can signal that the knowledge of the speaker is limited, as shown in (3).

- (3) a. [<sub>F</sub>10-nin]-wa kita.  
 10-CL-WA came  
 ‘(At least) 10 people-*wa* came.’
- b. Sukunakutomo 10-nin-ga kita.  
 at least 10-CL-NOM came  
 ‘At least 10 people came.’

The questions to be asked in this chapter is (i) whether the addressee’s inference that the speaker is not knowledgeable (ignorance inferences) is semantic or not, and (ii) whether the addressee draws such an inference in the same way when they interpret a sentence with *sukunakutomo* ‘at least’ and contrastive *wa*. To answer these questions, three experiments were carried out in order to examine whether and how these lexical items are context sensitive by manipulating questions and background contexts. The experiments revealed that the two lexical items trigger a similar kind of inference differently and also how inferences from each could be derived. The results of the experiments also gave us a clue as to what the formal analysis of contrastive *wa* needs to capture: Not *sukunakutomo*, but contrastive *wa* is sensitive to context, and in particular, it can be felicitously used when there is a potential contrast that could be brought up in the discourse.

Chapter 3 provides an analysis of contrastive *wa* based on the results of the experiments introduced in Chapter 2. Contrastive *wa* is treated as a realization of a contrastive topic, which has been argued to be able to access the discourse structure (Büring, 2003; Constanti, 2014) built up based on Questions under Discussion (QuDs: Roberts (1996, 2012)). The analysis of *wa* given in this chapter has two parts: The first part deals with how we can get the focus semantic value of the sentence that involves *wa*(s). The focus semantic value is used in order to capture what kind of discourse strategy is supposed to be used to answer the question. The second part discusses what is the conventional effect of using contrastive *wa* in Japanese, which makes it distinct from the realizations of contrastive topics in other languages.

In the first part, as a tool to derive the focus semantic value of a sentence involving con-



trastive *wa*, I adopt the Continuation Hypothesis (Barker and Shan, 2015): “The meaning of an expression depends on the surrounding context”. In particular, *wa* is treated as a type-shifter and makes the *wa*-phrase a function that takes the rest of the sentence (its continuation). The nested focus semantic value delivered by contrastive *wa* can be given using this mechanism efficiently, also capturing some empirical facts observed around this particular lexical item. For the second part, I argue that using contrastive *wa* has a special discourse effect that it indicates there are other potential QuDs to be pursued in the context. The flexibility of the implications conveyed by *wa* comes from latitude to form such alternative QuDs. These two components play significant roles in questions. In Chapter 5, it is argued that the special discourse effects of *wa* questions also come from the special focus semantic value and the conventional effect of contrastive *wa*.

Chapter 4 discusses what are called biased questions in Japanese. In asking questions, if a language permits, people employ a variety of ways to ask for the same information so that the conversation goes smoothly. For instance, in asking whether it is raining, you can ask it indicating that you have no idea about the weather, or you infer that it is likely to be so based on what you see in context. In Japanese, adding some particles to the question as shown in (4b-c) allows us to give rich information about the speaker’s bias or contextual information that an unmarked polar question such as (4a) does not provide.

- (4) a. Ame hutteru?  
rain falling?  
‘Is it raining?’ [Polar Question]
- b. Ame HUtte nai?  
rain falling NEG?  
‘It’s raining, isn’t it?’ [ONQ]
- c. Ame futteru no?  
rain falling NO(DA)?  
‘(Wow), is it raining?’ [No(da) Question]

I will formalize pragmatic information outer negation or *no(da)* add using and expanding the discourse model proposed by Earkas and Bruce (2010). In particular, in the case of *no(da)*, which can also be used in a declarative sentence, it is revealed that the contribution of this particle in the interrogative sentence is connected to that in the declarative sentence.

In addition to accounting for the discourse effects of individual lexical items, this chapter

also explores the contextual information conveyed by the question with multiple particles, as illustrated by the example in (5), where outer negation and two *no(da)* are used at the same time.

(5) *Hanako reports to Mariko that she found a lipstick mark on Taro's shirt. Mariko says:*

Taroo, uwaki-siteru nja nai no?  
 Taro cheat-do.PROG noda+wa nai<sub>2</sub> noda

'Taro is cheating on you, isn't he?'

I will show that the discourse effects of the questions with multiple particles could be constructed compositionally. The behavior of this kind of complex biased question also indicates that each particle has its own scope and they are arranged in a hierarchical structure.

Chapter 5 explores how contrastive *wa* is used in questions. Contrastive *wa* can be used in both polar questions and constituent questions as in (6-7).

(6)	[Taro] <sub>F</sub> -WA kimasita ka? Taro-WA came Q 'Did Taro <sub>CT</sub> come?'	(7)	[Dare] <sub>F</sub> -WA kimasita ka? who-WA came Q 'Who <sub>CT</sub> came?'
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Both questions above ask the same information that is asked by the version of questions without *wa*. In that sense, adding *wa* does not affect the semantics at all. Along the line of the analysis given in Chapter 4, *wa*-questions are to be treated as marked questions, which carry contextual information. Then our task is to figure out what kind of contextual information is actually conveyed by the use of contrastive *wa* in questions. Here I argue that *wa*-questions convey the contextual information about the discourse structure just as *wa*-assertions do. In other words, markedness of the questions in (6-7) come from the special discourse structure the interlocutors are supposed to entertain. It is easy to extend the analysis given in Chapter 3 so that it would give correct results for interrogative sentences. The special discourse structure we can get as a result can give a comprehensive account of the context in which *wa*-questions are felicitous.

The proposed analysis is also supported by two pieces of empirical facts. First, it is often the case that *wa*-questions are answered by keeping *wa* in the answer. This could be explained by positing that in both cases, *wa* is used to indicate a particular discourse structure is entertained at the time of asking/answering a question. This accords with the results of Experiment 1 given

in Chapter 2 as well. Second, it has been pointed out that adding contrastive *wa* can make otherwise infelicitous questions felicitous. One example is negative degree questions discussed by Schwarz and Shimoyama (2010):

- (8) a. \* doredake nagaku taizai simasen desita ka?  
how long stay didn't COP Q  
(lit.) 'How long did you not stay there?'
- b. [<sub>F</sub> doredake nagaku]-wa taizai simasen desita ka?  
how long-wa stay didn't COP Q  
'What is the minimum length such that you did not stay there?'

It is also argued that this is not the only case in which *wa* can ameliorate infelicitous questions. I will show that questions with an intervener such as an NPI can be rescued by contrastive *wa* as well. The amelioration effect of both cases is attributed to the special pragmatic effects that contrastive *wa* can bring up. For one thing, *wa*-constituent questions trigger strong existential presuppositions, which are tied to the basic conventional effect of the use of contrastive *wa*. This strong existential presupposition can work to weaken intervention effects, which are argued to be a pragmatic phenomenon in Japanese. In addition, the special focus semantic value is also at work in ameliorating negative degree questions. There I will argue that the discourse structure projected by contrastive *wa* attached to the degree *wh*-phrase is an ordered set of polar questions, which can turn otherwise unanswerable questions into answerable one.

Chapter 6 summarizes the whole dissertation and addresses the remaining problems. It is shown that how the approach taken in this dissertation could be extended to the account of the discourse effects of other particles or sentence types. Moreover, I will exhibit what kind of further experimental studies would be needed in order to get a better grasp of the behavior of particles.

## Chapter 2

### Conveying ignorance / uncertainty

#### 2.1 Introduction

When someone asks you a question, giving them a complete answer is usually ideal whenever possible. Unfortunately, however, there are sometimes cases where our knowledge is limited. In such a case, giving only a partial answer to the question still seems better than giving no answer at all or simply saying “I don’t know”. When people give partial answers to questions, people usually use some linguistic device to show explicitly the answers are not exhaustive. It is because, as mentioned in the very beginning, we are usually expected to give complete answers to the questions according to the Maxim of Quantity (Grice, 1975).

There are many ways to achieve this. For example, the expressions in (1) are used to convey that there might be discrepancies between the speaker’s knowledge and a state of affairs in the actual world by explicitly expressing some uncertainty about the answer. With these expressions, at the same time, the speaker conveys that what follows such expressions is the maximum information that they can provide as an answer to the question.

- (1) a. I am not sure, but ...
- b. As far as I know ...
- c. To my knowledge, ...

The expressions above semantically convey the speaker has uncertainty, or the speaker’s knowledge is somewhat limited. However, using these expressions are not the only options. The speaker can also rely on the addressee to infer her uncertainty. For instance, in the dialogue in

(2), B's answer with modified numerals is likely to make A think that B does not know the exact number of the people who came to the party.

(2) A: How many people came to the party?

B: {At least, More than} 10 people came.

Why? That is because the question posed by A is usually interpreted to ask for the exact number of the people under discussion. However, B's answer does not indicate an exact number; B just used modified numerals instead. If B knew the exact number, answering with that number would be most informative. Assuming B is cooperative, A can make an inference that B could not provide such an answer because B is not sure of the exact number (i.e., answering using an unmodified numeral violates the Maxim of Quality). Through this process, A can conclude that B does not know the exact number of the attendees.

The process illustrated above is how we can derive ignorance inferences from the use of modified numerals pragmatically. This is not the only possible way, however. It is possible that some lexical items semantically encode the ignorance even though ignorance is not apparently the primary meaning of the lexical item unlike the expressions shown in (1). For instance, the primary meaning of *at least n* is that *n* is the minimum number, which has nothing to do with ignorance. However, as shown below, compared to other modified numerals such as comparatives, it sometimes seems to be plausible to regard *at least n* as “semantically” different from *more than n-1*, in terms of ignorance inferences.

When there are multiple plausible ways to deliver inferences, the question is how we can know the process through which such inferences are obtained. This is the question addressed in this chapter and also has been discussed by linguists. It has been noticed that apparently there are some contrasts between comparatives and superlatives in English and other Indo-European languages — only superlatives seem to convey ignorance inferences in some contexts. For example, the pair of sentences in (3) shows different acceptability as an utterance by a person who is supposed to have basic knowledge of geometry.

(3) a. # A hexagon has **at least four** sides.

b. A hexagon has **more than three** sides.

What is interesting here is that the boldfaced parts above should mean logically the same thing. However, a sentence with a superlative *at least* is felt infelicitous in this context. That is supposed

to be because the use *at least* seems to suggest that the speaker is ignorant. By contrast, a comparative does not show such an effect. Of course, the utterance (3b) sounds less informative but still sounds reasonable because the actual number of sides of a hexagon is six, and six is more than three.

This aspect of discrepancy between comparatives and superlatives lead some people to conclude that only superlatives semantically encode ignorance inferences (Geurts and Nouwen, 2007; Nouwen, 2010). In this kind of analysis, comparatives such as *more than n* and superlatives such as *at least n+1* have distinct semantic denotations despite their apparent logical equivalency. One way to achieve this is to implement a possibility operator into the semantics of superlatives so that using a superlative, not a comparative, can convey ignorance.

The question arises here is whether ignorance inferences brought by superlatives are indeed context-insensitive. The contrast in (3) suggests that is indeed the case. At the same time, we observed that it is likely that the use of any modified numeral can trigger ignorance inferences in (2). In this particular case, the question the discourse participants are trying to resolve is the number of participants of the party. Without any further contextual information, it is quite natural to interpret *how many* as *exactly how many*. With such a question under discussion, any modified numerals should convey ignorance inferences as mentioned earlier. In other words, in (2), both a superlative and a comparative can trigger ignorance inferences.

By contrast, when a superlative or a comparative is used in a polar question as in (4), it is unlikely that the *yes* answer to the question is taken as indicating the person who answered the question does not know the exact number. It is because what is at issue in the dialogue in (4) is whether the minimum number of the people was 10 or 11, not the exact number of the people.

- (4) A: Did {at least, more than} 10 people came to the party?  
B: Yes, {at least, more than} 10 people came to the party.

Now we have another possibility — what brings ignorance inferences is a context or more precisely, Questions under Discussion (QuDs: Roberts (1996, 2012)).

People have done experimental studies to figure out the answer to the question: Exactly how are ignorance inferences derived? One way to answer this question is to manipulate the context and see if the strength of the ignorance inferences varies. If ignorance inferences are encoded as part of the lexical meaning of *at least*, for example, it predicts that ignorance inferences

are available regardless of what kind of QuD is at issue in context. However, if ignorance inferences are merely implicatures that the listener obtain via Gricean reasoning, the availability of such inferences would change depending on a QuD in context. By adopting such experimental designs gives us a better understanding of the process through which people get this particular kind of inference.

The aim of this chapter is to seek for the division of labor between semantics and pragmatics in deriving ignorance inferences in Japanese by exploiting experimental methods. The next section builds up a background by introducing how speakers' ignorance or uncertainty can be conveyed in Japanese. Section 2.2 introduces the first experiment, which explores QuD sensitivity of ignorance inferences conveyed by some lexical items in Japanese. Section 2.3 reports the results of the other two experiments, which were designed to see the use of the lexical items of interest in controlled context. Section 2.4 gives overall discussion of the three experiments and builds up a bridge between this chapter and the next chapter. This chapter ends with a brief conclusion in Section 2.5.

### 2.1.1 Conveying uncertainty in Japanese

In this dissertation, the interest lies in how people use a linguistic tool available in Japanese to convey ignorance. There are a variety of ways to do that. One way is to use *sukunakutomo*, which translates to *at least* in English, as shown in (5).

- (5) Sukunakutomo 10-nin-ga kita.  
at least 10-CL-NOM came  
'At least 10 people came.'

If a question is a *how many* question, using other kinds of modified numerals can also trigger ignorance inferences. For instance, *izyoo* in Japanese as in (6) can convey ignorance in answering a *how many* question.<sup>1</sup>

- (6) 10-nin-izyoo-ga kita.  
10-CL-more than-NOM came  
'More than 10 people came.'

Other than using modified numerals, it is also possible to use a discourse particle *wa*, which is known as a topic marker in Japanese. However, just using *wa* cannot convey ignorance.

<sup>1</sup>Unlike English, *sukunakutomo 10-nin* and *10-nin izyoo* are semantically equivalent since *n izyoo* allows to include *n*.

Specifically, it is necessary to put phonological focus to the numeral and add *wa* to it, as shown in (7). This *wa* that accompanies phonological focus is called contrastive *wa* in the literature (Kino, 1973), distinguishing it from *wa* used to mark an aboutness topic.

- (7)  $[_F 10\text{-nin}]\text{-wa kita.}$   
 10-CL-WA came  
 ‘10 people-*wa* came.’

The sentence in (7) can be translated to “At least 10 people came.” in English, and in this sentence, *wa* can convey ignorance of the speaker as English *at least* can do.

On the one hand, ignorance inferences triggered by contrastive *wa* have been extensively discussed in the literature. On the other hand, modified numerals in Japanese have not been discussed in detail. To the best of my knowledge, the literature that looked at the semantics of modified numerals is Kamiya and Matsuya (2011), which used superlative modifiers *sukunakutomo* ‘at least’ and *seizei* ‘at most’. However, they did not investigate ignorance inferences from these lexical items. Given this, deepening an understanding of the behavior of *sukunakutomo* ‘at least’ in Japanese is also one of the aims of the experiments described in this chapter.

Contrastive *wa* has attracted attention in the field for a long time (Hara, 2006; Kuroda, 2005; Ito, 2009a), and the process for deriving so-called ignorance inferences is animately discussed as well. Below, I briefly overview two approaches (Hara, 2006; Ito, 2009a) to accounting for ignorance inferences triggered by contrastive *wa*. Importantly, the two approaches make different predictions about the environments in which ignorance inferences are available.

Hara’s approach assumes that ignorance inferences from contrastive *wa* are associated with the process in interpreting a sentence with *wa*, as in (8).

- (8) Let  $w$  be a world variable,  $sp$  the speaker, F the focus-marked elements, B the background, R: restriction.
- $CON(w)(sp)(B(F))$
- a. asserts:  $B(F)(w)$
  - b. presupposes:  $\exists F'[[F' \in R] \& [B(F') \Rightarrow B(F)] \& [B(F) \not\Rightarrow B(F')]]$   
 (There exists  $B(F')$  which is stronger than  $B(F)$ )
  - c. implicates:  $\exists w'[w \in Dox_{sp}(w)][B(F')(w') = 0]$



$(=\diamond\neg(B(F'))))$  [Hara (2006, (26))]

Under this approach, even though ignorance inferences are not at issue or not part of semantic entailments obtained by contrastive *wa*, it is predicted that this implication is context-insensitive. This is because the ignorance inference comes from (8c), which states using contrastive *wa* implicates that it is possible that  $B(F')$ , where  $F'$  is an element that is stronger than  $F$  as long as the speaker's knowledge is concerned. Besides (8c) is part of implications and not part of the semantics of *wa*, this is very similar to the approach of Geurts and Nouwen (2007) and Nouwen (2010), which assumes the possibility operator is implemented as part of the lexical semantics of *at least*.

Tomioka's approach, on the other hand, does not use a possibility operator to derive ignorance inferences. He assumes that contrastive *wa* is associated with a speech act operator. If *wa* is used in a declarative sentence, to which a speech act operator *ASSERT* is associated, with an alternative set derived by the phonological focus, contrastive *wa* introduces a set of alternative assertions, as in (9b).

- (9) a. Taro-wa [<sub>F</sub>10 satu]-wa hon-o yonda.  
 Taro-TOP 10 CL-*wa* book-ACC read  
 'Taro read 10-wa books.'
- b.  $\rightsquigarrow$  {Taro read 0 books, Taro read 1 book, ... , Taro read 10 books, Taro read 11 books, Taro read 12 books, ...}
- c.  $\rightsquigarrow$  {~~Taro read 0 books, Taro read 1 book, ...~~ , Taro read 10 books, Taro read 11 books, Taro read 12 books, ...}

From the assertions, what is entailed by the ordinary semantic value of the sentence (i.e., *Taro read 10 books.*) is eliminated, as shown in (9c). Given the survived alternatives, the listener makes an inference about the reason why the speaker evoked such alternative assertions. One reason could be the speaker's ignorance: the speaker is sure that Taro read 10 books but is not sure if he read more than 10. This approach predicts that ignorance inferences are available when the listener can conclude that the speaker's ignorance could be a reason for evoking alternatives. In other words, ignorance inferences are not mandatory.

The next section introduces the first experiment. The purpose of the experiment is to investigate whether ignorance inferences from contrastive *wa* and *sukunakutomo* 'at least' are sensitive

to QuDs. The design and predictions of the experiment are given first, and then I illustrate what predictions can be made from the existing analyses.

## 2.2 QuD Sensitivity of Lexical Items — Experiment 1

### 2.2.1 Design and Predictions

This experiment follows the design of the experiments conducted in [Westera and Brasoveanu \(2014\)](#). They manipulated QuDs in order to check whether ignorance inferences from the answers with modified numerals are sensitive to QuDs or not. The basic insight is that if ignorance inferences are associated with semantic meaning of a certain lexical item, it is unlikely to be affected by QuDs.

In this experiment, participants were presented with conversations between a judge and a witness in a court. The legal context was meant to reinforce the fact that the witness was fully cooperative and informative. Participants saw three kinds of different screens for each trial: In the first screen, a question from the judge was displayed. There were three kinds of questions: polar questions, *how many questions*, and *what* questions. A set of example questions is given in [\(10\)](#).

(10) *Examples of questions by the judge*

a. POLAR

Sono ningyoo no uchi, {10-tai-wa/ sukunakutomo 10-tai-ga / 10-tai izyoo-ga}  
 that dolls out of 10-CL-wa/ at least 10-CL-ga / 10-CL more than-ga  
 oohiroma-ni aru no o mimasita ka?  
 hall-LOC exist NL ACC saw Q

‘Did you see {10-wa/ at least 10-ga/ more than 10-ga} of the dolls in the hall?’

b. HOW MANY

Sono ningyoo-no-uti ikutu-ga oohiroma-ni aru no o mimasita ka?  
 that dolls-out of how many-NOM hall-LOC exist NL ACC saw Q

‘How many of the dolls did you see in the hall?’

c. WHAT

nani-ga oohiroma-ni aru no o mimasita ka?  
 what hall-LOC exist NL ACC saw Q

‘What did you see in the hall?’

In the second screen, the answer to the question by the witness was provided as a self-paced reading task. Each answer was divided into six regions, as shown in (11), in which the parentheses indicate the region. One region was displayed at a time, and participants pressed the space bar to read the next phrase. There were three kinds of answers: SUP, COMP, and WA.

(11) *Examples of answers by the witness*

(Watashi-wa) (sono ningyoo no uchi) {(10-tai-wa)/ (sukunakutomo 10-tai-ga)/  
 I those dolls out of 10-CL-wa/ at least 10-CL-NOM/  
 (10-tai-izyoo-ga)} (oohiroma-ni) (aru-no-o) (mimasita).  
 10-CL-more than-NOM hall-LOC exist-NL-ACC saw

'I saw 10-wa/at least 10/more than 10 of the dolls in the hall.'

Region 1: Subject: *watashi-wa* 'I'

Region 2: partitive: *sono ningyoo no uchi* 'of the dolls'

Region 3: Quantified phrases:

{*10-cl-wa/sukunakutomo N-cl-ga/N-cl-izyoo-ga* 'N-wa/at least N/more than N'}

Region 4: place: *oohiroma-ni* 'at the hall'

Region 5: embedded verbs: *aruno-o* 'exist'

Region 6: matrix verb: *mimasita* 'saw'

After they had finished reading the whole answer, the screen was switched to the third one, which displayed the conclusion the judge drew from the witness's answer, and participants were asked to indicate to what extent the judge's conclusion was justified: (5: completely justified, 1: not justified at all). The conclusion for all the experimental items was "*The witness does not know the exact number of (the object)*".

There were two items per condition for a total of 18 experimental items.<sup>2</sup> Latin square design was used to balance the items in each of nine lists. In a list, there were 18 experimental items and 36 fillers: 54 items in total. Fillers included stimuli that did not involve partitives in questions, answers with (un)certainty adverbs *tabun* 'probably', *daitai* 'approximately', and *tasikani* 'certainly', and *tatta* 'only'. The judge's conclusions with filler items were "*The witness thinks the number of the object was relatively large/small.*" or "*The witness thinks she might have seen 9/10/11 objects.*" The order of the 54 stimuli was randomized for each participant. The experiment was conducted on the Internet via Ibx farm.<sup>3</sup>

<sup>2</sup>For the complete list of items, see Appendix.

<sup>3</sup><http://spellout.net/ibexfarm/>

The predictions are as follows: If the QuD is a *how many* question, any answer type should trigger ignorance inferences since the witness does not use an exact number in answering the question. By contrast, when the QuD is a polar question, we would get weaker ignorance inferences if they are pragmatically derived; what is at issue is whether the minimum number of objects was *n*.<sup>4</sup> Finally, *what* questions are open-ended and serve as a control.

## 2.2.2 Results

### 2.2.2.1 Ratings — Strength of Ignorance Inferences

18 native speakers of Japanese volunteered to participate in this experiment. The results of the acceptability judgment are summarized in Table 2.1-2.3 and Figure 2.1-2.3 below. The numbers represent the mean of the acceptability judgments (1: the conclusion is not justified (i.e., no ignorance inferences are available), 5: the conclusion is justified (i.e., ignorance inferences are available)), and the numbers in the parentheses represent the standard errors.

How many	Polar	What
4.25 (0.18)	3.86 (0.23)	3.92 (0.20)

Table 2.1: Means and standard errors of *sukunakutomo* answers across QuD types

How many	Polar	What
3.39 (0.23)	3.14 (0.26)	3.86 (0.21)

Table 2.2: Means and standard errors of *wa* answers across QuD types

How many	Polar	What
4.03 (0.18)	4.17 (0.17)	3.78 (0.22)

Table 2.3: Means and standard errors of *izyoo* answers across QuD types

<sup>4</sup>Again, *n izyoo* ‘more than n’ can include n, so the polar question with *izyoo* would be about the minimum number, as is the question with *sukunakutomo* ‘at least’. As for a polar question with *wa*, what is at-issue is whether there are *n* number of objects or not, and the minimum number of the object is not necessarily at-issue. See Chapter 5 for *wa*-questions.

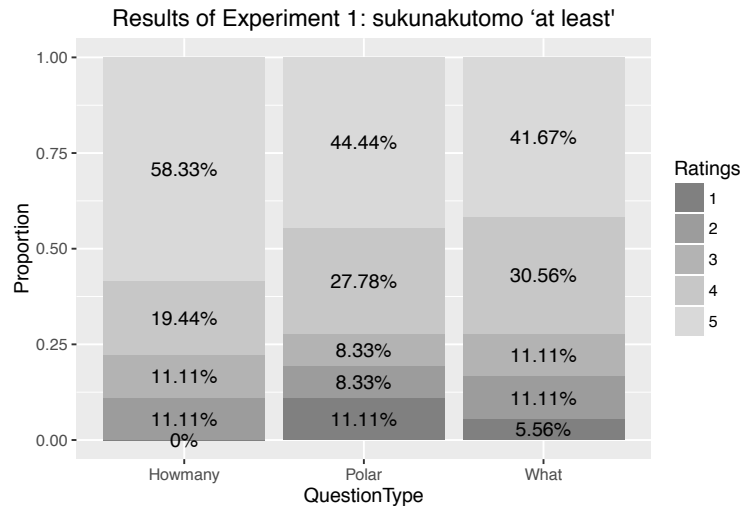


Figure 2.1: The proportion of the ratings for *sukunakutomo* answers with three QuDs

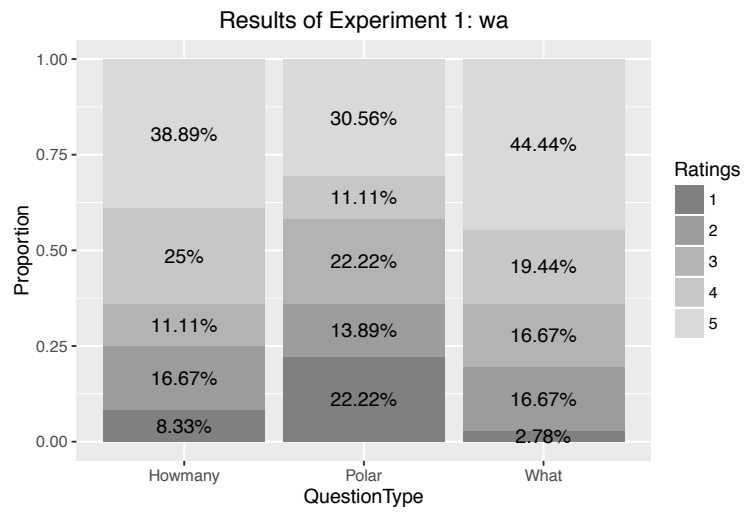


Figure 2.2: The proportion of the ratings for *wa* answers with three QuDs

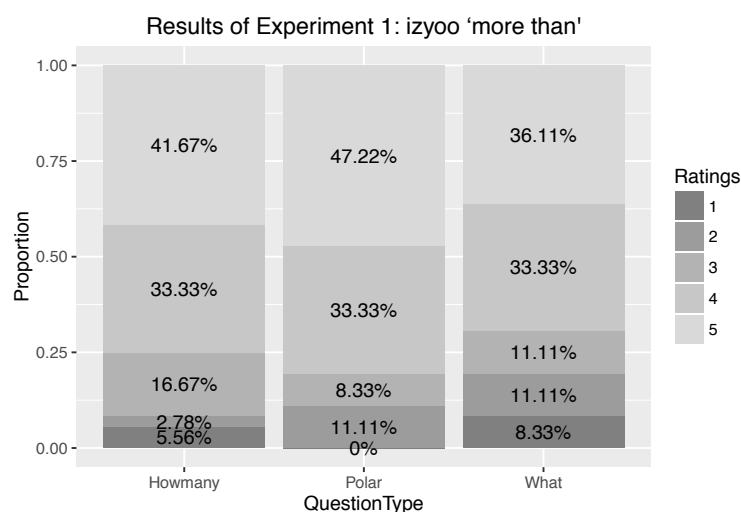


Figure 2.3: The proportion of the ratings for *izyoo* answers with three QuDs

For the statistical analysis, the data from COMP answers is included but will not be discussed in detail. I used mixed-effects ordinal probit regression models to analyze the data, treating the rating data as ordered factors.<sup>5</sup> The results with the model with the maximal random-effect structure that converged are reported below; this model included random intercepts for items and participants, QuD type random slopes for items and participants, and quantifier type random slopes for participants (no correlation between random intercepts and slopes was assumed). The reference level was *sukunakutomo* for the quantifier type, and WHAT for the QuD type.

There was a main effect of QuD type: ignorance inferences were rated higher with *how many* questions than the reference level: *what* questions ( $\beta=1.16$ ,  $SE=0.48$ ,  $z=2.43$ ,  $p < 0.05$ ). In addition, there was an interaction between question types and answer types. In particular, we found that when *wa* answers were used to answer *how many questions*, ignorance inferences were weaker ( $\beta=-1.21$ ,  $SE=0.43$ ,  $z=-2.80$ ,  $p < 0.01$ ). A similar effect can be observed with *wa* answers to polar questions ( $\beta=-0.7$ ,  $SE=0.4$ ,  $z=-1.75$ ,  $p = 0.08$ ). Although the interaction between *wa* and polar questions approached (but did not reach) significance, the two negative interactions together show that, overall, *wa* triggered weaker ignorance inferences than *sukunakutomo* in non-open-ended questions.

Examining only the *wa* data, we see that polar questions induced weaker ignorance infer-

<sup>5</sup>The models were estimated using the R package *ordinal* (Christensen, 2015).

ences relative to *what* questions ( $\beta=-0.73$ ,  $SE=0.33$ ,  $z=-2.22$ ,  $p < 0.05$ ) and that there was no difference between *what* and *how many*. In contrast, for *sukunakutomo*, *how many* questions induced stronger ignorance inferences relative to *what* questions ( $\beta=0.09$ ,  $SE=0.52$ ,  $z=2.10$ ,  $p < 0.05$ ), but there was no significant difference between *what* and polar questions.<sup>6</sup>

### 2.2.2.2 Reading Times

I report the results of the analysis of reading times even though the results were not so clear-cut and they were of our secondary interest to begin with. The exact relationship between reading times (cognitive cost) and the strength of ignorance inferences is to be investigated in the future research with a larger collection of the data.<sup>7</sup>

One participant whose mean RT was more than 3 standard deviations from the overall mean for all subjects was excluded from the analysis. The RTs per region for each answer type are shown in Figures 2.4 and 2.5 below. The influence of word length (measured in number of characters) and word position on RTs were factored out by running a linear mixed-effects regression model with log reading times (log RTs) as the dependent variable, word length and word position as fixed effects, and random intercepts for participants.<sup>8</sup> The resulting residualized log RTs were used as the dependent variable in all subsequent models. The model of analyzing reading times of the all data (including comparatives) included random intercepts for items and participant random slopes for QuD type. In region 4 (the first region immediately following the modified numerals), there was a main effect of answer type: comparative (*izyoo*) answers were read slower than *sukunakutomo* answers ( $\beta=0.18$ ,  $SE=0.09$ ,  $t = 1.98$ ,  $p < 0.05$ ). In addition, there was an interaction of question type and answer type: comparative answers were read faster when answering a POLAR question ( $\beta=-0.26$ ,  $SE=0.13$ ,  $t = -2.01$ ,  $p < 0.05$ ). There were no significant effects in regions 5-6.<sup>9</sup>

<sup>6</sup>The mixed-effect models used to analyze these subsets included random intercepts for items and participants, as well as QuD type random slopes (with no correlation between intercepts and slopes).

<sup>7</sup>In [Westera and Brasoveanu \(2014\)](#), they suggested that strong ignorance inferences were correlated with longer reading times in English.

<sup>8</sup>All linear mixed-effect models were estimated with the R package *lme4* ([Bates et al., 2015](#)).

<sup>9</sup>The behavior of comparatives is unexpected. We tentatively conjecture that comparative (*izyoo*) answers were read slower when answering WHAT questions than *sukunakutomo* or *wa* answers because *izyoo* can usually be associated with numerals (unlike *sukunakutomo* or *wa*, which have a less restricted distribution), and the QuD contributed by WHAT questions is not about numbers in any immediate way. In contrast, POLAR questions made it explicit that the QuD is about the number of objects under discussion, so *izyoo* answers are comparatively faster. Thus, the behavior of *izyoo* is interestingly different from the behavior of English more than; we leave the investigation of this contrast for a future occasion.

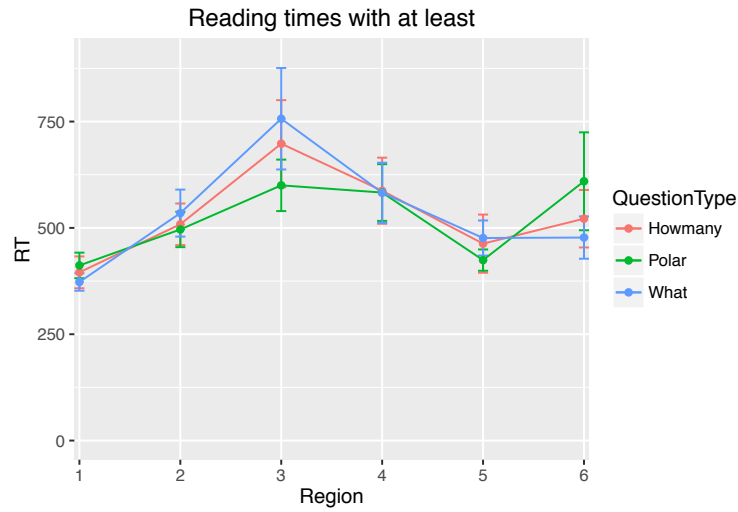


Figure 2.4: The reading times of *sukunakutomo* answers

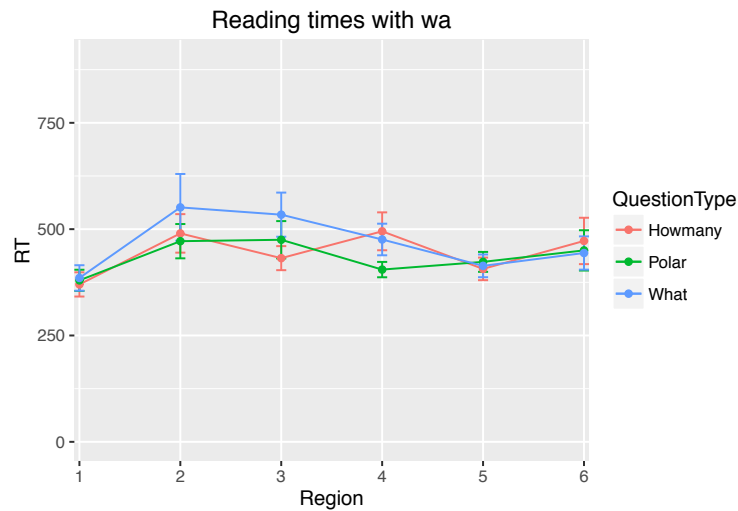


Figure 2.5: The reading times of *wa* answers

Looking at the subset of the data excluding the comparatives, we found that in Region 5, there was a tendency for *wa* answers to be read faster than the *sukunakutomo* answers; this effect approached but did not reach significance ( $\beta=-0.13$ ,  $SE=0.07$ ,  $t = -1.78$ ,  $p = 0.08$ ).

### 2.2.3 Discussion

The results first revealed that ignorance inferences triggered by *sukunakutomo* 'at least' are relatively context insensitive. Even though participants reported that they thought having igno-



rance inferences with *sukunakutomo* in answering *how many* questions were more reasonable than the other two kinds of questions, this is reasonable given that *how many* questions set the exact number of the object under discussion. What to be noted here is that there was no significant difference between polar questions and open-ended *what* questions. Since polar questions set the minimum number of the object under discussion, if ignorance inferences were pragmatically derived, the answer with *sukunakutomo* would not trigger such inferences. The prediction was nullified by the results, which indicate the procedure via which ignorance inferences from *sukunakutomo* are obtained should not so much depend on the QuD.

As for *wa*, first, weaker ignorance inferences were observed when *wa* answers were used to answer polar questions. This is predicted from the assumption that ignorance inferences are pragmatically derived. Since the QuD is not about the exact number of the object in this case, using the number + *wa* does not make the addressee infer that the speaker does not know the exact number.<sup>10</sup> In this respect, *wa* showed the behavior opposite to that of *sukunakutomo*. The behavior to *how many* questions needs a closer look. With this question type, stronger ignorance inferences would be predicted as long as the speaker uses any modifying expression with the numeral. However, not only did we not get stronger ignorance, but we observed a negative interaction effect here — when *wa* answers were used to *how many* questions, in particular, ignorance inferences were weaker.

The behavior of *wa* answers to polar questions can be accounted for as long as we rely on a pragmatic account of ignorance inferences. If ignorance were semantically implicated by the use of contrastive *wa*, ignorance inferences would be available no matter which kind of question it answers.<sup>11</sup> The behavior to *how many* questions could be accounted for by a pragmatic approach as well since the reason why the speaker evokes a set of alternative assertions by using *wa* does not have to be their ignorance. For instance, in (12), contrastive *wa* is used in an imperative, and therefore what is evoked by *wa* is a set of alternative orders. The reason for evoking alternative orders would not be the speaker's ignorance in this case. The implication that can be obtained from (12) is the speaker thinks there are other subjects to be prepared for.

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<sup>10</sup>It needs explaining why the speaker uses *wa*, not other particles in answering *wa* questions. In Chapter 5, I will discuss that is because *wa* questions invoke a special discourse structure, and the addressee uses *wa* to acknowledge the particular discourse structure to resolve the QuD. See Chapter 5 for the discussion.

<sup>11</sup>However, if using contrastive *wa* does evoke a set of alternative assertions as claimed by Tomioka (2009a), it is not clear why the speaker does that to answer the polar question.

- (12) [<sub>F</sub>Eego-wa] tyanto yatte-ok-e.  
 English-WA without-fail do-prepare-IMP  
 ‘At least, prepare yourself for ENGLISH.’ [Tomioka (2009a, (10))]

However, what could be a reason for which the witness evoked alternatives in the situation set up in Experiment 1? The alternative assertions evoked by the sentence with *wa* would look like (13) according to Tomioka’s account.

- (13) I saw 10-*wa* of the dolls in the hall.  
 ⇨ {I saw 11 of the dolls in the hall, I saw 12 of the dolls in the hall, ...}

In a court setting, the witness is supposed to be cooperative and give as much as information he could. Given the results of the experiment, people did not think the witness evoked alternatives due to his ignorance. In this case, it is not clear how the speaker used the alternatives that mention the number larger than 10.

#### 2.2.4 An Alternative Account

The results overall indicated that ignorance inferences from *sukunakutomo* are derived via a context-insensitive way while ignorance inferences from *wa* are likely to be derived pragmatically. However, just saying *wa* evokes a set of the alternative assertions does not seem to be very tenable, either. So we need to find a different way to derive ignorance inferences with *wa* which would accord with the results we got and to test the hypothesis in a different setting.

An alternative way to explain the behavior of *wa* is to say *wa* could invoke a different kind of alternatives. In fact, a sentence with contrastive *wa* could imply multiple things as shown in (14).

- (14) [<sub>F</sub>Taro]-*wa* kita. ‘[<sub>F</sub>Taro]-*wa* came.’  
 a. Taro came, but I do not know who else came.  
 b. Taro came, and Jiro did not come.

(14a) is an ignorance inference we have been talking about. There is no trouble in deriving this from a set of alternative assertions ({*Jiro came, Saburo came,...*}). However, (14b) is a little different. The implication given here is that there exists someone who did not come. If we replace *wa* with a default particle *ga*, we would not get such an implication from the assertion

itself. In other words, by using *wa*, the speaker can convey that she is contrasting Taro with other contextually salient individuals, about whom she is implicitly making a contrastive statement.

The proposal is that people understood the sentences with *wa* in Experiment 1 with an interpretation illustrated in (14b). In this interpretation, there is no ignorance inference, and therefore the speaker can be judged knowledgeable. In addition, the answers in Experiment 1 all contained partitives<sup>12</sup> and were set in a court-like situation; therefore, it is permissible to assume the participants thought there were contrasts between the objects the witness saw at a particular place and the rest of the objects, as illustrated in (15).

- (15) Watashi-wa sono ningyoo no uchi 10-tai-wa oohiroma-ni aruno-o mimasita.  
I those dolls out of 10-CL-wa hall-LOC exists-ACC saw  
'I saw 10-wa of the dolls in the hall.'
- a. I saw at least 10 of the dolls in the hall, but not sure how many.
- b. I saw 10 of the dolls in the hall, but I saw the rest in the bedroom/ but I did not see the rest of the dolls there.

This alternative hypothesis can explain the behavior of *wa* in Experiment 1. To *how many* questions, the sentence is ambiguous, and the participants got one of the interpretations in (15). Some of the participants thought the witness used *wa* since he does not have an exhaustive answer (=ignorance inferences), and others thought he used *wa* to mention the other group of the objects that is contrasted with those mentioned in the statement.

The alternative hypothesis and the results of Experiment 1 give the following prediction to be confirmed by other experiments: as long as the context licenses the speaker to make contrastive statements, *wa* could be used. The contrast could be between what the speaker knows and the uncertainty that the speaker has, but it does not have to be. It could be a different kind of contrast as we have observed in (15b). In other words, *wa* could be flexible. By contrast, *sukunakutomo* is strongly associated with ignorance regardless of the context. If there is a competition between the two lexical items, in a context in which the speaker is obviously ignorant, using *sukunakutomo* would be preferred to using *wa*. Furthermore, if the context allows us to assume that there is a contrastive statement that the speaker could make and the

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<sup>12</sup>The original reasons why we made all the experimental items include partitives are (i) With a partitive phrase (*N no uchi* 'out of N') and *sukunakutomo* 'at least' placed after that, it is possible to make sure that a superlative is modifying the numeral. (ii) Judge's mentioning the partitive phrase can establish a presupposition that there are multiple Ns under discussion and it can make the conversation more natural with *how-many* questions.

speaker is competent enough to make such a statement, *wa* would be the only option since *sukunakutomo* cannot be used in that way. The experiments introduced in the next section are designed to test this hypothesis.

## 2.3 Context Sensitivity of Lexical Items — Experiment 2&3

### 2.3.1 Design and predictions

Experiment 2 and 3 were carried out so as to investigate whether the contextual component could affect the choice of expressions (*wa*, *ga*, and *sukunakutomo*) in the answer. Experiment 2 investigated whether there is a clear contrast between the use of *wa* and that of *ga*.<sup>13</sup> Experiment 3 compared *wa* and *sukunakutomo*. The two experiments have the same design.

The contextual factors investigated in these experiments are the status of knowledge of the speaker and possible contrasts. The three kinds of contexts were set to cover all the possibilities, as illustrated in (16):

(16) Three contexts used in Experiment 2 and 3

- i. IGNORANT: the speaker is not knowledgeable, and there is no contrast  
*There was a social gathering of a lab. Taro wanted to attend, but due to a schedule conflict, he just went to the venue a little before it got started and said hello to people who were there and left. Next day, Hanako, Taro's friend, ran into Taro and asked, 'How many people were there at the social gathering yesterday?'*
- ii. CONTRAST: the speaker is knowledgeable, and there is a contrast  
*There was a social gathering of a lab, and Taro was the organizer and counted how many people actually came and how many did not. Taro's friend, Hanako, ran into him and asked, 'How many people came to the social gathering yesterday?'*
- iii. INCOMPATIBLE (with *wa*): the speaker is knowledgeable, no contrast in a context  
*There was a social gathering of a lab and Taro was the organizer and counted how many people actually came. Taro's friend, Hanako, ran into him and asked, 'How many people came to the social gathering yesterday?'*

<sup>13</sup>It is possible for *wa* to replace other particles such as the object marker *o*. However, only noun phrases used as a subject of non-stative predicates were used in Experiment 2-3.

The IGNORANT context is one in which the speaker is supposed not to have full-fledged knowledge about the number under discussion. In the CONTRAST context, it is made clear that the speaker knows the number under discussion. In addition to it, the context is designed to allow the speaker to make a contrastive statement: In (16ii), it is possible to make a contrastive statement about the number of absentees, for example. The last context is what is called INCOMPATIBLE context, which is designed to be incompatible with *wa* and *sukunakutomo* ‘at least’: the speaker is knowledgeable, which rules out the use of *sukunakutomo* and there is no contrast, which means *wa* cannot be licensed either.

There were four items for each condition (12 items total) and 32 fillers. The fillers included eight conditions used to examine whether the participants were paying attention to the background context. Examples of control fillers are provided in (17). There were two kinds of contexts: MORE THAN EXPECTED and LESS THAN EXPECTED, where the context suggests 10 is bigger or smaller than the speaker’s expectation. When 10 is larger than expected, only *mo*-answers should be felicitous, because this particle encodes the presupposition that the number is bigger than expected. By contrast, with a LESS THAN EXPECTED context, only *sika*+NEG-answers should be acceptable for the same reason. Without paying any attention to context, participants cannot determine which answer is felicitous.

(17) Examples of filler contexts

a. MORE THAN EXPECTED

*Taro had a make-up section yesterday. He had thought nobody might come because he told them that attendance was not obligatory and not going to be part of the grade. He just ran into Hanako, his colleague, and Hanako asked him ‘How many students came to your make-up class yesterday?’*

b. LESS THAN EXPECTED

*Taro had a make-up section of Intro to Linguistics, which had 50 students yesterday. He had thought almost everybody would come because he told them that attendance was obligatory and would be counted as part of the grade. He just ran into Hanako, his colleague, and Hanako asked him ‘How many students came to your make-up class yesterday?’*

(18) An answer pair of test filler questions

- a. *mo*-answer: compatible only with MORE THAN EXPECTED

10-nin mo kinoo zyugyoo-ni kita yo.  
10-CL MO yesterday to the class came

‘As many as 10 people came to the class yesterday.’

- b. *sika*+NEG-answer: compatible only with LESS THAN EXPECTED

10-nin sika kinoo zyugyoo-ni ko-nakat-ta yo.  
10-CL SIKa yesterday to the class come-NEG-PAST

‘Only 10 people came to the class yesterday.’

The experiments had two stages, both of which involved binary forced-choice tasks. On the first screen, the participants saw the context with a question and were directed to choose the more natural continuation between two possible answers. Once they chose an answer, the second screen displayed the context again, and the participant was asked to answer comprehension questions. For experimental items, the comprehension questions were always whether it was possible to assume that the speaker who answered questions knew the exact number of the people under discussion. The order of questions was randomized for each participant, and the experiments were distributed via Ibex farm.

The predictions for each experiment are as follows: In Experiment 2, in which *wa* and *ga* were compared, *wa* should be preferred in IGNORANT context since *ga* answers indicate the answer is exhaustive. *Wa* should be unavailable in incompatible context whereas *ga* is perfectly acceptable. As for CONTRAST context, the acceptability of *wa* would be higher than that with INCOMPATIBLE context since the contextual contrast made in CONTRAST context has a potential for licensing the use of *wa*. In Experiment 3, where *wa* and *sukunakutomo* were compared, both answers would be just chosen by chance in INCOMPATIBLE context since neither of them is compatible with the context. In IGNORANT context, *sukunakutomo* would be preferred to *wa* since *sukunakutomo* could encode ignorance in a more unambiguous way than *wa*. In CONTRAST context, *wa* should be preferred to *sukunakutomo* since *sukuakutomo* cannot be used to imply the existence of a possible contrastive statement that the speaker could make.

## 2.3.2 Results

### 2.3.2.1 Experiment 2

Eighty-eight native speakers of Japanese recruited on the Internet volunteered to participate in this experiment. Seventeen participants were excluded because they failed to choose the correct answers for fillers more than once. The data summary for the 71 remaining participants is provided in the table below.

	IGNORANT	CONTRAST	INCOMPATIBLE
<i>ga</i>	65	255	267
<i>wa</i>	219	29	17

Table 2.4: The results of Experiment 2 (*wa* vs. *ga*)

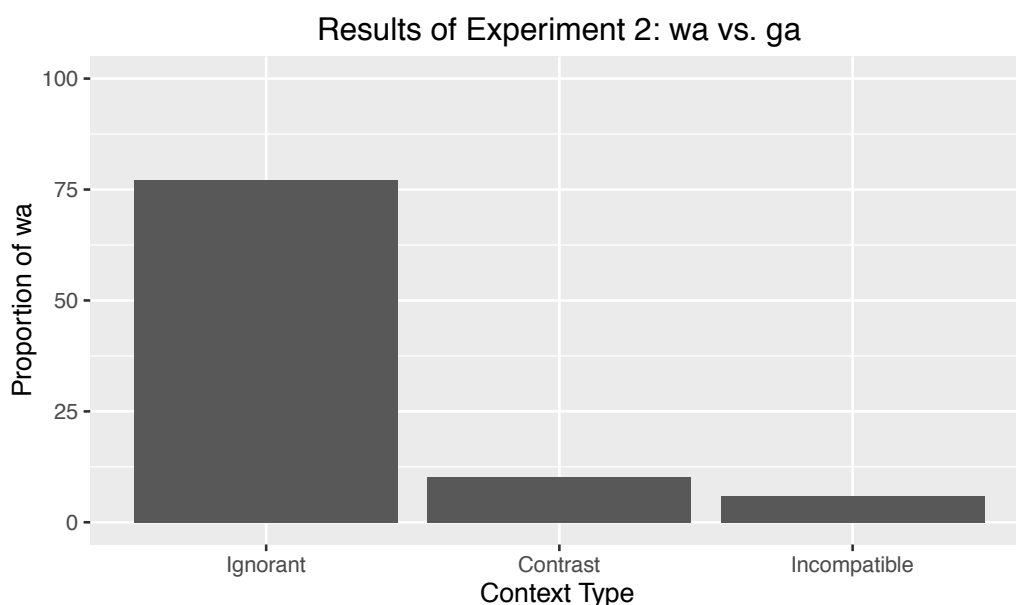


Figure 2.6: The proportions of *wa* choice across context types in Experiment 2

Mixed-effects logistic regression models were used to analyze the data; all models included crossed random intercepts and context random slopes for the 71 participants and 12 items. The reference level was set to *INCOMPATIBLE* for the context and to *ga* for the particle in the responses. Analysis showed that only the effect of the *IGNORANT* context was significant ( $\beta = 5.34$ ,  $SE = 0.95$ ,  $p < 0.001$ ). The *CONTRAST* context was not statistically different

( $\beta = 1.21$ ,  $SE = 0.93$ ,  $p = 0.20$ ) from INCOMPATIBLE contexts. These results showed the particle *ga*, which is used to mark an exhaustive answer, is preferred whenever the speaker is knowledgeable. By comparison, and contrary to expectations, the contrast in the context did not promote participants' use of *wa* often enough to be statistically significant.

It is worth noting, however, that examining the data by participant, there was a subset of participants who had a sharp contrast<sup>14</sup> as to the distinction of *ga* and *wa* between INCOMPATIBLE and IGNORANT contexts and showed preference for *wa* in the CONTRAST context.

In sum, although the experiment found only a subtle difference between *wa* and *ga* in terms of the sensitivity to contrast in the context, at least there was positive evidence that the CONTRAST context can promote use of *wa* for some speakers. In addition, the results confirmed that the speaker's knowledge is an important factor in deciding which of *wa* or *ga* is the natural option.

### 2.3.2.2 Experiment 3

Fifty-nine native speakers of Japanese participated in this experiment. None of the 59 participated in either Experiment 1 or 2. Twelve participants were excluded for failing to choose the correct answers for fillers more than once. The data summary for the remaining 47 participants is provided in the table below.

	IGNORANT	CONTRAST	INCOMPATIBLE
<i>at least</i>	146	63	93
<i>wa</i>	42	125	95

Table 2.5: The results of Experiment 3 (*sukunakutomo* vs. *wa*)

<sup>14</sup>By “a sharp contrast”, I am referring to people who chose *ga* for all INCOMPATIBLE contexts and *wa* for all IGNORANT contexts. In this experiment, there were people who chose *ga* for all contexts presumably because they were not sure which to choose and *ga* is the default particle to mark the subject.



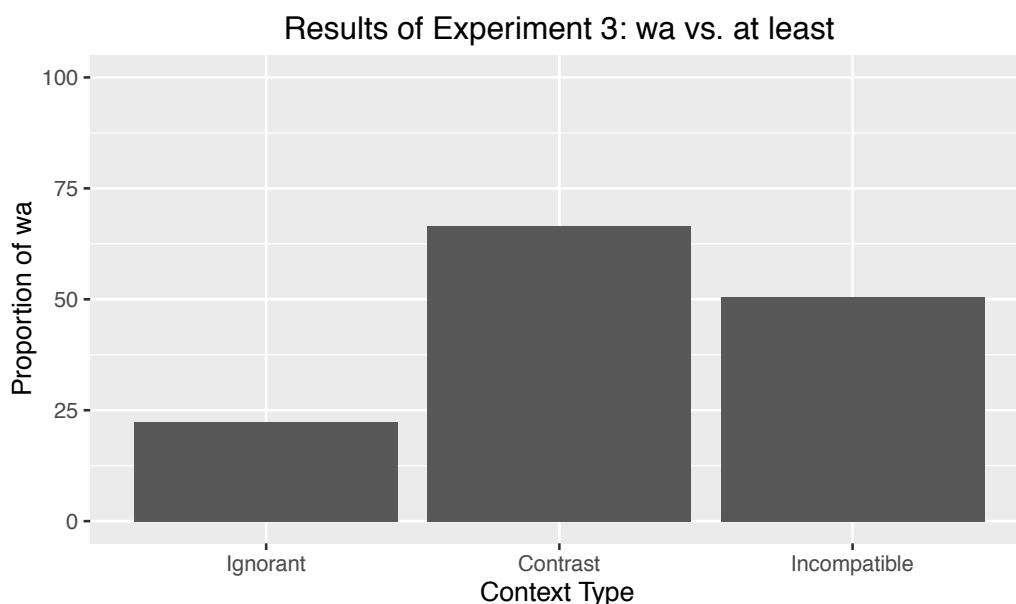


Figure 2.7: The proportions of *wa* choice across context types in Experiment 3

For INCOMPATIBLE contexts, both *sukunakutomo* and *wa* are predicted to be infelicitous because the speaker is presumed to be knowledgeable and there is no contrast. Therefore, both particles should be chosen more or less at random, and the results showed that it was indeed the case.

Mixed-effects logistic regression models were used to analyze the data; all models included crossed random intercepts and context random slopes for the 47 participants and 12 items. The reference level is again INCOMPATIBLE for contexts and *sukunakutomo* for answers. The analysis showed that *sukunakutomo* was more often used with IGNORANCE contexts ( $\beta = -1.70$ ,  $SE = 0.48$ ,  $p < 0.001$ ). Furthermore, *wa* was more often chosen with CONTRAST contexts ( $\beta = 1.01$ ,  $SE = 0.36$ ,  $p < 0.01$ ). In all, the results suggested that speakers were sensitive to whether there was a contrast or not in choosing between *wa* and *sukunakutomo* for a natural continuation of the sentence.

### 2.3.3 Discussion

Experiment 2 and 3 showed that native speakers are sensitive to context when they were forced to make a more natural choice between two options. Experiment 2 showed that when choosing

between *wa* and *ga*, they rely on contextual information to know whether the speaker is knowledgeable or not. This proved to be the case regardless of whether or not there was a contrast in the context, although there was a subset of speakers who appeared to be sensitive to this kind of contextual information. In other words, the majority of the participants chose *ga* in contexts where the speaker was supposed to be knowledgeable because *ga*, which carries exhaustive interpretations, can always suggest the answer is a complete answer to the QuD. This means that *ga* is always an available option whenever the speaker is fully knowledgeable.

Experiment 3 showed that a contrast available from the context could be a key to choosing between *wa* or *sukunakutomo* as an appropriate expression. Even though *sukunakutomo* is accompanied by *ga*, which marks exhaustive answers by itself, this expression was favored whenever the speaker was judged to be ignorant about the number under discussion. By comparison, when the speaker was judged knowledgeable, and crucially, there was a contrast in the context, *wa* was preferred. This difference is demonstrated even more clearly, given the results that both *wa* and *sukunakutomo* were chosen with equal frequency when the context indicated that the speaker was supposed to be knowledgeable and there was no contrast.

## 2.4 Overall Discussion

The results of Experiment 1-3 gave us the following results: Ignorance inferences from *sukunakutomo* ‘at least’ are less context sensitive (from stronger ignorance inferences from polar questions in Experiment 1). Since there is a closer connection between *sukunakutomo* and ignorance inferences, when the speaker is given a choice, they prefer to choose this lexical item to convey ignorance (from Experiment 3). By contrast, ignorance inferences from *wa* are sensitive to context (from Experiment 1). In particular, it is sensitive to what could be possible questions under discussion — when it is possible to make a contrast statement in context, *wa* can be used by the speaker in order to suggest it (from Experiment 3). In the following, I will what kind of analysis could best account for the behavior of *sukunakutomo* and *wa*. The analysis for *wa* will be discussed more intensively in the next chapter.

### 2.4.1 Ignorance inferences from *sukunakutomo*

The results from the experiments indicate we need a way to derive ignorance inferences without depending on context. To achieve the aim, I claim that adopting the semantics of *at least* proposed by Büring (2007, (30)), given below as (19) to Japanese counterpart is a plausible way to proceed.

- (19)  $\llbracket \textit{at least } A \rrbracket = \llbracket A \rrbracket - \cup (\textit{ABOVE}(A)) \vee \cup (\textit{ABOVE}(A))$   
 for any expression E,  $\textit{ABOVE}(E) := \cup \{O' \mid \langle \llbracket E \rrbracket, O' \rangle \in \llbracket E \rrbracket_A\}$   
 $(\llbracket E \rrbracket_A \text{ is scalar alternatives of E (Krifka, 1999)})$   
 $\rightsquigarrow$  Exactly A or more than A

Following Büring, I assume *at least n* is generated as the Degree Phrase specifier to an AP and moved to a propositional position. Then ‘*At least 10 people came.*’, for example, should have an LF and interpretation as in (20).

- (20) at least 10  $[\lambda d[\llbracket_{\text{AP}} d\text{-many} \rrbracket \text{ people came}]]$   
 $10 = \max(\lambda d. d\text{-many people came}) \vee 10 < \max(\lambda d. d\text{-many people came.})$

The availability of ignorance inferences from *sukunakutomo* can be explained by associating the inferences with the implicature caused by disjunction. Given that the sentence with *sukunakutomo* denotes  $p \vee q$  as an answer, it is implied that the speaker thinks both of  $p$  and  $q$  are possible answers. This implication can be derived by the Maxim of Manner or Quantity (Grice, 1975).

The process illustrated above does depend on pragmatic inference by the speaker — the semantics of *sukunakutomo* does not involve any semantic possibility operator unlike the analysis of *at least* proposed by Nouwen (2010). The detailed analysis of this particular modified numeral is not the main topic to be discussed in this dissertation, but the reason I did not implement a possibility operator is because *sukunakutomo* can be used with another modal operator and in that case it does not have to express an epistemic possibility. For instance, Büring (2007, (15)) argues that with *at least* and *must*, there are two possible interpretations:

- (21) John has to read at least three books.  
 a. It has to be the case that John read three or more books.  
 b. Three or more books is such that John has to read such many books.

The reading in (21a) is what Büring calls an authoritative reading while (21b) is a speaker insecurity reading. The potential problem for Nouwen (2010) is that with their analysis, it would not be possible to derive the authoritative reading without further ado, because their semantics of *at least* involves an epistemic possibility operator. According to my intuition, the Japanese counterpart of (21), which is given below as (22), has two readings, too.

- (22) John-wa sukunakutomo san-satu-no hon-o yoma-nakerebanaranai.  
 John-TOP at least 3-CL-GEN book-ACC read-must  
 'John must read at least three books.'

This is why I avoided implementing an epistemic possibility operator into the semantics of *sukunakutomo* itself. However, saying *sukunakutomo* has a disjunctive semantics can also account for context-insensitive ignorance inferences triggered by *sukunakutomo* in Experiment 1. Whatever the QuD might be, as long as the speaker chooses to use a disjunction, it should be the case that the speaker thinks both options are possible answers. This explains context-insensitivity of *sukunakutomo* in Japanese: even with polar questions, stronger ignorance inferences were obtained (mean rating = 3.86). In actuality, Büring's semantics of *at least* explains the behavior of *sukunakutomo* better than that of *at least* in English, which showed context sensitivity in Westera and Brasoveanu (2014)'s experiment.

Lastly, let me discuss briefly numerals without any numeral modifiers. The sentences with unmodified numerals such as (23) were not included in the experiments, but the unmodified numerals are usually interpreted as meaning *exactly n*. As a result, we do not get ignorance inferences from (23).

- (23) 10-nin-ga kita.  
 10-CL-NOM came  
 '10 people came.' ↗ Not sure how many

However, as is discussed in the literature, this *exactly n* interpretation is likely to come from Gricean reasoning. The addressee interprets a sentence such as (23) conveying as much information as possible the speaker can, and also the addressee expects the speaker to display some signal if there is any uncertainty about the number on the speaker's side.

The point I would like to mention here is that if the *exactly 10* interpretation is pragmatically derived from (23), the semantic meaning of this sentence should be '10 or more people came' which is the same as what (20) denotes. Both sentences convey the information that the

number of people who came is 10 or more than 10. This means that the difference between the two should come from pragmatics — with *sukuankutomo*, ignorance inferences are the default interpretation since the sentence is more marked due to its disjunctive semantics. Without any modifiers, such an inference does not come about by default. It is partly because the semantics does not contain disjunction, and also due to the existence of the lexical item that can explicitly signal uncertainty. Not using such an item can imply the number is precise when it does not accompany any modifiers.

#### 2.4.2 Ignorance inferences from *wa*

The first thing we need to explain is context-sensitivity of ignorance inferences from *wa*. In particular, it should be sensitive to a possible question to be asked in the discourse, as shown by the results of Experiment 3. At the same time, the analysis also must account for the two-sided meaning of *wa*: *wa* could derive ignorance inferences in a context where the speaker could be ignorant; at the same time, *wa* is used to make contrastive statements as well.

The upshot is that *wa* should be able to access a complex discourse structure. We have seen that just making alternative assertions does not fully account for available interpretations of sentences with contrastive *wa*. In particular, it is challenging to derive a contrastive interpretation from alternative assertions. To achieve this aim, treating contrastive *wa* as a contrastive topic would be the best way to do. Not only can this explain the empirical data but also matches the fact that *wa* is a topic marker in Japanese. The detailed analysis will be given in the next chapter, but below I will sketch how we derive ignorance inferences or contrastive statements by adopting an idea that contrastive *wa* is a contrastive topic.

The general idea about a contrastive topic (CT) is that it can access a complex discourse structure (Büring, 2003; Constanti, 2014). The discourse structure is built upon Questions under Discussion (QuDs) in the discourse (Roberts, 1996, 2012). For instance, it is observed that CTs are realized differently depending on the discourse structure entertained in the discourse<sup>15</sup>:

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<sup>15</sup>In (24), the words written with capital letters bear phonological focus. The focus (what is marked with F in the example) and CT both have phonological prominence, but how they have phonological prominence is different (Lackendorf, 1972).

- (24) Who ate what?
- a. A: What about Fred? What did he eat?  
 B: FRED<sub>CT</sub> ate BEANS<sub>F</sub>.
- b. A: What about beans? Who ate them?  
 B: FRED<sub>F</sub> ate BEANS<sub>CT</sub>.

In (24), a big question that the discourse participants are trying to resolve is ‘*Who ate what?*’ To answer this question, there are at least two ways to proceed. One way is to look for an answer person by person (24a), and the other is to answer food by food, as in (24b). The crucial finding is that if CT and F are switched in the same context, they are infelicitous.

Adopting the idea that *wa* is sensitive to the discourse structure, as shown above, it is possible to derive the two kinds of interpretations of our interest. The basic idea is that when the speaker uses contrastive *wa*, she is actually signaling that there is a complex discourse structure that could be entertained by the discourse participants. Depending on the structure, what is implicated by the use of *wa* would be different.

Given (25), let us look at how we can derive the two interpretations.

- (25) a. nan-nin-ga paatii-ni kita no?  
 how many-ACC party-to came Q  
 ‘How many people came to the party?’
- b. [<sub>F</sub>10 nin]-wa paatii-ni kita yo  
 10 people-*wa* party-to came  
 ‘10 people-*wa* came to the party.’  
 ~> More people might have come.  
 ~> There were people who did not come.

Let us see how we can derive the ignorance inference first. In such a case, the big question to be addressed in the discourse is the same as (25a). They want to figure out (exactly) how many people came. What is achieved by using a CT in (25b) is that the speaker is signaling she is adopting a particular strategy. That is, she is answering a part of the big question, namely ‘*As far as you know, how many came?*’. Mentioning that she is only answering a part of the big question, she is implicating that it is possible to ask another question such as ‘*Are there people who might have come but you are not sure?*’. In all, what is indicated by using *wa* in this case

is that the speaker is not competent — her assertion might not have the maximum information that is needed to answer the QuD in the discourse.

When the speaker is competent but uses contrastive *wa* regardless, the speaker is signaling that there is another question that can be asked, too. The question cannot be random but should be (i) related to the alternative evoked by the focus and (ii) relevant to the question answered by the *wa* answer in that they can make up a big QuD together. In (25), the possible question suggested by the use of *wa* by a competent speaker could be one such as ‘*How many people did not come?*’, which relates to the asserted answer because it uses the same alternative set. In addition, this question can be considered relevant to the question in (25a), given that not only the attendees to the party but also the absentees could be at issue in some context.

This approach accounts for the basic behavior of *wa* answers in Experiments and also accords with some empirical facts. One thing is the focus alternative is utilized to make up a possible QuDs that the speaker implicates to be asked in the discourse. In addition, the nature of *wa*, which is a topic marker in Japanese, is captured by saying this particular *wa* is operated at a level of discourse topic.

## 2.5 Chapter Conclusion

In this chapter, ignorance inferences that could be obtained from two lexical items (contrastive *wa* and *sukunakutomo* ‘at least’) in Japanese were discussed. Though it is not trivial where is the division of labor between semantics and pragmatics in deriving such inferences, the experimental studies could give us clues to more plausible analyses. In this chapter, it was shown that ignorance inferences in Japanese are derived via two different mechanisms: *sukunakutomo* triggers them via disjunctive semantics (Büring, 2007) or alternatively the speaker can use *wa* to imply that the speaker is not competent through implicating it is possible to ask a question that mentions some possibility. The latter strategy depends on the context, in particular, QuDs. This discourse sensitive strategies can be best accounted for by claiming *wa* is a CT. The next chapter discusses this proposal in more detail.

## Chapter 3

### Contrastive *wa* as a Contrastive Topic

#### 3.1 Introduction

In the previous chapter, it was revealed that ignorance inferences from contrastive *wa* were context-sensitive. In particular, this lexical item is sensitive to QuDs that are potentially available in context. Given that *wa* is a topic marker in Japanese, it is quite reasonable to assume that contrastive *wa* is a realization of a contrastive topic (CT), which is argued to be able to access the structured discourse (Büring, 2003; Constant, 2014) built up on Questions under Discussion (QuDs (Roberts, 1996)). This chapter aims to give a formal analysis of contrastive *wa* that can account for the behavior of contrastive *wa* that we observed in Chapter 2 as well as other general characteristics of the item, which have been extensively discussed in the literature.

This chapter is organized as follows: In the next section, I will illustrate things that need to be accounted for with respect to the behavior of (contrastive) *wa* in Japanese, which includes flexible implications conveyed by contrastive *wa* discussed in the last chapter. In section 3.3, I will lay out an informal sketch of the analysis, which bases on an account for the behavior of contrastive topics in English. Section 3.4 shows how the formal tool (continuation) can provide plausible solutions along with a brief introduction of this framework. Given the whole picture of the proposed analysis, the proposed approach will be evaluated comparing it with the other studies of contrastive *wa* or contrastive topics in the literature in section 3.5. The last section provides a quick summary of the chapter and remaining problems, and it also serves to set up a little bridge between the first half of the dissertation and the second.



## 3.2 Things that need to be accounted for

In this section, I will review the behavior of (contrastive) *wa* in general, which needs to be accounted for by the analysis. Though the main interest of this dissertation is contrastive *wa*, this section begins with a brief illustration of non-contrastive *wa* (i.e., *wa* used as an aboutness topic) since in the ordinary dimension both topic *wa* and contrastive *wa* will be treated on a par, as will be shown later.

### 3.2.1 *Wa* as an aboutness topic marker

The morpheme *wa* is a well-known topic marker in Japanese. The most basic function of this particle is to mark an aboutness topic (Reinhart, 1981) as in (III). In this sentence, *wa* marks a discourse-old (or familiar) referent and a predicate adds a description about the entity. Typically, with this usage of *wa*, a phrase XP to which *wa* is attached does not have phonological focus marking (F-marking).

- (1) Taro-wa gakusee da.  
Taro-*wa* student COP  
'Taro is a student.'

In (III), semantically *wa* itself does not seem to do anything. Changing *wa* into *ga* in (III) does not change an at-issue content that Taro is a student even though the two sentences are used differently in terms of the discourse structure. Relatedly, typically this non-contrastive *wa* cannot be used to mark new information: it cannot be used to introduce a new discourse referent, as in (2). Using *wa* with a phrase that does not bear phonological focus to answer a constituent question is infelicitous (3b).

- (2) \* Mukasimukasi, arutokoro-ni oziisan-wa imasita.  
once upon a time in some place an old man-*wa* existed  
'One upon a time, there lived an old man.'
- (3) a. Nani-ga suki desu ka?  
what-NOM likable COP Q  
'What do you like?'
- b. \* Udon-wa suki desu  
udon-*wa* likable COP  
'I like udon'

### 3.2.2 Contrastive *wa*

When an XP that *wa* is attached to has an element that bears phonological focus, *wa* is considered as being used as contrastive *wa*. This particular usage of *wa* is our main interest in this chapter. In the following, the distinct properties of this lexical item are illustrated.

#### 3.2.2.1 Contrastive *wa* answers

Even though a phrase with an aboutness *wa* cannot be used as an answer to a question, once there is an associated focus, *wa*-marked phrases can be used to answer a question. However, the *wa*-marked answers are different from answers that are marked with the default particle in that *wa* answers can convey more than the literal meaning. For instance, from the answer with *wa* such as (4b), it is possible to get an ignorance inference of the speaker (i.e., the speaker is not sure what else Taro ate) or to infer that there were some dishes that Taro did not eat.

- (4) a. Taro-wa nani-o tabemasita ka?  
Taro-TOP what-ACC ate Q  
'What did Taro eat?'
- b. [<sub>F</sub>Udon]-wa tabemasita.  
udon-wa ate  
'He ate udon.'
- ↪ There are other food that Taro might have eaten.  
↪ There are other food that Taro did not eat.

In this case, information structurally the *wa*-phrase works as Focus, which gives new information. Furthermore, it is worth noting that there is no other focus other than contrastive *wa* involved in the sentence. For example, in (4b), the verbal part does not bear phonological focus. This would be one of the unique properties of Japanese contrastive *wa* since lone CTs are not always available in German, for example (Büring, 2003, 532).

#### 3.2.2.2 Resists being attached to the maximal element

Contrastive *wa* cannot be used when whatever *wa* attaches to refers to the maximum in the relevant domain, as shown by (5a) and (5b).

- (5) a. Question: How many people came?

# [F Minna]-wa kita.  
everyone-*wa* came.

(Intended:) ‘Everybody came.’

- b. Context: *Taro is teaching a class of 30 students. Hanako asks how many of them passed the exam, and Taro answers:*

# [F 30 nin]-wa ukatta yo.  
30 CL-*wa* passed

‘30 students passed.’

(5a) is a case in which the lexical item attached to *wa* semantically refers to the maximum. By contrast, in (5b), the *wa* answer is infelicitous because in this context, it refers to the maximum in the relevant domain.

It is not the case that *wa* can never be used with an item such as *minna* ‘everybody’, however. With negation, the sentence is grammatical (6). When negation is present, it needs to be interpreted as sentential negation taking wide scope rather than being interpreted as predicate negation. This scope inversion phenomena is what we can also observe with CTs in other languages as well (Büring, 1997).

(6) [F Minna]-wa konakatta.  
everyone-*wa* did not come.

‘It was not the case that everyone came.’

↪ Not all people came. (\*Nobody came.)

### 3.2.2.3 Interaction with Focus

As mentioned earlier, in some languages contrastive topics appear with other foci. The main job of CTs used with Foci is to indicate that the speaker is entertaining a certain strategy to resolve the QuD which is addressed in context. Such a role of a CT can be illustrated in the English example below.<sup>1</sup>

(7) Who ate what?

a. A: What about Fred? What did he eat?

B: FRED<sub>CT</sub> ate BEANS<sub>F</sub>.

---

<sup>1</sup>In English, CTs are realized by a certain phonological accent, namely B-accent (Jackendoff, 1972). The so-called (informational) focus has a different accent pattern (i.e., A-accent).

- b. A: What about beans? Who ate them?  
 B: FRED<sub>F</sub> ate BEANS<sub>CT</sub>.

Here, a big question to be resolved is ‘*Who ate what?*’ To figure out answers to this question, there are at least two ways to proceed. One way is to look for an answer person by person (7a), and the other is to give answers food by food, as in (7b). The crucial finding is that if CT and F are switched in the same context, they are infelicitous, as shown in (8).

- (8) Who ate what?  
 a. # A: What about Fred? What did he eat?  
 B: FRED<sub>F</sub> ate BEANS<sub>CT</sub>.  
 b. # A: What about beans? Who ate them?  
 B: FRED<sub>CT</sub> ate BEANS<sub>F</sub>.

The interactions between foci and CTs are explained by positing that the different realizations of them presuppose the different discourse structures or strategies (i.e., how to approach an answer to QuD) (Büring, 2003; Constant, 2014).

Contrastive *wa* can interact with foci as well. The example below is a Japanese version of (8). (9a), in which *wa* marks the subject is completely felicitous, while (9b) is degraded.

- (9) Context: Speakers are trying to figure out who ate what.

- Taroo-wa? Nani-o tabeta?  
 Taro-TOP what-ACC ate  
 ‘What about Taro? What did (he) eat?’  
 a. TAROO<sub>CT</sub>-wa MAME<sub>F</sub>-o tabeta.  
 Taro-*wa* beans-ACC ate  
 Taro ate beans.  
 b. # TAROO<sub>F</sub>-ga MAME<sub>CT</sub>-wa tabeta.  
 Taro-*wa* beans-ACC ate

Following the analysis of contrastive topics in the literature, the contrast between (9a-b) shows that each of them presupposes different strategies to answer the overarching QuD.

### 3.2.2.4 Multiple CTs

It is possible to have multiple contrastive *was* in a sentence as in (10).

- (10) John<sub>F</sub>-wa Mary<sub>F</sub>-wa Bob<sub>F</sub>-ni-wa syookaisita.  
 John-wa Mary-wa Bob-DAT-wa introduced  
 John<sub>CT</sub> introduced Mary<sub>CT</sub> to Bob<sub>CT</sub>.’ [Yabushira (2017, 25)]

Note that the first *wa* phrase can be ambiguous: generally a sentence-initial *wa* could be an aboutness topic. In (10), there are still at least two contrastive *was* in a row. This might not be a unique property of contrastive *wa*, as Constanti (2014, 76) notes that English can have multiple CTs in a sentence as well when there is an appropriate context, as shown by (11).

- (11) **The ABC Diet:** Everyday, one eats the following three meals, in any order: Avocado, Burrito, Cheesecake.
- a. For each day of the week, tell me what time you have each food.
  - b. On Sundays<sub>CT</sub> ... the burrito<sub>CT</sub> ... I have for lunch<sub>F</sub>.

It is worth noting that CT-marked phrases are organized in the order of the sorting keys. In (10), the underlying QuD ‘*Who introduced whom to whom?*’ is answered by referring to the subject first, to the direct object second, and then finally to the indirect object.

### 3.2.2.5 Sentence initial CTs

The *wa* marked phrase can appear either sentence internally or initially, as in (12a-b).

- (12) a. Taroo-ga Hanako<sub>F</sub>-wa paatii-ni syootai-sita.  
 Taro-NOM Hanako-wa party-DAT invite-did  
 ‘Taro invited Hanako<sub>CT</sub> to the party.’
- b. Hanako<sub>F</sub>-wa Taroo-ga paatii-ni syootai-sita.  
 Hanako-wa Taro-NOM party-DAT invite-did  
 ‘Taro invited Hanako<sub>CT</sub> to the party.’

Hoji (1985, 131) provides an argument that the *wa* phrase in (12b) is base-generated in that position by showing that it cannot be reconstructed, as shown by (13). If the phrase were marked with *o*, which is an accusative marker, the sentence would be grammatical since in this case the phrase with *zibun* is supposed to be scrambled from the base-generated position (i.e., the object position of *suteta* ‘threw away’) and hence it can be reconstructed.<sup>2</sup>

<sup>2</sup>Hoji (1985, 147) mentions that (13) can be good if *wa* has heavy stress. I do not think putting stress on *hon* ‘book’ can rescue the sentence in the same way, so I assume even with a contrastive interpretation, the *wa*-phrase in (13) is base-generated in the sentence-initial position. Hoji further argues that the topic *wa* is base generated in the (sentence initial) topic position, while contrastive *wa* is moved there from the original position. But note that contrastive *wa*

- (13) \* sono zibun nituite-no hon-wa John-ga suteta.  
 that self about book-wa John-NOM threw away  
 ‘As for that book about himself, John threw it away.’

What the data above suggests is that when a *wa*-phrase is placed in the sentence initial position, it has a different structure from that with *wa* in-situ (14a). When we have a sentence-initial *wa*, the root clause has a null pronoun, *pro* co-indexed with the sentence-initial *wa*-phrase, as shown by (14b).

- (14) a. [<sub>S</sub> ... XP<sub>F</sub>-wa ...] [wa appears in the root clause]  
 b. XP<sub>F<sub>i</sub></sub>-wa [<sub>S</sub> ... *pro*<sub>*i*</sub> ... ] [wa appears in the topic position]

Under this approach, it is predicted that if we try to make a sentence in which there is a sentence-initial *wa*-phrase but the root clause cannot have *pro*, the result would be ungrammatical. It is possible to test this hypothesis using anti-pronominal contexts, in which an overt or covert pronoun cannot occur (Postal, 1998). The prediction is indeed borne out, as shown by ungrammaticality of (15a), which has a change-of-color environment, where *pro* cannot occur. This contrasts with (15b), in which the *wa*-marked color term is in-situ, and the sentence is grammatical and has an intended interpretation.

- (15) a. \* Ao-ni-wa Taroo-ga kabe-o nutta.  
 blue-DAT-wa Taro-NOM wall-ACC painted  
 (Intended:) ‘Taro painted the wall blue<sub>CT</sub>.’  
 b. Taroo-ga kabe-o ao-ni-wa nutta.  
 Taro-NOM wall-ACC blue-DAT-wa painted  
 ‘Taro painted the wall blue<sub>CT</sub>.’

### 3.2.2.6 Island sensitivity

As reported by Hara (2006, 72-73), contrastive *wa* cannot appear inside a temporal clause or a relative clause, as shown by (16-17).

- (16) \* Itsumo uchini John<sub>F</sub>-wa kita toki, inu-ga hoeru.  
 always house-DAT John-wa came when dog-NOM bark  
 (Intended:) ‘When at least John comes to our house, the dog always barks.’

does not have to occur sentence initially as shown by (17b) even though there is indeed a tendency to occur sentence-initially. Furthermore, as mentioned earlier, it has been argued that the sentence initial *wa* could be ambiguous. For these reasons, I assume the sentence initial *wa*-phrase is base-generated regardless of whether it is intended to be thematic or contrastive.

- (17) \* Itsumo [Chomsky<sub>F</sub>-wa kaita hon]-ga shuppan-sa-re-ru.  
 always Chomsky-*wa* wrote book-NOM publish-do-PASS-PRES  
 (Intended:) ‘The book which at least Chomsky wrote is always published.’

These sentences above can be rescued by attaching *wa* to the whole island, as shown below:

- (18) ✓ Itsumo uchini John<sub>F</sub>-ga kita toki-wa, inu-ga hoeru.  
 always house-DAT John-NOM came when-*wa* dog-NOM bark  
 ‘When at least John comes to our house, the dog always barks.’
- (19) ✓ Itsumo [Chomsky<sub>F</sub>-ga kaita hon]-wa shuppan-sa-re-ru.  
 always Chomsky-NOM wrote book-NOM publish-do-PASS-PRES  
 ‘The book which at least Chomsky wrote is always published.’

If *wa* needs to move to get interpreted, the contrast above would be accounted in a straightforward way: In (18-19) *wa* is outside an island and therefore there is no illicit movement.

However, it is not clear whether *wa* cannot appear inside the island at all. Kuroda (2005, 17) used an *if*-sentence with a contrastive *wa* (20) in his discussion.

- (20) mosi Nomo-wa genki dattara, Dodgers-ga katta daroo.  
 if Nomo-*wa* well were Dogers-NOM won would  
 ‘If Nomo had been well, Dodgers would have won.’

Kuroda argues that (20) implies that if at least Nomo had been well, Dodgers would have won, even if others had not been. To me, it is possible to get such a reading. Furthermore, in a pilot experiment I did so as to explore how people judge this sentence, there were people who answered *wa* in the antecedent of conditionals sounded good. So at least to some native speakers, *wa* can appear in the *if*-clause.

In addition, it seems that in some contexts contrastive *wa* can appear even inside a relative clause. One such context is where contrasted DPs occur overtly inside the relative clause:

- (21) Kore-wa Taro-wa hihan-sita ga, Jiro-wa home-ta peepaa da.  
 this-TOP Taro-*wa* criticize-PAST but Jiro-*wa* praise-PAST paper COP.  
 ‘This is the paper which Taro criticized but Jiro praised.’

In addition, it seems that *wa* can appear with some kind of modal inside the relative clause.<sup>3</sup>

- (22) Syatyoo-wa [nihongo<sub>F</sub>-wa hana-seru] hito-o sagasi-teiru.  
 CEO-TOP Japanese-*wa* speak-can person-ACC seek-PROG  
 ‘The CEO is looking for a person who can speak (at least) Japanese.’

<sup>3</sup>I appreciate Satoshi Tomika for pointing this out to me.

Given the data, it would be reasonable to conclude that the appearance of *wa* is not syntactically banned. In other words, when *wa* cannot appear inside certain kinds of islands, it would be due to semantic/pragmatic issues it faces.

### 3.2.2.7 Contrastive *wa* with various sentence types

It has been known that contrastive *wa* is perfectly compatible with various kinds of sentences types or speech acts, as pointed out by Tomioka (2009a, 7). For example, *wa* can be felicitously used with imperatives or interrogatives.<sup>4</sup> This characteristic is unique to contrastive *wa* in Japanese, since CTs in other languages cannot appear in such a variety of sentence types, and their distributions are more limited.

(23) *Interrogative*

Taro-wa [<sub>F</sub>mame]-wa tabeta no?  
Taro-wa beans-wa ate Q

‘Did Taro eat (at least) beans?’

(24) *Imperative*

[<sub>F</sub>udon]-wa tabe-ro  
udon-wa eat-IMP

‘Eat udon (at least).’

### 3.2.3 Summary

Here is a list of the properties of *wa* that need to be accounted for:

(25) *The behavior of wa:*

- a. It can work as an aboutness topic without phonological focus
- b. When contrastive *wa* is used as an answer, it conveys extra implications, including ignorance inferences.
- c. It cannot be attached to whatever denotes the maximum without a sentential negation.
- d. It interacts with informational focus and indicates different answering strategies.
- e. It can appear multiple times in a sentence.
- f. It can appear sentence-initially with a co-occurring *pro*.
- g. It can appear inside some but not all syntactic islands.
- h. It can appear in various sentence types.

<sup>4</sup>The interrogative sentences with *wa* will be investigated in Chapter 5, while I will leave *wa*-imperatives for my future research.



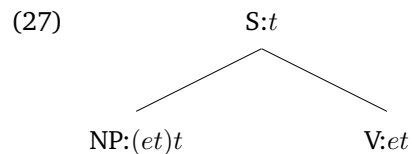
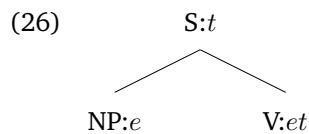
The next section will sketch the informal explanations to these characteristics of *wa*.

### 3.3 A Sketch of the Proposed Analysis

The core of the proposed analysis has three parts. First, *wa* functions as a kind of type-shifter. In particular, *wa* makes the semantic type of a phrase to which it is attached a higher type. Second, when *wa* is used with something with phonological focus, it generates a special focus semantic value, while the ordinary semantic value remains untouched. Finally, contrastive *wa* conventionally signals that it is possible to ask questions that are about the alternatives invoked by the F-marking on the phrase to which *wa* is attached and related to the overarching QuD to be resolved in the immediate context.

#### 3.3.1 *Wa* as a type-shifter

Let us look at the first point with a simple example. When we have a noun and a one-place predicate the most basic thing we can do is to take the predicate as a function and the noun as its argument, as in (26). This is not the only way to compose a sentence, however. Alternatively, we can switch the role of the NP and the verb by type-shifting: taking the NP as a function that takes a one-place predicate as its argument, as shown by (27).



This kind of type-shifting is very commonly done to account for a scope-taking element. The treatment of quantifiers in Heim and Kratzer (1998) is like this. The quantifier takes an abstracted proposition, which is of type *et*, as its argument and gives back a truth value. The idea shared by the type-shift illustrated in (27) and what is used in computing the meaning of a quantifier is that the NP takes a VP as its argument. What we are going to see is to do this kind of type-shift everywhere. Since we want something of type *t* as its final result, when we types-shift some XP that is of type  $\sigma$ , the result will be  $(\sigma t)t$ . This kind of type-shifting is what is called continuization in the next section.

In the cases we are going to see, the semantic value we would get would not be changed

in the ordinary dimension before and after type-shifting. Considering a simple case where a sentence contains an intransitive verb and an NP is marked with *wa*, we can get a type-shifted interpretation of *Taro*, which is of type  $(et)t$  as follows:

(28) *The semantics of Taro after type-shift*

$$\llbracket \text{Taro} \rrbracket^o = \lambda f_{et}.f(t)$$

An intransitive verb will be taken as the argument of this type-shifted DP and then we can get a proposition of type  $t$ :

$$\begin{aligned} (29) \quad & \llbracket \text{Taro came} \rrbracket^o \\ &= \llbracket \text{Taro} \rrbracket^o (\llbracket \text{came} \rrbracket^o) \\ &= [\lambda f_{et}.f(t)] (\lambda x.\text{come}(x)) \\ &= \text{come}(t) \end{aligned}$$

As long as the ordinary semantic value is concerned, we can see that the value we eventually get is not different from the one obtained without any type-shifts. This is a welcome result since there is no effect of focus in this dimension, and there is no difference between contrastive and non-contrastive *wa*.

It should be further noted that even when we have *wa* in the object position, we can apply the same semantics — the object NP has type  $(et)t$ . Crucially, there is no LF movement necessary to compute the meaning of the sentence. It could be done by making everything continuized. That is, we can make everything a function and use those functions as a way to express the meaning of a proposition  $t$ . The full derivation and definition will be provided in the next section. Since type-shifting everything does not impose any overt or LF movement, this approach predicts that quantifiers can potentially take its scope over the sentence from the inside of islands. This is the same for the focus semantic value, which will be discussed in the next section.

### 3.3.2 *Wa* with a focused element

The second component of the proposed analysis lies in the special focus semantic value. In talking about the focus semantic value, we first need to talk about everything as a set. When an element does not have an F-marking, the focus semantic value of it is a singleton set whose only member is identical to the ordinary semantic value of the item. For instance, the focus semantic value of *Taro* before type-shift is  $\{t\}$ , and that of an intransitive verb *come* is  $\{\lambda x.\text{come}(x)\}$ . In

computing the focus semantic value of the sentence *Taro came.*, we apply alternative-friendly functional application, which is known as Pointwise Functional Application (PFA), which can be expressed as below. When we apply (30) to  $\llbracket \text{come} \rrbracket^f$  (  $\llbracket \text{Taro} \rrbracket^f$  ), we get a singleton proposition  $\{\text{come}(t)\}$ , which is considered to be the focus semantic value of an ordinary declarative sentence.

(30) Pointwise Functional Application

If  $\alpha$  is a branching node with daughters  $\beta$  and  $\gamma$ , and  $\llbracket \beta \rrbracket^{w,g} \subseteq D_{\sigma\tau}$  and  $\llbracket \gamma \rrbracket^{w,g} \subseteq D_{\sigma}$ , then  $\llbracket \alpha \rrbracket^{w,g} = \{f(x) \in D_{\tau} : f \in \llbracket \beta \rrbracket^{w,g} \ \& \ x \in \llbracket \gamma \rrbracket^{w,g}\}$

If we decide to apply particular type-shifts to everything, we simply need to do the same thing to everything using sets. For instance, we have seen that *Taro* can be type-shifted by *wa* so that it will be of type  $(et)t$  in the ordinary dimension. When we want its focus semantic value and when *Taro* is not F-marked, it just needs to be treated as a singleton set that has the ordinary semantic value as its member — it looks  $\{\lambda f \in D_{et}.f(t)\}$ , whose type is  $((et)t)t$ . In the same way, an intransitive verb *come* can be expressed as  $\{\lambda x_e.\text{come}(x)\}$ , which is of type  $(et)t$ . The two can be composed via PFA and then give exactly the same result as we saw. Note that this is what happens when an XP with *wa* does not have any F-marking. In other words, it is when *wa* works as an aboutness topic. As we have already seen, since this *wa* does not do anything special in particular in discourse, this is a welcome result. *Wa* without a F-marked XP just changes the way of composition, not the result.

When *wa* occurs with an XP that has an F-marking (i.e, *wa* is now contrastive *wa*), *wa* does something special in the focus dimension; it works as a contrastive topic. In order for *wa* to be felicitously used, it should be the case that the focus semantic value of XP should be a superset of that of the ordinary semantic value, and the results of combining XP with the rest of the sentence match the strategy to be employed in context (indicated as CT in (31)). The crucial difference between a phrase with F-marking and that without is that the one with F-marking denotes an alternative set. For instance,  $Taro_F$  denotes a set of people  $\{x : \text{person}(x)\}$ . Even in this case, *wa* still type-shifts the alternative set, as is the case when XP does not have an F-marking. In addition to type-shifting, *wa* does something extra: it makes a set of sets of propositions, as indicated in (31) after the presupposition. The result, which is a set of sets of propositions, is obtained through the following processes: (i) *wa* takes an alternative set as its first argument,

(ii) make each member of the alternative set as a singleton set and use them as arguments of the function which is taken as the second argument (i.e., a set of one-place predicate), and (iii) storing the results in a set. For the convenience of the following discussion, the result of *wa*'s taking an NP as its argument is given in (B2). I also omitted the presuppositional part for the sake of simplicity here.

$$(31) \quad \llbracket \text{wa} \rrbracket^f = \lambda X_{\sigma t} . \lambda F_{(\sigma t)t} : X \supset \{ \llbracket \text{XP} \rrbracket^o \} \wedge F(X) = \text{CT} . \{ p | a \in X \wedge p = F(\eta a) \}$$

where  $\llbracket \eta \rrbracket = \lambda a . \lambda b . a = b$  and CT is a strategy to be employed in the context.

$$(32) \quad \llbracket \text{NP}_F\text{-wa} \rrbracket^f = \lambda F_{(et)t} . \{ F(\{x\}) | x = x \}$$

Let us look at what happens with a sentence ‘*Taro<sub>F</sub>-wa came.*’ For the sake of simplicity, our domain of people only contains three people, {t, j, h}.

$$(33) \quad \llbracket \text{Taro}_F\text{-wa came} \rrbracket^f = \llbracket \text{Taro}_F\text{-wa} \rrbracket^f ( \llbracket \text{come} \rrbracket^f )$$

$$= \lambda F_{(et)t} . \{ F(\{x\}) | x = x \} ( \{ \lambda x . \text{come}(x) \} )$$

$$= \{ \{ \text{come}(x) \} | x = x \} \quad \text{[by } \beta\text{-reduction]}$$

$$\rightsquigarrow \{ \{ \text{come}(t) \}, \{ \text{come}(j) \}, \{ \text{come}(h) \} \}$$

What contrastive *wa* does extra in the focus dimension is to pack individual propositions. The final result we get in this case is a set of sets of singleton propositions: this discourse structure reflects the process through which the person is trying to answer the underlying question — in this case, ‘*Who came?*’. This cognitive process potentially accords with the idea that *wa* is used to make categorical judgments, which are autonomous cognitive acts (Kuroda, 2005, 29), as discussed in Section B.5.

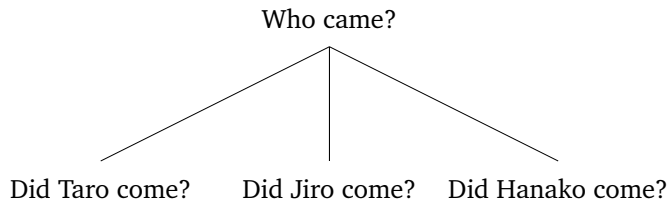
The difference between the ordinary F-marking and adding *wa* on top of it is that the latter evokes a set of singleton sets of propositions. This difference enables us to capture the empirical fact that we need to have different patterns of focus marking and CT-marking depending on the strategy the speaker is trying to adopt as answering a question. Depending on what *wa* is marking, we have different sets of questions that are sorted by different keys.

### 3.3.3 Conventional Effects of Contrastive *wa*

The final component is a conventional effect of contrastive *wa*. As we saw, contrastive *wa* generates a set of sets of propositions by picking up members of the alternative set and then

applying them to the function one by one. The focus semantic value that is obtained in the end reflects the QuD tree the speaker uses to answer the particular question. For example, as we saw, the focus semantic value of the sentence *Taro<sub>F</sub>-wa came.* is a set of sets of singleton propositions. The focus semantic value can also be expressed as a discourse tree as below:

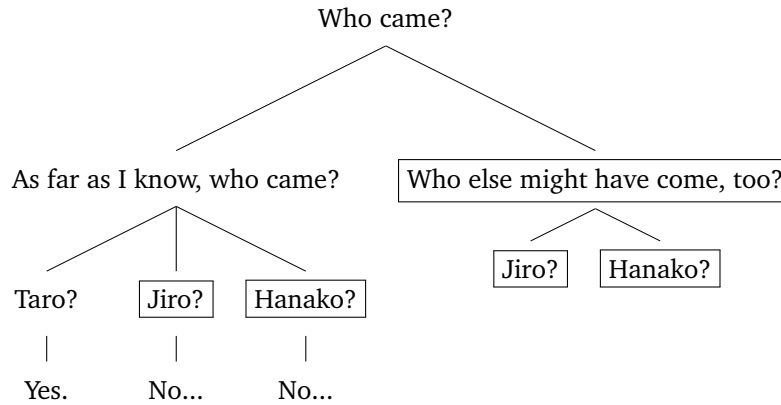
$$(34) \quad \llbracket \text{Taro}_F\text{-wa came.} \rrbracket^f \\ \rightsquigarrow \{ \{ \text{come}(t) \}, \{ \text{come}(j) \}, \{ \text{come}(h) \} \}$$



Going through these polar questions, the speaker asserts that Taro indeed has a property under discussion — he did come, by making a categorical judgment about Taro. If the speaker could make the same categorical judgments about other people, namely, Jiro and Hanako in this context, the speaker would have said so. However, it is worth noting that this exhaustive implication is what can be conveyed even when the speaker chooses not to use *wa* since we assume that cooperative discourse participants usually give as much information as required.

Now how is using *wa* on top of invoking the focus alternative set different from just using focus? The difference is that by using *wa*, it is possible to open up opportunities to refer to possible other questions about alternatives that are not mentioned by the assertion with *wa*. Why would the speaker do it? The simple reason would be that she thinks those questions could be relevant and better brought up in the conversation. For instance, if the discourse participants are trying to figure out who came, but the person who was asked the question has limited knowledge, she can say ‘*Taro<sub>F</sub>-wa came.*’ to express that it would be better to talk about properties that Jiro or Hanako has. Such a property could be “*x* might have come but I am not sure”, for example. In other words, the speaker is trying to be very cooperative: not only is she giving out the maximum amount of information, but also she is suggesting asking other questions could be helpful.

(35)



The reason for referring to alternatives not mentioned in the answer does not have to be that the speaker has some uncertainty. She could implicitly mention Jiro and Hanako because they did not come and the speaker thought it is worth mentioning: Maybe they were going out together leaving Taro, for instance. What the speaker can achieve by using *wa* can be just hinting about possible other questions. In fact, it is perfectly acceptable to say “Taro<sub>F</sub>-*wa* came. But I cannot say anything about the other two!”, as pointed out by [Yabushita \(2017\)](#).

In any case, the use of contrastive *wa* suggests that other questions are worth mentioning and related to the members of an alternative set, evoked by the phonological focus. This conventional effect also accounts for the empirical fact that contrastive *wa* cannot appear with whatever denotes the maximum. If *wa* is used with such an item, it is not possible to refer to potential follow-up questions since there is nothing that is not mentioned by the *wa*-assertion.

## 3.4 A Continuation Based Account of Contrastive *wa*

### 3.4.1 Introducing Continuations

This section aims to provide the details of the proposed analysis using continuations. As briefly mentioned earlier, the core idea is that *wa* is treated as a type-shifter that gives what is attached to it a higher-type so that it can take the rest of the sentence as its argument. First, I will introduce background and notations I will use and then give the basic ingredients of the analysis. After that, I will show how the formal analysis is connected to the informal sketch of the analysis given in the last section, and how it can account for the empirical facts.

In order to capture what *wa* does, I will adopt the continuation hypothesis, as stated in [\(36\)](#).

(36) *The continuation hypothesis*

Some natural language expressions denote functions on their continuations, i.e., functions that take their own semantic context as an argument.

[Barker and Shan (2015, (1))]

On this hypothesis, *wa*-marked elements can be considered to denote functions on its continuations. That is, *wa* makes something a function and takes scope over the surrounding expression. More generally, a continuation is a portion of the context surrounding an expression. For example, in a sentence (BZ), the boldfaced part is a continuation of a boxed expression *everyone*.

(37) **Taro invited** everyone **yesterday**:  $S, t$ .

everyone:  $(S \backslash (NP \backslash S)), (et)t$  [quantifier]

**Taro invited \_ yesterday**:  $(NP \backslash S), et$  [continuation]

-  $(A \backslash B)$ : There is a “gap” of category A

-  $(C // D)$ : D is a continuation (surrounding context)

Let us see how this can be expressed syntactically and semantically, following the notations used in Barker and Shan (2015). Syntactically, a sentence has a category S. The continuation lacks something to be an S. In the example above, the boldfaced part is missing something whose category is NP in order to be an S. We do not care exactly where the NP is located. As long as the continuation surrounds the NP in some fashion, we can get a sentence: S. In order to label such a category, we use  $\backslash$ .<sup>5</sup> The syntactic category of the continuation is expressed as  $(A \backslash B)$ , which basically means “it would be category B with a missing expression of category A” (Barker and Shan, 2015, 13). Using this notation, the syntactic category of the continuation in (BZ) is expressed as  $(NP \backslash S)$ . A different slash:  $//$  is used to express an opposite relation:  $(C // D)$  means this would become C if D would surround it. Using this, a category of *everyone* in (BZ), for example, can be expressed as  $(S \backslash (NP \backslash S))$ : in order for *everyone* to become an S, it needs to be surrounded by what lacks an NP to become S.

Semantically, *everyone* takes its continuation as its argument and gives back the truth value. The type of a proposition is  $t$ , and in (BZ), the semantic type of the boldfaced part (i.e., continuation for *everyone*) is  $et$ , for that part becomes a complete sentence once it can fill the missing NP of type  $e$ . Then the semantic type of *everyone* will be  $(et)t$ .

<sup>5</sup>The two slashes ( $\backslash$ ,  $//$ ) introduced here are different from what is used in a categorial grammar (Lambek, 1958) in that the directions of these slashes do not indicate the direction of an argument.

More generally, if a syntactic category  $X$  has semantic type  $\alpha$ , its continuation is  $\alpha t$ . Let  $c_X$  be a continuation of  $X$ , we can get (38), a list of semantic types of continuations of commonly used syntactic categories. These are to be distinguished from continuized categories, which are functions from continuations to truth values. Continuized categories are indicated by underlining. The notation used in this section follows Barker (2001).

(38) Continuations	(39) Continuized Categories
$c_S: tt$	$\underline{S}: (tt)t$
$c_{NP}: et$	$\underline{NP}: (et)t$
$c_{VP}: (et)t$	$\underline{VP}: ((et)t)t$
$c_{Vt}: (e(et))t$	$\underline{Vt}: ((e(et))t)t$

Using continuized categories provides the same semantic denotation obtained by using a more familiar non-continuized version of semantics. What to be noted here is that when we have a binary branching rule, there are two ways to compose the two. For instance, when we have the rule  $S \rightarrow NP VP$ , it is possible to interpret that an NP is the continuation of VP or vice versa. In either way, we can get  $t$  as output. When we have no or only one quantifier, the two compositions give us exactly the same result. What is given in (40a, d) is just one way to continuize the grammar. (41) is how the continuized grammar can derive the meaning of a simple sentence *John sneezed*.

- (40) a.  $S \rightarrow NP VP: \lambda c_S. \underline{VP}(\lambda P_{et}. \underline{NP}(\lambda x_e. c_S(P(x))))$   
 b.  $NP \rightarrow \text{John}: \lambda c_{NP}. c_{NP}(j)$   
 c.  $VP \rightarrow \text{sneezed}: \lambda c_{VP}. c_{VP}(\lambda x. \text{sneezed}(x))$   
 d.  $VP \rightarrow Vt NP: \lambda c_{VP}. \underline{NP}(\lambda x. \underline{Vt}(\lambda R_{e(et)}. c_{VP}(R(x))))$   
 e.  $Vt \rightarrow \text{saw}: \lambda c_{Vt}. c_{Vt}(\lambda x. \lambda y. \text{saw}(y, x))$
- (41) *The derivation of the ordinary semantic value of 'John sneezed'*

$[_S [_{NP} \text{John}] [_{VP} \text{sneezed}]]$   
 $\rightsquigarrow$  (by (40a))  
 $\lambda c_S. \underline{VP}(\lambda P. \underline{NP}(\lambda x. c_S(P(x))))$   
 $\rightsquigarrow$  ( $\underline{VP} = \lambda c_{VP}. c_{VP}(\lambda x. \text{sneezed}(x))$ )  
 $\lambda c_S. [\lambda c_{VP}. c_{VP}(\lambda x. \text{sneezed}(x))] (\lambda P. \underline{NP}(\lambda x. c_S(P(x))))$   
 $\rightsquigarrow$  ( $\beta$ -reduction)



$$\begin{aligned}
& \lambda_{c_S}.\underline{\text{NP}}(\lambda x.c_S(\lambda x.\text{sneezed}(x))) \\
\rightsquigarrow & (\underline{\text{NP}} = \lambda c_{\text{NP}}.c_{\text{NP}}(j)) \\
& \lambda_{c_S}.[\lambda c_{\text{NP}}.c_{\text{NP}}(j)](\lambda x.c_S(\lambda x.\text{sneezed}(x))) \\
\rightsquigarrow & (\beta\text{-reduction}) \\
& \lambda_{c_S}.c_S(\text{sneezed}(j))
\end{aligned}$$

The last line will be turned into  $\text{sneezed}(j)$  after we provide it with the trivial continuation of S:  $\lambda p.p$ .

Using this system, there will be no type-mismatch even when a quantifier phrase appears in the object position. As we saw earlier, a quantifier such as *everyone* has type  $(et)t$ . Its translation can be expressed as in (42); It takes something of type  $et$  (i.e., a continuation of an NP) and gives back  $t$ .

$$(42) \quad \text{NP} \rightarrow \text{everyone}: \lambda c_{\text{NP}}.\forall x : c_{\text{NP}}(x)$$

Looking at (40d), the continuized NP does take something of type  $et$  (i.e.,  $\lambda x.\underline{\text{Vt}}(\lambda R_{e(et)}.c_{\text{VP}}(R(x)))$ ), which is why we do not have any type mismatch without movement in this system. (43) is the derivation of the meaning of a sentence *John saw everyone*. We can see that having a quantifier in the object position is not a problem.

(43) *The derivation of the ordinary semantic value of 'John saw everyone'*

$$\begin{aligned}
& [{}_S [{}_{\text{NP}} \text{John}] [{}_{\text{VP}} [{}_{\text{Vt}} \text{saw}] [{}_{\text{NP}} \text{everyone}]]] \\
\rightsquigarrow & (\text{by (40a)}) \\
& \lambda_{c_S}.\underline{\text{VP}}(\lambda P_{et}.\underline{\text{NP}}_{\text{Sub}}(\lambda x_e.c_S(P(x)))) \\
\rightsquigarrow & (\text{by } \underline{\text{VP}} \rightarrow \underline{\text{Vt}} \underline{\text{NP}}: \lambda c_{\text{VP}}.\underline{\text{NP}}(\lambda x.\underline{\text{Vt}}(\lambda R_{e(et)}.c_{\text{VP}}(R(x)))))) \\
& \lambda_{c_S}.[\lambda c_{\text{VP}}.\underline{\text{NP}}_{\text{Obj}}(\lambda y.\underline{\text{Vt}}(\lambda R_{e(et)}.c_{\text{VP}}(R(y))))] (\lambda P_{et}.\underline{\text{NP}}_{\text{Sub}}(\lambda x.c_S(P(x)))) \\
\rightsquigarrow & (\text{by } \beta\text{-reduction}) \\
& \lambda_{c_S}.\underline{\text{NP}}_{\text{Obj}}(\lambda y.\underline{\text{Vt}}(\lambda R_{(et)t}.\underline{\text{NP}}_{\text{Sub}}(\lambda x.c_S(R(y)(x)))))) \\
\rightsquigarrow & (\underline{\text{NP}}_{\text{Obj}} = \lambda c_{\text{NP}}.\forall x : c_{\text{NP}}(x)) \\
& \lambda_{c_S}.[\lambda c_{\text{NP}}.\forall x : c_{\text{NP}}(x)] (\lambda y.\underline{\text{Vt}}(\lambda R_{(et)t}.\underline{\text{NP}}_{\text{Sub}}(\lambda x.c_S(R(y)(x)))))) \\
\rightsquigarrow & (\text{by } \beta\text{-reduction, } \alpha\text{-conversion}) \\
& \lambda_{c_S}.\forall z : \underline{\text{Vt}}(\lambda R_{(et)t}.\underline{\text{NP}}_{\text{Sub}}(\lambda x.c_S(R(z)(x)))) \\
\rightsquigarrow & (\underline{\text{Vt}} = \lambda c_{\text{Vt}}.c_{\text{Vt}}(\lambda x.\lambda y.\text{saw}(y, x))) \\
& \lambda_{c_S}.\forall z : [\lambda c_{\text{Vt}}.c_{\text{Vt}}(\lambda x.\lambda y.\text{saw}(y, x))] (\lambda R_{(et)t}.\underline{\text{NP}}_{\text{Sub}}(\lambda x.c_S(R(z)(x))))
\end{aligned}$$

$$\begin{aligned}
&\rightsquigarrow \text{(by } \beta\text{-reduction)} \\
&\quad \lambda_{c_S}.\forall z : \underline{\text{NP}}_{\text{Sub}}(\lambda x.c_s(\text{saw}(x, z))) \\
&\rightsquigarrow (\underline{\text{NP}}_{\text{Sub}} = \lambda_{c_{\text{NP}}}.c_{\text{NP}}(j)) \\
&\quad \lambda_{c_S}.\forall z : [\lambda_{c_{\text{NP}}}.c_{\text{NP}}(j)] (\lambda x.c_s(\text{saw}(x, z))) \\
&\rightsquigarrow \text{(by } \beta\text{-reduction)} \\
&\quad \lambda_{c_S}.\forall z : c_s(\text{saw}(j, z))
\end{aligned}$$

After feeding a trivial continuation to the final result, we get what we want:  $\forall z : \text{saw}(j, z)$

Recall that there are multiple ways to continue the grammar when we have a binary branching rule. The rules in (40a, d) can be written in different ways, and if there is only one quantifier, we get the same result regardless of which grammar is used. However, when we have multiple quantifiers, the different ways of compositions give us the different results regarding the scope of the quantifiers. In other words, using a different continued grammar is a way to express different scope relations with continuations. In continuations, there is no syntactic movement required to derive multiple possible interpretations; The different scoping relations of quantifiers are expressed as different orders of applying continuations. For instance, by using the rule in (40a), we would get an interpretation in which the object takes scope over the subject since the VP takes the subject NP as its argument. By contrast, using a rule in (44), it is possible to get an interpretation in which the subject scopes over the object since the VP is now an argument of the subject NP.

$$(44) \quad S \rightarrow \text{NP VP}: \lambda_{c_S}.\underline{\text{NP}}(\lambda x_e.\underline{\text{VP}}(\lambda P_{et}.c_s(P(x))))$$

### 3.4.2 Alternatives and Continuation

In discussing contrastive *wa*, it is necessary to talk about the focus semantic values, which deal with alternatives. Although there are multiple ways to handle them,<sup>6</sup> here I will just apply continuations at set level: “Set-level” individuals have type *et*, “set-level” one-place predicates have type  $(et)t$ , and so on.

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<sup>6</sup>Using monads is one way to do this. See Charlow (2014) for the discussion.

## (45) Semantic types with sets

S:  $tt$ NP:  $et$ VP:  $(et)t$ Vt:  $(e(et))t$ 

## (46) Continuations

 $c_S: (tt)t$  $c_{NP}: (et)t$  $c_{VP}: ((et)t)t$  $c_{Vt}: ((e(et))t)t$ 

## (47) Continuized Categories

S:  $((tt)t)t$ NP:  $((et)t)t$ VP:  $((et)t)t)t$ Vt:  $((e(et))t)t)t$ 

On the surface, they look complicated, but the computation can be done straightforwardly. The meaning of a simple sentence like ‘*John sneezed.*’ can be computed with the following basic set-level semantics and using continuations like below:

## (48) The focus semantic values before continuization

a.  $\llbracket \text{John} \rrbracket^f = \{j\}$ b.  $\llbracket \text{sneezed} \rrbracket^f = \{\lambda x. \text{sneeze}(x)\}$ 

## (49) The grammar with continuization

a.  $S \rightarrow \text{NP VP}: \lambda c_S. \underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}. \underline{\text{NP}}(\lambda X_{et}. c_S(\mathcal{P}(X))))$ , where  $X$  is a set of individuals and  $\mathcal{P}$  is a set of one-place predicates, and  $\mathcal{P}(X)$  is computed by Pointwise Functional Application: PFA (see (30))

b.  $\text{NP} \rightarrow \text{John}: \lambda c_{NP}. c_{NP}(\{j\})$ , where  $c_{NP}(\{j\})$  is computed by PFA

c.  $\text{VP} \rightarrow \text{sneezed}: \lambda c_{VP}. c_{VP}(\{\lambda x. \text{sneeze}(x)\})$ , where  $c_{VP}(\{\lambda x. \text{sneeze}(x)\})$  is computed by PFA

(50) The derivation of the focus semantic value of ‘*John sneezed.*’ $[s_{\text{NP}} \text{John}]_{\text{VP}} \text{sneezed}]$  $\rightsquigarrow$  (by (49a)) $\lambda c_S. \underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}. \underline{\text{NP}}(\lambda X_{et}. c_S(\mathcal{P}(X))))$  $\rightsquigarrow$  ( $\underline{\text{VP}} = \{\lambda x. \text{sneeze}(x)\}$ ) $\lambda c_S. [\lambda c_{VP}. c_{VP}(\{\lambda x. \text{sneeze}(x)\})] (\lambda \mathcal{P}. \underline{\text{NP}}(\lambda X. c_S(\mathcal{P}(X))))$

$\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S} \underline{\text{NP}}(\lambda X.c_S(\{\lambda x.\text{sneeze}(x)\}(X)))$   
 $\rightsquigarrow$  ( $\underline{\text{NP}} = \lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{j\})$ )  
 $\lambda_{c_S}. [\lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{j\})] (\lambda X.c_S(\{\lambda x.\text{sneeze}(x)\}(X)))$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S}.c_S(\{\lambda x.\text{sneeze}(x)\}(\{j\}))$   
 $\rightsquigarrow$  (by Pointwise Functional Application)  
 $\lambda_{c_S}.c_S(\{\text{sneeze}(j)\})$

The trivial continuation for  $c_S$  is  $\{\lambda p.p\}$ , which is of type  $(tt)t$ , and via PFA, it gives back (in this case) a singleton set of proposition,  $\{\text{sneeze}(j)\}$ , which is the final result of compositionally computing alternatives for a declarative sentence, assuming no F-marking is specified.

By contrast, when *John* is F-marked, we would need the following for the calculation:

(51)  $\text{NP} \rightarrow \text{John}_F$ :  $\lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{x : x \in D_e\})$  (or, alternatively:  $\lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{x_e | x = x\})$ )

With this, the calculation of ‘*John<sub>F</sub> sneezed.*’ differs from (50) starting from the fourth step. When the domain of individuals (people) consists of  $\{j, m, s\}$ , the final result is a set of three propositions which are different from one another with respect to the subject:

(52) *The derivation of the focus semantic value of John<sub>F</sub> sneezed.*

$[\text{S}[\text{NP John}_F][\text{VP sneezed}]]$   
 $\rightsquigarrow$  (by (49a), translation of  $\underline{\text{VP}}$ , and  $\beta$ -reduction)  
 $\lambda_{c_S} \underline{\text{NP}}(\lambda X.c_S(\{\lambda x.\text{sneeze}(x)\}(X)))$   
 $\rightsquigarrow$  ( $\underline{\text{NP}} = \lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{x : x \in D_e\})$ )  
 $\lambda_{c_S}. [\lambda_{c_{\text{NP}}}.c_{\text{NP}}(\{x : x \in D_e\})] (\lambda X.c_S(\{\lambda x.\text{sneeze}(x)\}(X)))$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S}.c_S(\{\lambda x.\text{sneeze}(x)\}(\{j, m, s\}))$   
 $\rightsquigarrow$  (by Pointwise Functional Application)  
 $\lambda_{c_S}.c_S(\{\text{sneeze}(j), \text{sneeze}(m), \text{sneeze}(s)\})$

When we feed  $\{\lambda p.p\}$  to the final result, via PFA, we get  $\{\text{sneeze}(j), \text{sneeze}(m), \text{sneeze}(s)\}$ . Overall, by shifting everything to set level, we can handle alternatives without any further additions with continuations.

### 3.4.3 Contrastive *wa*: Putting ordinary and focus semantics value together

In this section, I will show the formal denotation of continuized *wa* and how it works to account for the various phenomena we discussed in section 3.2. During the process, it is also revealed that sentence-initial *wa* and *wa* in-situ have semantically different roles since the sentence-initial one works as a binder of a covert pronoun *pro* which occurs in the root clause. However, the basic machinery is the same between two kinds of *was*: The illustrations of the system can be given based on the contrastive *wa* in-situ.

#### 3.4.3.1 *Wa* in-situ

As informally mentioned in the previous section, *wa* works to type-shift an element so that it can take the rest of the sentence as its argument. Taking a *wa*-marked NP in-situ as in (53), we can see that the *wa*-marked phrase is supposed to have exactly the same semantic type as a quantifier such as *everyone*. Let us think about a simple sentence with an intransitive verb: ‘*Taro-wa sneezed.*’ The *wa*-marked NP now takes the rest of the clause as its continuation, its argument. A *wa*-NP takes something that is of type *et* and gives us a truth value. In other words, it has type  $(et)t$ .

- (53) Taro-*wa sneezed.*:  $S, t$ .  
       Taro-*wa*:  $(S \backslash (NP \backslash S)), (et)t$  [wa-phrase]  
       \_ *sneezed*:  $(NP \backslash S), et$  [continuation]

In this particular case, the semantics of *wa* can be simple: syntactically it is of category  $NP \backslash NP$ , which means it expects an NP to appear immediately before it and gives us back the same syntactic category. Note that the backslash ( $\backslash$ ) used here has its usual categorial grammar use (Lambek, 1958). Semantically, *wa* makes an NP continuized — makes an NP a function that takes a continuation of the NP as the first argument. The syntactic category and the semantic denotation of *wa* with an NP are given in (54). More generally, *wa* with an XP can be expressed with the same recipe. For an XP of type  $\sigma$ , *XP-wa* will be also of category XP and its semantic type can be given using the type  $\sigma$ , as in (55).

- (54) *Non-contrastive wa with an NP in the ordinary dimension*  
       *wa*:  $(NP \backslash (S \backslash (NP \backslash S))), e((et)t), \lambda x_e. \lambda c_{NP}. c_{NP}(x)$

- (55) *Wa with an XP in the ordinary dimension*  
 $wa: (XP \setminus (S // (XP \setminus S))), \sigma((\sigma t)t), \lambda x_{\sigma} . \lambda c_{XP} . c_{XP}(x)$

With the semantics given in (54), the ordinary semantic value of ‘*Taro sneezed*’ can be calculated in a straightforward way. After *wa* takes *Taro* as its first argument, it gives back a function  $\lambda c_{NP} . c_{NP}(t)$ . Saturating  $c_{NP}$  with a continuation  $\lambda x . \text{sneeze}(x)$ , we get  $\text{sneeze}(t)$ , which is exactly what expresses the meaning of the sentence. As a result, nothing interesting happens with respect to the ordinary semantic value. This is a welcome result since sentences with and without *wa* have the same truth conditions. *Wa* just adds one step in the composition and that addition does not affect the result, at least here. This is the same for topic *wa* and contrastive *wa*; both of which leave the ordinary truth conditions untouched.

In the examples used above, *wa* has been used to mark NPs. However, it can mark other categories and the computation of the focus semantic value can be done exactly in the same way. For instance, contrastive *wa* can be used with a quantifier such as *nannin-ka* ‘some people’. In such a case, too, *wa* type-shifts the quantifier even though it has already a higher type as an NP. Quantifiers are usually treated to be of type  $(et)t$ , but *wa* shifts it to  $((et)t)t$ . For instance, with continuation, the semantics of shifted *nannin-ka* ‘some people’ can be given as in (56). The semantics of *wa* does not have to be changed, but the semantics of other categories needs to be shifted since the continuation of a QP is  $((et)t)t$ . For instance, the semantics of intransitive verbs such as *come* will look like as in (57). Using (56) and (57), it is possible to give the semantics of *nannin-ka-wa kita*. ‘Some people-*wa* came.’ can be given as in (58).

$$(56) \quad \llbracket wa \rrbracket^{\circ} ( \llbracket \text{some people} \rrbracket^{\circ} ) = \lambda c_{QP} . c_{QP} ( \lambda P_{et} . \exists x . P(x) )$$

$$(57) \quad \llbracket \text{come} \rrbracket^{\circ} = \lambda Q_{(et)t} . Q ( \lambda x . \text{come}(x) )$$

- (58) *The derivation of the ordinary semantic value of ‘Some people-*wa* came.’*

$$\begin{aligned} & \llbracket \text{some people-*wa* came} \rrbracket^{\circ} \\ &= \llbracket wa \rrbracket^{\circ} ( \llbracket \text{some people} \rrbracket^{\circ} ) ( \llbracket \text{came} \rrbracket^{\circ} ) \\ &= [ \lambda c_{QP} . c_{QP} ( \lambda P_{et} . \exists x : P(x) ) ] ( \lambda Q_{(et)t} . Q ( \lambda x . \text{come}(x) ) ) \\ & \text{(by } \beta \text{-reduction)} \\ &= \exists x : \text{come}(x) \end{aligned}$$

As we have seen earlier, in the ordinary semantic dimension, *wa* just shifts the type and virtually does not change the truth-conditional content.

Now let us talk about the focus semantic value. As for non-contrastive *wa*, we do not have to do anything. It basically takes a singleton set and makes it continuized at a higher level, as in (59). The type looks complicated, but what it does is not. An NP-*wa*, which does not have an F-marking, then takes something that is of type  $(et)t$  as its argument. They are composed via PFA and then we would get  $\{\text{sneeze}(t)\}$  as a result, as shown in (60).

(59) *Wa with an NP in the focus dimension*

$wa: (\text{NP} \setminus \text{NP}), (et)((et)t)t, \lambda X_{et}.\lambda c_{\text{NP}.c_{\text{NP}}}(X)$

$\llbracket \text{Taro-wa} \rrbracket^f = \lambda c_{\text{NP}.c_{\text{NP}}}(\{t\})$

(60) *The derivation of the focus semantic value of ‘Taro-wa sneezed.’*

$[_{\text{S}}[_{\text{NP}} \text{Taro-wa}]_{\text{VP}} \text{sneezed}]$

$\lambda c_{\text{S}}.\underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}.\underline{\text{NP}}_{wa}(\lambda X_{et}.c_{\text{S}}(\mathcal{P}(X))))$

$\rightsquigarrow (\underline{\text{VP}} = \lambda c_{\text{VP}.c_{\text{VP}}}(\{\lambda x.\text{sneeze}(x)\}))$

$\lambda c_{\text{S}}. [\lambda c_{\text{VP}.c_{\text{VP}}}(\{\lambda x.\text{sneeze}(x)\})] (\lambda \mathcal{P}.\underline{\text{NP}}_{wa}(\lambda X.c_{\text{S}}(\mathcal{P}(X))))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$\lambda c_{\text{S}}.\underline{\text{NP}}_{wa}(\lambda X.c_{\text{S}}(\{\lambda x.\text{sneeze}(x)\}(X)))$

$\rightsquigarrow (\underline{\text{NP}} = \lambda c_{\text{NP}.c_{\text{NP}}}(\{t\}))$

$\lambda c_{\text{S}}. [\lambda c_{\text{NP}.c_{\text{NP}}}(\{t\})] (\lambda X.c_{\text{S}}(\{\lambda x.\text{sneeze}(x)\}(X)))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$\lambda c_{\text{S}}.c_{\text{S}}(\{\lambda x.\text{sneeze}(x)\}(\{t\}))$

$\rightsquigarrow$  (by Pointwise Functional Application)

$\lambda c_{\text{S}}.c_{\text{S}}(\{\text{sneeze}(t)\})$

Turning to contrastive *wa*, the semantics of contrastive *wa* is given below as (61). First, since it is a realization of the contrastive topic in Japanese, first the first argument *wa* takes (XP) should be a proper superset of the denotation of XP in the ordinary dimension. In addition, the result of applying X to the continuation should match the strategy indicated in context. These requirements are expressed as a presupposition in (61). Given the presupposition is met, what needs to be done is to derive a set of sets of propositions using the focus alternatives evoked by F-marking of the first argument and its continuation. This denotation of *wa* can do what Topic Abstraction proposed by Constanti (2014) does; *wa* can derive nested alternative propositions by using the focus alternatives invoked by the phonological focus on the element which it is

attached to.

(61) *Semantics of Contrastive wa*

$$\llbracket \text{wa} \rrbracket^f = \lambda X_{\sigma t} . \lambda c_{XP} : X \supset \{ \llbracket \text{XP} \rrbracket^o \} \wedge c_{XP}(X) = \text{CT} . \{ p | a \in X \wedge p = c_{XP}(\eta a) \} \text{ where}$$

$$\llbracket \eta \rrbracket = \lambda a . \lambda b . a = b \text{ and CT is a strategy to be employed in the context.}$$

What is basically done above is *wa* first prepares to make sorted propositions using the focus alternative of  $X$ . Then it makes those individuals into singleton sets (via  $\eta$ ) and applies them to its continuation,  $c_{XP}$ .  $\eta$  is necessary since PFA cannot be executed without it because of the type mismatch. After that, *wa* makes a large set that is made up of the results. What differentiates a focused element with *wa* and without is, with *wa*, each member of the focus alternative is stored as a set again and then each of them is applied to the continuation. When *wa* is attached to an  $\text{NP}_F$ , the semantics of the NP can be given as in (62).

(62) *Semantics of Contrastive wa with an NP<sub>F</sub>*

$$\llbracket \text{NP}_F\text{-wa} \rrbracket^f = \lambda F_{(et)t} : \text{NP}_F \supset \{ \llbracket \text{NP} \rrbracket^o \} \wedge F(\text{NP}_F) = \text{CT} . \{ F(\{x\}) | x = x \}$$

Let us see how it works with a sentence ‘*Taro<sub>F</sub>-wa sneezed.*’ with  $D_e = \{t, j, h\}$  in which Taro, Jiro, Hanako are only individuals in the contextually restricted domain. In the derivation, the presuppositions of contrastive *wa* are omitted for the sake of simplicity.

(63) *The derivation of the focus semantic value of ‘Taro<sub>F</sub>-wa sneezed.’*

$$\begin{aligned} & \llbracket \text{S}[\text{NP Taro}_F\text{-wa}][\text{VP sneezed}] \rrbracket \\ & \lambda c_S . \underline{\text{VP}}(\lambda \mathcal{P}_{(et)t} . \underline{\text{NP}}_F\text{-wa}(\lambda X_{et} . c_S(\mathcal{P}(X)))) \\ & \rightsquigarrow (\underline{\text{VP}} = \lambda c_{VP} . c_{VP}(\{\lambda x . \text{sneeze}(x)\})) \\ & \lambda c_S . [\lambda c_{VP} . c_{VP}(\{\lambda x . \text{sneeze}(x)\})] (\lambda \mathcal{P} . \underline{\text{NP}}_F\text{-wa}(\lambda X . c_S(\mathcal{P}(X)))) \\ & \rightsquigarrow (\text{by } \beta\text{-reduction}) \\ & \lambda c_S . \underline{\text{NP}}_F\text{-wa}(\lambda X . c_S(\{\lambda x . \text{sneeze}(x)\}(X))) \\ & \rightsquigarrow (\underline{\text{NP}}_F\text{-wa} = \lambda F_{(et)t} . \{F(\{x\}) | x = x\}) \\ & \lambda c_S . [\lambda F_{(et)t} . \{F(\{x\}) | x = x\}] (\lambda X . c_S(\{\lambda x . \text{sneeze}(x)\}(X))) \\ & \rightsquigarrow (\text{by } \beta\text{-reduction}) \\ & \lambda c_S . \{c_S(\{\lambda x . \text{sneeze}(x)\}(\{x\})) | x = x\} \\ & \rightsquigarrow (\text{by Pointwise Functional Application}) \\ & \lambda c_S . \{c_S(\{\text{sneeze}(x)\}) | x = x\} \end{aligned}$$



$\rightsquigarrow$  (by  $c_S = \{\lambda p.p\}$  and  $\beta$ -reduction)  
 $\{\{\lambda p.p\}(\{\text{sneeze}(x)\})|x = x\}$   
 $\rightsquigarrow$  (by Pointwise Functional Application)  
 $\{\{\text{sneeze}(x)\}|x = x\}$   
 $\rightsquigarrow \{\{\text{Taro sneezed}\}, \{\text{Jiro sneezed}\}, \{\text{Hanako sneezed}\}\}$

The crucial step is the third step in the derivation. Here each member of  $D_e$  is made into a singleton set and made ready to be combined with the continuation, which is a set of one-place predicates. Since there is no F-marking in the continuation part in this case, it is a singleton set of a one-place predicate. Combining singleton sets consisting of individuals in the domain and the continuation, sets of a singleton proposition are derived in the fifth step via PFA.

When a continuation part has F-marking somewhere inside, we have a little more complicated results. Let us think about a sentence that has contrastive *wa* and (informational) focus: ‘*Taro<sub>F</sub>-wa Hanako<sub>F</sub>-o invited.*’ in which contrastive *wa* is marking the subject and the object is just marked with phonological focus. If the underlying QuD is *Who invited whom?*, this particular way of answering the question presupposes that the host-by-host strategy is adopted rather than the guest-by-guest strategy.

(64) *The derivation of the focus semantic value of ‘Taro<sub>F</sub>-wa invited Hanako<sub>F</sub>.’*

$[S_{[NP \text{ Taro}_F\text{-wa}][VP [NP \text{ Hanako}_F\text{-o} \text{ invited}]]]$   
 $\rightsquigarrow (\underline{NP}_{F\text{-wa}} = \lambda F_{(et)t} . \{F(\{x\})|x = x\})$   
 $\lambda_{c_S} . [\lambda F_{(et)t} . \{F(\{x\})|x = x\}] (\lambda X_{et} . \underline{NP}_F(\lambda Y_{et} . \underline{Vt}(\lambda \mathcal{R}_{((e(et))t)} . c_S(\mathcal{R}(Y)(X))))))$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S} . \{\underline{NP}_F(\lambda Y_{et} . \underline{Vt}(\lambda \mathcal{R}_{((e(et))t)} . c_S(\mathcal{R}(Y)(\{x\}))))|x = x\}$   
 $\rightsquigarrow (\underline{NP}_F = \lambda c_{NP} . c_{NP}(\{y : y \in D\}))$   
 $\lambda_{c_S} . \{\lambda c_{NP} . c_{NP}(\{y : y \in D\})\} (\lambda Y_{et} . \underline{Vt}(\lambda \mathcal{R}_{((e(et))t)} . c_S(\mathcal{R}(Y)(\{x\}))))|x = x\}$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S} . \{\underline{Vt}(\lambda \mathcal{R}_{((e(et))t)} . c_S(\mathcal{R}(\{y : y \in D\})(\{x\}))))|x = x\}$   
 $\rightsquigarrow (\underline{Vt} = \lambda c_{Vt} . c_{Vt}(\{\lambda x . \lambda y . \text{invite}(x)(y)\}))$   
 $\lambda_{c_S} . \{\lambda c_{Vt} . c_{Vt}(\{\lambda x . \lambda y . \text{invite}(x)(y)\})\} (\lambda \mathcal{R}_{((e(et))t)} . c_S(\mathcal{R}(\{y : y \in D\})(\{x\}))))|x = x\}$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S} . \{c_S(\{\lambda x . \lambda y . \text{invite}(x)(y)\}(\{y : y \in D\})(\{x\}))|x = x\}$

$\rightsquigarrow$  (by Pointwise Functional Application)  
 $\lambda c_S. \{c_S(\{\text{invite}(y)(x)|y = y\})|x = x\}$   
 $\rightsquigarrow$  (by  $c_S = \{\lambda p.p\}$  and  $\beta$ -reduction)  
 $\{\{\lambda p.p\}(\{\text{invite}(y)(x)|y = y\})|x = x\}$   
 $\rightsquigarrow$  (by Pointwise Functional Application)  
 $\{\{\text{invite}(y)(x)|y = y\}|x = x\}$   
 $= \{\{\text{invite}(t)(t), \text{invite}(j)(t), \text{invite}(h)(t)\},$   
 $\{\text{invite}(t)(j), \text{invite}(j)(j), \text{invite}(h)(j)\},$   
 $\{\text{invite}(t)(h), \text{invite}(j)(h), \text{invite}(h)(h)\}\}$   
 $\rightsquigarrow \{\{\text{Taro invited Taro, Taro invited Jiro, Taro invited Hanako}\},$   
 $\{\text{Jiro invited Taro, Jiro invited Jiro, Jiro invited Hanako}\},$   
 $\{\text{Hanako invited Taro, Hanako invited Jiro, Hanako invited Hanako}\}$

In this case, the VP part (*invited Hanako<sub>F</sub>*) will denote a set of functions in which the first argument of *invite* is filled with individuals in the domain. In other words, it is a set of one-place predicates each of which awaits the second argument, namely, the subject. When the set of functions is taken as an argument of the *wa*-marked phrase, each member of the denotation of the focus semantic value of *wa*-marked phrase will be turned to a singleton set and applied to the set of one-place predicates. Then the result will be a set of sets of questions which are sorted by the subject, which has *wa*-marking.

In the examples above, we happened to have the *wa*-phrases in a place where there would not occur a type-mismatch, namely the subject position, which is supposed to take a VP as its argument. Regardless of whether the verb is an intransitive or transitive, VPs are standardly of type *et*, so there is no problem. When the *wa*-marked phrase occupies the object position, however, there would be type mismatch — semantically, a *wa*-marked NP needs to take a set of one-place predicates as its first argument, but in this case, the first argument they would encounter would be a set of two place predicates. If we do not use continuations, there needs to be a kind of QR. However, with continuations, even when the *wa*-marked phrase is occupying the object position, it can take scope over the entire sentence, as we saw a quantifier such as *everyone* can take scope over the sentence from the object position without movement; We can do that just by continuizing everything.

Below, it is shown how a desired semantic value is derived with contrastive *wa* in the object

position, using *Taro-wa Hanako<sub>F</sub>-wa invited*. ‘Taro invited Hanako<sub>CT</sub>’. Note that the first *wa* is not attached to an F-marked element so it does not do anything semantically interesting.

(65) *The derivation of the focus semantic value of a sentence with contrastive wa in the object*

$$\begin{aligned}
& [{}_S [{}_{NP} \text{Taro-wa}] [{}_{VP} [{}_{NP} \text{Hanako}_F\text{-wa}] \text{invited}]] \text{ ‘Taro invited Hanako}_{CT}\text{’} \\
& \lambda_{c_S}. \underline{NP}_{wa} (\lambda X. \underline{NP}_{wa-F} (\lambda Y. \underline{Vt} (\lambda \mathcal{R}. c_S (\mathcal{R}(Y)(X)))))) \\
& \rightsquigarrow (\underline{NP}_{wa} = \lambda c_{NP}. c_{NP} (\{t\})) \\
& \lambda_{c_S}. [\lambda c_{NP}. c_{NP} (\{t\})] (\lambda X. \underline{NP}_{wa-F} (\lambda Y. \underline{Vt} (\lambda \mathcal{R}. c_S (\mathcal{R}(Y)(X)))))) \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \lambda_{c_S}. \underline{NP}_{wa-F} (\lambda Y. \underline{Vt} (\lambda \mathcal{R}. c_S (\mathcal{R}(Y)(\{t\})))) \\
& \rightsquigarrow (\underline{NP}_{F-wa} = \lambda F_{(et)t}. \{F(\{x\}) | x = x\}) \\
& \lambda_{c_S}. [\lambda F_{(et)t}. \{F(\{x\}) | x = x\}] (\lambda Y. \underline{Vt} (\lambda \mathcal{R}. c_S (\mathcal{R}(Y)(\{t\})))) \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \lambda_{c_S}. \{\underline{Vt} (\lambda \mathcal{R}. c_S (\mathcal{R}(\{x\})(\{t\}))) | x = x\} \\
& \rightsquigarrow (\underline{Vt} = \lambda c_{Vt}. c_{Vt} (\{\lambda x. \lambda y. \text{invite}(x)(y)\})) \\
& \lambda_{c_S}. \{\{\lambda c_{Vt}. c_{Vt} (\{\lambda x. \lambda y. \text{invite}(x)(y)\})\} (\lambda \mathcal{R}. c_S (\mathcal{R}(\{x\})(\{t\}))) | x = x\} \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \lambda_{c_S}. \{c_S (\{\lambda x. \lambda y. \text{invite}(x)(y)\} (\{x\})(\{t\})) | x = x\} \\
& \rightsquigarrow (\text{by Pointwise Functional Application}) \\
& \lambda_{c_S}. \{c_S (\{\text{invite}(x)(t)\}) | x = x\} \\
& \rightsquigarrow \{\{\text{invite}(t)(t)\}, \{\text{invite}(j)(t)\}, \{\text{invite}(h)(t)\}\} \\
& \rightsquigarrow \{\{\text{Taro invited Taro}\}, \{\text{Taro invited Jiro}\}, \{\text{Taro invited Hanako}\}\}
\end{aligned}$$

The result is a set of sets of propositions sorted by the object, which is *wa*-marked. There is no type-mismatch in anywhere — both the first NP and the second NP take a function from a set of individuals to a set of propositions as its first argument and the scope of *wa* can still be over the entire sentence.

It is worth emphasizing that there is no syntactic movement involved. Therefore, nothing prevents contrastive *wa* from taking scope over the entire sentence even from the inside of the island. In this way, it is possible to practically allow *wa* to be used inside the island. This can account for the empirical fact that it is not the case that *wa* can never be used inside the island. Of course, it is necessary to explain the data in which *wa* inside the island is clearly

ungrammatical. However, this in-situ approach has its own virtue.

One advantage to adopt the continuation hypothesis and regard the *wa*-marked phrase works as a function is that we can derive the denotation of a sentence with multiple CTs for free. Constant (2014) mentions that multiple CTs can appear in a sentence in English when an appropriate QuD is set. In Japanese, we can have multiple CTs as well, as pointed out by Yabushita (2017, 25).<sup>7</sup>

- (66) John<sub>F</sub>-wa Mary<sub>F</sub>-wa Bob<sub>F</sub>-ni-wa syookai-si-ta.  
 John-wa Mary-wa Bob-DAT-wa introduce-do-PAST  
 John<sub>CT</sub> introduced Mary<sub>CT</sub> to Bob<sub>CT</sub>.'

Having multiple CTs is not a real problem for Constant. However, it is still true that it is necessary to have a modified Topic Abstraction in order for Constant to derive the focus semantic value of this complex case. By contrast, the denotation of contrastive *wa* given earlier can give the heavily nested focus semantic values without any modification. The derivation of a sentence with two contrastive *was* (in the subject and object) is given below.

- (67) *The derivation of the focus semantic value of a sentence with multiple contrastive wa*  
 $[S [NP \text{ Tarō}_F\text{-wa}]] [VP [NP \text{ Hanako}_F\text{-wa} \text{ invited}]] \text{ 'Tarō}_{CT} \text{ invited Hanako}_{CT}'$   
 $\lambda_{c_S}. \underline{NP}_{wa-F} (\lambda X. \underline{NP}_{wa-F} (\lambda Y. \underline{V}_t (\lambda \mathcal{R}. c_S(\mathcal{R}(Y)(X))))))$   
 $\rightsquigarrow (\underline{NP}_{F-wa} = \lambda F_{(et)t}. \{F(\{x\}) | x = x\})$   
 $\lambda_{c_S}. [\lambda F_{(et)t}. \{F(\{x\}) | x = x\}] (\lambda X. \underline{NP}_{wa-F} (\lambda Y. \underline{V}_t (\lambda \mathcal{R}. c_S(\mathcal{R}(Y)(X))))))$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S}. \{\underline{NP}_{wa-F} (\lambda Y. \underline{V}_t (\lambda \mathcal{R}. c_S(\mathcal{R}(Y)(\{x\}))) | x = x\}$   
 $\rightsquigarrow (\underline{NP}_{F-wa} = \lambda F_{(et)t}. \{F(\{x\}) | x = x\})$   
 $\lambda_{c_S}. \{\lambda F_{(et)t}. \{F(\{y\}) | y = y\}] (\lambda Y. \underline{V}_t (\lambda \mathcal{R}. c_S(\mathcal{R}(Y)(\{x\}))) | x = x\}$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S}. \{\{\underline{V}_t (\lambda \mathcal{R}. c_S(\mathcal{R}(\{y\})(\{x\}))) | y = y\} | x = x\}$   
 $\rightsquigarrow (\underline{V}_t = \lambda c_{Vt}. c_{Vt}(\{\lambda x. \lambda y. \text{invite}(x)(y)\}))$   
 $\lambda_{c_S}. \{\{\lambda c_{Vt}. c_{Vt}(\{\lambda x. \lambda y. \text{invite}(x)(y)\})\} (\lambda \mathcal{R}. c_S(\mathcal{R}(\{y\})(\{x\}))) | y = y\} | x = x\}$   
 $\rightsquigarrow$  (by  $\beta$ -reduction)  
 $\lambda_{c_S}. \{c_S(\{\lambda x. \lambda y. \text{invite}(x)(y)\}(\{y\})(\{x\})) | y = y\} | x = x\}$

<sup>7</sup>Note that the sentence-initial *wa*-phrase could be interpreted as an aboutness topic. There is no such an ambiguity with respect to the other two *wa*-phrases.

$\rightsquigarrow$  (by Pointwise Functional Application)  
 $\lambda c_S. \{ \{ c_S(\{\text{invite}(x)(y)\}) \mid y = y \} \mid x = x \}$   
 $\rightsquigarrow \{ \{ \{\text{invite}(t)(t)\}, \{\text{invite}(j)(t)\}, \{\text{invite}(h)(t)\}\},$   
 $\quad \{ \{\text{invite}(t)(j)\}, \{\text{invite}(j)(j)\}, \{\text{invite}(h)(j)\}\},$   
 $\quad \{ \{\text{invite}(t)(h)\}, \{\text{invite}(j)(h)\}, \{\text{invite}(h)(h)\}\} \}$   
 $\rightsquigarrow \{ \{ \{\text{Taro invited Taro}\}, \{\text{Taro invited Jiro}\}, \{\text{Taro invited Hanako}\}\},$   
 $\quad \{ \{ \{\text{Jiro invited Taro}\}, \{\text{Jiro invited Jiro}\}, \{\text{Jiro invited Hanako}\}\},$   
 $\quad \{ \{ \{\text{Hanako invited Taro}\}, \{\text{Hanako invited Jiro}\}, \{\text{Hanako invited Hanako}\}\} \}$

What makes it possible to derive the nested focus value here is that by using continuation, the two *wa*-marked focus phrases take their own continuations of the right type:  $(et)t$ . The first *wa* makes a set of sets of propositions and the second one makes another set of sets of propositions inside the one made by the first one. As a result, with this order of computation, we would get a set of sets of sets of propositions that are sorted by the subject first and then by the object. The same computation procedure can be followed even when there are more than two contrastive *was*.

### 3.4.3.2 Sentence initial *wa*

In the earlier section, it was shown that there is evidence that supports the idea that the sentence initial contrastive *wa* is base-generated and binds a null pronoun (*pro*). If it is correct, the syntactic category and semantic role of *wa* in the designated topic position are slightly different from *wa* used in the root clause. Recall that *wa* marking an NP has syntactic category  $(NP \setminus (S / (NP \setminus S)))$ , which means that *wa* takes (i) an NP immediately before it and (ii) whatever lacks an NP to become an S and then gives back S, as shown by (68). By contrast, *wa* in the topic position first takes an NP immediately before it and then (ii) takes a sentence S that needs an NP binding a pronoun inside to get a full interpretation and occurs immediately after the *wa*-phrase, as in (69).

(68) *Wa taking an NP in-situ in the ordinary dimension*

$wa: (NP \setminus (S / (NP \setminus S))), e((et)t), \lambda x. \lambda c_{NP}. c_{NP}(x)$

[<sub>S</sub> ... XP<sub>F</sub>-*wa* ...]

[*wa* appears in the root clause]

(69) *Wa in the topic position in the ordinary dimension*

$wa: NP \setminus (S/NP \triangleright S), e((et)t), \lambda x. \lambda c_{NP}. c_{NP}(x)$

$XP_{Fi-wa} [s \dots pro_i \dots ]$

[*wa* appears in the topic position]

Note that even though the two *was* have different syntactic categories, they have exactly the same semantic type.

In order to express a different environment in which a *wa*-phrase is used, I will adopt the treatment of clauses that have unbounded pronouns following [Barker and Shan \(2015\)](#). There are largely two ingredients. First, here I assume that the presence of an unbounded pronoun is reflected in the syntactic category ([Jacobson, 1999](#)). To indicate a clause that has an unbounded pronoun, I will use the notation:  $NP \triangleright S$ , which is, for example, the category of the sentence such as '*He sneezed*'. The idea behind this is that a sentence with an unbounded pronoun does not have a complete interpretation until the referent of the pronoun is specified. The root clause with *pro* is considered to have exactly the same status, and this is the argument that the *wa*-phrase in the topic position takes, as shown in (69).

Second, it is assumed that pronouns take scope. They work as an NP in the composition but take scope over a sentence, and make the sentence an open proposition ([Dowty, 2007](#)). Given that, the lexical denotation of the pronoun including *pro* can be expressed as an identity function:  $\lambda c_{NP}. \lambda y. c_{NP}(y)$ , as shown in (70). Using (70) and the continuized grammar, we can get the meaning of the sentence of *He sneezed* as an open proposition, after feeding a trivial continuation to the final result of the derivation in (71).

(70)  $\underline{NP} \rightarrow he: \lambda c_{NP}. \lambda y. c_{NP}(y)$

(71) *The derivation of the ordinary semantic value of a sentence with a pronoun*

$[s_{[NP \ He]} [VP \ sneezed]]$

$\lambda c_S. \underline{NP}(\lambda x_e. \underline{VP}(\lambda P_{et}. c_S(P(x))))$

$\rightsquigarrow (\underline{NP} = \lambda c_{NP}. \lambda y. c_{NP}(y))$

$\lambda c_S. [\lambda c_{NP}. \lambda y. c_{NP}(y)] (\lambda x_e. \underline{VP}(\lambda P_{et}. c_S(P(x))))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$\lambda c_S. \lambda y. \underline{VP}(\lambda P_{et}. c_S(P(y)))$

$\rightsquigarrow (\underline{VP} = \lambda c_{VP}. c_{VP}(\lambda x. sneeze(x)))$

$\lambda c_S. \lambda y. [\lambda c_{VP}. c_{VP}(\lambda x. sneeze(x))] (\lambda P_{et}. c_S(P(y)))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$$\lambda_{c_S}. \lambda y. c_S(\text{sneeze}(y))$$

Going back to a sentence with a *wa*-phrase in the topic position, the root clause that contains *pro* bound by the *wa*-phrase is supposed to look like the final result in (Z1); an open proposition that awaits something of category NP. Taking up a sentence ‘*Hanako<sub>F</sub>-wa, Taro pro invited.*’, the root clause ends up with having an interpretation in (Z2a). On the other hand, if the *wa*-phrase in the topic position has the same semantics as the *wa*-phrase in-situ, it has the interpretation as in (Z2b), which is of type  $(et)t$ .

(72) *Hanako<sub>F</sub>-wa, Taro pro invited.* ‘Hanako, Taro invited her.’

- a.  $[s_{[NP \text{ Taro}]}[VP_{[NP \text{ pro}]} \text{ invited}]] = \lambda_{c_S}. \lambda y. c_S(\text{invite}(y)(t))$
- b.  $[NP \text{ Hanako-wa}] = \lambda_{c_{NP}}. c_{NP}(h)$

It is obvious that we cannot use (Z2a) as an argument of (Z2b) since the root clause is of type  $(tt)(et)$ . However, once we feed a trivial continuation  $c_S$  to (Z2a), they can be combined without any problem, and as a result, we can get “ $\text{invite}(h)(t)$ ” as the semantic value of the entire sentence, which is what we want as the meaning of ‘*Hanako, Taro invited her.*’

In the focus dimension, the same process can be applied as long as the root clause ends up with having a semantic type  $(et)t$  after applying the focus dimension version of trivial continuation for an S. Once  $c_S$  is removed, *wa*-phrase, which is supposed to be of type  $((et)t)t$  can take the root clause as its argument. The following shows the computation of the sentence ‘*Hanako<sub>F</sub>-wa, Taro pro invited.*’ in the focus dimension.

(73) *Hanako<sub>F</sub>-wa, Taro pro invited.* ‘Hanako, Taro invited her.’

- a.  $[s_{[NP \text{ Taro}]}[VP_{[NP \text{ pro}]} \text{ invited}]] = \lambda_{c_S}. \lambda Y. c_S\{\text{invite}(y)(t) | y \in Y\}$
- b.  $[NP \text{ Hanako<sub>F</sub>-wa}] = \lambda F_{(et)t}. \{F(\{x\}) | x = x\}$
- c.  $(Z3b)(c_S(Z3a)) \rightsquigarrow [\lambda F_{(et)t}. \{F(\{x\}) | x = x\}] (\lambda Y. \{\text{invite}(y)(t) | y \in Y\})$   
 $= \{\{\text{invite}(y)(t) | y \in \{x\}\} | x = x\}$   
 $= \{\{\text{invite}(x)(t)\} | x = x\}$

given that the domain of  $D_e$  consists of  $\{t, j, h\}$ :

$$\rightsquigarrow \{\{\text{invite}(t)(t)\}, \{\text{invite}(j)(t)\}, \{\text{invite}(h)(t)\}\}$$

$$\rightsquigarrow \{\{\text{Taro invited Taro}\}, \{\text{Taro invited Jiro}\}, \{\text{Taro invited Hanako}\}\}$$

In the previous paragraph, there was a reservation that the same process can be applied “as long as the root clause ends up with having a semantic type  $(et)t$  after applying the focus dimension version of trivial continuation for an S.” The reservation is necessary since in case the root clause has another CT, the *wa*-phrase cannot take the root clause as its argument without any adjustments. Let us look at what the problem is, taking the sentence ‘*Hanako<sub>F-wa</sub> Taro<sub>F-wa</sub> pro invited*’. The intended interpretation of the sentence is ‘Hanako<sub>CT</sub>, Taro<sub>CT</sub> invited her.’

First, let us see what we get as the meaning of the root clause if we do the calculation just in the same way as we did before:

(74) *Hanako<sub>F-wa</sub> Taro<sub>F-wa</sub> pro invited*. ‘Hanako<sub>CT</sub>, Taro<sub>CT</sub> invited her.’

a. The computation of the root clause:

$$\begin{aligned}
& [s[_{NP} \text{ Taro}_{F-wa}][_{VP}[_{NP} \text{ pro}] \text{ invited}]] \\
& \quad \lambda c_S. \underline{NP}_{F-wa}(\lambda X. \underline{NP}_{pro}(\lambda Y. \underline{Vt}(\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(X)))))) \\
& \rightsquigarrow (\underline{NP}_{F-wa} = \lambda F_{(et)t}. \{F(\{x\})|x = x\}) \\
& \quad \lambda c_S. [\lambda F_{(et)t}. \{F(\{x\})|x = x\}] (\lambda X. \underline{NP}_{pro}(\lambda Y. \underline{Vt}(\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(X)))))) \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \quad \lambda c_S. \{\underline{NP}_{pro}(\lambda Y. \underline{Vt}(\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(\{x\}))))|x = x\} \\
& \rightsquigarrow (\underline{NP} = \lambda c_{NP}. \lambda Y. c_{NP}(Y)) \\
& \quad \lambda c_S. \{[\lambda c_{NP}. \lambda Y. c_{NP}(Y)](\lambda Y. \underline{Vt}(\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(\{x\}))))|x = x\} \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \quad \lambda c_S. \{\lambda Y. \underline{Vt}(\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(\{x\})))|x = x\} \\
& \rightsquigarrow (\underline{Vt} = \lambda c_{Vt}. c_{Vt}(\{\lambda x. \lambda y. \text{invite}(x)(y)\})) \\
& \quad \lambda c_S. \{\lambda Y. [\lambda c_{Vt}. c_{Vt}(\{\lambda x. \lambda y. \text{invite}(x)(y)\})](\lambda \mathcal{R}.c_S(\mathcal{R}(Y)(\{x\})))|x = x\} \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \quad \lambda c_S. \{\lambda Y. c_S(\{\lambda x. \lambda y. \text{invite}(x)(y)\}(Y)(\{x\}))|x = x\} \\
& \rightsquigarrow (\text{by Pointwise Functional Application}) \\
& \quad \lambda c_S. \{\lambda Y. c_S(\{\text{invite}(y)(x)|y \in Y\})|x = x\}
\end{aligned}$$

b. (74a) after applying  $c_S$

$$\{\lambda Y. \{\text{invite}(y)(x)|y \in Y\}|x = x\}$$

In (74b), we see the final result after applying a trivial continuation (at the set level). What we end up with having is something that is of type  $((et)t)t$ . Recall that a contrastive *wa*-phrase in



the focus dimension is of type  $((et)t)t$ . That is, it looks for an argument that has type  $(et)t$ . Now we have a type mismatch. Note that this type mismatch cannot be fixed by changing the order of evaluations. On the assumption that the *wa*-phrase in the topic position binds a *pro* in the root clause, this is the only possible way to combine the two.

Given the discussion above, if we do not change the semantics of the contrastive *wa*-phrase in the topic position, whenever the root clause already has a nested focus semantic value, there would be a type mismatch. Actually, it is not so clear that in the sentence I used in illustrating the problem, namely '*Hanako<sub>F</sub>-wa Taro<sub>F</sub>-wa pro invited.*', whose intended interpretation is '*Hanako<sub>CT</sub>, Taro<sub>CT</sub> invited her.*', *Hanako* can be interpreted as a contrastive topic. Whether such an interpretation is really available or not needs investigating to begin with. It is worth mentioning, however, that an example of multiple CTs in Japanese often involves a series of *wa*-phrases in a canonical word order. As mentioned in discussing *wa* in-situ, having multiple *wa*-phrases is no problem if they all occur in-situ. If this contrast is real, it is predicted by the machinery used to compute the focus semantic value pursued in this section.

A strong prediction that can be made out of the discussion is that it is not possible to have multiple contrastive *was* split in the topic position and in the root clause due to a type-mismatch. However, this seems to be too strong. As mentioned earlier, the sentence-initial *wa* is generally ambiguous between an aboutness topic and a contrastive topic. When the *wa*-phrase in the left periphery (i.e., the sentence-initial one) is interpreted as an aboutness topic, the sentence could be grammatical. This is puzzling if we try to account for oddness of the sentence with split multiple contrastive *wa*-phrases by a type-mismatch, since even if the *wa* is not a contrastive one, there should be a type-mismatch between the *wa*-phrase and the root clause; As mentioned earlier, both kinds of *wa* phrases should have the same semantic type.

Then it is more reasonable to assume that the contrastive *wa*-phrase in the topic position and those in the root clause can theoretically co-exist, but it is just hard to interpret the sentence with such a configuration. Recall that the problem we had when there is another CT in the root clause is a type mismatch. If we do not touch the semantics of a *wa*-phrase at all, there is no fixing it. However, once we allow a reasonable type-shift, we can get the interpretation we want. Let us think what we want *wa* to look like to continue the computation. Even when there is another CT in the root clause, if the *wa*-phrase had the interpretation given as NP-*wa*<sub>2</sub> below, the computation could continue:

$$(75) \quad \llbracket \text{NP-wa}_2 \rrbracket^f = \lambda \mathcal{F} . \{ \{ F(\{x\}) \mid x = x \} \mid F \in \mathcal{F} \} \text{ where } \mathcal{F} \text{ is of type } ((et)t)t$$

This NP-wa<sub>2</sub> can be expressed by using the interpretation of the ordinary NP-wa:  $\llbracket \text{DP-wa} \rrbracket$ , as in (76).

$$(76) \quad \llbracket \text{NP-wa}_2 \rrbracket^f = \lambda \mathcal{F} . \{ \llbracket \text{NP-wa} \rrbracket^f (F) \mid F \in \mathcal{F} \} \text{ where } \mathcal{F} \text{ is of type } ((et)t)t$$

The result in (76) is mathematically closely related to the semantics of NP-wa; What is given in (76) can be characterized as an image of  $\mathcal{F}$  under  $f$ , which is the function denoted by NP-wa. Generally, the image of a subset  $A \subseteq X$  under  $f$  is defined as in (77). Using this notation, the function given in (75) can be expressed more simply using  $f$ , which is the function denoted by NP-wa, as in (78). In other words, it is an image of  $\mathcal{F}$  under the semantics of contrastive wa in-situ.

$$(77) \quad \text{Image of a subset: } f[A] = \{ f(a) \mid a \in A \}$$

$$(78) \quad \llbracket \text{DP-wa}_2 \rrbracket^f = f[\mathcal{F}] \text{ where } \mathcal{F} \text{ is of type } ((et)t)t$$

The computation in (78) is a little more complicated than the ordinary translation of contrastive wa. Whenever we have a nested value already at the root clause level, this type-shift needs to be executed so that the computation can proceed. The difficulty of having split CTs could be due to this type-shift. In this account, the contrast between an aboutness topic and a contrastive topic could reside in the complexity of the computations between them. Note that this type-shift is not necessary as long as what we do not have any other CT in the root clause since there is no problem in computation. In other words, giving the basic semantics that is the same as the in-situ version to the wa in the topic position can predict that there is no problem (or no additional processing cost) in using a CT in the topic position with a root clause that has (informational) focus. That is indeed the case. Let us say the underlying QuD is ‘Who invited whom?’ and the speaker is using a “guest-by-guest” strategy. It can be done by using contrastive wa in the topic position with the focus in-situ.

(79) *The derivation of the focus semantic value of a sentence with topicalized contrastive plus focus*

$\llbracket_{\text{Topic}} \text{Hanako}_F\text{-wa} \rrbracket \llbracket_{\text{S}} \llbracket_{\text{NP}} \text{Taro}_F\text{-ga} \rrbracket \llbracket_{\text{VP}} \llbracket_{\text{NP}} \text{pro} \rrbracket \text{invited} \rrbracket \rrbracket$  ‘Hanako<sub>CT</sub>, Taro<sub>F</sub> invited her.’

$\llbracket \lambda F_{(et)t} . \{ F(\{z\}) \mid z = z \} \rrbracket (\lambda Y . \{ \text{invite}(y)(x) \mid y \in Y \wedge x = x \})$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$$\begin{aligned}
& \{\{\text{invite}(y)(x)|y \in \{z\} \wedge x = x\}|z = z\} \\
& = \{\{\text{invite}(z)(x)|x = x\}|z = z\} \\
& = \{\{\text{Taro invited Hanako, Jiro invited Hanako, Hanako invited Hanako}\}, \\
& \quad \{\text{Taro invited Taro, Jiro invited Taro, Hanako invited Taro}\}, \\
& \quad \{\text{Taro invited Jiro, Jiro invited Jiro, Hanako invited Jiro}\}\}
\end{aligned}$$

The result is a set of sets of propositions, which are sorted by the guest, as wanted.

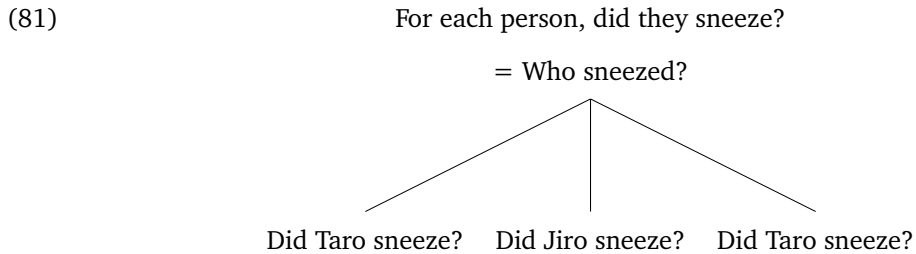
In summary, this section revealed that using continuation to formally define the semantics of *wa* can give us reasonable accounts of some of the empirical facts introduced in Section 3.2. Continuation gives us a formal way to get the focus semantic value which demonstrates in what context contrastive *wa* can be used. It can also capture a difference between contrastive *wa* in-situ and that in the topic position. To account for a variety of implications that contrastive *wa* convey, however, we need one more ingredient: conventional effects of using contrastive *wa*, which is discussed in the next section.

### 3.4.4 Conventional Effects of Contrastive *wa*

In the previous sections, we have seen how the semantic denotation of *wa* could be expressed using continuations and focus alternatives. Contrastive *wa* uses a set of alternatives invoked by phonological focus to generate propositions about them, using continuations. Taking up a simple example like ‘*Taro<sub>F</sub>-wa sneezed.*’ ‘*Taro<sub>CT</sub> sneezed.*’, we get a set of sets of propositions among which the subjects range over the set of individuals:

$$\begin{aligned}
(80) \quad & \llbracket \text{Taro}_F\text{-wa sneezed.} \rrbracket^f \\
& = \{\{\text{sneeze}(t)\}, \{\text{sneeze}(j)\}, \{\text{sneeze}(h)\}\} \\
& \rightsquigarrow \{\{\text{Taro sneezed}\}, \{\text{Jiro sneezed}\}, \{\text{Hanako sneezed}\}\}
\end{aligned}$$

This focus semantic value is a set of sets of singleton propositions. To put differently, the focus semantic value could be expressed as “For each person, did they sneeze?”. The answer to this question is also the answer to the question ‘Who sneezed?’. Using a tree (d-tree) to schematically represent a discourse structure, the discourse structure that is expressed by the focus semantic value given in (80) will be expressed as below:

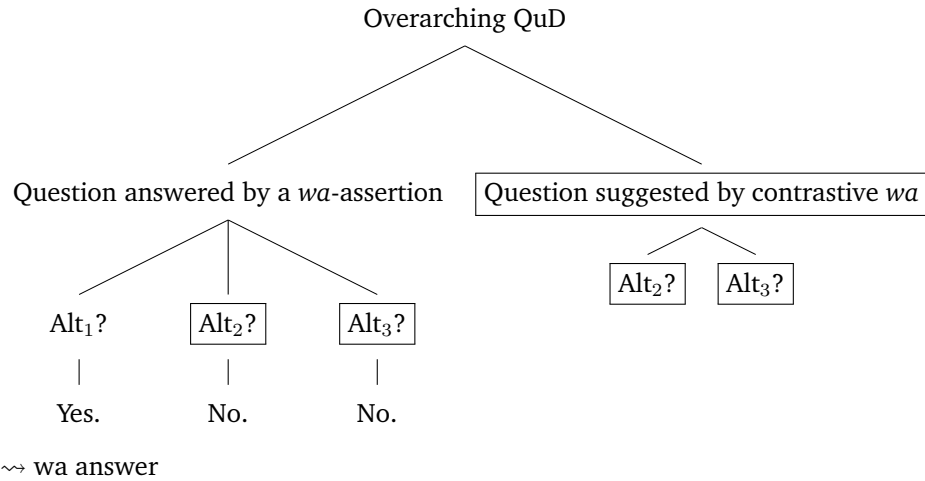


When someone uses contrastive *wa*, they can indicate that they are using this particular d-tree to approach the answer; seeking answers to these polar questions to answer the overarching QuD to be resolved in the context.

However, conventionally contrastive *wa* can do more than this. Not only can an assertion with contrastive *wa* give an answer, but it can convey some kind of non-exhaustivity. A typical example is an ignorance inference we have seen. Using contrastive *wa* conveys that the stronger alternatives could be an answer to the question. For instance, when the speaker utters ‘*Taro<sub>F</sub>-wa sneezed.*’ ‘*Taro<sub>CT</sub> sneezed.*’, this way of answering the question suggests that ‘*Taro and Jiro sneezed*’ or ‘*Taro, Jiro, and Hanako sneezed.*’ might also be an answer to the question. In other words, the speaker does not have full knowledge about the answer. Nevertheless, as we have overviewed, this ignorance inference is not the only possible implication conveyed by the use of contrastive *wa*. It can also convey that the other two did not sneeze, for example.

Bearing the possible implications in mind, the conventional effect of contrastive *wa* can be expressed as follows: Using contrastive *wa* indicates that the speaker can provide some information about the alternatives that are not used in the original assertion with contrastive *wa*. In the case we are now looking at, for example, saying ‘*Taro<sub>F</sub>-wa sneezed.*’ can indicate that the speaker could make some assertion about Jiro or Hanako. Such an assertion made up with those unused alternatives could be considered to be an answer to another potential QuD to be resolved in the context, given that the speaker is assumed to make assertions that are relevant to the immediate conversational goal. Then the question the speaker is answering by an assertion with contrastive *wa* and a potential question suggested by the use of contrastive *wa* need to be subsumed by the same overarching QuD. Schematically, we would get a discourse tree like below:

(82) *A discourse tree projected by the use of contrastive wa in the answer*



(82) shows that a *wa*-answer resolves a question, and it also invokes other potential questions that can be asked in the discourse. The questions can be made by using the alternatives that are not used in the *wa*-answer, namely *Alt*<sub>2</sub> and *Alt*<sub>3</sub>. What we need to make such potential questions with these alternatives is a suitable continuation; If the alternatives are of type *et* in the focus dimension, we need to look for something of type *(et)t*. The possible implications delivered by the use of contrastive *wa* vary depending on what continuations are used in the context. The constraints on possible QuDs invoked by *wa*-assertions are given below:

(83) When ‘*X*<sub>F</sub>-*wa* *Y*’ where *Y* is a continuation of *X* is used as an answer, it is presupposed that:

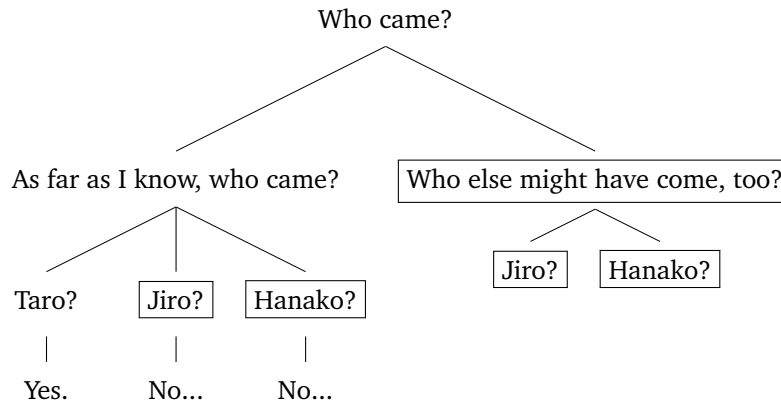
- a. There is  $a \in \llbracket X \rrbracket^f$  such that  $\llbracket Y \rrbracket^o(a)$  is not true.
- b. For a set  $\mathcal{A}$  that has  $a$  given by (83a) as its member, it is possible to make another QuD using a different continuation *Z*. The QuD and the question answered by the *wa* assertion need to be subsumed by the same overarching QuD.

In other words, the question obtained by  $\{Z(\{a\}) \mid a \in \mathcal{A}\}$  is relevant in context and it is projected as a potential future QuD.

The first part states that *wa* works to indicate that there is at least one alternative worth mentioning even though the answer to the polar question made with it is negative. The second part is about the potential QuD. The QuD is built up by composing the alternative that was not used in the assertion and another continuation which is distinct from what is used in the answer.

Now let us see how we can derive ignorance inferences and other contrastive interpretations using the constraint above.

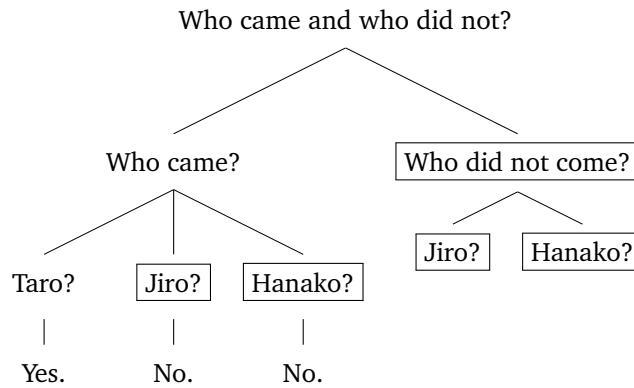
(84) A d-tree that can trigger ignorance inferences of the speaker



When an ignorance inference is available, the continuation used to make a potential QuD would look like “ $\lambda x.x$  might have come, too”. What to be noted here is that the *wa* answer that is used to answer the original question indicates that the speaker is now dividing the question into several sub-questions. In other words, they indicate that the answer they provide is not informative enough to resolve the QuD ‘Who came?’ since their knowledge is limited. By providing an opportunity for the addressee to ask other people that are not mentioned, the speaker is trying to be as cooperative as possible. However, it should be noted that the addressee is not obliged to take up such a question if they easily understand the intent of evoking those potential questions.

When the speaker is knowledgeable, the intent of projecting potential QuD is a little different. In those cases, by the use of contrastive *wa*, the speaker indicates that the alternatives not used are also worth mentioning as part of the discourse. For instance, if the QuD is *Who came?* and the speaker is knowledgeable enough to answer the question but still thinks some absentees are worth mentioning, they could suggest it by using *wa* and projecting a discourse tree like below:

(85) A d-tree that is compatible with a context in which the speaker is knowledgeable



This projected discourse allows the discourse participants to mention possible absentees. For instance, after ‘*Taro<sub>F</sub>-wa came.*’, the speaker can follow up by saying ‘*But Jiro<sub>F</sub>-wa did not come, and therefore the party was not so fun.*’ or as such.

Note that the information the speaker can try to add by using an assertion with contrastive *wa* is not necessarily “informative” in some sense. For instance, the speaker can follow up by saying ‘I cannot tell about the other people’ after saying ‘*Taro<sub>F</sub>-wa came.*’. That assertion might not be as informative as required in the discourse or as the addressee wishes, but still, the speaker is trying to be as cooperative as possible by mentioning the existence of others, and those might have a common property — for those people, the speaker cannot tell the addressee the detail about them.

Now it has been shown that we have a way to use continuations to project potential questions. From those questions, we can derive various kinds of implications that contrastive *wa* can convey. The main contribution of contrastive *wa* is to add more information about non-mentioned alternatives. Because of this, using contrastive *wa* is predicted to be infelicitous whenever there are no such non-mentioned alternatives available. This explains why contrastive *wa* cannot occur with whatever denotes the maximum.

## 3.5 Consequences and Implications

### 3.5.1 Connection between topic and contrastive *wa*

Using continuation, the proposed analysis makes it possible to derive the desired focus semantic value of a sentence with contrastive *wa*. In the process, a set of alternatives takes its continuations as its argument and makes a set of propositions. This process could be connected to the

basic contribution of *wa* Kuroda (2005) proposes: *Wa* makes a categorical judgment. The process of making the alternatives can be considered as a procedure in trying to make categorical judgments about the alternatives and then check them one by one. An example from Kuroda (2005, 10) is relevant to this point.

(86) A and B are engaged in conversation on general topics in literature. A asks B:

- a. tokorode, dare ga nihon iti no sakka desyoo  
by-the-way who Japan one writer be-would  
'Who would be the greatest writer of Japan?'

B is silent for a while, pondering on the question, then says:

- b. Un, soo da, Nogami Yaeko wa Nihon iti no sakka desu yo  
Yes, so is Nogami Yaeko Japan one writer be  
'yes, that's right, Nogami Yaeko is the greatest writer of Japan, I would say.'

In this case, B ponders who is the greatest writer of Japan and uses the *wa*-phrase in the answer. Kuroda uses this example to show that it is not the case that *wa* only marks discourse-old information. In the example given above, it is true that the *wa*-phrase does not necessarily have a contrastive *wa* interpretation. In fact, Kuroda regards a topic *wa* as different from contrastive *wa*. However, the cognitive process during using a *wa*-phrase depicted in his paper seems parallel to what the focus semantic value of the sentence with contrastive *wa* tells us:

B could have gone over an undetermined range of candidates in search of the greatest before identifying Nogami as the one. We could imagine that B even did not know the answer when A put the question to B. In responding, B predicated the greatest Japanese writer of Nogami Yaeko, perhaps with some surprise, even to himself/herself. [Kuroda (2005, 10) ]

In this particular case, the speaker is not ignorant about their own opinion about who he considers being the greatest writer of Japan. Rather, using *wa* indicates that the speaker went over the possible candidates one by one and reached the conclusion that Nogami Yaeko is the one that has the very property. This way of answering is compatible with giving an answer "with some surprise to the speaker" as Kuroda pointed out since the use of *wa* in this context implicates that there are other candidates that the speaker thought might be the answer to the question.



As mentioned above, Kuroda himself regards contrastive *wa* and topic *wa* different. It could well be that these are totally different items and they accidentally have the same sound and are used similarly. However, the proposed analysis that treats contrastive *wa* as a contrastive topic which is a special version of topic *wa* can capture the close similarity of the two lexical items by treating both of them as topic markers, which are used to steer the conversation in a certain direction.

### 3.5.2 Comparison with the other analyses of CTs in the literature

In this section, I will overview how the proposed analysis and the previous analyses of CTs or contrastive *wa* are similar and also different. First, the proposed analysis is compared with the analysis of CTs in English by Constant, which shares the idea that CTs access structured QuDs in context with the proposed analysis. Afterward, it is also discussed how the proposed analysis could be differentiated from the analyses of contrastive *wa* in Japanese in the literature.

#### 3.5.2.1 Comparison with CT in English (Constant, 2014)

The proposed analysis shares the core idea with the analysis of contrastive topics in English; CTs can access structured discourse structures (Büring, 2003; Constant, 2014). With this kind of approach, we need to figure out how particular discourse structures could be connected to the semantics of the answer, namely, its focus semantic value. The semantics of contrastive *wa* in Japanese given in this chapter is basically the modified version of Topic Abstraction proposed by Constant (2014) in order to derive nested focus semantic values.

(87) *Topic Abstraction* (Constant, 2014, 95)

- a.  $[[\text{CT-}\lambda_i \phi]]^o = \lambda x. [[\phi]]_{g[i \rightarrow x]}^o$  (Ordinary Semantic Value)
- b.  $[[\text{CT-}\lambda_i \phi]]^f = \{\lambda x. [[\phi]]_{g[i \rightarrow x]}^f\}$  (Focus Semantic Value)

In (87a), which demonstrates what we have for the ordinary semantic value, the CT operator does nothing special. It is just a simple lambda-abstraction. On the other hand, in the focus dimension (87b), a function from an individual to the truth value will be embraced in a set. This set of functions will be combined with a set of individuals, and via PFA, we can get a set of sets of propositions.

As can be seen in (87), it is assumed that there is the movement of a CT phrase. Therefore, the root clause has some trace that has the same index as the moved CT phrase. This works to account for some island sensitivity behaviors of CTs; CTs within islands are predicted to be ungrammatical without any pied-piping. However, it rules out every instance of CTs that occur inside of the island, which is problematic to explain the empirical facts in Japanese: Sometimes CTs do appear inside the island. This is why I adopt the system which practically allows us to derive the same kind of focus semantic value without positing any movement.

Another advantage of the proposed analysis is it can account for possible differences in parsing difficulty of multiple CTs. With Topic Abstraction (87), it is necessary to modify the rule when there is more than one CT in the sentence so that one CT operator can bind the two variables. Such a manipulation can handle multiple CT instances, but we need to modify the rule again when there are three CTs, etc. In Japanese, using more than one CT is not a problem as long as they are used in the canonical position. Therefore, as long as contrastive *wa* are in-situ, it seems that no special modification of the rule is necessary. The proposed analysis can generate the denotation of multiple CTs without any problems and modifications to the rule, as shown earlier. Indeed, there is a difficulty in parsing a sentence with multiple CTs when they are split between the topic position and the root clause. However, the discrepancy between such cases and multiple CTs in the canonical positions can be accounted for by the fact that the CT in the topic position and that in the canonical position have semantically different roles. The CT in the topic position is the binder of the variable in the root clause, which looks like what we obtain from Topic Abstraction, while that in the canonical position does not play such a role. A type-shift is necessary to interpret the CT in the topic position when there is another CT in the root clause, which could well be a reason for parsing difficulty. Further experimental studies would be needed to see if people actually find parsing sentences with split CTs more difficult than parsing sentences with CTs in-situ, but the proposed analysis has a potential to account for an asymmetry in Japanese at least.

### 3.5.2.2 Comparison with the analysis of contrastive *wa* in Japanese

Contrastive *wa* has attracted much attention in the literature of Japanese linguistics, and many different approaches have been proposed. Some of them were introduced already in Chapter 2: Hara (2006) and Tomioka (2009a), but there are not the only ones (e.g., Oshima (2002);

Yabushira (2017)). In this section, I will point out how the proposed analysis is similar to the previous ones and how it can be differentiated from them.

First, all of the analyses including the proposed one involve utilizing the focus alternatives that are associated with the item attached to *wa*. Those alternatives are combined with the rest of the sentence and used at some level of computation. The analyses vary in terms of where those are used — in Tomioka’s approach, for example, the alternatives are computed at the Speech Act level. By contrast, they are used in the presupposition in Hara’s analysis and Oshima’s. In the proposed analysis, they are used to derive the focus semantic value, which is used to see if using a CT is felicitous as an answer to a question and also compute a potential QuD in the context.

Second, not all analyses care about the structured discourse, which is the core of the proposed analysis. The analysis proposed by Yabushira (2017) is similar to one illustrated in this chapter in that it points out that *wa* answer is actually answering a polar question. The semantics and pragmatics of CT proposed by Yabushira (2017, 37) is given below:

(88) *(Subset of) Semantics of CT*

- a.  $\gamma$  is a sentence with CT-marked phrases
- b.  $?\text{-}\gamma$  is the interrogative sentence directly corresponding to  $\gamma$  in that only the focused phrases are related by the corresponding WH-phrases and, if there is no focused phrase,  $?\text{-}\gamma$  is a polar interrogative sentence;
- c.  $\text{wh-}\gamma$  is the interrogative sentence resulting from  $\gamma$  by replacing the CT-marked phrases as well as the focused phrases if any with the corresponding WH-phrases

(89) *Pragmatics of CT*

- a. Sentence  $\gamma$ , indicative or interrogative, explicitly or implicitly assumes interrogative sentence  $\text{wh-}\gamma$  as QUD;
- b. When  $\gamma$  is an indicative sentence, the answerer or the utterer of  $\gamma$  opts to answer  $?\text{-}\gamma$  instead of  $\text{wh-}\gamma$  for some reason.

Following the procedure here, when a person says ‘Taro<sub>F</sub>-*wa* came.’, they implicitly or explicitly assumes interrogative sentence ‘Who came?’ as the QuD, but actually they are answering a sub-question of the QuD, ‘Did Taro came?’ for some reason. There could be various reasons behind it; It could be the speaker’s uncertainty or the speaker might not be able to provide

information about the other people (what is called secrecy or confidentiality in his paper). The idea illustrated as pragmatics of CT is roughly the same as one illustrated in this paper; CT-answers assumes a corresponding wh-question as the underlying QuD, but actually, the answer is given by searching answers to polar questions. The difference between this approach and mine is that nothing is said about a potential QuD in the future discourse.

Another point made about the behavior of contrastive *wa* (and also contrastive topics in general) is that it brings about a reversed polarity implicature (Oshima, 2002).

(90) Taro<sub>CT</sub> ate beans<sub>F</sub>.

In (90), the reversed polarity implicature is that nobody other than Taro ate beans. This implication is mentioned in Büring (2003) as an implicature since it is “cancelable.” However, I agree with Oshima that it is not. Büring argues that it is cancellable since the speaker can continue by saying ‘Maybe, Mary ate beans, too.’ Such a continuation is indeed possible in Japanese, but as Oshima points out, without *maybe* but with *in fact*, which is typically used to cancel an implicature, the sentence is infelicitous. This suggests that the reversed polarity implicature should be treated as part of the semantic effect of this lexical item. This property of *wa* is implemented as one of the constraints on the potential future QuD in the proposed analysis. The motivation of using contrastive *wa* is that bringing up the unused alternatives to ask further questions about them. If some of those shared the same property as the used alternative in the *wa*-assertion, they would have been incorporated as part of the answer. This part is not implemented as the semantics of *wa* per se, but as the conventional effect of this lexical item in the proposed analysis, which can account for why the RPI is not cancellable.

Finally, the proposed analysis aims to unify a variety of implications that can be conveyed by the use of contrastive *wa*. However, it should be noted that this is not necessarily the aim of all of the previous approaches. For instance, as we briefly overviewed in Chapter 2, the approach taken in Hara (2006) focuses on non-exhaustive interpretations or ignorance inferences, which is one of the possible implications conveyed by contrastive *wa*. Some of the analyses are compatible with the empirical fact that a knowledgeable speaker can use contrastive *wa*, but they use different strategies to derive possible implications. In this dissertation, it is proposed that different implications can be conveyed by different future QuDs projected by the conventional effect of contrastive *wa*, which utilizes the focus alternatives and continuations. This account

has several advantages; One advantage is that it can account for why contrastive *wa* could often be used with *ga* or *demo* ‘but’. After using such lexical items, the speaker can follow-up the projected questions by themselves if they want. Another is that this approach could be easily applied to interrogatives involving contrastive *wa*, as discussed in Chapter 5 since the ingredient used in the analysis is a very basic mechanism that uses the focus semantic value of the sentence.

### 3.6 Chapter Conclusion

This chapter provided an analysis of the semantics of contrastive *wa* in Japanese, which is based on the idea that contrastive *wa* is a realization of a CT and it can access a structured discourse. In order to account for as many empirical facts illustrated in Section 3.2 as (25) as possible, *wa* is treated as a function on its continuation and formalization is given under such a system to derive its focus semantic value. In addition, contrastive *wa* is given a conventional effect: It projects a possible QuD to be resolved in the context.

Semantically, in the ordinary dimension, *wa* does nothing special. This can account for the connection between a so-called topic *wa* and contrastive *wa* in the ordinary dimension, in which they share the same at-issue meaning (25a). In contrast, in the focus dimension, contrastive *wa* is treated as a special *wa* which needs to take something with F-marking as the first argument. Then *wa* derives a set of propositions, whose member is made up by using members of the focus alternatives and its continuation. The results show in what kind of discourse structure, or under what kind of strategy, the *wa* answer is supposed to be felicitous (25d). The mechanism used in the proposed analysis does not impose movement, hence it practically allows *wa* to occur in the syntactic island (25g). Furthermore, the semantic denotation of *wa* works when we have multiple CTs without any further addition as long as they occur in-situ (25e). Finally, different semantic roles are given to contrastive *wa* in the topic position and that in-situ, given that only the former semantically works as a binder of a pronoun (25f).

Conventionally, contrastive *wa* projects possible moves in the discourse which mentions unused alternatives. Those possible future QuDs can be made up by using those unused alternatives and its continuation. As long as the results are related to the question addressed by the *wa*-answer, QuDs could be flexible enough to allow a various kind of possible implications including ignorance inferences and contrastive interpretations (25b). Since *wa* conventionally

works to implicitly mention the unused alternatives, it cannot be used with whatever denotes the maximum (25c).

There are things that still need explanations, however. As mentioned earlier, the proposed analysis is not designed to handle the case in which the particle *wa* has a phonological focus, not the element attached to it. In such a case, it seems that ignorance inferences are not available but contrastive interpretations are still available. There is no way to explain the contrast triggered by the different placement of phonological focus under the proposed analysis, but it seems that the part of the analysis could be applied since the available interpretations are a subset of what is available with the case where the phonological focus is attached to the non-*wa* portion.

Furthermore, whether there is a real difficulty in interpreting sentences with split multiple CTs needs exploring with an appropriate experiment as well. This is also the same for a CT inside the syntactic islands. The unavailability of a CT inside an island could well be a necessary type-shift in the composition. If that is the case, setting up an appropriate context could make such a type-shift easier than it is done with out-of-blue context. An experimental study for these special cases is left for the future research.

Finally, in section 3.2, I illustrated that *wa* could be used in various kinds of sentences types. How the proposed analysis can be applied to *wa* in imperatives awaits further exploration since the semantics and discourse effects of imperatives in Japanese themselves need close examination. However, the proposed analysis can be straightforwardly applied to contrastive *wa* in interrogative sentences at least. When we have contrastive *wa* in an interrogative sentence, we have something extra on top of the semantics of an unmarked interrogative. In order to investigate such special questions in detail, first it is necessary to understand how questions in Japanese work. In the next chapter, unmarked questions and other basic marked questions are investigated so as to build up the background to analyze the discourse effects of various kinds of questions in Japanese. After that, in Chapter 5, I will provide a partial answer to a question, ‘How can *wa* be used in a variety of sentence types?’: (25h), discussing *wa*-questions.

## Appendix: A formal system developed in Chapter 3

### Semantic Types

1.  $e$  is a type.
2.  $t$  is a type.
3. When  $\sigma$  and  $\tau$  are both types,  $\sigma\tau$  is a type.

### Continuations in the Ordinary Dimension

$c_S$ :  $tt$ ; Trivial continuation for an S:  $\lambda p.p$

$c_{NP}$ :  $et$

$c_{VP}$ :  $(et)t$

$c_{Vt}$ :  $(e(et))t$

### Continuized Grammar in the Ordinary Dimension

- (1) a.  $S \rightarrow NP VP$ :  $\lambda c_S.VP(\lambda P_{et}.NP(\lambda x_e.c_S(P(x))))$   
b.  $VP \rightarrow Vt NP$ :  $\lambda c_{VP}.NP(\lambda x.Vt(\lambda R_{e(et)}.c_{VP}(R(x))))$

### Continuized Lexicon in the Ordinary Dimension

- (2) a. NPs  $\rightarrow$  John:  $\lambda c_{NP}.c_{NP}(j)$ , Taro:  $\lambda c_{NP}.c_{NP}(t)$ , Jiro:  $\lambda c_{NP}.c_{NP}(j)$ , Hanako:  $\lambda c_{NP}.c_{NP}(h)$ ,  
everyone:  $\lambda c_{NP}.\forall x : c_{NP}(x)$ , someone:  $\lambda c_{NP}.\exists x : c_{NP}(x)$ , pro:  $\lambda c_{NP}.\lambda y.c_{NP}(y)$   
b. VPs with an intransitive verb  $\rightarrow$  sneezed:  $\lambda c_{VP}.c_{VP}(\lambda x.sneezed(x))$   
c. Vt  $\rightarrow$  saw:  $\lambda c_{Vt}.c_{Vt}(\lambda x.\lambda y.see(y, x))$ , invited:  $\lambda c_{Vt}.c_{Vt}(\lambda x.\lambda y.invite(y, x))$   
d.  $wa$  (contrastive/non-contrastive)  $\rightarrow \lambda x_\sigma.\lambda f_{\sigma t}.f(x)$

### Continuations in the Focus dimension

$c_S$ :  $(tt)t$ ; Trivial continuation for an S:  $\{\lambda p.p\}$

$c_{NP}$ :  $(et)t$

$c_{VP}$ :  $((et)t)t$

$c_{Vt}$ :  $((e(et))t)t$

### Continuized Grammar in the Focus Dimension

- (3) a.  $S \rightarrow NP VP: \lambda c_S.VP(\lambda \mathcal{P}_{(et)t}.NP(\lambda X_{et}.c_S(\mathcal{P}(X))))$ , where  $\mathcal{P}(X)$  is computed by Pointwise Functional Application
- b.  $VP \rightarrow Vt NP: \lambda c_{VP}.NP(\lambda X_{et}.Vt(\lambda R_{(e(et))t}.c_{VP}(R(X))))$  where  $c_{VP}(R(X))$  is computed by Pointwise Functional Application
- c. Pointwise Functional Application  
 If  $\beta \subseteq D_{\sigma\tau}$  and  $\gamma \subseteq D_\sigma$ , then  $\beta(\gamma) = \{f(x) \in D_\tau : f \in \beta \ \& \ x \in \gamma\}$

### Continuized Lexicon in the Focus Dimension

- (4) a.  $NPs \rightarrow John: \lambda c_{NP}.c_{NP}(\{j\})$ ,  $pro: \lambda c_{NP}.\lambda y.c_{NP}(\{y\})$  etc. where  $c_{NP}(\{j\})$  or  $c_{NP}(\{y\})$  is computed by PFA
- b.  $VPs$  with an intransitive verb  $\rightarrow$ sneezed:  $\lambda c_{VP}.c_{VP}(\{\lambda x.sneeze(x)\})$ , where  $c_{VP}(\{\lambda x.sneeze(x)\})$  is computed by PFA
- c.  $Vt \rightarrow$  saw:  $\lambda c_{Vt}.c_{Vt}(\{\lambda x.\lambda y.see(x)(y)\})$  etc., where  $c_{Vt}(\{\lambda x.\lambda y.see(x)(y)\})$  is computed by PFA
- d. non contrastive  $wa \rightarrow \lambda X_{\sigma t}.\lambda F_{(\sigma t)t}.F(X)$ , where  $F(X)$  is computed by PFA
- e. contrastive  $wa \rightarrow \lambda X_{\sigma t}.\lambda c_{XP} : X \supset \{ \llbracket XP \rrbracket^o \} \wedge c_{XP}(X) = CT.\{p | a \in X \wedge p = c_{XP}(\eta a)\}$  where  $\llbracket \eta \rrbracket = \lambda a.\lambda b.a = b$  and CT is a strategy to be employed in the context.
- f. Type-shifted  $wa \rightarrow \lambda \mathcal{F}.\{ \llbracket DP-wa \rrbracket^f(F) | F \in \mathcal{F} \}$  where  $\mathcal{F}$  is of type  $((et)t)t$   
 This type-shift is applied to a contrastive  $wa$ -phrase in the topic position when two contrastive  $wa$  are split in a topic position and in a root clause.



## Chapter 4

# Asking Questions — Biased Questions in Japanese

### 4.1 Introduction

In the preceding chapters, we have seen there are multiple ways to convey uncertainty and ignorance of the speaker given a question (under discussion). One of the strategies that the speaker can adopt is to use contrastive *wa*, by which she can evoke a set of possible other sub-QuDs available in the discourse. What the speaker is doing by using this special lexical item is making a special assertion by which they could refer to a sub-question that could be a QuD to be resolved in context, in addition to conveying the information denoted by the non-*wa* part as an at-issue content.

In asking questions, too, there are a variety of strategies that the speaker can apply. From now on, I will start discussing the strategies the speaker can use in asking questions. One example of the strategies used in questions is using ‘biased questions’, which are the topic of this chapter and the next chapter. In using an unmarked polar question in English such as (1), it is commonly assumed that the speaker is ignorant about the answer. This is a natural consequence of the assumption that the semantics of an interrogative sentence merely denotes a set of possible answers (Hamblin, 1973), which is assumed to be a set of propositions throughout this dissertation: {*It is raining.*, *It is not raining.*}. By contrast, if the speaker uses a tag question in (2) in requesting the same same information, namely, whether it is raining, the addressee usually understands that the speaker has a bias toward a positive answer; The speaker thinks it is more likely to have a *yes* answer.

(1) Is it raining?

(2) It is raining, isn't it?

By using biased questions, the speaker can convey she has some bias toward one of the answers in addition to requesting for the information. Conveying such a bias at the same time as asking a question can inform the addressee about the background assumption of asking the question.

There are plenty of works on biased questions in many languages including Japanese (Earkas and Bruce, 2010; Earkas and Roelofsen, 2017; Ito and Oshima, 2014; Ladd, 1981; Pope, 1972; Romero and Han, 2004; Sudo, 2013). The general goal of ours is to figure out what contextual information natural languages can convey in questions and in what way. Investigating Japanese, in which biased questions are formed by using a particle or combinations thereof, can give a contribution to this research project in a unique way. First of all, some of those discourse particles used to make biased questions can also be used in declaratives. That means that the contributions of those particles in interrogative sentences could be derived by combining their basic contributions in declaratives and the nature of questioning. Moreover, unlike English, in which biased questions are expressed by different syntactic structures of the sentences, biased questions in Japanese are formed by putting a particle or combinations thereof to the sentence radical. The latter strategy is unique and helps us understand how discourse effects observed in English are in fact decomposable in another language and how the discourse effects are structured.

This chapter begins with presenting data and then accounts for a subset of the biased questions in Japanese.<sup>1</sup> Then I will show when multiple particles are used to form biased questions, their total effects can be derived compositionally. The final results give us an interesting insight: Pragmatic components (i.e., discourse effects) do have what other components of natural languages (syntax or semantics, for example) have, namely hierarchical structures and compositionality.

#### 4.1.1 Biased Questions in Japanese

In this chapter, I will first discuss two kinds of biased questions in Japanese: Outer negation questions (ONQs), and *no(da)*-questions. After figuring out the nature of the discourse effects

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<sup>1</sup>This chapter is not intended to show an exhaustive research on biased questions in Japanese. The questions I will discuss in this chapter are merely a subset of biased questions available in Japanese. There are other particles that can form biased questions and they can also be used in combination with other particles as well. I will leave exploring them for my future research.

of these two questions, I start discussing biased questions formed by combining negation (inner negation or outer negation) and *no(da)*.<sup>2</sup> For *no(da)*, I will first discuss what the particle does in declaratives. After that, I will apply the contributions of the particle to interrogative sentences and show the discourse effects of biased questions can be derived from its basic contributions.

Before going into the discussion, I would like to lay out the assumptions. First of all, I treat all the small items (outer negation, *no(da)*, and contrastive *wa*) that are used to form biased questions as items that do not affect the semantics of interrogative sentences. In other words, all biased questions share the same semantic denotation with unmarked polar questions. The semantic denotation of an interrogative sentence is assumed to be a set of possible answers, following Hamblin (1973). As a result, all of the interrogative sentences illustrated below in (3) are supposed to have the semantic denotation (in the ordinary semantics value), given in (4).

- (3) a. Ame hutteru?  
rain falling?  
'Is it raining?' [Polar Question]
- b. Ame HUtte nai?  
rain falling NEG?  
'It's raining, isn't it?' [ONQ] (4) {it is raining, it is not raining}
- c. Ame futteru no?  
rain falling NO(DA)?  
'(Wow), is it raining?' [No(da) Question]
- d. [<sub>F</sub>Ame]-wa futteru?  
rain-TOP falling  
'Is it raining (at least)?' [Wa Question]

Since each interrogative sentence given in (3) is used to request the information regarding whether it is raining, they share the basic discourse effects that are connected to a particular sentence type, namely, a polar interrogative sentence. The differences among the questions lie on the conditions in which using a certain type of questions is felicitous. In other words, the use of marked interrogative sentences are connected to the unique special effects. That is why special attention would be paid to marked questions in (3b-d) since they can convey the extra

<sup>2</sup>The biased questions discussed in this chapter are all non-constituent questions (i.e., polar questions). It is not possible to form a constituent question with an outer negation. Even though it is possible to use *no(da)* with a constituent question, I perceive no difference between constituent questions with *no(da)* and those without. As far as I know, biased questions discussed in the literature are all polar questions. However, it does not mean that constituent questions cannot be biased at all. In Chapter 5, I will discuss interrogative sentences involving contrastive *wa*, which will be treated as marked and biased questions. There, I discuss that constituent questions with contrastive *wa* can convey a strong existential bias.

information about the discourse that default questions do not. Following [Earkas and Roelofsen \(2017\)](#), such extra information is called “special discourse effects” as opposed to the basic discourse effects that are shared by all kind of polar questions in (B). Compared to unmarked questions, namely, polar questions such as (Ba) without any particles, the marked questions such as ONQs or *no(da)* questions above are special in that each of them has different special discourse effects. In the following discussion, I will also assume that those special discourse effects observed in biased questions such as ((Bb-d) can be derived from the basic contributions of particles in the case of Japanese if the grammar allows us to use the same particle in declarative sentences as well.

#### 4.1.2 The basic discourse effects

In giving the analyses, I will use a discourse model proposed by [Earkas and Bruce \(2010\)](#) to illustrate discourse effects. In this section, the basic discourse effects of simple assertions and questions are demonstrated in introducing terminology and assumptions.

The discourse model of [Earkas and Bruce \(2010\)](#) is made up of several components: discourse commitments, the common ground, the Table, and projected sets. Discourse commitments of each participant  $X$  ( $DC_X$ ) is made up of a set of propositions that  $X$  has committed to. They do not have to be true in the actual world, but for the purpose of the conversation, they are assumed to be true. The common ground ( $cg$ ) consists of a set of propositions that is consistent with a set of backgrounded propositions. The common ground also includes propositions that are confirmed by all the discourse participants in context. This way of defining the common ground comes from [Stalnaker \(1978\)](#). At some time in a conversation, what is obtained by  $\cap cg$  can also be called the context set ( $cs$ ). The Table is a stack of proposals made in the discourse. Each proposal is a proposition, and once it is placed on the Table, the discourse is steered so that it could be resolved. How the common ground is going to be changed is indicated in the projected sets ( $ps$ ). The projected sets can be obtained by intersecting the alternatives on the Table and  $cs$ .

##### 4.1.2.1 Assertion

Let us look at how this discourse model works with simple examples. Assume that there are two discourse participants: Hanako and Taro. Before either of them makes an assertion, we have a

common ground  $s_1$ , which only contains their shared knowledge. The projected set will be the same as the common ground since at that time there is nothing on the Table. Then let us assume Hanako made an assertion, as in (5):

- (5) Jiro-wa ie-ni iru yo.  
 Jiro-TOP house-in stay  
 'Jiro is at home.'

The discourse model after such an assertion is shown as Table 4.1. At this moment, a proposition  $p$ : *Taro is at home* is added to  $DC_H$ , the list of discourse commitment of Hanako. At the same time,  $p$  is also placed on the Table. Now the conversation is steered so that they can resolve this issue. At this time, the common ground is not changed — since Taro has not agreed to add  $p$  to the common ground yet. The projected set will contain  $\{s_1 \cup \{p\}\}$ . Depending on how Taro reacts to this proposal (confirming by saying *yes* or denying by saying *no*)<sup>3</sup>, they decide whether they include  $p$  to the *cg*. I do not go into the detail of the operations of confirming or denying the proposal, but the confirmation is simple — the interlocutor agrees to add  $p$  to the common ground. When Taro denies, they need to either agree to disagree, or either of them has to retract their commitment.

Hanako	Table	Taro
$DC_H: p$	$\langle \text{Jiro is at home.}; \{p\} \rangle$	
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}\}$	

Table 4.1: An output discourse of an unmarked assertion

In sum, the basic effect that an assertion has is (i) the speaker of the assertion adds the proposition to her DC, and (ii) put it on the Table. In other words, to propose to add it to the common ground.

#### 4.1.2.2 Question

Moving to questions, let us assume Hanako started a discourse by asking a question below:

- (6) Jiro-wa ie-ni iru?  
 Jiro-TOP house-in stay  
 'Is Jiro at home?'

<sup>3</sup>In this case, the silence can also mean acceptance of the proposal — adding  $p$  to the common ground.

(6) is an unmarked question asking whether Jiro is at home. The discourse structure after asking a polar question is shown below as Table 4.2. Unlike an assertion, asking a question does not add anything to  $DC_H$  since Hanako does not commit to the proposition  $p$ : *Jiro is at home*. Furthermore, instead of just  $p$ , what is put on the Table this time is a pair of the syntactic form of the question and also the semantic denotation of the question. In this case, the former will be *Jiro is at home* and the latter will be  $\{p, \neg p\}$ . Given that the common ground before Hanako’s asking question is  $s_1$ , the projected set now contains two members in its set:  $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$ . Depending on Taro’s answer, they decide which of these two options is to be added to the common ground.

Hanako	Table	Taro
	$\langle \text{Is Jiro at home?}; \{p, \neg p\} \rangle$	
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.2: An output discourse of an unmarked question

In all, the basic effects brought by X’s asking a polar question are as follows: (i) to put  $\{p, \neg p\}$  on the Table (ii) not to add anything to the discourse commitment of X.

## 4.2 Outer Negation Questions

### 4.2.1 Background

The first type of biased question introduced here is outer negation questions. Before discussing ONQs, let me show why they can be considered as “outer” negation as opposed to “inner” negation. Throughout this chapter, I will call inner negation  $nai_1$  and outer negation  $nai_2$ , respectively.

Ito and Oshima (2014) pointed it out that negative questions in Japanese are ambiguous. For instance, the question in (7) is ambiguous and can be interpreted in two ways, as shown by the rough translations into English in (i-ii).

- (7) Taro-wa hasira-nai desu ka?  
Taro-TOP run.IMPF-NEG COP Q
- (i) ‘Taro is going to run, isn’t he?’ ( $nai_2$ )
- (ii) ‘Is Taro not going to run?’ ( $nai_1$ )

There are several ways to distinguish these two interpretations. One difference is that *nai*<sub>1</sub> can bear phonological focus and *nai*<sub>2</sub> cannot.<sup>4</sup> Another way to distinguish the two interpretations is to look at how they are answered. There are interactions between the question types and responses with the polarity particles, namely *hai*/*iie* ‘yes/no’ answers to these questions.

The polarity particles *hai* / *un* ‘yes’ and *iie* / *uun* ‘no’ in Japanese are used differently from those in English. As it has been noted in the literature (Pope, 1972; Yabushita, 1992), *hai* ‘yes’ always indicates agreement to the proposition under discussion, which is the proposition put on the Table, using the terminology from the discourse model. By contrast, unlike the English polarity particle *no* as shown in (8), *iie* ‘no’ cannot be used to show the negative polarity of the answer; it can only be used to show disagreement to the proposition under discussion. Borrowing the terminology from Farkas and Bruce (2010); Farkas and Roelofsen (2017), Japanese polarity particles lack [+/-] features and only express [AGREE/REVERSE] features.

(8) *Polarity particles in English*

A: John did not come.

B: No, he DID. [No realizes [REVERSE]]

B: No, he did not. [No realizes [-]]

(9) *Polarity particles in Japanese*

a. A: John-wa konakatta.  
John-TOP did not come  
'John did not come.'

b. B: Iie, John-wa kimasita.  
No, John-TOP came  
'No, John did come.'

c. \* B: Iie, John-wa kimasendesita.  
No, John-TOP did not come  
'No, John did not come.'

In (9b), using *iie* is felicitous since what B is trying to do is to disagree with the statement made by A. (9c) indicates that *iie* in Japanese cannot be used as a way to indicate the statement is negative, while *no* in English can be used for that purpose.

Given this property of Japanese polarity particles, we can observe negative questions can be

<sup>4</sup>However, it is not always possible to distinguish the two by phonological accent. Actually (7) cannot be disambiguated phonologically since the predicate part *hasira* ‘run.IMPF’ cannot bear phonological focus by itself.

answered in two ways: In one case, *hai, un* ‘yes’ is used with a negative proposition and *iie, uun* ‘no’ is used with a positive proposition while in the other case it is vice versa. Which pattern is used depends on the kind of negation used. Let me use examples in which we can phonologically distinguish the two negative questions. In (10), negation part has phonological prominence as indicated by capital letters in (10a), which indicates the negation is inner negation: *nai*<sub>1</sub>.

- (10) a. Taro-wa hasitte NAI<sub>1</sub>?  
 Taro-TOP running NEG  
 ‘Is Taro not running?’
- b. \*Un, hasitteru. / Uun, hasitteru.  
 yes (he) is running no, (he) running  
 ‘\*Yes, he is running./ No, he is running.’ [REVERSE, +]
- c. Un, hasitte nai. / \*Uun, hasitte nai.  
 yes (he) is running NEG no, (he) running NEG  
 ‘Yes, he is not running./ \*No, he is not running.’ [AGREE, -]

If the statement is positive, namely, ‘*Taro is running.*’, only using *uun* ‘no’ is felicitous. Using *uun* ‘no’ with the negative statement is impossible, as shown by (10c).

When we have a question with *nai*<sub>2</sub>, in which the predicate part has phonological prominence, we get the exactly opposite behavior.

- (11) a. Taro-wa haSItte nai<sub>2</sub>?  
 Taro-TOP running NEG  
 ‘Taro is running, isn’t he?’
- b. Un, hasitteru. / \*Uun, hasitteru.  
 yes (he) is running no, (he) running  
 ‘Yes, he is running./ \*No, he is running.’
- c. \*Un, hasitte nai. / Uun, hasitte nai.  
 yes (he) is running NEG no, (he) running NEG  
 ‘\*Yes, he is not running./ No, he is not running.’

In this case, *un* ‘yes’ is compatible with a positive statement while *uun* ‘no’ is compatible with a negative statement, as in (11). The behavior of the polarity particles shown in (11) indicates that when *nai*<sub>2</sub> is used, what is at-issue or highlighted is a positive proposition without negation. In this sense, it is reasonable to conclude that the negation *nai* occupies a place outside of the sentence radical. This is why it is plausible to regard *nai*<sub>2</sub> as outer negation.



The idea that *nai*<sub>2</sub> is outside of the sentence radical can be confirmed by the interaction with other semantic operators as well. First, as discussed in [Ito and Oshima \(2014, \(10-11\)\)](#), shown in [\(12-13\)](#), only *nai*<sub>1</sub> can license NPIs like *amari* ‘particularly’. By contrast, *nai*<sub>2</sub> can occur with PPIs such as *warito* ‘quite’. The contrast can be accounted for if two types of negation occupy different positions; in particular, *nai*<sub>2</sub> is outside of the main proposition.

- (12) Ano hito, amari mise-ni kite-nai<sub>1</sub>?  
 that person quite to the store come-NEG  
 ‘Does he not often come to the store?’ [NPI]
- (13) Ano hito, warito mise-ni kite-nai<sub>2</sub>?  
 that person quite to the store come-NEG  
 ‘He often comes to the store, doesn’t he?’ [PPI]

Secondly, it has been known that the scope of negation in Japanese usually targets the predicate. In other words, negation usually takes narrow scope with respect to the quantifier in the subject position, as shown by [\(14\)](#).

- (14) Dono gakusee-mo kite-nakatta<sub>1</sub>.  
 every student came-nai<sub>1</sub>  
 ‘Every student did not come.’ [∀ > ¬]/\*[¬ > ∀]

However, when the sentence is turned into a question, depending on which *nai* is used, we get two different readings and hence two different kinds of answers ([Hasegawa, 1991](#); [McGloin, 1976](#); [Yatabe, 1996](#)), as shown by the contrast between [\(15\)](#) and [\(16\)](#).

- (15) a. Dono gakusee-mo kite-NAkatta<sub>1</sub>?  
 every student come-nai<sub>1</sub>  
 ‘Is it true that no student came?’ [∀ > ¬]
- b. Un, minna kite-nakatta.  
 yes everyone come-NOT  
 ‘Yeah, nobody came.’
- (16) a. Dono gakusee-mo Kite-nakatta<sub>2</sub>?  
 every student come-nai<sub>2</sub>  
 ‘Isn’t it true that every student came?’ [¬ > ∀]
- b. Un, minna kiteta yo.  
 yes everyone came  
 ‘Yeah, everyone came.’

Given that *yes* in Japanese only signals agreement to the proposition under discussion, the *yes* answer used to agree to the positive statement, as in (16b) shows that *nai*<sub>2</sub> cannot be part of the proposition.

#### 4.2.2 An Analysis

In the previous section, we have seen that a question with *nai*<sub>2</sub>, which can be regarded as outer negation, shows the same behavior to the positive polar question with respect to the use of polarity particles. The next question to be addressed is whether and how an ONQ and a polar question (without any particles) are different. In the following, I will show that the two types of questions are indeed different by demonstrating that they are used differently depending on whether the speaker has some bias toward one of the possible answers or not. Furthermore, it will be shown that using outer negation in a question is obligatory when the speaker intends to include their private bias in the output of the discourse model so that the addressee could take it into consideration in answering the question. This is also the case with other kinds of biased questions, and as a result, it means that the unmarked polar question is understood as neutral by the addressee since the speaker is expected to provide as much as contextual information as possible.

Before going into the discussion, two concepts used in the analysis are introduced. As Sudo (2013) claimed, at least to account for the behavior of biased questions in Japanese, it is necessary to distinguish private bias and contextual evidence. The definition is given in (17).

(17) a. *Private bias*

The bias which is only accessible to the speaker.

b. *Contextual Evidence*

The evidence that is available to the interlocutors in context and gives a bias toward a certain answer.

Private bias: (17a) is anchored to the speaker who uses a biased question. When they have a private bias, they incline to think that one of the possible answers are likely to be the true answer, but crucially the bias is not shared by the addressee. Contextual evidence (17b) gives a bias toward one of the answers as well, but it needs to be accessible to both the speaker and also the addressee. The speaker can indicate that they have a certain bias in asking questions,

but as [Sudo \(2013\)](#) argues, in Japanese, the use of the particles makes it clear on which ground the speaker's bias is based.

Let us go through situations that have different parameters of the two components given in (17). The first one is the simplest one: the speaker does not have any bias and also there is no contextual evidence available to the discourse participants. Such a context is given in (18).

(18) *A has not checked the weather forecast today. She is sitting in a windowless room. B comes in from outside.*

↪ No private bias, no contextual evidence.

a. # Soto, ame futte nai<sub>2</sub>?  
outside rain falling nai<sub>1</sub>

[nai<sub>2</sub> question]

b. Soto, ame futteru?  
outside rain falling  
'Is it raining outside?'

[polar question]

In this context, using a nai<sub>2</sub> question to ask whether it is raining is infelicitous. By contrast, using a polar question is natural. The contrast indicates that a nai<sub>2</sub> question has to carry some kind of bias.

Let us add contextual evidence. The contextual evidence could be positive or negative. For example, when the question at issue is whether it is raining, an example of positive evidence is a wet raincoat that B wears<sup>5</sup> — it can give A a bias toward a positive answer by B. On the other hand, if the question under discussion is whether it is sunny, a wet raincoat is regarded as negative evidence.

(19) a. Positive Context

*A is in a windowless room. A friend just comes in with a wet rain coat.*

A: #Ima ame futte nai<sub>2</sub>? 'It's raining, isn't it?'

[nai<sub>2</sub> question]

A: #Ima ame futteru? 'Is it raining?'

[polar question]

b. Negative Context

*A is in a windowless room. A friend just comes in with a wet rain coat.*

A: #Ima harete nai<sub>2</sub>? 'It's sunny, isn't it?'

[nai<sub>2</sub> question]

A: #Ima hareteru? 'Is it sunny?'

[polar question]

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<sup>5</sup>This wet raincoat example originates from [Gunlogson \(2001, 96\)](#).

In (19a-b), we see both polar questions and *nai*<sub>2</sub> questions are infelicitous when some contextual evidence is present. From this, it is possible to conclude that the bias that *nai*<sub>2</sub> questions carry cannot be contextual.

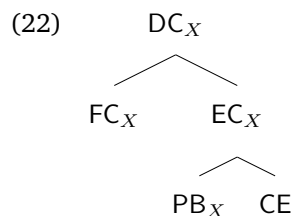
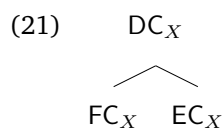
Next, let us look at a case in which the speaker has private bias. Assume A had checked the weather forecast in the morning and has some idea about what the weather would look like in the afternoon. B comes in without anything that can give A a bias toward either of the possible answers.

(20) *A checked the weather forecast in the morning and expected it to be raining in the afternoon. She is sitting in a windowless room in the afternoon. B comes in from outside.*

- a. A: Nee, soto, ame futte *nai*<sub>2</sub>? [ *nai*<sub>2</sub> question ]  
'It is raining outside, isn't it?'  
B: 'Yes, it is raining.'  
A: #'Oh, right. The weather forecast said it would.'
- b. A: Nee, soto, ame futteru? [ polar question ]  
'Is it raining outside?'  
B: 'Yes, it is raining.'  
A: ✓'Oh, right. The weather forecast said it would.'

In this case, it is possible to use either question. Crucially, note that a *nai*<sub>2</sub> question (20a) is completely felicitous. As evidence to show that a *nai*<sub>2</sub> question does convey that the speaker has private bias, it is unnatural for A to express that she did not have a bias in asking the question. For instance, in this context, it is possible that A forgot about what the weather forecast had said when she actually asked the question about the weather then B's answer made A remember it. Such a continuation is not possible with a *nai*<sub>2</sub> answer while it is fine with an unmarked polar question. From this, we can confirm that *nai*<sub>2</sub> questions "require" the speaker to have a positive bias at the time of asking the question, and they are used to indicate such a bias. The contributions of outer negation questions given here are different from those discussed in Sudo (2013). Sudo (2013) shows that outer negation questions are "compatible" with positive epistemic bias. I argue that the contributions of outer negation be stronger than that; If it were merely "compatible" with positive private bias, outer negation would be felicitous in context (20a).

How can we formally differentiate the two questions? Just using the discourse structure proposed by [Farkas and Bruce \(2010\)](#) cannot fully distinguish the two. Here we need to add something that can take care of the difference between the two questions in terms of the bias they are carrying. In order to account for biased questions in English such as tag questions, [Farkas \(2017\)](#) added  $EC_X$ , evidenced commitments to the discourse model. The idea is that the discourse commitments (DC) can be divided into two kinds: one of them is firm commitments ( $FC_X$ ) and the other is evidenced commitments ( $EC_X$ ), as in (21). Expanding the idea of adding  $EC_X$ , I will argue that private bias and contextual evidence are what consist subclasses of  $EC$ , as shown in (22). The idea is that the origin of the bias could be either something that the speaker privately has or contextually available evidence, and in Japanese biased questions, each kind of evidenced commitment is treated differently. In (22), it is shown that  $EC$  is divided into two:  $PB_X$  is a bias anchored to evidence that is available only to the discourse participant X,  $CE$  is a bias that bases on the contextually available evidence.



Here  $PB$  and  $CE$  are both treated as what are conveyed by part of conventional effects associated with each question type. In other words, they are not part of the semantics. There are several reasons why separating them from the semantics is more reasonable. First, they are not part of the question. A *yes*-answer to the question conveying the existence of  $PB$ , for instance, does not convey anything about the bias: It does not convey the speaker's agreement on the contextual information. In that sense, they cannot be part of semantics or at-issue content. Furthermore, the information about  $EC$  does not interact with other semantic operations. In Chapter 5, we will see that *wa* polar questions project a set of sets of polar questions as the discourse structure entertained by interlocutors, but the information on  $EC$  is not included in the projected discourse. It is attached only to what is actually uttered. Given these, it is more reasonable to give the information about  $EC$  a different layer from that the semantic component resides in. Furthermore, since  $EC$  is related to information of the immediate context at the time when a certain question is used, it would be reasonable to assume the conveyance of such

contextual information is conventionally associated with the use of certain kinds of questions.

Before looking at outer negation questions, let us see how the discourse effects of default polar questions in Japanese look in the extended discourse model. As we have seen, it can only be used felicitously when a context is supposed to be neutral — there is no private bias or contextual evidence. This property is different from polar questions in English, which are unmarked but compatible with a biased context. This unique property of Japanese polar questions can be captured by saying the default polar question does not add anything to  $PB_X$  or CE:

(23) *The discourse effects of the default polar questions in Japanese*

- a. Add the table  $\{p, \neg p\}$
- b. Highlight a proposition expressed by the syntactic form of the question

Note that highlighting does not mean the highlighted proposition is favored or it is the proposition that the speaker believes that is likely to be the answer to the question. It just serves to indicate the topic under discussion and be the target of the polarity particle *hai, iie* ‘yes, no’. This question indicates there is nothing in CE or  $PB_{sp}$ .

Compared to the basic discourse effects of polar questions illustrated in (23), outer negation questions do a little more than the default polar question. (24c) below is what we did not have in (23) and a special discourse effect of this particular marked question.

(24) *The discourse effects of the outer negation questions ( $p$ -nai<sub>2</sub>) in Japanese*

- a. Add  $\{p, \neg p\}$  to the Table
- b. Highlight a proposition expressed by the syntactic form of the question
- c. Add  $p$   $PB_{sp}$ ; indicate that the speaker has private bias for  $p$

It adds a proposition denoted by the sentence to which outer negation is attached to  $PB_{sp}$ .<sup>6</sup> Having private bias does not mean that the speaker indicates that  $p$  is “very likely” to be true; It does not require that the speaker has high credence in the truth of  $p$ , and can be used in a

---

<sup>6</sup>It should be noted that *nai*<sub>2</sub> can be used with the normal negation *nai*<sub>1</sub> in a question to form a biased negative question as in (10). Just like a positive outer negation question, it does not add anything to CE but conveys that  $PB_{sp}$  is  $\neg p$ .

- i. Ame futte naku nai?  
rain falling nai<sub>1</sub> nai<sub>2</sub>  
‘It is not raining, is it?’

context in which the probability that  $p$  is true is less than 50%, as we will see shortly. In sum, the discourse structure after Speaker A asked a  $nai_2$  question would look like Table 4.3.

A	Table	B
	$\langle \text{Is it raining?}; \{p, \neg p\} \rangle$	
$PB_A:p$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.3: An output discourse of a question,  $p+nai_2$ ?

I have argued that outer negation questions in Japanese signal that the speaker has private bias for the sentence radical. Unlike inner negation  $nai_1$ ,  $nai_2$  does not do anything semantically, and in that sense, it does not look like “negation”. Given that, one might think that what I have called outer negation,  $nai_2$ , is not actually a negative morpheme, but it is a discourse particle and more like *no(da)*. I take a position that it is not a total accident that  $nai_2$  has the same form as inner negation does. Using whatever can be considered to be outer negation to form biased questions seems to be a common strategy across languages, as we can see in High Negation Polar Question (HN PQ) in English, as in (25).

(25) Isn't there a vegetarian restaurant around here? [Ladd (1981, (1))]

If  $nai_2$  is really “negation”, what does it negate? As for the analysis of HN PQs, Romero and Han (2004), for instance, argue that outer negation in English is analyzed as negation that takes scope over an epistemic conversational operator, VERUM. By contrast, in van Rooy and Šafářová (2003), what we call outer negation just negates propositions. In their analysis of negative polar questions, using negation signals that having a negative answer will bring more surprisal to the speaker and in that sense, it is more informative.

I do not have a definite answer as to what Japanese outer negation negates, but at least, adopting analyses of HN PQs in English to explain the behavior of outer negation questions in Japanese does not fully work. This is partly because HN PQs in English and outer negation questions in Japanese have different distributions, to begin with. For instance, outer negation questions in Japanese can be used even when the probability of the sentence radical's being true is less than 50%, which does not seem to be the case with HN PQs.<sup>7</sup> However, modifying the

<sup>7</sup>See (25) for such a context. Using a HN PQ in English is infelicitous.

idea from [van Rooy and Šafářová \(2003\)](#) that outer negation negates the proposition and uses  $\neg p$  at pragmatic level seems to be a good way to go. Since *nai*<sub>2</sub> conveys that the bias the speaker has is solely based on what they privately know, that in turn could convey that having a negative answer (this would be what *p+nai*<sub>2</sub> would bring up) would be no surprise to the speaker.<sup>8</sup>

## 4.3 *No(da)* Questions

### 4.3.1 Background

Now we start talking about another kind of biased question, *no(da)* questions. Before looking at *no(da)* questions, however, we should look at how it can be used in declarative sentences since unlike outer negation, *no(da)* can be used there, too. If special effects brought by the use of *no(da)* in a declarative sentence and an interrogative one have some commonality, the analysis should capture it.

A minimal pair of declarative sentences with and without *no(da)* is shown in (26). In a given context, uttering (26a), which is a declarative sentence without any particle, sounds a little degraded since it sounds the speaker is depicting the event rather than stating they have just realized the event is happening. If the speaker is trying to convey that they have just realized that it is raining by the raindrop that hit her face, (26b) is more natural. This is why [Ijima \(2010\)](#) states that when *no(da)* is used in an utterance, this often signals that the sentence radical is new information to the speaker.

(26) *The speaker just got out of the house and a drop of rain hit his face.*

- a. ? Ame-ga hutte-iru.  
rain-NOM fall-ing  
'It is raining.'
- b. Ame-ga hutte-iru nda.  
rain-NOM fall-ing noda  
'It is raining.'

The *no(da)* in (26) is a monologue but it does not have to be.

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<sup>8</sup>Interestingly, this is opposite to the analysis of [van Rooy and Šafářová \(2003\)](#): Outer negation questions indicate that having a negative answer is a surprise to the speaker. The reason why we got a different conclusion would be because some of the HNPQs in English would be translated into more complex biased questions in Japanese.



(27) *The speaker is in a windowless room. A friend just comes in a wet raincoat. The speaker reacts by saying:*

- a. # (A,) ima ame-ga hutte-iru.  
oh now rain-NOM fall-ing  
'(Oh,) it is raining now.'
- b. (A,) ima ame-ga hutte-iru nda.  
oh now rain-NOM fall-ing noda  
'Oh, it is raining-*no(da)* now.'

The term “new information” should be treated with care because it does not have to be completely brand-new to the speaker. For example, (26-27b) can be uttered by a speaker who has already checked the weather forecast and knows it is likely to be raining. Even in such a situation, uttering (26-27b) after checking it is indeed raining is completely natural and it can even accompany *yappari* ‘as expected’, which explicitly expresses the speaker had such an expectation. If there is no expectation, *no(da)* sentences can be interpreted as conveying the speaker’s surprise, but it does not always have to be interpreted in that way.

(28) summarizes the contribution of this particle in a declarative sentence.

(28) *The discourse effect of no(da) in a declarative sentence*

By uttering a sentence containing *no(da)*, the speaker signals that the content of the sentence radical is stored as new information.

Turning to *no(da)* questions, we need to identify in what context *no(da)* questions are used felicitously as we did in examining outer negation questions. Before looking into them, however, some background on this particle is in order. First, throughout this dissertation *da* is kept inside the parentheses. This is because whether *da* appears in a question or not varies depending on the formality of the question.<sup>9</sup>

- (29) a. Ame futteru no(\*da)?  
rain falling noda  
'Is it raining?'
- b. Ame futteru n desu ka?  
rain falling noda Q

---

<sup>9</sup>In the two questions in (29), the use of *ka* is also different. It is indeed possible to use *ka* in (29a), but even when *ka* does appear there is no semantic effect. The only difference I can detect between the two version is that the question sounds masculine with *ka*. In the same way, (29b) can be uttered as a question even without *ka* if it accompanies rising intonation. To my ears, (29b) with *ka* (and rising intonation) sounds more natural but there are people who uses just rising intonation without using *ka*.

‘Is it raining?’

The *da* part can be regarded as a copula, which conjugates depending on the level of formality. In (29b), it has a formal form *desu*. However, in (29a), which is intended to be a casual form, it is infelicitous to use *da*. Still the two questions in (29), I consider, are semantically and pragmatically equivalent except their formality. As discussed later in this chapter, *da* can appear when there is another particle used after *no(da)* even with in a casual form. So I will treat the sentences with and without *da* in the same way.

Now let us look at how *no(da)* questions are used with a variety of contexts. First, assume that context is neutral; the speaker does not have any prior belief at all, and there is no contextual evidence.

(30) *A has not checked the weather forecast today. She is sitting in a windowless room. B comes in from outside.*

↪ No private bias, no contextual evidence.

- a. # Soto, ame futteru no?  
outside rain falling noda  
‘Is it raining outside?’ [no(da) question]

In this neutral context, using *no(da)* is not felicitous. Recall that a polar question without a particle is felicitous in a neutral context. Again, the infelicity of using a *no(da)* question in such a context indicates that *no(da)* questions carry a requirement for a certain kind of bias, unlike an unmarked polar question.

The next case is one in which the speaker has a bias, but there is no contextual evidence. Recall that in such a context, using an outer negation question is felicitous.

(31) *A checked the weather forecast in the morning and expected it to be raining in the afternoon. She is sitting in a windowless room in the afternoon. B comes in from outside.*

- a. A: Soto, ame futte nai<sub>2</sub>?  
outside rain falling nai<sub>2</sub>  
‘It is raining outside, isn’t it?’ [nai<sub>2</sub> question]
- b. ?? A: Soto, ame futteru no?  
outside rain falling noda  
‘Is it raining outside?’ [no(da) question]

(B1b) sounds degraded compared to a *nai*<sub>2</sub> question repeated here as (B1a). Speaker's having a bias, therefore, cannot license the use of *no(da)* questions.

In a case where there is positive contextual evidence available, using a *no(da)* question is felicitous, as shown by (B2).

(32) a. Positive Context

*A is in a windowless room. A friend just comes in with a wet rain coat.*

A: Ima ame futteru no? 'Is it raining?' [no(da) question]

b. Negative Context

*A is in a windowless room. A friend just comes in with a wet rain coat.*

A: #Ima hareteru no? 'Is it sunny?' [no(da) question]

Note that it is not the case that any kind of contextual evidence can license the use of *no(da)* questions. As (B2b) shows, negative contextual evidence cannot license the *no(da)* question.

In sum, *no(da)* questions are a special type of biased question in Japanese: they require the presence of contextual evidence in favor of *p*. Note that in (B2a), the speaker can have private bias but does not have to. When the speaker does have some bias, that bias can be either positive or negative. For instance, (B2a) can be uttered by a speaker who had checked the weather forecast beforehand and expected it to be raining at that time. Alternatively, the speaker could have an expectation that it would be sunny. In this case, the *no(da)* question can be interpreted as a question with surprise. In any event, having such a bias is not necessary, and there is no restriction on the kind of private bias.

Summarizing the discourse effects of *no(da)* questions, we can get (B3). (B3a-b) are exactly the same as the discourse effects of unmarked polar questions and outer negation questions. The special effect is the last one (B3c), which is the requirement on the contextual evidence.

(33) *The discourse effects of no(da) questions in Japanese*

- a. Add the table  $\{p, \neg p\}$
- b. Highlight a proposition expressed by the syntactic form of the question
- c. Indicate there is contextual evidence for *p*

### 4.3.2 An Analysis

We have seen the discourse effect of assertions with  $no(da)$  and questions with  $no(da)$ . We have seen that when used in a declarative sentence,  $no(da)$  indicates that the sentence radical is stored as new knowledge on the speaker’s side, while used in an interrogative sentence, it indicates that there is contextual evidence present. I argue that the commonality between the two usages of  $no(da)$  in different sentence types is that, in both cases,  $no(da)$  indicates there is contextual evidence. I will also show that the discourse effects of  $no(da)$  assertions and  $no(da)$  questions can be obtained by combining the effect brought by  $no(da)$  with the basic discourse effects of assertions and questions, respectively.

Recall that the contribution given in (28) is neutral as to whether the speaker has a prior belief or not.  $No(da)$  just signals the content of the sentence radical has just been stored as the speaker’s knowledge. In acquiring new knowledge, there has to be some contextual evidence that attests to the relevant fact. That is how using  $no(da)$ , in turn, also signals the existence of contextual evidence as well. As a result, we can conclude that what  $no(da)$  indicates is that there is contextual evidence that supports the truth of the sentence radical.

To capture the special effect of an assertion and a question with  $no(da)$ , we can use CE in the output discourse. The discourse after an assertion with  $no(da)$  is given below as Table 4.4. An assertion with  $no(da)$  signals that the proposition is just stored as the speaker’s new information, and that in turn indicates that there is some contextual evidence that prompted it.

A	Table	B
$DC_A: p$	$\langle \text{It is raining.}; \{p\} \rangle$	
CE: $p$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}\}$	

Table 4.4: An output discourse of an assertion,  $p+no(da)$

Note that the only difference between Table 4.4 above and that is for an output of an unmarked assertion is the addition of CE part. The difference between an assertion with and without  $no(da)$  is that without  $no(da)$ , there does not have to be contextual evidence. An assertion without  $no(da)$  could be a statement about the speaker’s prior knowledge, for instance, which does not require the presence of the contextual evidence. Note that in Table 4.4, the basic effects of an assertion are preserved — The sentence radical is put on the table and the projected

future discourse is such that adding  $p$  to the common ground after getting an approval by an addressee.

Just in the same way we could get the output discourse of an assertion  $p+no(da)$ , we can also get the output discourse of a question  $p+no(da)$  as in Table 4.5. This is the result we can get by adding  $CE:p$  to the output discourse of an unmarked question. Again, note that the output discourse keeps the basic contribution of the sentence type — an interrogative sentence. It puts possible answers on the Table and projects possible directions in which the discourse can proceed.

A	Table	B
	$\langle \text{Is it raining?}; \{p, \neg p\} \rangle$	
$CE:p$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.5: An output discourse of a question,  $p+no(da)$ ?

I have shown that when a particle can be used in different sentence types, the discourse effects of the whole sentence can be captured by combining the basic effects brought by the sentence type and the effects of the particle. This approach accords with the approach taken to account for biased questions in English in Earkas and Roelofsen (2017) — all biased questions share the same basic effects as interrogative sentences and special effects are connected to the realizations of each biased question. *No(da)* in Japanese, interestingly, shows the effects of particles can be in effect across different sentence types. This is what I will argue applies to *wa*-questions in Japanese in the next chapter. Before discussing another example in which the contribution of the particle can be in effect across sentence types, in the next section, I will show a further compositional approach is possible when we have biased questions that are formed by the combinations of multiple particles.

## 4.4 Compositional Approach to Biased Questions in Japanese

In the previous sections, we have explored discourse effects of biased questions formed with a sentence radical plus a particle or an expression. However, putting a single particle/expression

is not the only way to form biased questions in Japanese; it is possible to use multiple particles at the same time to form one biased question. This property of biased questions in Japanese is unique since in English one cannot combine multiple kinds of biased questions at a time:

(34) \* Isn't it raining, is it?

Given that forming biased questions with multiple particles is possible in Japanese, the question we need to ask is how their discourse effects are derived. In particular, it is worth exploring whether the questions with multiple particles have discourse effects that can be predicted from their parts. In the following, I will argue that it is indeed possible to get discourse effects of complex biased questions from their parts.

As supportive evidence to show discourse effects are compositional, biased questions formed with *no(da)* and negation are used. As outlined in Section 4.2, negative morpheme *nai* 'not' in Japanese is ambiguous when used in interrogative sentences. However, it has been pointed out by Ito and Oshima (2014) that the ambiguity disappears in some cases in which *nai* is used as part of complex biased questions, as illustrated in (35).

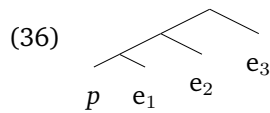
(35) Possible combination of *nai* + *(no)da* and interpretations:

- a.  $nai + noda \rightarrow nai_1 + noda$  [nai<sub>1</sub> interpretation only]
- b.  $noda + nai \rightarrow noda + nai_2$  [nai<sub>2</sub> interpretation only]
- c.  $noda + nai + noda \rightarrow noda + nai_{1/2} + noda$  [Both interpretations are available]

A natural question that arises here is why in some cases *nai* is ambiguous while there is no ambiguity in (35a-b). One possible answer might be saying that the expressions in (35) are used as chunks, and they have fixed interpretations by their own. However, in the following, I instead argue that assuming the expressions in (35) are compositionally constructed would be a plausible way to account for possible interpretations. Unavailable interpretations are ruled out since the discourse effects that are obtained in the end are infelicitous, or the question becomes not very informative with a certain combination of the particles. In showing how they are explained, I will also claim that complex discourse effects cannot be merely additive but need to be compositionally derived.

#### 4.4.1 The composition of biased questions

The first thing we can notice from the patterns given in (35) is that it suggests that discourse effects are not simply additive. If they were, there would be no difference between (35a) and (35b), for example. Adding *no(da)* and negative morpheme should have brought the same result, but the order of combining those particles does matter. To be more precise, each particle has its scope. In accounting the patterns in (35), it seems plausible to assume that the outer particle takes the entire sentence in its scope. So a sentence radical and particles make up a hierarchical structure, as illustrated in (36).



$p$  in (36) is a sentence radical, and  $e_n$  is a discourse particle. In this configuration,  $e_2$  affects, for example, the unit that is made up of combining  $p$  and  $e_1$ . If we switched the order of the particles, each particle then has a different scope from that it had in the previous order. Assuming each particle has scope and they make up a hierarchical structure explains the fact that the order of the particles matters.

Above, it was stated that each particle has its own “scope”. However, what could be the target of their scope? We assume that adding discourse particles to questions does not change the information requested by the question, so this scope cannot be semantic scope. Instead, here I would assume that discourse particles target contextual component in the discourse. In other words, they only affect PB and CE in our discourse model.

#### 4.4.2 Redefining outer negation and *no(da)*

Now let me redefine outer negation and *no(da)* as operators that manage part of discourse effects, PB and CE. As I said, they just affect the contextual information, leaving the semantic contents untouched.

- (37) a. outer negation:  $Cl_o \rightarrow Cl_i \in PB$  if  $Cl_i$  is empty,  $Cl_o \rightarrow PB_X: p$   
 b. *no(da)*:  $Cl_o \rightarrow Cl_i \in CE$  if  $Cl_i$  is empty,  $Cl_o = CE: p$

The basic idea here is that the discourse structure of the complex sentence with multiple particles is calculated one by one. A discourse particle takes the discourse information of its scope as input

and then embed the input in the part of discourse effects. The result will be a new input of the particle that scopes over if there is any. It is assumed that there is no contextual information conveyed by a sentence without any particle. In that case, the particle uses the information of sentence radical to calculate the discourse effects. The assumption that unmarked sentences does not have any contextual information is plausible at least to account for the Japanese data, given that a default polar question can be used only in a completely neutral context.<sup>10</sup>

Using these operations, now we can derive the discourse effects of complex biased questions. In the next section, the total discourse effects of the combinations of *nai* and *no(da)* are derived by using (BZ) and the results will tell us exactly in what context those biased questions are felicitous and also why some combinations are not available.

### 4.4.3 Applications

#### 4.4.3.1 Pattern 1: $nai+no(da) \rightarrow nai_1+no(da)$

The first case we look at is when *nai* precedes *no(da)*. In this case, the scope of *no(da)* will be  $p+nai$ . In this case, *nai* ‘not’ can only be interpreted as inner negation. However, let us consider what would happen if *nai* were outer negation, which conveys there is private bias. Under this assumption, when the discourse structure of  $p+nai_2$  is computed, the output context contains  $p \in PB_X$  since the output discourse of  $p$  contains nothing in CI. *No(da)* takes the output context of  $p+nai_2$  as an input context. Only CI will be manipulated while what is on the Table, in the common ground and in the projected set remain untouched. The output context of  $nai_2+no(da)$  question would look as below:

A	Table	B
	$\langle \text{Is it raining?}; \{p, \neg p\} \rangle$	
CI:CE( $PB_A(p)$ )		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.6: An output discourse of a question,  $p+nai_2+no(da)$ ?

<sup>10</sup>I also assume some particles are just used to signal a particular sentence type, and they do not contribute to pragmatic effects at all. For instance, a question particle *ka* would be one of them; it just signals that the sentence is a question and does not touch the CI component at all.



Now the total contextual information we get from the result indicates that there is contextual evidence that the speaker has private bias for  $p$ . What could be such contextual evidence? Given the definition of  $PB_A(p)$ , it shows that the speaker A is biased toward  $p$  rather than  $\neg p$  based on what is not available to the other discourse participants. Then, there cannot be any contextual evidence for that. Besides, thinking back another way to interpret the contribution of  $no(da)$ , it is also supposed to convey that having a certain private bias is new information to the speaker, which is impossible. As a result, the total discourse effects of the question is a contradiction, and this is why the  $nai_2$  interpretation would not be available in this combination.

What about having  $nai_1$  in place of  $nai_2$ ? Inner negation  $nai_1$  is an ordinary negation, so I assume it does not have any pragmatic effect. It is a part of the sentence radical. Therefore, the basic discourse effect of  $p+nai_1+no(da)$  will be the same as  $p+no(da)$ , except that what is highlighted is  $\neg p$  and what is added to CE is the contextual evidence that supports  $\neg p$ .

A	Table	B
	$\langle \text{Is it not raining?}; \{p, \neg p\} \rangle$	
CI:CE( $\neg p$ )		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.7: An output discourse of a question,  $p+nai_1+no(da)$ ?

This predicts the fact that a  $nai_1 + no(da)$  question is felicitous when there is contextual evidence that supports  $\neg p$  available:

(38) *A is in a windowless room. A friend just comes in with a wet rain coat.*

Ima tenki yoku nai<sub>1</sub> no?  
now weather good NEG noda

'Is the weather not good?'

[ $nai_1+no(da)$ ]

#### 4.4.3.2 Pattern 2: $no(da)+nai \rightarrow no(da)+nai_2$

When  $nai$  comes after  $no(da)$ , we get the opposite result. That is, now the negative morpheme  $nai$  needs to be interpreted as outer negation and it is not possible to interpret  $nai$  as an inner negation. Below, I show that the  $nai_1$  interpretation is not available because of an interaction of

*no(da)* and negation, while the interpretation with *nai*<sub>2</sub> is available since it delivers a meaningful discourse effect that can be computed compositionally from the discourse effects of *no(da)* and outer negation. Interestingly, the discourse effects of this complex question are similar to those of English tag questions.

As mentioned when we have looked at negation in Japanese, negation is interpreted at the predicate level. Therefore, it is not possible to interpret negation as a sentential negation, as shown by (39) below, which is repeated from Section 4.2.1.

- (39) *Dono gakusee-mo kite-nakatta*<sub>1</sub>.  
 every student came-nai<sub>1</sub>  
 ‘Every student did not come.’ [ $\forall > \neg$ ]/\* [ $\neg > \forall$ ]

However, when a sentence with *no(da)* is negated, it usually accompanies a focused element in the sentence radical, and negation can target the focused element. For instance, (40) is a sentence with *no(da)* and negation, and the focus is on *gakusee* ‘student’. The intended interpretation is ‘*It was not the case every “student” came.*’ What is implied by the sentence is that people with another property are such that they all came. For example, it can imply that it is not students but teachers, all of which came.

- (40) *Dono* [<sub>F</sub>*gakusee*]-*mo kita node wa nai*.  
 every student came noda TOP *nai*<sub>1</sub>  
 ‘It was not the case every “student” came.’

In this case, *nai*<sub>1</sub> can take wide scope over the entire sentence, and in particular negation scopes over the quantifier in the subject. This contrasts with usual scope of *nai*<sub>1</sub>, which targets only the predicate. In addition, in this construction there is a positive proposition contrasted and it is believed to be true by the speaker. Using *no(da)* + (wa) + *nai* when the speaker does not have such a positive belief is infelicitous, as shown by (41). This contrasts with a negative sentence without *no(da)*, which allows the continuation that indicates there is no contrasted positive statement (42).

- (41) # *Taro-no sigoto-wa* [<sub>F</sub>*kaishain*] *na node wa nai ga, nani-ka-wa wakara-nai*.  
 Taro-GEN job-TOP office worker NL noda TOP *nai*<sub>1</sub> but what-Q-TOP know-NAI<sub>1</sub>.  
 ‘It is not the case that Taro’s job is “an office worker” but I don’t know what he is actually doing.’

- (42) *Taro-no sigoto-wa* [<sub>F</sub>*kaishain*] *de wa nai ga, nani-ka-wa wakara-nai*.  
 Taro-GEN job-TOP office worker COP TOP *nai*<sub>1</sub> but what-Q-TOP know-NAI<sub>1</sub>.

‘Taro’s job is not an office worker but I don’t know what he is actually doing.’

(41) indicates that when the sentence with *no(da)* is negated, there should be a positive sentence that is contrasted with the negative one.

Semantically negation used here can be treated as sentential negation, but what does it do pragmatically? In this case, we can interpret negation as negating the CI component:  $\neg\text{CE}:p$  indicates the contextual evidence does not support  $p$ . Note that this is different from  $\text{CE}:\neg p$ , which indicates that contextual evidence supports  $\neg p$ . This contextual information and the invoked focus alternative can bring the effect that  $p$  is falsified and also there is a contrasted positive proposition. Then the discourse after a person asserts  $p$ : ‘*Taro is an office worker.*’ + *no(da)* + *nai*<sub>1</sub> can be expressed as in Table 4.8.

A	Table	B
$\text{DC}_A: \neg p$	$\langle \text{Taro is not an office worker}; \neg p \rangle$	
CI: $\neg\text{CE}:p$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{\neg p\}\}$	

Table 4.8: An output discourse of an assertion,  $p + \text{no}(da) + \text{nai}_1$

I assume the effect illustrated above is carried over when the sentence accompanies rising intonation, being intended to be used as a question, as in (43). In this case, there should be a positive statement about Taro’s property that is contrasted with *gakusee* ‘student’. If there is such a contrasted positive statement, it is more cooperative to ask a question about the positive property. Note that it is not the case that *nai* can never have an interpretation as an inner negation after *no(da)* (and *wa*). When a contrasted positive statement is present, it can appear as part of the question, as in (44). This indicates that the reason why *nai*<sub>1</sub> interpretation is not available after *no(da)* is not because it is not syntactically allowed but pragmatically odd.

(43) # Taro-wa gakusee na node wa nai<sub>1</sub>?  
 Taro-TOP student COP noda TOP nai<sub>1</sub>  
 ‘Is Taro not a student?’

(44) Taro-wa kaishain de, gakusee na nja nai<sub>1</sub>?  
 Taro-TOP office worker COP student COP no(da) NEG  
 ‘Is Taro an office worker, not a student?’

Let us move to the case where *nai* following *no(da)* is outer negation. In this case, the input context used to calculate the whole discourse effect by adding *nai*<sub>2</sub> is the output context

obtained by adding *no(da)* to *p*. It takes what is put in CI by *no(da)* and then modifies it so that now the contextual evidence that supports *p* is considered as the speaker’s private bias.

A	Table	B
	$\langle \text{Is it raining?}; \{p, \neg p\} \rangle$	
CI: $PB_A(CE(p))$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.9: An output discourse of a question,  $p + no(da) + nai_2$ ?

Now CI has  $PB_A(CE(p))$ , which indicates that A has private bias that there could be contextual evidence that supports *p*. This does not require the contextual evidence to be available to the interlocutors. It is sufficient that if A believes there is potential contextual evidence for *p*.

How is  $PB_A(CE(p))$  different from just having  $PB_A:p$ , which is indicated by *nai<sub>2</sub>* questions? The difference between *nai<sub>2</sub>* questions and using the combination of *no(da)* and *nai<sub>2</sub>* is that the former can be used when the possibility of getting a positive answer is quite low. By contrast, *no(da) + nai<sub>2</sub>* questions cannot be used in such a context. We can observe such a contrast in (45), which is a context from Ito and Oshima (2014, (32)).

(45) Situation: *The speaker is looking for her friend Yamada. She has been informed that Yamada is visiting one of the 10 residents on the second floor of the dormitory, but does not know in which room he actually is. She decides to check the rooms one by one. She first goes to room #201, and asks the resident:*

- a. Nee, Yamada-kun kite-nai<sub>2</sub>?  
hey Yamada come-nai<sub>2</sub>  
'Hey, is Yamada here?'
- b. # Nee, Yamada-kun kiteru nja nai<sub>2</sub>?  
hey Yamada come noda+wa nai<sub>2</sub>

In (45), given the context, the speaker has private bias that Yamada might be there. Since this is her first try, the possibility of getting a positive answer is merely 10%. Even so, using a *nai<sub>2</sub>* question is completely felicitous. Therefore, the high credence is not necessary to license the use of *nai<sub>2</sub>* questions; just having private bias is sufficient. However, using a *no(da) + nai<sub>2</sub>* question is not felicitous. (45b) could be a perfect way of asking whether Yamada is there if it turned out the resident of room #201 was a good friend of Yamada and the speaker knew it. Otherwise,

the speaker can use a  $no(da)+nai_2$  question in giving her 9th try or last try. In any case, using the combination of  $no(da)+nai_2$  in a context in (45) is infelicitous since there is no potential contextual evidence.

As a result,  $no(da)+nai_2$  questions are used when the speaker's credence is moderate at least. The existence of potential evidence that could support her bias can add some credence to her bias. In this sense,  $no(da)+nai_2$  questions are similar to English tag questions, which convey that the speaker has moderate to high credence in the truth of the sentence radical, according to [Farkas and Roelofsen \(2017\)](#). In fact, using an English tag question in the context given in (45) is not felicitous. An interesting difference between English and Japanese is that the credence level is expressed by a certain combination of the discourse effects by multiple particles in Japanese while it is not decomposable in English.

#### 4.4.3.3 Pattern 3: $no(da)+nai+no(da) \rightarrow no(da)+nai_{1/2}+no(da)$

The last combination is the most complicated one. When  $nai$  is sandwiched by two  $no(da)$ s,  $nai$  can be interpreted in either way. Below, it will be shown that  $nai$  can be interpreted in two ways since the discourse effects brought by either combination are felicitous.

##### Pattern 3-1: $no(da)+nai+no(da) \rightarrow no(da)+nai_2+no(da)$

Let us look at the case in which  $nai$  is interpreted as outer negation. In this case, the input context when the second  $no(da)$  is attached is the one we have just looked at in the previous section. The Table, Common Ground, and the Projected Set are all the same as the default polar question. In CI, we have  $PB_A(CE(p))$ . Adding  $no(da)$  takes the input and indicate that the contextual information is now what is suggested by the contextual evidence.

A	Table	B
	$\langle \text{Is it raining?}; \{p, \neg p\} \rangle$	
CI: $CE(PB_A(CE(p)))$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.10: An output discourse of a question,  $p+nai_2+no(da)$ ?

What does this contextual information convey exactly? It conveys that the available contextual evidence leads the speaker to believe that there is contextual evidence that supports the truth of

the proposition denoted by the sentence radical. In other words, the speaker is conveying that it seems that it is reasonable for her to infer that  $p$  is true from the contextual evidence. Let us see such an example:

(46) *Hanako reports to Mariko that she found a lipstick mark on Taro's shirt. Mariko says:*

Taroo, uwaki-siteru nja nai no?  
 Taro cheat-do.PROG noda+wa nai<sub>2</sub> noda

'Taro is cheating on you, isn't he?'

The information asked by the question is still whether Taro is cheating on Hanako, so the semantic content is not changed. However, from this question we can gather much contextual information — Hanako's story could be the contextual evidence that is associated with the outermost *no(da)*. The contextual evidence supports that the person who used the question, in this case Mariko, believes that there is contextual evidence that supports  $p$ . What Mariko is emphasizing by using this particular type of question is that she was led to have private bias that there could be contextual evidence that suggests Taro is cheating from what is available from the immediate context. For example, assume a context in which Mariko really likes the couple, so she cannot believe that Taro is cheating on Hanako. However, according to Hanako's story Mariko thought it is plausible to conclude that it is likely. In such a situation, to my ear asking (46) sounds more moderate than using a *nai<sub>2</sub>* question, for example.

**Pattern 3-2: *no(da)+nai+no(da) → no(da)+nai<sub>2</sub>+no(da)***

Let us look at the last case — when *nai<sub>1</sub>* is sandwiched by two *no(da)*s. Remember that when a *no(da)* sentence is negated, there is a contrasted proposition. Consider the almost same sentence we have just seen above and the only difference between them is whether *nai* is focused or not: (47). In this case, we can tell that *nai* is *nai<sub>1</sub>*, namely inner negation, since only inner negation can bear focus.

(47) *Later, Taro tells Hanako that a stranger had just bumped into him on a train. Hanako reports to Mariko about it and Mariko asks:*

Taroo, uwaki siteru nja NAI no?  
 Taro cheat ing noda nai<sub>1</sub> noda

'Taro is not cheating on you, is he?'

Let us say the phonological prominence is put on the predicate part. Then what is contrasted will be a proposition ‘*Taro is cheating on you*’ in this case. The question still asks whether Taro is not cheating on Hanako, highlighting the negative answer. What is special about this question is it conveys a little complicated information on contextual evidence. This is expressed as  $CE(\neg CE(p))$  in Table 4.11. This basically tells us that context is such that it involves contextual evidence that indicates that (another piece of) contextual evidence does not support  $p$ .

A	Table	B
	$\langle \text{Is Taro not cheating on you?}; \{p, \neg p\} \rangle$	
CI: $CE(\neg CE(p))$		
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$	

Table 4.11: An output discourse of a question,  $p + no(da) + nai_1 + no(da)?$

Unfolding the contextual information above using the example in (47), the first CE corresponds to Hanako’s story that Mariko hears. The second one is what Taro told Hanako. The contextual information conveyed by Mariko’s using this question is that she takes Hanako’s story as contextual evidence that supports that Taro’s story does not support the truth of  $p$  (= *Taro is cheating on Hanako*).

So overall, this question is still semantically used to figure out whether Taro is not cheating on Hanako is true or not. However, it has far richer contextual information than an unmarked polar question.

## 4.5 Chapter Conclusion

In this chapter, two expressions that can make biased questions have been investigated in detail: outer negation  $nai_2$  and  $no(da)$ . Simple biased questions that are formed by using one of them were investigated at the beginning in terms of the contextual information they convey — private bias and contextual evidence. As for  $no(da)$ , it was revealed that there is a continuation between the discourse effects of  $no(da)$  in declaratives and those in interrogatives. The particles do not affect semantic components but manipulate pragmatic component, which I called CI.

Using the two possible interpretations of negative morpheme  $nai$ , I also argued that it is plausible to assume that the discourse effects are composed compositionally in a hierarchical

structure. The discourse effects of complex biased questions formed by multiple particles are predictable from their parts just as the semantic value of the sentence is. The discourse particles have their own scope and the effects are calculated step by step. The unique characteristic of Japanese discourse particles — multiple particles can be used at the same time — tell us that the discourse effects that cannot be decomposed into smaller parts in other languages like English can be expressed in a different way (i.e., combining particles) in Japanese.

Now recall that contrastive *wa* can be used in interrogative sentences. We have seen that using contrastive *wa* does not seem to affect the truth-conditional components in declaratives in Chapter 3. Contrastive *wa* does not seem to affect the semantic component when it is used in questions, either. *Wa*-questions request the same amount of information as questions without *wa* do. Then what is “extra” special discourse effect of *wa* questions? In Chapter 3, I argued that contrastive *wa* accesses the discourse structure or potential QuDs. This component could be a good candidate of the “extra” effect. In the next chapter, I will discuss questions with contrastive *wa*, *wa*-questions in short, using and expanding the discourse structure used in this chapter and combining it with the analysis given in Chapter 3.



## Chapter 5

### Wa-Questions

#### 5.1 Introduction

In Chapter 3, I argued that contrastive *wa* should be treated as a realization of a contrastive topic (CT) in Japanese. I explained how this particular lexical item can be used in a declarative sentence and how its conventional effect can generate various implications. I briefly mentioned in that chapter that it is possible to use contrastive *wa* in an interrogative sentence as well, as shown in (1).

- |     |  |     |  |
|-----|--|-----|--|
| (1) | [Taro] <sub>F</sub> -WA kimasita ka?<br>Taro-WA came Q<br>'Did Taro <sub>CT</sub> come?' | (2) | Taro-WA kimasita ka?<br>Taro-WA came Q<br>'Did Taro come?' |
|-----|--|-----|--|

The information sought by the question in (1), which is an interrogative sentence involving contrastive *wa*, is no different from that requested by the question without using contrastive *wa*: (2). Both questions ask whether Taro came or not. In this sense, the two polar questions appear to have the same semantic denotation. However, the two questions are used differently. If there is no semantic difference between (1) and (2), then it is possible that the difference between them lies in the conditions in which each question can be felicitously used. Such a difference would mean that the two kinds of polar questions, (1) and (2), have different discourse effects. If this is correct, the question in (1) can be regarded as a special marked question, which can only be used in a specific context. In other words, *wa*-questions are like outer negation questions and *no(da)* questions, which, as discussed in Chapter 4, have special discourse effects. It should

be recalled that we concluded that (2), which is an unmarked polar question, does not have any special requirements with regard to context.

In Chapter 4, we confined ourselves to discussing special polar questions. Interestingly, *wa* can also mark the *wh*-phrase and, as a result, constituent questions can involve *wa*, as in (3). As we will see later, a question such as (3) is possible but very marked.

- (3) [Dare]<sub>F-WA</sub> kimasita ka?  
who-WA came Q  
'Who<sub>CT</sub> came?'

In terms of semantics, (3) does not seem to be different from the version without *wa*. It asks the addressee to name the people who came. As we will see, the difference between questions with *wa* and those without *wa* is the context in which they are used. Using (3) to ask who came is felicitous when the speaker is trying to establish a contrast between those who came and those who did not. Without *wa*, the addressee would not perceive that kind of contrast. In other words, the use of *wa* conveys some extra information in addition to asking the addressee for an answer to the question. This is what distinguishes constituent questions with *wa* from those without. Therefore, it is possible to treat (3) as another type of special question. The questions to be asked are exactly what kind of bias or contextual information constituent questions with contrastive *wa* convey and how they convey this information.

Since we have seen that *wa* can be used in both declaratives and interrogatives, it is natural to ask whether the special effect that *wa*-questions such as (1) and (3) have can be connected with the effect of declarative sentences involving contrastive *wa*, which was explored in Chapter 3. On the discourse effects across sentence types discussed in Chapter 4, it was shown that the discourse effects of questions with *no(da)* are connected with those of *no(da)* assertions. This chapter extends the approach we took to explain the discourse effects of *no(da)* questions in order to understand the special behavior of questions that involve contrastive *wa*.

The aim of this chapter is twofold, and the rest of the chapter is organized to correspond with this. The first part aims to pin down the exact conditions in which *wa*-questions (both polar questions and constituent questions) can be felicitously used. This will be achieved in the next section (Section 5.1.1) with the introduction of the relevant data and observations from the literature. In the second part, I argue that it is indeed possible to connect those special contexts required by *wa*-questions and the analysis of contrastive *wa* used in an assertion in Chapter 3. The pro-

posed analysis builds on the assumption that contrastive *wa* in an interrogative sentence is also the realization of a CT, regardless of whether the question is a polar question or a constituent question. In other words, the use of contrastive *wa* in an interrogative sentence also indicates a particular discourse structure. The analysis in Chapter 3 can be extended to address interrogative sentences in order to understand the discourse structure projected by *wa*-questions. To make such an extension possible, it is first necessary to extend the continuation-based analysis to address interrogative sentences. This is achieved in the first section of Section 5.2, which uses the revised framework to show how we can derive the focus semantic value of polar/constituent *wa*-questions and what the focus value tells us. Section 5.3 shows how the proposed analysis can be supported by two empirical observations: (i) *wa*-questions are answered by *wa*-answers, and (ii) *wa*-questions can ameliorate infelicitous questions.

### 5.1.1 Background: How *wa*-questions are used

The fact that contrastive *wa* can be used in interrogative sentences is widely acknowledged (Tomioaka, 2009a), and it is not difficult to find an example such as (1), which is a polar question that involves some element marked by *wa* and phonological focus. The naive intuition about the situation in which polar questions with *wa* are used is that the *wa*-marked element is contrasted with the other individuals in the domain. In (1), for example, what is additionally conveyed by this particular type of question is that the speaker is especially curious about whether Taro came or not among people who might have come.

By contrast, a question that involves a wh-phrase marked with *wa*, such as (2), is relatively rare and very marked. It is sometimes claimed that *wa* can never be used with a wh-phrase. However, this is not strictly true. As we will see, *wa*-constituent questions can be felicitously used in certain contexts. We can even find some examples on the Internet, as in (4).<sup>1</sup>

(4) *Context: A asked B whether he likes the nape of the neck, but B said no.*

A: Ja, nani-wa sukina no?  
Then what-WA like noda

‘Then what-wa do you like?’

<sup>1</sup>[https://twitter.com/what\\_colorxxxx/status/1000692591455752193](https://twitter.com/what_colorxxxx/status/1000692591455752193), accessed on September 11, 2018

Given that *wa* can mark a *wh*-phrase as long as the context is appropriate, a more precise description of constituent questions with *wa* is that they are infelicitous when out of context. They can only be felicitous within a highly specific context.

In what context, then, are *wa*-constituent questions felicitous? A typical case is where there are multiple groups of individuals between which the speaker is trying to establish a contrast. An example of such a context is illustrated in (5). In this case, the speaker is using *wa* to establish a contrast between those who ate udon and those who ate soba.

- (5) [Dare]<sub>F-WA</sub> udon-o tabete, [dare]<sub>F-WA</sub> soba-o tabeta no?  
 who-WA udon-ACC ate who-WA soba-ACC ate Q  
 ‘Who<sub>CT</sub> ate udon and who<sub>CT</sub> ate soba?’

The context illustrated above fits the conditions for which Miyagawa (1987) argues that *wa*-constituent questions are felicitous. Miyagawa summarizes the conditions as follows (6):

- (6) Conditions for the appropriate use of *wa* with *wh*-phrase (Miyagawa, 1987, (10))  
 a. The speaker and the hearer share the knowledge of the existence of an identifiable set of individuals in the immediate conversational context.  
 b. Every member of this set must be exhaustively represented in the *Wh-wa* question.

While the conditions presented in (6) can account for the fact that *wa* constituent questions are felicitous in the context illustrated in (5), they appear to be too strong. In fact, both of the two conditions in (6) undergenerate cases in which *wa-wh* questions are felicitous. First, (6b) states that “every member” of the set must be exhaustively represented in the *wh*-question, which is indeed the case in (5), assuming that everyone ate either udon or soba. However, this condition would indicate that (4) is not felicitous since there is no question that asks about the thing that is not liked by B. The conversation presented in (7) is a similar case, in which using a *wa*-constituent question would be regarded as infelicitous according to (6b).

- (7) a. A: paatii-wa doo datta?  
 party-TOP how was  
 ‘How was the party?’  
 b. B: tumannakatta. Jiro kitenakatta si.  
 was boring Jiro did not come  
 ‘It was boring (since) Jiro wasn’t there.’

- c. A: ee, jaa, [dare]<sub>F</sub>-wa kiteta no?  
 well then who-WA came Q  
 ‘Well, then, who was there?’

Given that the *wa*-question in (7c) is felicitous, it can be said that an explicit contrasted question is not always necessary. In (7), there is no explicit question that asks who did not come. Rather, in this case, A’s question introduces an overarching QuD to be resolved: how the party was. Then, B answers it by saying it was boring and mentioning someone who was absent from the party. This answer given by B introduces an implicit question: ‘Who did not come to the party?’ B’s question asks who the attendees were, and this question contrasts with the implicit question. This example shows that *wa*-constituent questions can be licensed by an implicit question given in the discourse. It is too strong to say that “every member” needs to be exhaustively represented in *wa*-constituent questions.

Furthermore, (6a) is also strong, in my opinion. The example that Miyagawa gives to illustrate this condition is presented in (8) below. The judgment is Miyagawa’s (Miyagawa, 1987, (16)).

- (8) a. Speaker A:

Taroo to Hanako to dareka ga saakasu ni itta. Hitori wa nijji ni  
 Taro and Hanako and someone NOM circus to went. one TOP 2 o'clock at  
 itte, moo futari wa sanji ni itta.  
 go.GER more two TOP 3 o'clock at went

‘Taro and Hanako and someone went to the circus. One went at 2, and the other two went at 3.’

- b. Speaker B:

\*dare wa nijji ni itte, dare wa sanji ni itta no?  
 who TOP 2 o'clock at go.GE who TOP 3 o'clock at went Q

‘Who-*wa* went at 2, and who-*wa* went at 3?’

Miyagawa argues that the reason why (8b) is ungrammatical is that the set contains *dareka* ‘someone’, which prevents this set from being completely identifiable. First, I do not agree with Miyagawa’s judgment. The question sounds fine as long as B believes that A knows the answer to the question, namely, which people out of three went to the circus at 3 o’clock and who the only person who went there at 2 o’clock was.<sup>2</sup> Moreover, according to this argument, when

<sup>2</sup>A possible answer A can give is something like “Hanako went there at two and the rest went there at three.”

*wa*-questions are felicitous, it should be the case that both the speaker and the addressee have an exhaustive list of individuals that the question refers to, and those individuals should be relatively specific. This does not appear to be the case with (17), for example. It could be the case that both A and B know the potential attendees, but A does not have to know exactly who they are in order to ask the question in (17c).

Overall, Miyagawa's generalization about the conditions for using *wa*-constituent questions seems too strong. However, I agree with his idea that the markedness of *wa*-questions comes from the basic contribution of this particle *wa*: *wa* anaphorically refers to a contextually determinable set of individuals. This is exactly what contrastive *wa* does with the phonological focus it bears, as seen in Chapter 3. Therefore, it does not matter whether all alternatives are identifiable. Contrastive *wa* simply evokes a set of alternatives available in the domain and then indicates that it is "possible" to mention the alternatives that are not given in the answer to the original question. In sum, by weakening the conditions proposed by Miyagawa, it is possible to identify a context in which a *wa*-question is felicitous and connect it with the analysis given in Chapter 3. *Wa*-questions are felicitous when more than one group of individuals can be contrasted. Mentioning a contrasted group is not obligatory, and it could be merely a suggested move.

In the next section, I will present an analysis of *wa*-questions that follows from the analysis of contrastive *wa* in Chapter 3. The assumption here is that when *wa* is used in either polar questions or constituent questions, it is contrastive *wa* and, hence, a realization of a CT in Japanese. With regard to polar questions, this is a rational assumption since *wa*-marked DPs in polar questions, in theory, do not have to bear phonological focus. Bearing phonological focus on top of *wa*-marking indicates that the *wa* is contrastive *wa*, not an aboutness *wa*. By contrast, *wa*-constituent questions need to be treated with care because *wh*-phrases usually bear focus — it could be the case that *wa* is not a CT.<sup>3</sup> However, I would argue that treating *wa* attached to a *wh*-phrase as a CT leads us to a better understanding of this particular kind of question and its special effect.

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<sup>3</sup>For example, Kinjo (2017) argues that *wa* attached to the *wh*-phrase should be analyzed as a thematic *wa*.

## 5.2 *Wa*-Questions with Continuations

### 5.2.1 Continuations and Questions

In this section, I apply the analysis of contrastive *wa* from Chapter 3 to interrogative sentences with contrastive *wa*. The core idea of the analysis was that using continuations, we can regard contrastive *wa* as a type-shifter that assigns a higher semantic type to an element. Before directly applying the analysis to *wa*-questions, however, it is necessary to provide additional background on how continuations can be used to analyze interrogative sentences.

First, we will examine constituent questions. In [Barker and Shan \(2015, 51\)](#), it is assumed that the syntax keeps track of the constituent that is questioned in the interrogative sentence. In other words, it is lexically encoded in a *wh*-word that once the *wh*-phrase takes its continuation, it gives back an interrogative sentence that questions a particular constituent. For instance, a syntactic category of *who* which appears in-situ is  $(NP?S) // (NP \setminus S)$ . That is, *who* takes whatever lacks an NP to become an S as its argument and then gives back a sentence in which the NP is questioned. Semantically, *who* takes the continuation of an NP, namely  $c_{NP}$ , and gives back the denotation of an interrogative sentence the scope of which is the *wh*-word. I use the same notation used in [Barker and Shan \(2015\)](#), presented in (9) below. I will assume that constituent questions denote a set of possible answers ([Hamblin, 1973](#));  $\mathbf{who}(\lambda x.c_{NP}(x))$  denotes a set of propositions which differ from one another with respect to which individual  $x$  refers to.<sup>4</sup>

(9) Syntactic category and meaning of *who*

Who:  $(NP?S) // (NP \setminus S)$ ,  $\lambda c_{NP}.$   $\mathbf{who}(\lambda x.c_{NP}(x))$

Using this lexical entry, the derivation of the meaning of the interrogative sentence, ‘*Who came?*’ can be presented as shown below:

(10) *The ordinary semantic value of ‘Who came?’*

$[_S[_{NP} \text{Dare}_F\text{-ga}][_{VP} \text{kimasita ka}]]$  ‘Who came?’

$\lambda c_S. \underline{NP} (\lambda x_e. \underline{VP} (\lambda P_{et.c_S}(P(x))))$

$\rightsquigarrow (\underline{NP} = \lambda c_{NP}. \mathbf{who}(\lambda x.c_{NP}(x)))$

$\lambda c_S. [\lambda c_{NP}. \mathbf{who}(\lambda x.c_{NP}(x))] (\lambda x. \underline{VP} (\lambda P.c_S(P(x))))$

<sup>4</sup>The account given of interrogative sentences in [Barker and Shan \(2015\)](#) is neutral across variants of semantics of questions.

$$\rightsquigarrow \text{(by } \beta\text{-reduction)}$$

$$\lambda_{c_S}. \mathbf{who}(\lambda x. \mathbf{VP}(\lambda P.c_S(P(x))))$$

$$\rightsquigarrow (\mathbf{VP} = \lambda c_{VP}. c_{VP}(\lambda x.come(x)))$$

$$\lambda_{c_S}. \mathbf{who}(\lambda x. [\lambda c_{VP}. c_{VP}(\lambda x.come(x))] (\lambda P.c_S(P(x))))$$

$$\rightsquigarrow \text{(by } \beta\text{-reduction)}$$

$$\lambda_{c_S}. \mathbf{who}(\lambda x.c_S(come(x)))$$

After feeding the trivial continuation of S into the final result in (10), we get  $\mathbf{who}(\lambda x.come(x))$ , which can be translated as ‘who has the property of having come?’. This is the meaning of the sentence ‘Who came?’.

As for polar questions, I assume that they are also marked so as to indicate that the entire proposition is questioned. In the case of polar questions in Japanese, they are marked either with a question particle *ka* or a rising intonation. Such question particles can be characterized as having a category  $S \setminus (S?S)$ : it takes a preceding S and then gives back  $S?S$ , which indicates that the sentence is a polar question. Semantically, such questions operators (Q) can be regarded as a function that takes a proposition  $p$  as its argument and then asks whether  $p$  is the case, as shown below:

(11) Syntactic category and meaning of question operators

Q:  $S \setminus (S?S)$ ,  $\lambda p. \mathbf{is-it-the-case}(p)$

In this chapter, Q is used only in polar questions, and not in constituent questions. As far as the semantics of *wh*-words in Japanese is concerned (Shimoyama, 2001, 2006), *ka* does not perform any special function in semantic composition<sup>5</sup>; *wh*-words, which denote a set of individuals, play a critical role in deriving alternatives.

### 5.2.2 Polar Questions with *wa*

Given the analysis in Chapter 3, the ordinary semantic value of a polar question will be exactly the same as a polar question without a CT, since CTs only affect the focus semantic value. In other words, *wa*-polar questions are supposed to have the same semantic denotations as unmarked polar questions. In turn, following the approach taken in Chapter 4, polar questions with contrastive *wa* should have the same basic discourse effects as other polar questions; they

<sup>5</sup>At least when we look at the root question.



put the semantic denotation of the polar question  $\{p, \neg p\}$  on the Table and project two options in the projected set: adding  $p$  or  $\neg p$  to the common ground. That is, when  $s_1$  is the common ground at the time of asking the question, the projected set looks like  $\{s_1 \cup \{p\}, s_1 \cup \{\neg p\}\}$ . The derivation of the ordinary semantic value of polar questions with a CT is given in (12). The computation works exactly in the same way as we have seen in Chapter 3 until a Q-operator is applied.

(12) *The ordinary semantic value of ‘Did Taro<sub>CT</sub> come?’*

$[Q[S[{}_{NP} \text{ Tarof-wa}][{}_{VP} \text{ kimasita }]]ka]$  ‘Did Taro come?’

$\lambda_{c_S}. \underline{NP} (\lambda x_e. \underline{VP} (\lambda P_{et}. Q(c_S(P(x))))))$

$\rightsquigarrow (\underline{NP} = \lambda c_{NP}. c_{NP}(t))$

$\lambda_{c_S}. [\lambda c_{NP}. c_{NP}(t)] (\lambda x. \underline{VP} (\lambda P. Q(c_S(P(x))))))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$\lambda_{c_S}. \underline{VP}(\lambda P. Q(c_S(P(t))))$

$\rightsquigarrow (\underline{VP} = \lambda c_{VP}. c_{VP}(\lambda x. \text{come}(x)))$

$\lambda_{c_S}. [\lambda c_{VP}. c_{VP}(\lambda x. \text{come}(x))] (\lambda P. Q(c_S(P(t))))$

$\rightsquigarrow$  (by  $\beta$ -reduction)

$\lambda_{c_S}. Q(c_S(\text{come}(t)))$

After feeding  $\lambda p.p$  and Q-operator is applied:

$\rightsquigarrow$  **is-it-the-case**(come( $t$ ))

By contrast, the focus semantic value of *wa*-polar questions will be different from that of polar questions without *wa* since the discourse structure entertained in using a *wa*-question will be special. In order to compute the focus semantic value, the Q-operator must be modified slightly. To derive the focus semantic value of the sentence, the Q-operator given below is used:

(13) Question operator in the focus dimension

**Q**:  $\{\lambda p. \text{is-it-the-case}(p)\}$

This operator takes a set of propositions as its argument and then gives back the results using pointwise functional application.

We will see how everything is computed with this operator and contrastive *wa* below:

(14) *The focus semantic value of ‘Did Taro<sub>CT</sub> come?’*

$[Q[S[{}_{NP} \text{ Tarof-wa}][{}_{VP} \text{ kimasita }]]ka]$  ‘Did Taro come?’

$$\begin{aligned}
& \lambda c_S. \underline{\text{NP}}_{F-wa} (\lambda X_{et}. \underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}. Q(c_S(\mathcal{P}(X)))))) \\
& \rightsquigarrow (\underline{\text{NP}}_{F-wa} = \lambda F_{(et)t}. \{F(\{x\})|x = x\}) \\
& \lambda c_S. [\lambda F_{(et)t}. \{F(\{x\})|x = x\}] (\lambda X_{et}. \underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}. Q(c_S(\mathcal{P}(X)))))) \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \lambda c_S. \{\underline{\text{VP}}(\lambda \mathcal{P}_{(et)t}. Q(c_S(\mathcal{P}(\{x\}))))|x = x\} \\
& \rightsquigarrow (\underline{\text{VP}} = \lambda c_{VP}. c_{VP}(\{\lambda x. \text{come}(x)\})) \\
& \lambda c_S. \{[\lambda c_{VP}. c_{VP}(\{\lambda x. \text{come}(x)\})] (\lambda \mathcal{P}_{(et)t}. Q(c_S(\mathcal{P}(\{x\}))))|x = x\} \\
& \rightsquigarrow (\text{by } \beta\text{-reduction}) \\
& \lambda c_S. \{Q(c_S(\{\lambda x. \text{come}(x)\}(\{x\})))|x = x\} \\
& \rightsquigarrow (\text{by Pointwise Functional Application and applying trivial continuation}) \\
& \{Q(\{\text{come}(x)\})|x = x\} \\
& \rightsquigarrow (\text{by Q: } \{\lambda p. \text{is-it-the-case}(p)\} \text{ and Pointwise Functional Application}) \\
& \{\{\text{is-it-the-case}(\text{come}(x))\}|x = x\}
\end{aligned}$$

The final result obtained here is  $\{\{\text{is-it-the-case}(\text{come}(x))\}|x = x\}$ , which is a set of polar questions that differ from one another with respect to  $x$ . Expressed in words, the focus semantic value is “for each person, did they come?”. This value would not be obtained if there was no contrastive  $wa$  in the polar question. If we apply the same process to a polar question without a CT, we merely get  $\{\text{is-it-the-case}(\text{come}(t))\}$ .

It has been shown that polar questions with and without contrastive  $wa$  are different in terms of the focus semantic value but not the ordinary semantic value. Therefore, one apparent result is that the existence of contrastive  $wa$  does not make any semantic contribution in an interrogative sentence in the same way as it does not change the truth-conditional meaning in a declarative sentence. Overall, this is a welcome result since the information sought by polar questions with  $wa$  is exactly the same as that sought by polar questions without  $wa$ . From a different perspective, the two kinds of questions share the basic discourse effects: they both put possible answers ( $p$  and  $\neg p$ ) on the Table and project two possible discourse move in the projected sets. What is added by  $wa$  should reside in a different component.

Above, we were able to identify that the difference between polar questions with and without contrastive  $wa$  lies in the focus semantic value. Polar questions with contrastive  $wa$  denote a set of polar questions that range over the focus alternatives for its focus semantic value while polar

questions without *wa* do not involve such alternatives. Given the assumption that the focus semantic value reflects the discourse structure that is entertained at the time of an utterance, it can be concluded that the difference between the two kinds of polar questions lies in the strategy to be adopted to answer the question; polar questions with contrastive *wa* are felicitous only when it is appropriate to ask the same kind of questions about other individuals in the focus alternative set. By contrast, polar questions without *wa* do not have such a requirement. For instance, the questions presented in (15) are used in different contexts, respectively.

- (15) a. Hanako-wa Taro-ni denwa sita?  
 Hanako-TOP Taro-DAT telephone did  
 ‘Did Hanako call Taro?’
- b. Hanako-wa [<sub>F</sub> Taro]-ni-wa denwa sita?  
 Hanako-TOP Taro-DAT-WA telephone did  
 ‘Did Hanako call Taro<sub>CT</sub>?’

(15a) is an unmarked polar question. It can be used when the speaker simply wants to know whether Hanako called Taro. On the other hand, (15b) would be odd if it was used out of context since using it presupposes a particular discourse structure is entertained by the person who asks this question. (15b) is felicitous only if it is possible that Hanako called individuals other than Taro but what the speaker wants to know is whether she called Taro.

In Chapter 3, it was shown that contrastive *wa* also has a conventional discourse effect that signals the existence of other possible questions to be resolved in the given context. In the same way, contrastive *wa* used in an interrogative sentence can signal a possible discourse move. In this case, *wa* can signal that it is possible to proceed to ask questions indicated by the focus semantic value. This is a slightly different move from which we saw in Chapter 3 in that it does not necessitate a new set of questions since having an answer to the original polar questions does not resolve other questions denoted by the focus semantic value. For instance, (15b) signals that it is possible to ask ‘Did Hanako call Jiro?’ as well; by using *wa*, the speaker acknowledges that there are other people Hanako might have called, but the speaker’s priority is knowing whether Hanako called Taro. Hence, asking a follow-up question about Jiro, who might be the speaker’s second priority, is a completely natural move. However, it should be noted that the speaker does not have to make such a move, as we saw in Chapter 3. It might be the case that the speaker acknowledges that there are other possible people Hanako might have called but is not

interested in whether Hanako called those people as well.

We can also identify the property of contrastive *wa* that signals the existence of possible alternative questions using the discourse model introduced in the previous chapter. In that chapter, it was asserted that projected sets indicate a future move in the discourse. In the case of an unmarked polar question, such a question projects two possibilities: either  $p$  or  $\neg p$  is added to the common ground. This, in turn, means the speaker is waiting for the addressee's reaction to decide which possibility to accept. *Wa*-polar questions add extra elements: possible follow-up questions. By suggesting potential questions on the speaker's side, *wa*-polar questions can give the addressee an opportunity to provide answers to those implicit questions. If such answers to the questions suggested by the use of *wa* are  $Q_{wa}$ , then the projected sets now include possibilities to pursue the suggested question in addition to adding the answer to the original polar question to the common ground. The output discourse after the use of *wa*-polar question appears as in Table 5.1.

A	Table	B
	$\langle \text{Did Taro come?}; \{p, \neg p\} \rangle$	
<b>Common Ground:</b> $s_1$	<b>Projected Set:</b> $ps_1 = \{s_1 \cup \{p\}, s_1 \cup \{\neg p\},$ $s_1 \cup \{p\} \cup \{Q_{wa}\},$ $s_1 \cup \{\neg p\} \cup \{Q_{wa}\}$	

Table 5.1: An output discourse of a *wa*-polar question

There are four possibilities listed in the projected set. The output discourse above shows that pursuing suggested questions is optional. Either the speaker or the addressee can take up such an opportunity, but they do not have to.

### 5.2.3 Constituent Questions with *wa*

Now, we will examine constituent questions with *wa*. As before, *wa* does not perform any function in the ordinary dimension. As a result, we should get the same ordinary semantic value for constituent questions regardless of whether *wa* marks the *wh*-phrase or not. For instance, the two constituent questions given below in (16-17) both have  $\mathbf{who}(\lambda x.come(x))$  as the ordinary semantic value.

- (16) Dare-ga kimasita ka?  
 who-NOM came Q  
 ‘Who came?’
- (17) Dare-wa kimasita ka?  
 who-WA came Q  
 ‘Who<sub>CT</sub> came?’

In order to derive the focus semantic value of *wa*-constituent questions, it is necessary to consider what the meaning of *who-wa* is in the focus dimension. First, I follow Shimoyama (2001, 2006) in treating the meaning of *who* in the focus dimension as a set of individuals. Hence, *who* is of type  $(et)$ . This takes a set of one-place predicates  $(et)t$  as its argument (i.e., a continuation for an NP), as in (18), and via PFA, we can obtain a set of propositions that range over a set of individuals in the domain as a result, which is what we assume to be the semantic denotation of constituent questions.

Given this, the semantics of *who+wa* in the focus dimension turns out to be the same as that of an NP<sub>F</sub>+*wa* as in (19). Then, it turns out that the focus semantic value of *wa*-constituent questions looks like that of *wa*-assertions. The focus semantic value of (17) is given below as (20).

- (18) The meaning of *who* in the focus dimension  
 $\text{who} \rightarrow \lambda_{c_{NP}.c_{NP}}(\{x : x \in D_e\})$  where  $c_{NP}(\{x : x \in D_e\})$  is computed by PFA
- (19) The meaning of *who-wa* in the focus dimension  
 $\text{who-wa} \rightarrow \lambda_{c_{NP}}.\{c_{NP}(\{x\}) | x = x\}$  where  $c_{NP}(\{x\})$  is computed by PFA
- (20) The focus semantic value of *Who-wa came?*  
 $\{\{\text{come}(x) | x = x\}$   
 In words: for each person, did they come?

What is projected by (20) is a set of sets of singleton propositions that vary with respect to  $x$  so that  $x$  ranges over the domain of individuals. This focus semantic value is special insofar as it presupposes a particular way of seeking the answer to the question; it directs the addressee to go over a set of polar questions so as to identify the people who came.

In addition to this, since this question involves contrastive *wa*, it also has a conventional effect of this lexical item: it is used to indicate that there are other questions to be resolved in the given context. In contrast to polar questions, with constituent questions, we must have a different continuation to make such an alternative question since the alternative question needs

to ask what is not resolved by the answer to the original question. As a result, there must be individuals that are contrasted in the given context in order for the *wa*-constituent question to be used felicitously. This is why *wa*-constituent questions are marked and why the contexts in which they are felicitous are highly restricted. The special effects of *wa*-constituent questions are summarized in (21) below.

(21) *Special effects of wa-constituent questions*

- a. It indicates that a particular strategy is expected to be used in order to answer the constituent question: going over a set of polar questions
- b. Contrastive *wa* also suggests that it is possible to refer to questions about unused alternatives. It is also possible for questions that already exist in the given context to be part of such questions.

So far, it has been shown that the focus semantic value that is obtained by extending the analysis from Chapter 3 indicates the kind of context in which *wa*-polar/constituent questions are felicitous. The next section reveals how these effects accord with other empirical facts, connecting them with the discussion in Chapters 3 and 4.

### 5.3 Consequences

The previous section showed how the focus semantic value of *wa*-questions can be derived by extending the continuation-based analysis from Chapter 3. Doing so shows that contrastive *wa* used in the interrogative sentence functions just in the same way as in the declarative sentence, as a tool to indicate that a particular discourse structure is entertained. In particular, the focus semantic value plays an important role in evoking the discourse structure entertained at the time of asking the question and, in turn, the context in which this kind of special question is felicitous. Given the discussion in the previous section and the conventional effect of contrastive *wa*, we can further account for some of the other peculiar behaviors of this lexical item. In the following sections, the two phenomena will be examined individually. The first is the expression of question and answer congruence in *wa*-questions, which also relates to some of the results of Experiment 1. The other is contrastive the ability of contrastive *wa* to weaken intervention effects and obviate negative islands.

### 5.3.1 Question and Answer Congruence

When an element in an interrogative sentence is marked by contrastive *wa*, it is natural to use *wa* in the same position to answer the question. This applies to both constituent questions and polar questions, as shown in (22b-23b). This can be explained by assuming that *wa* in both of the questions and answers is contrastive *wa*, which in each case marks CTs. In Chapter 3, we observed cases in which contrastive *wa* was used in the assertion to answer the *wh*-question without *wa*. In such a case, contrastive *wa* is used to change the discourse structure from the one that is given by the original question to a new discourse structure. By contrast, at the time in which (22b-23b) are uttered, *wa*-questions have already introduced a particular discourse structure. What a *wa*-answer indicates, in this case, is that the special discourse structure is acknowledged, and the answer is given according to that discourse structure.

- |      |   |      |  |
|------|---|------|--|
| (22) | <p>a. [Dare]<sub>F-WA</sub> kimasita ka?<br/>         who-WA came Q<br/>         ‘Who<sub>CT</sub> came?’</p> <p>b. [Taro]<sub>F-WA</sub> kimasita<br/>         Taro-WA came<br/>         ‘Taro<sub>CT</sub> came.’</p> | (23) | <p>a. [10-nin]<sub>F-WA</sub> kimasita ka?<br/>         10-CL-WA came Q<br/>         ‘Did [10 people]<sub>CT</sub> come?’</p> <p>b. Hai, [10-nin]<sub>F-WA</sub> kimasita.<br/>         yes, 10-CL-WA came<br/>         ‘[10 people]<sub>CT</sub> came.’</p> |
|------|---|------|--|

The same logic can be applied to (23b). In this case, the question is a polar question with contrastive *wa*. (23a) is semantically the same as the version without *wa*, but its focus semantic value will be a set of polar questions that range over other degrees (i.e., the number of individuals). The use of *wa* in the answer to the question reflects the fact that such a discourse structure is acknowledged and entertained. As a result, the answer in (23b) does not trigger an ignorance inference even though it accompanies contrastive *wa*, and this answer can be followed up by an assertion that adds more information. For instance, (23b) can be followed by the statement “And in fact, 18 people came in total”. Adding such a follow-up statement is impossible when (23b) is used as an answer to the question, ‘How many people came?’, which is without *wa*. This is because the person who uses a polar question with *wa*, such as (23a), merely indicates that the number 10 is of their interest at the time of asking this question, but, at the same time, they indicate that other numbers could be under discussion.<sup>6</sup> For example, the person who was

<sup>6</sup>The other numbers that could be referred to would presumably be more than 10 since if 10 people came it necessarily

asked the question is free to identify those numbers as the exact number of the people who came, for example.

In Experiment 1, introduced in Chapter 2, we observed that participants reported that *wa* answers used to polar questions with *wa* did not trigger strong ignorance inferences (mean = 3.14, standard error = 0.26). This is not a surprising result given that the question the *wa*-assertion answered was not a *how-many* question. However, the contrast between *wa*-answers to the polar questions and other answers (with *sukunakutomo* ‘at least’ and *izyoo* ‘more than’) to the polar questions still need to be explained since participants tended to think that ignorance inferences were still available even when *sukunakutomo* ‘at least’ or *izyoo* ‘more than’ were used to answer polar questions that included the exactly the same lexical item. Following the analyses in Chapter 3 and this chapter, the contrast can be attributed to the unique property of contrastive *wa*; when answering *wa*-questions, *wa* in the answer is merely used to acknowledge of a special discourse structure introduced by the question.

### 5.3.2 Pragmatic Effects of *wa*-questions

Even though *wa* questions do not semantically differ from questions without *wa*, the discourse effects of contrastive *wa* have a pragmatic impact that is significant enough to make otherwise infelicitous questions felicitous. This ability to ameliorate infelicitous questions is first observed by Schwarz and Shimoyama (2010) with negative island obviation with a degree phrase. This section will first show that questions with negative islands are not the only questions that contrastive *wa* can ameliorate. It can ameliorate a question with an NPI, which is considered a strong intervener in Japanese. I will argue that these amelioration effects observed with interrogative sentences can be accounted for by the special discourse effects introduced by contrastive *wa* in a question.

#### 5.3.2.1 Background

It has been observed that negative degree questions are often infelicitous. One such an example is given in (24). Attempts have been made to explain the origin of this infelicity syntactically and semantically <sup>2</sup> (Abrusán and Spector, 2011; Cresti, 1995; Kroch, 1989; Rizzi, 1990; Szabolcsi

<sup>2</sup>means ‘9 people came’ is also true given that ‘9 people came’ semantically means ‘At least 9 people came’.

<sup>3</sup>See Abrusán (2014) for an overview of the weak island phenomena.



and Zwarts, 1993). Japanese shows similar behavior, as can be observed in (25a). Interestingly, it has been pointed out that adding *wa* to the *wh*-degree phrase can obviate negative islands (Schwarz and Shimoyama, 2010), as shown in (25b). While it is interesting that there is a way to rescue negative questions in Japanese, the question of why adding *wa* can obviate negative islands remains to be answered. Given that this *wa* is attached to a *wh*-degree phrase, which is unlikely to be a (thematic) topic, it is reasonable to regard this *wa* as contrastive *wa*. Furthermore, as the translation given in (25b) shows, this *wa* is interpreted to mean something very similar to “at least” and thus to ask the minimum degree under discussion, which is the available interpretation of contrastive *wa*.<sup>8</sup> As we observed in Chapter 2, in this case, contrastive *wa* and *sukunakutomo* ‘at least’ are interpreted in a very similar way on the surface. Nonetheless, using *sukunakutomo* ‘at least’, which literally refers to the minimum, cannot rescue the sentence, as shown in (25c).

- (24) \* How long did you not stay there?
- (25) a. \* doredake nagaku taizai simasen desita ka?  
       how     long     stay didn’t COP Q  
       (lit.) ‘How long did you not stay there?’
- b. [<sub>F</sub> doredake nagaku]-wa taizai simasen desita ka?  
       how     long-wa     stay didn’t COP Q  
       ‘What is the minimum length such that you did not stay there?’
- c. \*? sukunakutomo doredake nagaku taizai simasen desita ka?  
       at least     how     long     stay didn’t COP Q  
       (Intended:) ‘What is the minimum length such that you did not stay there?’

The explanation of why (25b) is acceptable according to Schwarz and Shimoyama (2010) is that *wa* has the semantics of *at least* and can function as a scale-aligner. Without *wa*, negative degree questions cannot have an answer that is maximally informative, which is also the case in English (Beck and Rullman, 1999; Dayal, 1996). This explains why questions such as (25a) are infelicitous.<sup>9</sup> However, if the proposal of Schwarz and Shimoyama (2010) is on the right track, and *wa* has the semantics similar to *sukunakutomo* ‘at least’, this does not explain why (25c), in which *sukunakutomo* ‘at least’ directly modifies the degree predicate, is ungrammatical. At the

<sup>8</sup>It should be noted that as we will see, the question is interpreted as one about the actual length of stay, not the length of “non-stay”.

<sup>9</sup>It is necessary to assume that degree predicates have an “*exactly*” semantics. Therefore, adding *wa* is not semantically vacuous.

same time, it is important to consider what effect adding contrastive *wa* to the *wh*-phrase has in general since, as previously mentioned, it is not always the case that contrastive *wa* can be used with the *wh*-word.

Interestingly, *wa* can rescue other infelicitous questions as well; adding *wa* to the *wh*-phrase can rescue a question that has a focus-sensitive element or quantifier that c-commands the *wh*-phrase. In other words, adding *wa* to the *wh*-phrase can weaken what are known as intervention effects (Beck, 1996, 2006). Intervention effects in Japanese were first observed by Hoji (1985), and what is known as a stronger intervener is an NPI. When we have an intervener that c-commands a *wh*-phrase, the sentence is ungrammatical, as in (26a). However, the sentence can be rescued by scrambling the *wh*-phrase so that it is no longer c-commanded by the NPI anymore, as in (26b). The contrast between (26a) and (26b) shows that the surface movement is not affected by the intervener — what is blocked by the “intervener” is only movement in LF.

- (26) a. ?\* Daremo nani-o yom-ana-katta no?  
 anyone what-ACC didn't read Q  
 ‘(Intended:) What did no one read?’
- b. Nani-o daremo yom-ana-katta no?  
 what-ACC anyone didn't read Q  
 ‘What did no one read?’

Interestingly, adding *wa* to the *wh*-phrase in-situ can ameliorate the sentence, as shown in (27).

- (27) Daremo nani-wa yom-ana-katta no?  
 anyone what-WA didn't read Q  
 ‘What did no one read?’

It should be noted that a particular context is required for the question in (27) to be used felicitously. This is due to the discourse effect brought about by contrastive *wa*: adding *wa* to the *wh*-phrase is a very marked move and is therefore considered to be bad out of context. However, setting up an appropriate context, namely, a context in which it is reasonable to divide a set of individuals into several subgroups, (27) can be completely natural, as shown in (28).

- (28) *Context: Speaker A and B are talking about which student read which article from the reading list over the break. Speaker A has the list of student-article pairs and tells B that*

most of the articles were read by some student. B wants to improve the list by replacing unpopular articles with better ones. B asks:

- a. Jaa, daremo nani-**wa** yom-ana-katta no?  
 then anyone what-WA didn't read Q  
 'Then, what did no one read?'

In this case, the conversation between A and B sets up the context in which they are contrasting articles that are read by some student and unpopular articles that are not read by anyone. Such a context licenses using *wa* with the *wh*-phrase, and the use of *wa* can improve the sentence. It should be noted here that when the context permits and *wa* marks the *wh*-phrase, scrambling the *wh*-phrase with *wa* is not necessary so as for the sentence to be grammatical. Scrambling the *wh*-phrase is possible, and interpreting the sentence with the scrambled *wh*-phrase might be easier than parsing the sentence without scrambling. A crucial contrast to which we need to pay attention is the one between (27) and (26a), in which the *wh*-phrase is in-situ and does not accompany contrastive *wa*. Furthermore, it is not only context that plays a role in amelioration — merely setting up the context given in (28) cannot rescue (26a), in which the *wh*-phrase is not marked with *wa*.

We have seen that adding *wa* to the *wh*-phrase can make otherwise infelicitous questions felicitous. The analysis of *wa*-questions in this chapter shows that *wa* does not perform any special function in the semantics. Then, how can *wa* make the amelioration possible? In the next two sections, I will show how an analysis of *wa*-constituent questions can explain the mechanism of amelioration. Amelioration with NPIs is discussed first since this requires no addition to the existing lexical entry. Negative island obviation will be discussed after adding lexical entries for degree predicates using continuations.

### 5.3.2.2 Accounting for Amelioration: with NPIs

If we apply the analysis of *wa* to *wa*-constituent questions with an NPI, such as (27), what we obtain as the focus semantic value of the sentence will be a set of polar questions that range over the focus alternatives (i.e., in this case, a set of articles in the reading list).

- (29) The focus semantic value of *What did nobody read?*: (27)  
 $\{\{\forall x : \neg \text{read}(x, y)\} | y = y\}$   
 $\rightsquigarrow \{\{\text{Did nobody read Paper A?}\}, \{\text{Did nobody read Paper B?}\}, \dots\}$

This question can be paraphrased as “Find some paper that has the property of not being read by anyone by going through all the polar questions denoted by the focus semantic value”. Also, the property is contrasted with another property such as “some people read *x*.” In order for the *wa*-questions to be felicitous, at least the person who asks the question needs to believe that it is possible to divide a set of papers into several subgroups since *wa* conventionally indicates that “unused” alternatives are worth mentioning. In other words, the speaker has a bias in thinking that each group has at least one paper. This “existence” bias might not seem special since constituent questions usually have so-called existential presuppositions or at least what can be characterized as the speaker’s epistemic bias that there should be at least one individual that has the property under discussion. For instance, when a person asks (30a), they usually assume that Taro read something. However, such a bias does not have to be shared with the addressee; the addressee’s answering ‘Nothing.’ does not cause any conversational crisis. The cancelability of the existential “presupposition” can be ascertained by embedding the sentence under the verb *know* (Groenendijk and Stokhof, 1982).

- (30) a. What did Taro read?  
 b. If Jiro knows what Taro read, and Taro actually read nothing, Jiro knows Taro read nothing.

(30b) demonstrates a natural sequence of reasoning even when it is translated into Japanese as long as the *wh*-phrase is marked with the default particle (in this case, the accusative case, *-o*). In this case, the existential presupposition is successfully canceled in the embedded context.

In contrast, the existential presupposition carried by contrastive *wa* seems stronger than those introduced by unmarked constituent questions. This effect can be obtained from the conventional effect of *wa*; in order to contrast multiple groups of individuals, the answer to the original constituent questions needs to mention at least one individual in the domain. In support of this claim, if we embed a *wa*-constituent question under the verb *know*, its existential presupposition cannot be canceled. (31) is not felicitous.

- (31) # Mosi Ziroo-ga Taroo-ga nani-wa yonda ka sittei-te, Taroo-ga zissai  
 if Jiro-NOM Taro-NOM what-WA read COMP know-and Taro-NOM actually  
 nani-mo yoma-nakat-tara, Ziroo-wa Taroo-ga nani-mo yoma-naka-tta to  
 anything read-NEG-COND Jiro-TOP Taro-NOM anything read-NEG-PAST COMP  
 sitteiru.  
 know

'If Jiro knows what<sub>CT</sub> Taro read, and actually Taro read nothing, Jiro knows Taro read nothing.'

The reason why (31) is infelicitous is that the second sentence in the antecedent of the conditional clashes with the presupposition that is expressed by contrastive *wa* in the first sentence; contrastive *wa* in the first part introduces a presupposition that there is something that is read by Taro.<sup>10</sup> This contrasts with what we observed in the version without *wa*. In sum, adding *wa* can strengthen the existential presupposition of the constituent question via its conventional effect.

How can the ability of *wa* to strengthen the existential presupposition be related to the amelioration of intervention effects? The answer lies in another Japanese lexical item that can weaken intervention effects. Tomioka (2009b, (6b)) observed that *naze* 'why' does not require scrambling even when there is an intervener such as an NPI on the path of LF movement.

- (32) Dare-mo naze ko-nak-atta-no?  
anyone why come-NEG-PAST-Q  
'Why did no one come?'

It should be noted that a version with *naze* scrambled to the beginning of the sentence generally sounds better than (32). However, the crucial point is that (32) sounds much better than the sentence with a different kind of *wh*-phrase in-situ in the same position, as we observed in (26a).

The contrast between *naze* 'why' and other *wh*-phrases is problematic for any semantic or syntactic accounts of intervention effects. In addition, Tomioka (2007) has shown that the strength of intervention effects (i.e., the acceptability of the sentences) varies depending on the lexical item that acts as an intervener. Therefore, Tomioka argues that an intervention effect in Japanese is a pragmatic phenomenon rather than a syntactic or semantic one, and I take the same approach.<sup>11</sup> According to this pragmatic approach, a sentence such as (26a) is infelicitous since it is ill-formed in terms of information packaging.

The framework of information packaging Tomioka adopts to account for the ill-formedness is the information packaging theory in Vallduví (1993). In this framework, a sentence is divided

<sup>10</sup>How to treat the embedded *wa*-question is a problem to be addressed in future research. The intuitive idea is that under the embedded context, the discourse structure reflects how the knowledge or information is stored in the subject's mental state. Under the embedded context, it would also be the case that there are several subgroups of individuals that are contrasted in terms of the property they have. I appreciate Satoshi Tomioka's bringing up this issue.

<sup>11</sup>Taking such an approach is also natural here since no LF movement of the *wh*-phrase in Japanese is assumed in this dissertation.

into two parts: a FOCUS and a GROUND. The FOCUS contains new information, and the GROUND contains old information. The GROUND part can be divided into two further parts: a LINK and a TAIL. The LINK indicates the address where information in the sentence is stored — it specifies which file card is updated (File Change Semantics (Heim, 1982)). In Japanese, a link is usually realized with a thematic *wa* (Portner and Yabushita, 2001). A TAIL is old information that does not belong to a link.

In pragmatic terms, the reason for an intervention effect such as that seen in (26a) is as follows. A *wh*-phrase is to be treated as a focus since it specifies new information, and the rest of the sentence should be backgrounded. The best place to store the background portion is after the *wh*-phrase, namely a post-focus position, which is known to be phonologically reduced (post-focus reduction (Ishihara, 2003)). An NPI, which is not a part of the focus, is not an ideal item to be placed in the pre-focus position because it should be backgrounded. This is why (26a) is bad. Once we scramble a *wh*-phrase, an NPI now occupies a post-focus position, which is phonologically reduced and suitable for backgrounded items. Therefore, it is not problematic for an NPI to occur there. Consequently, the sentence is now well-formed in terms of information packaging.

We still need to explain why *naze* ‘why’ can weaken pragmatic intervention effects in Japanese. According to Tomioka (2009b), the reason that *naze* ‘why’ can be in-situ (32) is because the presupposition of *naze* ‘why’ can background the pre-focus element. In a *why*-question, the non-*why*-portion needs to be presupposed. For instance, the question in (33a) presupposes that Taro came. This presupposition is strong and therefore cannot be canceled under the verb *know*, as shown in (33b).

- (33) a. Why did Taro come?  
 b. # If Jiro knows why Taro came, and actually Taro did not come, Jiro knows why Taro did not come.

Being presupposed, the non-*why*-portion of the question, which involves an NPI in (32), should be part of the knowledge shared among the discourse participants. Therefore, it is fine that an NPI appears before the focus. In this way, the presupposition of *why* can weaken the intervention effect.

Given that the *wh*-phrase with *wa* introduces a stronger existential presupposition, it is pos-

sible to apply the same mechanism to account for the amelioration observed in (27). Only with a *wh*-phrase with *wa*, (not with a normal *wh*-phrase), is it presupposed that there is at least one entity that becomes an answer to the question. In other words, as is the case in (32), the non-*wh* part, namely that there is something such that is read by nobody, is presupposed. Since the NPI is now in the presupposed portion, it is not problematic for it to appear in the non-post-focus position. As mentioned earlier, even when *wa* is attached to the *wh*-phrase, scrambling it can improve the sentence. However, the post-focus position is still the ideal position for an NPI to appear in the sentence. The same effect is observed with *naze* ‘why’, and this parallelism between the questions with *naze* ‘why’ and those with the *wa*-marked *wh*-phrase supports the fact that the amelioration effect we can observe in them is, in essence, the same.

### 5.3.2.3 Accounting for Amelioration: Negative Islands

To account for the negative island obviation with *wa*, it is first necessary to examine how *wa* works with the degree phrase. We will assume that the degree phrase such as *tookakan* ‘10 days long’ is of type *d* and is taken as an argument of the property of a degree such as “ $\lambda d$ . event’s duration is equal to or greater than  $d$ ”, which is of type *dt*. Adding *wa* to the degree phrase continuizes its semantics. Just as *wa* continuized something of type *e* in Chapter 3, *wa* can type-shift the degree phrase so that it becomes of type  $(dt)t$ , as shown in (34), where  $c_{\text{DegP}}$  is a continuation of a degree phrase and of type *dt*. This change does not affect the ordinary semantic value; it just changes the way in which two things are composed.

(34) *Continuized version of tookakan in the ordinary dimension*

$\underline{\text{DegP}} \rightarrow \text{tookakan}$  ‘10 days’:  $\lambda c_{\text{DegP}}.c_{\text{DegP}}(10 \text{ days})$

Now, we will turn to the semantics of a degree *wh*-phrase such as *how long*. Following the treatment of *wh*-questions given earlier, we will say that *doredake nagaku* ‘how long’ syntactically functions as *d* and it marks that it is the degree that is asked by the question, as given in (35).

(35) How long:  $(\text{DegP?S}) // (\text{DegP} \setminus \text{S}), \lambda c_{\text{DegP}}. \mathbf{how\ long}(\lambda d.c_{\text{DegP}}(d))$

When this is combined with whatever lacks a degree in the ordinary dimension, it gives us a question about a degree as its output.

In the focus dimension, when the degree phrase bears phonological focus, it denotes a set of degrees. Before being continuized, *tookakan* ‘10 days long’ with phonological focus denotes

a set of lengths of time counted in days. In other words, *tookakan<sub>F</sub>* in the focus dimension is of type  $dt$ . This is combined with a set of functions from a degree to the truth value, which is of type  $(dt)t$ , and via pointwise functional application, we obtain a set of propositions that range over degrees, which is the denotation of usual *wh*-questions. When it is continuized, a degree phrase takes  $c_{\text{DegP}}$ , which is now of type  $(dt)t$ , as its argument, and gives a set of propositions via pointwise functional application (36). As a result, a continuized DegP in the focus dimension is of type  $((dt)t)t$ .

(36) *Continuized version of DegP<sub>F</sub> in the focus dimension*

$$\underline{\text{DegP}}_F = \lambda c_{\text{DegP}}.c_{\text{DegP}}(\{d | d \in D_{\text{Degree}}\})$$

As for the denotation of *doredake nagaku* ‘how long’ in the focus dimension, I adopt the same approach I took when discussing *who*. In parallel with the semantics of *dare* ‘who’, which denotes a set of individuals in the focus domain, I let *doredake nagaku* ‘how long’ denote a set of degrees. Then, the continuized semantics of *doredake nagaku* in the focus domain without *wa* looks exactly like (36).

When we apply the contribution of *wa* to the degree phrase in the focus dimension, which is to create a set of sets of propositions utilizing the focus alternative and the continuation, we get the following denotation for *doredake nagaku-wa* ‘how long-wa’ in the focus dimension:

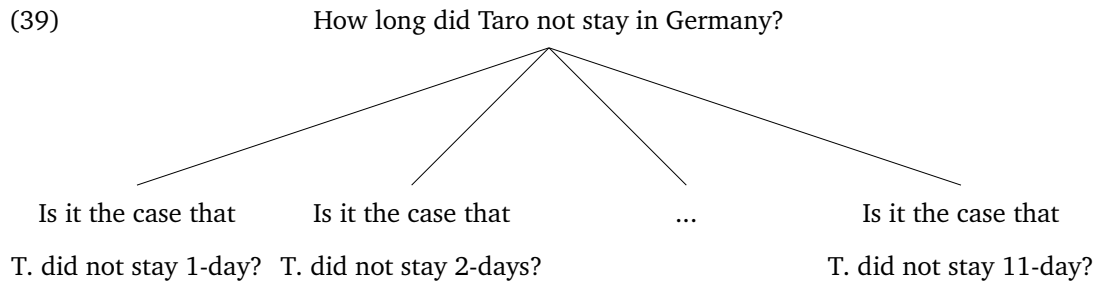
$$(37) \quad \llbracket \text{doredake nagaku-wa} \rrbracket = \lambda c_{\text{DegP}}.\{c_{\text{DegP}}(\{d\}) | d = d\}$$

When (37) is combined with  $c_{\text{DegP}}$ , it denotes a set of sets of singleton propositions that range over degrees that are under discussion in the context. For instance, when this is combined with  $\{\lambda d. \text{Taro did not stay in Germany for } d \text{ days}\}$ , the focus semantic value of the question looks like (38).

$$(38) \quad \llbracket \text{How long-wa did Taro not stay in Germany?} \rrbracket^f \\ \rightsquigarrow \{\{\text{Taro did not stay } d\text{-long}\} | d = d\}$$

Now, this focus semantic value directs the addressee to answer this question specifically by going over a set of polar questions. Although the organization of such polar questions could be arbitrary in cases of *who* or *what* questions, it is reasonable to think that the degree questions are ordered from a smaller degree to a larger one, not in a random order, as shown in (39).





If the actual length of Taro’s staying in Germany is 10 days, the addressee obtains the first positive answer when they reach  $d=11$ . After  $d=11$ , the answers to the polar questions are always positive because of the entailment. As a result, the most informative answer is obtained when  $d$  is 11. Consequently, the answer is interpreted that the actual length of stay is less than 11 days.

The crucial contribution of *wa* is to project a set of polar questions ordered according to the semantic strength or a scale, and this is what makes a negative degree question answerable. As long as we are given a certain scale from which the entailment relation can be established, there should be a point at which the answer to the question becomes positive. In the case discussed above, the point is  $d=11$ . Since the scale of the length of stay is now divided into two parts based on the answer to the polar question, a cooperative speaker is expected to give the point at which they obtain the first positive answer as the most informative answer to the question.

This is not a semantic but a pragmatic way of rescuing negative degree questions. In the approach taken above, it is the ability of *wa* to indicate a certain answering strategy to be adopted that makes the amelioration of negative degree questions possible. Concretely, *wa* orders a set of polar questions with respect to semantic strength (degrees) so that it is possible for the addressee to obtain the most informative answer to the question. The idea that *wa* aligns answers according to semantic strength is also adopted by Schwarz and Shimoyama (2010). However, the proposed analysis differs from theirs in two ways. First, the proposed analysis does not require an assumption that degree predicates have the *exactly* semantics as shown in (40a). Second, *wa* is treated as a semantically vacuous lexical item. In the analysis of Schwarz and Shimoyama (2010), *wa* does have a semantic contribution: it modifies the degree predicate so that it has *at least* semantics (40b).

(40) a.  $\llbracket \text{nagaku} \rrbracket = \lambda d. \lambda e. \lambda w. e\text{'s duration in } w = d$

b.  $\llbracket \text{nagaku wa} \rrbracket = \lambda d.\lambda e.\lambda w. e\text{'s duration in } w \geq d$

One drawback of the semantic account of negative island obviation is that it cannot explain why using the item that literally means *at least*, namely *sukunakutomo* in Japanese cannot obviate negative islands. If modifying the *exactly* semantics is a key for negative island obviation, *sukunakutomo* should be able to ameliorate negative degree questions, but apparently, it cannot. The proposed approach attributes this contrast to the fact that only contrastive *wa* has special pragmatic effects. Furthermore, we can also explain why this negative island obviation is a special phenomenon observed in Japanese, for adding *at least* cannot rescue the negative degree questions in English. It is the special discourse effects of *wa*, which are the pragmatic contributions of this particular item, that work to obviate the negative island.

It is also worth noting that the approach pursued here does not require an assumption of the dense scales (Fox and Hackl, 2006). The reason why negative degree islands without *wa* are bad is that a question such as (41) would be understood as asking the maximum length of not-staying (Rullman, 1995).

- (41) \* doredake nagaku taizai simasen desita ka?  
 how long stay didn't COP Q  
 (lit.) 'How long did you not stay there?'

Using the verb *taizai-suru* 'stay' implies the stay was temporary. Then, it is not possible to get the maximum  $d$  such that not-staying is  $d$ -long;  $d$  could be an infinitely large number, and hence this question is unanswerable. In fact, if it is understood that there is a maximum of  $d$  such that the negative event lasts for  $d$ -long, the negative degree question can be grammatical. Such a case is illustrated in (42).

- (42) Context: Taro is talking to a person at a city hall after coming back to Japan from the U.S., where he was studying for 5 years. The city hall person asks Taro:

doredake nagaku nihon-ni imasen desita ka?  
 how long in Japan not exist COP Q  
 'How long were you not in Japan?'

This question is felicitous even without *wa*, because this is an answerable question in the given context; there can be a degree that is the maximum length of time for not-being in Japan,

which, in this example, is 5 years. In sum, adding *wa* can turn the question that usually asks the maximum *d* of the negative event into one that asks the minimum *d* such that *d* is not the length of the (positive) event, and this is how *wa* can make a negative degree question answerable.

Finally, the proposed analysis predicts that *wa* can rescue otherwise infelicitous negative questions as long as some kind of scale is used to provide an answer to the question. The prediction is borne out — adding *wa* to the *wh*-phrase can rescue a negative question with a manner adverb as well. Without *wa*, the negative manner question is infelicitous in Japanese (44a) as well as in English (43). However, adding *wa* can make the question felicitous, as seen in (44b).

(43) \* How can Taro not speak English?

(44) a. \* Taro-wa donna-huu-ni eigo-o hanasemasen ka?  
Taro-TOP which-way-in English-ACC cannot speak Q

b. Taro-wa donna-huu-ni-wa eigo-o hanasemasen ka?  
Taro-TOP which-way-in-WA English-ACC cannot speak Q

The question in (44b) is understood as asking for a point in a scale from which the polar questions obtain positive answers. If Taro can speak English better than average learners but cannot like a native speaker, the answer can be given using *wa*, as in (45).

(45) [Neitibu-mitai]<sub>F</sub>-ni-wa hanasemasen.  
native-like-in-WA cannot speak  
'He cannot speak [like a native speaker]<sub>CT</sub>.'

↪ His fluency does not exceed the level of native speakers (but is better than average learners).

In this case, too, adding contrastive *wa* to the *wh*-phrase directs the addressee to go over a set of polar questions that are ordered according to a scale of English fluency. As a result, the answer to the question refers to a point from which a set of polar questions denoted by the use of contrastive *wa* obtains positive answers.

## 5.4 Chapter Conclusion

In this chapter, interrogative sentences that involve contrastive *wa* were explored, thus unifying the analysis of contrastive *wa* from Chapter 3 with that of biased questions in Japanese from

Chapter 4. I have shown that it is not difficult to generalize the continuation-based analysis of *wa* to derive the focus semantic value of *wa*-questions, which indicates a certain strategy to resolve the answer to the question. One virtue of this unified analysis is that it enables us to capture the connection between *wa*-assertions and *wa*-questions by referring to discourse structures (i.e., the focus semantic values), which play an important role in both asking and answering questions. When the question involves contrastive *wa*, the answer is often marked with *wa* to acknowledge a particular structure projected by the question, and such a *wa*-assertion has a different effect than one used to answer non-*wa*-questions.

As we saw in Chapter 3, the use of contrastive *wa* in an interrogative sentence, like its use in a declarative sentence, also has a conventional effect of projecting other questions that can potentially be asked in the future discourse. In the case of *wa*-constituent questions, the use of *wa* implicitly suggests the existence of other possible QuDs to be pursued, which implies that the alternatives could be divided into more than one subgroup. This effect can play a prominent role in weakening intervention effects by bringing about a robust existential presupposition that cannot be canceled. It is this strong presupposition that plays the main role in ameliorating a question with an intervener in Japanese, in which intervention effects can be better understood as information structural issues. In the case of negative degree questions, adding *wa* can turn a question about the maximum degree of a negative state into a question that requests a certain point in a scale, which can rescue otherwise infelicitous and unanswerable questions. By attributing the main source of negative island obviation to the unique contribution of contrastive *wa*, it has also been shown why negative island obviation appears to be a phenomenon that is unique to Japanese.

## Appendix: A formal system extended in Chapter 5

### Semantic Types

1.  $e$  is a type.
2.  $t$  is a type.
3.  $d$  is a type.
4. When  $\sigma$  and  $\tau$  are both types,  $\sigma\tau$  is a type.

### New Continuized Lexical Entries in the Ordinary Dimension

- (1) a.  $\text{who} \rightarrow \lambda c_{\text{NP}}.\mathbf{who}(\lambda x.c_{\text{NP}}(x))$
- b.  $\text{how long} \rightarrow \lambda c_{\text{DegP}}.\mathbf{how long}(\lambda d.c_{\text{DegP}}(d))$
- c.  $\text{Q} \rightarrow \lambda p.\mathbf{is-it-the-case}(p)$
- d.  $\text{10 days (long)} \rightarrow \lambda c_{\text{DegP}}.c_{\text{DegP}}(\text{10 days})$

### New Continuized Lexical Entries in the Focus Dimension

- (2) a.  $\text{who} \rightarrow \lambda c_{\text{NP}}.c_{\text{NP}}(\{x : x \in D_e\})$  where  $c_{\text{NP}}(\{x : x \in D_e\})$  is computed by PFA
- b.  $\text{how long} \rightarrow \lambda c_{\text{DegP}}.c_{\text{DegP}}(\{d : d \in D_d\})$  where  $c_{\text{DegP}}(\{d : d \in D_d\})$  is computed by PFA
- c.  $\text{10 days (long)}_F \rightarrow \lambda c_{\text{DegP}}.c_{\text{DegP}}(\{d : d \in D_d\})$  where  $c_{\text{DegP}}(\{d : d \in D_d\})$  is computed by PFA

## Chapter 6

### Conclusion

#### 6.1 Overall Summary

In this dissertation, we explored the discourse effects brought by three kinds of expressions in Japanese: contrastive *wa*, outer negation, and *no(da)* and the combinations of thereof. Even though these particles do not have direct effects on the semantic contents, they provide rich contextual information such as the speaker's bias, the existence of contextual evidence, and a possible move in the future discourse.

Though contrastive *wa* does not change at-issue meanings in any way, it has a connection with the “semantic” component since whether its use is felicitous or not depends whether the focus semantic value of the sentence accords with the strategy that is expected to be employed in the discourse. Note that this is a general property of contrastive topics in languages discussed in the literature, not a unique property of contrastive *wa*. What could be unique or at least different from English contrastive topics about contrastive *wa* is that (i) *wa* can appear inside some syntactic islands and can be used multiple times at a time, (ii) it has a special conventional effect, namely, suggesting possible questions to be asked in the future, and (iii) it can be used in questions (and other sentence types). The approach given in Chapter 3 is designed to be able to account for these peculiar characteristics of contrastive *wa* in Japanese. The derivation of the focus semantic value is formalized by adopting the continuation hypothesis so that contrastive *wa* would have the freedom to scope over the rest of the sentence. The conventional effect allows *wa*-assertions to have not random but flexible implications, as demonstrated by the experiments

reported in Chapter 2.

The information conveyed by biased questions, on the other hand, is disconnected from semantics. However, the discourse effects provided by particles and combinations of thereof have a significant effect on the conversation. In particular, in Japanese, it is possible to observe what each particle is doing in a sentence and how the effects of combinations of particles are derived. This peculiar aspect of Japanese biased questions is valuable to get a better understanding of discourse effects observed in a different language; Its discourse effect might be decomposable into some smaller parts in another language in which those smaller parts have lexical realizations. In Chapter 4, for example, I showed that the discourse effects that are very similar to those of tag questions in English are realized by the combination of two particles in Japanese. Languages differ with respect to the kind of information that certain expressions can convey, and parameterizing such information would be very helpful in order to get a better grasp of language variations.

Finally, in part of Chapter 4 and Chapter 5, I showed that there is a connection between the effects brought about by a particle in declarative sentences and those in interrogative sentences. This is a way to explain the total discourse effects of a sentence by composing what is brought by a particular sentence type, which becomes a baseline, and the contribution of particle(s). Part of this dissertation showed that at least in order to explain the effects brought by *no(da)* and *wa*, this approach is promising and is also supported by some empirical facts.

## 6.2 Remaining Issues

As every dissertation does, this dissertation arouses a lot of questions to be pursued in the future. The rest of this dissertation illustrates some of them.

First, as mentioned in Chapter 4, the items discussed in this dissertation are just part of many particles that can form biased questions in Japanese. For example, [Sudo \(2013\)](#) discusses *desyo* and [Hara \(2017\)](#) investigates polar questions with *daroo*. These particles also can be used in declarative sentences, so it would be worth investigating whether the contribution of these particles in assertions can be extended to that in questions as is done in this dissertation. Furthermore, they can be used with other particles as well, but again, not all combinations are allowed. It needs exploring if some combinations are not available because of the mismatches

of syntactic positions that those particles need to occupy or infelicitous discourse effects that are produced as the result of composition.

Besides a lot of particles that are set aside here, there are also sentence types that are not discussed in this dissertation. One of them is imperatives. Contrastive *wa*, for example, can be used in an imperative (Ito, 2009a). One thing to be explored is how we can extend the QuD-based approach of contrastive *wa* to the imperatives involving contrastive *wa*. If it is possible to consider that an imperative contributes to the addressee's To-Do List (Portner, 2007), one potential way to extend the analysis to contrastive *wa* in imperatives would be that assuming that the QuD to be resolved is about the addressee's To-Do list, and using *wa* can suggest that there are other things that should be added to the To-Do List but are low in priority. However, we also need to pay attention to the fact that there are multiple ways to give an order in Japanese such as (2-3), besides using morphological imperatives (III).

- |              |              |                |
|--------------|--------------|----------------|
| (1) hashir-e | (2) hasit-te | (3) hasiru-nda |
| run-IMP      | run-TE       | run-no(da)     |

Giving appropriate characterizations to imperatives is not an easy task (Condoravdi and Lauer, 2012; Schmerling, 1982), and the first task to be done here would be to identify the discourse effects of different types of apparent imperatives. As we did in analyzing multiple kinds of questions in Japanese, if it is possible to analyze different forms of imperatives based on the items used to form such orders, it might be helpful to decompose imperatives in other languages and extract the basic discourse effect of different sorts of imperatives.

Another thing I wholly dismissed in this dissertation is a variation in intonation contour. It is not the case that all rising intonations that constitute interrogative sentences are the same, and apparently unmarked polar questions could be used in the presence of contextual evidence with a certain intonation pattern. In English, it has been reported that there are two kinds of rising declaratives (Jeong, 2018). Given that, there might well be several kinds of intonation contour for interrogative sentences in Japanese. In addition, rising intonation does not go along with some variants of imperatives although it has been claimed that English does have such a variant of imperatives (Rudin, 2018). A thorough investigation would be needed to understand what discourse effects intonation has in Japanese and how they are combined with the discourse effects of other parts in utterances.

There are many things to be explored about even the particles discussed in this dissertation



as well. In particular, on contrastive *wa*, there are remaining problems to be resolved in addition to its use in imperatives. First, as mentioned in Chapter 3, it would need further studies about island sensitivity of this lexical item. For instance, it is not so clear whether contrastive *wa* is bad in the conditional. The example below is repeated from Chapter 3 and cited from [Kuroda \(2005\)](#):

- (4) mosi Nomo-wa genki dattara, Dodgers-ga katta daroo.  
if Nomo-*wa* well were Dodgers-NOM won would  
'If Nomo had been well, Dodgers would have won.'

Remember that using contrastive *wa* needs a particular discourse structure that the discourse participants entertain. What to be figured out is whether some people judge (4) is bad because it is not allowed in syntax at all (i.e., contrastive *wa* is inside an island) or they fail to accommodate such a discourse structure in interpreting the sentence out-of-blue. For instance, if one does not have any knowledge about baseball players, it might be hard for them to figure out why *wa* is used there, to begin with.

I carried out a pilot experiment using contrastive *wa* in the antecedent of indicative and counterfactual conditionals, in which people were just asked to give the acceptability of each sentence without any context. The hypothesis was maybe counterfactual conditionals can promote people to give better ratings than indicative conditionals since, in the counterfactual sentence, there should be something in a hypothetical world that is explicitly contrasted with the state of affair in the actual world. Also, such a contrasted part can be marked with the phonological focus ([Ogihara, 2000](#)). In the case of (4), the phonological focus on *Nomo* indicates that the hypothetical world taken in consideration in this counterfactual sentence is that such a world in which Nomo is well and, that is the minimum difference between the actual world and the hypothetical world. However, there was no significant difference between the acceptability of indicative conditionals and counterfactual ones in the results. Regardless, it was the case that people did not reject conditionals with *wa* altogether.

One potential way to figure out the status of *wa* better is to add more background context in asking participants for their judgments. For instance, in case of (4), if contrastive *wa* was judged odd just because of lack of contextual information, adding the following fact would promote people to give a better rating to the sentence: "Nomo belongs to Dodgers and is generally very good at holding the opposing team on that day. However, he got sick and could not play on the

day. Dodgers lost in the game.” It would be interesting to see adding this kind of contextual cue makes any difference in people’s judging indicative conditionals and counterfactual ones.

As for the other island conditions, it needs further study as to understand why using contrastive *wa* is bad in some but not all island environments. It could be due to a real semantic type mismatch as mentioned in Chapter 3, or maybe dealing with alternatives inside the subordinate clauses casts a heavy cognitive burden on people in parsing. In Japanese, there is always an option to use a *wa*-marked phrase in the left periphery and *pro* inside the island. This might be a pragmatically more preferable way than using contrastive topic inside the island to realize a contrastive topic.

Finally, figuring out the things mentioned above would be helpful in understanding the process in which children acquire how to use languages strategically in the conversation and also guiding language learners through the apparently complicated and subtle intention in the speaker’s using certain expressions. Having a better apprehension of a particular language also leads to understanding linguistic variations better. There is a long way to go, but reaching there is part of the ultimate goal of the project that started with this dissertation.

# Appendix

## Experimental stimuli: Experiment 1

- (1) a. Judge's question: POLAR  
sono ningyoo no uchi, { sukunakutomo 10 tai ga/ 10 tai izyoo ga/ 10 tai wa } oo-  
hiroma ni aruno o mikakemasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the dolls in the hall?'
- b. Judge's question: WHAT  
oohiroma de nani o mikakemasita ka?  
'What did you see in the hall?'
- c. Judge's question: HOW MANY  
sono ningyoo no uchi, nan tai ga oohiroma ni aruno o mikakemasita ka?  
'How many dolls did you see in the hall?'
- d. Witness's answer  
watasi wa sono ningyoo no uchi, { sukunakutomo 10 tai ga/ 10 tai izyoo ga/ 10 tai  
wa } oohiroma ni aruno o mikakemasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the dolls in the hall.'
- (2) a. Judge's question: POLAR  
sono yankii tachi no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/ 10 nin wa }  
konbini no mae ni iruno o mimasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the naughty ones in front of  
the convenience store?'
- b. Judge's question: WHAT  
konbini no mae de nani o mikakemasita ka?  
'What did you see in front of the convenience store?'
- c. Judge's question: HOW MANY  
sono yankii tachi no uchi, nan nin ga konbini no mae ni iruno o mimasita ka?  
'How many naughty ones did you see in front of the convenience store?'
- d. Witness's answer  
watasi wa sono yankii tachi no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/  
10 nin wa } konbini no mae ni iruno o mimasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the naughty ones in front of the  
convenience store.'
- (3) a. Judge's question: POLAR  
sono koin no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10 mai wa } yuka  
no ue ni aruno o mitukemasita ka?  
'Did you find { at least 10 / more than 10 / 10-wa } of the coins on the floor?'

- b. Judge's question: WHAT  
yuka no ue ni nani ga aruno o mitukemasita ka?  
'What did you find on the floor?'
- c. Judge's question: HOW MANY  
sono koin no uchi, nan mai ga yuka no ue ni aruno o mitukemasita ka?  
'How many coins did you find on the floor?'
- d. Witness's answer  
watasi wa sono koin no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10 mai wa } yuka no ue ni aruno o mitukemasita.  
'I found { at least 10 / more than 10 / 10-wa } of the coins on the floor.'
- (4) a. Judge's question: POLAR  
sono inu no uchi, { sukunakutomo 10 piki ga/ 10 piki izyoo ga/ 10 piki wa } hokenzyo ni iruno o mikakemasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the dogs in the animal shelter?'
- b. Judge's question: WHAT  
hokenzyo de nani o mikakemasita ka?  
'What did you see in the animal shelter?'
- c. Judge's question: HOW MANY  
sono inu no uchi, nan biki ga hokenzyo ni iruno o mikakemasita ka?  
'How many dogs did you see in the animal shelter?'
- d. Witness's answer  
watasi wa sono inu no uchi, { sukunakutomo 10 piki ga/ 10 piki izyoo ga/ 10 piki wa } hokenzyo ni iruno o mikakemasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the dogs in the animal shelter.'
- (5) a. Judge's question: POLAR  
sono daiamondo no uchi, { sukunakutomo 10 ko ga/ 10 ko izyoo ga/ 10 ko wa } beddo no sita ni aruno o mitukemasita ka?  
'Did you find { at least 10 / more than 10 / 10-wa } of the diamonds under the bed?'
- b. Judge's question: WHAT  
beddo no sita ni nani o mitukemasita ka?  
'What did you find under the bed?'
- c. Judge's question: HOW MANY  
sono daiamondo no uchi, nan ko ga beddo no sita ni aruno o mitukemasita ka?  
'How many diamonds did you find under the bed?'
- d. Witness's answer  
watasi wa sono daiamondo no uchi, { sukunakutomo 10 ko ga/ 10 ko izyoo ga/ 10 ko wa } beddo no sita ni aruno o mitukemasita.  
'I found { at least 10 / more than 10 / 10-wa } of the diamonds under the bed.'
- (6) a. Judge's question: POLAR  
sono kuruma no uchi, { sukunakutomo 10 dai ga/ 10 dai izyoo ga/ 10 dai wa } tyuushazyoo ni tomatteiruno o mikakemasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the cars at the parking lot?'
- b. Judge's question: WHAT  
tyuushazyoo de nani o mikakemasita ka?  
'What did you see at the parking lot?'
- c. Judge's question: HOW MANY  
sono kuruma no uchi, nan dai ga tyuushazyoo ni tomatteiruno o mikakemasita ka?  
'How many cars did you see at the parking lot?'

- d. Witness's answer  
 watasi wa sono kuruma no uchi, { sukunakutomo 10 dai ga/ 10 dai izyoo ga/ 10 dai wa } tyuushazyoo ni tomatteiruno o mikakemasita.  
 'I saw { at least 10 / more than 10 / 10-wa } of the cars at the parking lot.'
- (7) a. Judge's question: POLAR  
 sono noraneko no uchi, { sukunakutomo 10 piki ga/ 10 piki izyoo ga/ 10 piki wa } kooen ni iruno o mikakemasita ka?  
 'Did you see { at least 10 / more than 10 / 10-wa } of the stray cats in the park?'
- b. Judge's question: WHAT  
 kooen de nani o mikakemasita ka?  
 'What did you see in the park?'
- c. Judge's question: HOW MANY  
 sono noraneko no uchi, nan biki ga kooen ni iruno o mikakemasita ka?  
 'How many cats did you see in the park?'
- d. Witness's answer  
 watasi wa sono noraneko no uchi, { sukunakutomo 10 piki ga/ 10 piki izyoo ga/ 10 piki wa } kooen ni iruno o mikakemasita.  
 'I saw { at least 10 / more than 10 / 10-wa } of the stray cats in the park.'
- (8) a. Judge's question: POLAR  
 sono ichimanensatu no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10 mai wa } hikidasi no naka ni aruno o mimasita ka?  
 'Did you see { at least 10 / more than 10 / 10-wa } of the ten-thousand yen bills in the drawer?'
- b. Judge's question: WHAT  
 hikidasi no naka ni nani ga aruno o mimasita ka?  
 'What did you see in the drawer?'
- c. Judge's question: HOW MANY  
 sono ichimanensatu no uchi, nan mai ga hikidasi no naka ni aruno o mimasita ka?  
 'How many ten-thousand yen bills did you see in the drawer?'
- d. Witness's answer  
 watasi wa sono noraneko no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10 mai wa } hikidasi no naka ni aruno o mimasita.  
 'I saw { at least 10 / more than 10 / 10-wa } of the ten-thousand yen bills in the drawer.'
- (9) a. Judge's question: POLAR  
 sono taburetto no uchi, { sukunakutomo 10 dai ga/ 10 dai izyoo ga/ 10 dai wa } danbooru no naka ni aruno o mitukemasita ka?  
 'Did you find { at least 10 / more than 10 / 10-wa } of the tablets in cardboard box?'
- b. Judge's question: WHAT  
 danbooru no naka ni nani o mitukemasita ka?  
 'What did you find in the cardboard box?'
- c. Judge's question: HOW MANY  
 sono taburetto no uchi, nan dai ga danbooru no naka ni aruno o mitukemasita ka?  
 'How many tablets did you find in the cardboard box?'
- d. Witness's answer  
 watasi wa sono taburetto no uchi, { sukunakutomo 10 dai ga/ 10 dai izyoo ga/ 10 dai wa } danbooru no naka ni aruno o mitukemasita.  
 'I found { at least 10 / more than 10 / 10-wa } of the tablets in cardboard box.'

- (10) a. Judge's question: POLAR  
sono kusuri no uchi, { sukunakutomo 10 zyoo ga/ 10 zyoo izyoo ga/ 10 zyoo wa }  
bin no naka ni aruno o mimasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the pills in the bottle?'
- b. Judge's question: WHAT  
bin no naka ni nani ga aruno o mimasita ka?  
'What did you see in the bottle?'
- c. Judge's question: HOW MANY  
sono kusuri no uchi, nan zyoo ga bin no naka ni aruno o mimasita ka?  
'How many pills did you see in the bottle?'
- d. Witness's answer  
watasi wa sono kusuri no uchi, { sukunakutomo 10 zyoo ga/ 10 zyoo izyoo ga/ 10  
zyoo wa } bin no naka ni aruno o mimasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the pills in the bottle.'
- (11) a. Judge's question: POLAR  
sono naihu no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon wa }  
teeburu no ue ni aruno o mikakemasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the knives on the table?'
- b. Judge's question: WHAT  
teeburu no ue ni nani ga aruno o mikakemasita ka?  
'What did you see on the table?'
- c. Judge's question: HOW MANY  
sono naihu no uchi, nan bon ga teeburu no ue ni aruno o mikakemasita ka?  
'How many knives did you see on the table?'
- d. Witness's answer  
watasi wa sono naihu no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon  
wa } teeburu no ue ni aruno o mikakemasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the knives on the table.'
- (12) a. Judge's question: POLAR  
sono zyookyaku no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/ 10 nin wa }  
zaseki ni suwatteiruno o mimasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the passengers sitting on the  
seat?'
- b. Judge's question: WHAT  
densya no naka de nani o mimasita ka?  
'What did you in the train?'
- c. Judge's question: HOW MANY  
sono zyookyaku no uchi, nan nin ga zaseki ni suwatteiruno o mimasita ka?  
'How many passengers did you in the train?'
- d. Witness's answer  
watasi wa sono zyookyaku no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/ 10  
nin wa } zaseki ni suwatteiruno o mimasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the passengers sitting on the seat.'
- (13) a. Judge's question: POLAR  
sono zyuu no uchi, { sukunakutomo 10 tyoo ga/ 10 tyoo izyoo ga/ 10 tyoo wa }  
suutukeesu no naka ni aruno o mimasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the guns in the suitcase?'

- b. Judge's question: WHAT  
suutukeesu no naka ni nani ga aruno o mimasita ka?  
'What did you see in the suitcase?'
- c. Judge's question: HOW MANY  
sono zyuu no uchi, nan tyoo ga suutukeesu no naka ni aruno o mimasita ka?  
'How many guns did you see in the suitcase?'
- d. Witness's answer  
watasi wa sono zyuu no uchi, { sukunakutomo 10 tyoo ga/ 10 tyoo izyoo ga/ 10 tyoo wa } suutukeesu no naka ni aruno o mimasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the guns in the suitcase.'
- (14) a. Judge's question: POLAR  
sono bin no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon wa } reezooko no naka ni aruno o mimasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the bottles in the refrigerator?'
- b. Judge's question: WHAT  
reezooko no naka ni nani ga aruno o mimasita ka?  
'What did you see in the refrigerator?'
- c. Judge's question: HOW MANY  
sono bin no uchi, nan bon ga reezooko no naka ni aruno o mimasita ka?  
'How many bottles did you see in the refrigerator?'
- d. Witness's answer  
watasi wa sono bin no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon wa } reezooko no naka ni aruno o mimasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the bottles in the refrigerator.'
- (15) a. Judge's question: POLAR  
sono dansee no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/ 10 nin wa } biru no mae ni tatteiruno o mikakemasita ka?  
'Did you see { at least 10 / more than 10 / 10-wa } of the men standing in front of the building?'
- b. Judge's question: WHAT  
biru no mae de nani o mikakemasita ka?  
'What did you see in front of the building?'
- c. Judge's question: HOW MANY  
sono dansee no uchi, nan nin ga biru no mae ni tatteiruno o mikakemasita ka?  
'How many men did you see in front of the building?'
- d. Witness's answer  
watasi wa sono dansee no uchi, { sukunakutomo 10 nin ga/ 10 nin izyoo ga/ 10 nin wa } biru no mae ni tatteiruno o mikakemasita.  
'I saw { at least 10 / more than 10 / 10-wa } of the men standing in front of the building.'
- (16) a. Judge's question: POLAR  
sono nekkuresu no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon wa } hikidasi no naka ni aruno o mitukemasita ka?  
'Did you find { at least 10 / more than 10 / 10-wa } of the necklaces in the drawer?'
- b. Judge's question: WHAT  
hikidasi no naka ni nani o mitukemasita ka?  
'What did you find in the drawer?'

- c. Judge's question: HOW MANY  
sono nekkuresu no uchi, nan bon ga hikidasi no naka ni aruno o mitukemasita ka?  
'How many necklesses did you find in the drawer?'
- d. Witness's answer  
watasi wa sono nekkuresu no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/  
10 pon wa } hikidasi no naka ni aruno o mitukemasita.  
'I found { at least 10 / more than 10 / 10-wa } of the necklaces in the drawer.'
- (17) a. Judge's question: POLAR  
sono nezi no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon wa }  
koogubako no naka ni aruno o mitukemasita ka?  
'Did you find { at least 10 / more than 10 / 10-wa } of the screws in the toolbox?'
- b. Judge's question: WHAT  
koogubako no naka ni nani o mitukemasita ka?  
'What did you find in the toolbox?'
- c. Judge's question: HOW MANY  
sono nezi no uchi, nan bon ga koogubako no naka ni aruno o mitukemasita ka?  
'How many screws did you find in the toolbox?'
- d. Witness's answer  
watasi wa sono nezi no uchi, { sukunakutomo 10 pon ga/ 10 pon izyoo ga/ 10 pon  
wa } koogubako no naka ni aruno o mitukemasita.  
'I found { at least 10 / more than 10 / 10-wa } of the screws in the toolbox.'
- (18) a. Judge's question: POLAR  
sono syasin no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10 mai wa } hon  
no aida ni hasamatteiruno o mitukemasita ka?  
'Did you find { at least 10 / more than 10 / 10-wa } of the pictures in the book?'
- b. Judge's question: WHAT  
hon no aida ni nani o mitukemasita ka?  
'What did you find in the book?'
- c. Judge's question: HOW MANY  
sono syasin no uchi, nan mai ga hon no aida ni hasamatteiruno o mitukemasita ka?  
'How many pictures did you find in the book?'
- d. Witness's answer  
watasi wa sono syasin no uchi, { sukunakutomo 10 mai ga/ 10 mai izyoo ga/ 10  
mai wa } hon no aida ni hasamatteiruno o mitukemasita.  
'I found { at least 10 / more than 10 / 10-wa } of the pictures in the book.'



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