Quantification and Nominal Structure

量化と名詞構造

A Dissertation Presented to
the Graduate School of Arts and Sciences
Internatioanl Christian University,
for the Degree of Doctor of Philosophy

国際基督教大学大学院
アーツ・サイエンス研究科提出博士論文

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Abstract

This dissertation investigates the syntax and semantics of quantification and nominal structure, concentrating on strong quantifiers and numeral-classifier sequences in Japanese.

Chapter 2 focuses on Japanese strong quantifiers *subete* 'all' and *hotondo* 'most'. I argue that the strong quantifiers in Japanese take individuals as their first arguments to create generalized quantifiers, that is, they are of type $\langle e, \langle et, t\rangle\rangle$, not $\langle et, \langle et, t\rangle\rangle$ as in the standard Generalized Quantifier analysis. I develop an analysis that the Japanese strong quantifiers can be located either in the specifier position or the head of QP. Consequently, due to the head-finality of Japanese, a word order variation emerges in which the strong quantifiers are to appear in prenominal and postnominal positions. The analysis, on the one hand, is compatible with the no-variation hypothesis advanced by Matthewson (2001), which claims that the denotation of strong quantifies should be cross-linguistically uniform. Specifically, I show that the denotations of the strong quantifiers in Japanese do not differ from those of their counterparts in English (i.e., *all* and *most*). On the other hand, the analysis accounts for the language-specific word order variation.

In Chapter 3, I turn to numeral-classifier constructions in Japanese. I claim that classifiers in Japanese are required not because of the semantic property of nouns but because of the property of numerals. The role of classifiers is to turn numerals into predicates, and as a result, numeral-classifier sequences are allowed to modify nouns. Based on this assumption, I present an analysis that a numeral and a classifier form a complex head. I then propose that Japanese allows two kinds of structures for numeral-classifier constructions. In one structure, numeral-classifier sequences are heads, taking NPs as their complement. In the other structure, numeral-classifier sequences are projected in a specifier position of a functional projection within the nominal projection. This analysis provides a direct way of

accounting for the word order variation of numeral-classifier sequences.

Chapter 4 examines a particular construction where numeral-classifier sequences appear with proper names or pronouns. I discuss novel data that numeral-classifier sequences can modify proper names or pronouns from the postnominal position but not from the prenominal position. Furthermore, I show that the postnominal numeral-classifier sequences in this construction contribute non-at-issue meanings. I argued that the numeral-classifier sequences introduce conventional implicatures and offer a multidimensional analysis.

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Contents

Chapter 1

Introduction

This dissertation investigates the syntax and semantics of quantification and nominal structure. Since the emergence of Generalized Quantifier theory (Montague 1973, Barwise & Cooper 1981), Barwise & Cooper's (1981) proposal opens inquiry as to whether the Generalized Quantifier theory is applicable to all quantifiers and whether it holds cross-linguistically. One of the significant contributions of Barwise & Cooper's (1981) proposal is to unify the behaviors of quantifier determiners and to make a compositional analysis of the meanings of quantified noun phrases. Cross-linguistic researches have revealed that quantifiers show non-uniformity in several aspects such as scopal behaviors, the syntactic position of quantifier determiners and the semantics of them (see Bach et al. 1995, Gil, Harlow & Tsoulas 2013, Szabolcsi 2010). These researches about quantifier phrases give rise to an intense debate on to what extent the internal composition of quantifier phrases is universal and to what extent the mapping from syntax to semantics is language-specific. To have a deeper understanding of quantification in general, previous studies have suggested that more cross-linguistic research is called for on the behavior of each quantifier and the syntax-semantics mapping on the internal structure of quantifier phrases and quantifier determiners (Matthewson 2001, Partee 1995 a.o,).

The goal of this dissertation is to contribute to the debate on the universality and the language-specificity of the internal composition of quantification in nominal domain by examining quantifiers in Japanese. This language provides a rich source for the investigation. First, the languages is a strictly head-final language; second, it is an article-less, bare-

argument language, that is, it lacks the obligatory morphological distinction between singular and plural, between indefinite and definite and between count nouns and mass nouns; third, it is a classifier language; finally, it allows quantifier to appear in several positions relative to a head noun. Since few languages have these properties, the examination of quantification in Japanese will shed light on both the empirical and theoretical foundation. In addition, the investigation will reveal the detailed internal structure of extended nominal projection because the creation of quantification is tightly connected to the internal functional structure of nominals.

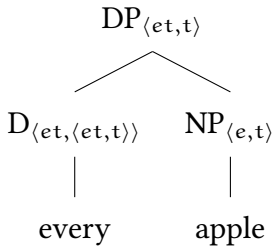
1.1 Issues in quantification in Japanese and Overview

This dissertations can be divided into two parts. This dissertations can be divided into two parts. The first part (Chapter 2) is about strong quantifiers in Japanese. The second part (Chapter 3 and Chapter 4) is about numeral-classifier sequences in Japanese. In this section, I address issues about these two types of quantifiers in Japanese and give an overview of my proposal.

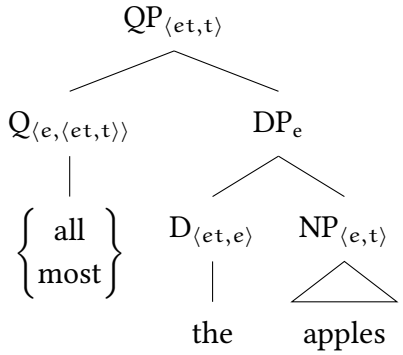
1.1.1 Strong quantifiers

One of the major questions to be considered in this thesis is of what semantic type strong quantifiers in Japanese are. Given the standard Generalized Quantifier theory, they are of type $\langle et, \langle et, t\rangle\rangle$. This means that strong quantifiers combine with a predicative phrase. According to an alternative analysis proposed by Matthewson (2001), they are of type $\langle e, \langle et, t\rangle\rangle$. Matthewson (2001) claims that the creation of generalized quantifier involves two steps: domain restriction and quantification over the restricted domain. The difference between the Generalized Quantifier analysis and Matthewson's (2001) analysis is not only in the semantic type of strong quantifiers but also the internal structure of generalized quantifiers. As illustrated in (1), in the Generalized Quantifier analysis, a generalized quantifier is composed of a strong quantifier and a noun, whereas in Matthewson's analysis, it is composed of a strong quantifier and a DP which is derived by the combination of a determiner and a noun.

(1) a. Generalized Quantifier analysis



b. Matthewson's analysis



The two analyses have a different assumption about the way generalized quantifiers are created. In the Generalized Quantifier analysis, it is a one-step process, whereas in Matthewson's analysis, it is a two-step process.

An issue of analyzing Japanese and article-less, bare-argument languages in general, is that it is not straightforward to categorize the type of quantifiers based on morpho-syntactic properties of nominals to which quantifiers attach. In Japanese, there is no morphological marker to distinguish singulars from plurals, and indefinites from definites. Further, since all nouns can appear as bare, no morphological distinction is made among singular count nouns, plural count nouns, and mass nouns, as shown in (2).

(2) a. Bill-wa ringo-o tabeta.
Bill-TOP apple-ACC ate
'Bill ate an apple/apples/the apple/the apples.'

b. Bill-wa pan-o tabeta.
Bill-TOP bread-ACC ate
'Bill ate bread/the bread.' (K. Yoshida 2008: 422 (2))

Since bare nouns can appear in argument position, they can be considered as type-e expressions. We may conclude that strong quantifiers attach to a type-e expression. However, as in (3), bare nouns can function as predicates in predicative copular sentences,

(3) Kore-wa ringo-da.
this-TOP apple-COP
'Int. This is an apple.'

The lack of morphsyntactic evidence makes it difficult to determine whether strong quantifiers attach to a predicative phrase (type $\langle e, t \rangle$) or argumental phrase (type e).

Moreover, if Japanese strong quantifiers combine with type-e expressions as in Matthewson's analysis, it is not clear whether the way of creating generalized quantifiers is similar to English *all* and *most*, which involves two-step process. In other words, it is not obvious whether strong quantifiers attach to a DP with a null determiner. The question regarding the semantic type of the strong quantifiers in Japanese and the internal structure of generalized quantifiers is tightly related to the status of nouns in the language. Thus, we need to look into the syntax and semantics of nouns to test whether there is a null determiner in the structure of generalized quantifiers or intrinsically bare nouns denote argument type (e.g., Chierchia 1998a,b).

Another issue regarding Japanese strong quantifiers is word order variation. In Japanese, strong quantifiers such as *subete* 'all' and *hotondo* 'most' can appear before or after a noun as shown in (4).[1] When they come before a noun, a genitive maker *-no* links the quantifiers and nouns.

(4) a. *Prenominal strong quantifiers*
John-wa {subete-no /hotondo-no} hon-o yomi-oeta.
John-TOP {all-GEN /most-GEN} book-ACC read-finished
'John finished reading {all /most} of the books.'

b. *Postnominal strong quantifiers*
John-wa hon {subete-o /hotondo-o} yomi-oeta.
John-TOP book {all-ACC /most-ACC} read-finished
'John finished reading {all /most} of the books.'

The word order variation in Japanese challenges the Generalized Quantifier analysis and Matthewson's (2001) analysis since in the two analyses, possible positions for quantifiers are

1. In addition to the prenominal and postnominal positions, strong quantifiers can appear after a case-marked head nouns, which is known as floating quantifiers.

(i) *Floating strong quantifier*
ringo-{ga/o} **subete**
apple-{NOM/ACC} all
'all (the) apples'

In the dissertation, I will not examine this constructions because floating quantifiers can be considered as a adverb (see Nakanishi 2008). Since my main concern in this thesis is a quantification in nominal domain, I leave floating quantifiers for future research.

restricted to a head position. Neither of the two analyses expect the word order variation.

In Chapter 2, I analyze strong quantifiers in Japanese *suebete* 'all' and *hotondo* 'most' based on Matthewson's (2001) analysis. The chapter examines the property of nominals in Japanese and see whether Japanese nouns are interpreted as definite DPs. The investigation shows that Japanese nouns may be definite DPs or specific indefinite DPs. I suggest that these DPs have a null determiner. Based on the discussion about Japanese nominals, I argue that the strong quantifiers in Japanese are of type $\langle e, \langle et, t\rangle\rangle$. The way of creating generalized quantifiers in Japanese is the same as in English. I then propose that the strong quantifiers may be heads or specifiers of QP. Since Japanese is a head-final language, this analysis explains the word order variation: when a strong quantifier is in Spec,QP, the prenominal order is derived, whereas when it is in the head of QP, the postnominal order is generated. In addition, I point out that the two orders are not identical in their interpretation. I offer a semantic analysis, which captures the difference.

1.1.2 Numeral-classifier sequences

Japanese is a classifier language, and classifiers cannot be omitted when numerals are present. Moreover, just like the strong quantifiers, numeral-classifier sequences can appear prenominally and postnominally.[2]

(5) a. *Prenominal numeral-classifier construction*
John-ga san-satsu-no hon-o yonda.
John-NOM 3-CL-GEN book-ACC read
'John read three books.'

b. *Postnominal numeral-classifier construction*
John-ga hon san-satsu-o yonda.
John-NOM book 3-CL-ACC read
'John read three books.'

2. Just like the strong quantifiers, numeral-classifier sequences can appear as floating quantifiers.

(i) *Floating numeral-classifier sequence*
ringo-{ga/o} **san-ko**
apple-{NOM/ACC} 3-CL
'three apples'

The floating numeral-classifier construction will not be discussed In the dissertation.

In the standard Generalized Quantifier analysis, numerals are treated as "quantifier determiners", occupying D position. Recent studies, in contrast, have assumed that they are adjectives of type $\langle e, t\rangle$ (F. Landman 2004, Rothstein 2016) or modifiers of type $\langle et, et\rangle$ (Ionin & Matushansky 2006). Crucial is that in these studies, numerals are not in D position. Two questions arise: whether numeral-classifier sequences in Japanese should be analyzed differently from strong quantifiers, and if they differs from strong quantifiers, where exactly they are located.

The syntax and semantics of numeral-classifier sequences are also closely related to the role of classifiers. There are two major analyses: one analysis claims that classifiers are required due to the property of numerals (Krifka 1995); the other postulates that classifiers are needed because of the property of nouns (Chierchia 1998a). These two analyses assume different structures for numeral-classifier constructions: for the classifier-for-numeral analysis, a numeral and a classifier form a constituent to the exclusion of a noun, whereas for the classifier-for-noun analysis, a noun and a classifier form a constituent to the exclusion of a numeral. To explore the syntax and semantics of numeral-classifier sequences in Japanese, we thus answer the question as to why classifiers are required in the language.

In addition to the role of classifiers, any analysis of numeral-classifier sequences in Japanese must answer the question as to how and why the word order variation is produced. It should be noted that even though the order between numerals and nouns differ as in (5), the meaning of the numeral-classifier constructions are identical. Thus, any compositional analysis should capture this invariability of meanings which is yielded by the different word orders.

In Chapter 3, I examine numeral-classifier sequences. Adopting a numeral-as-adjective analysis, I first show that numeral-classifier sequences differ from strong quantifiers. They function as predicates and are DP-internal elements. I then analyze the role of classifiers and show that Japanese is a classifier-for-numeral language, where classifiers are required not by nouns but by numerals. Based on these examinations, I make the syntax and semantic analysis of numeral-classifier constructions, in which I propose that a numeral and a classifier form a complex head. I extend the two-structure analysis in Danon (2012) and propose that

numeral-classifier sequences may occupy a head position which takes a projection of nouns or a specifier position of a functional projection. This two-structure analysis accounts for the word order variation due to the head-finality of Japanese.

1.1.3 Numeral-classifier constructions with proper names and pronouns

In Japanese, numeral-classifier sequences can modify proper names and pronouns. However, there is an asymmetry: the postnominal numeral-classifier sequences can modify proper names and pronouns, whereas the prenominal ones cannot, as illustrated in (6) and (7).

(6) Postnominal

a. John to Mary futa-ri-ga sono shigoto-o tantoo-shita.
John and Mary 2-CL-NOM that job-ACC in.charge-did
'Lit. John and Mary Two were in charge of that job.'

b. Kare-ra futa-ri-ga sono shigoto-o tantoo-shita.
he-PL 2-CL-NOM that job-ACC in.charge-did
'Lit. They two were in charge of that job.'

(7) Prenominal

a. *Futa-ri-no John to Mary-ga sono shigoto-o tantoo-shita.
2-CL-GEN John and Mary-NOM that job-ACC in.charge-did
'Lit. Two John and Mary were in charge of that job.'

b. *Futa-ri-no kare-ra-ga sono shigoto-o tantoo-shita.
2-CL-GEN he-PL-NOM that job-ACC in.charge-did
'Lit. Two they were in charge of that job.'

Given the fact that numeral-classifier sequences modifying common nouns can appear prenominally and postnominally, this asymmetry is puzzling.

What is more interesting is that in the acceptable postnominal cases, numeral-classifier sequences do not contribute to at-issue meaning. For example, in (6) the information expressed by the numeral-classifier sequence is paraphrased as 'the cardinality of John and Mary/them'. With this information in mind, consider the following example.

(8) { John to Mary / Kare-ra } futa-ri-ga sono shigoto-o tantoo-shita
{ John and Mary / he-PL } 2-CL-NOM that job-ACC in.charge-did
wakedewanai.
it.is.not.the.case.that
'Lit. It is not the case the case that { John and Mary / they } two were in charge of that job.'

Example (8) entails the proposition that the cardinality of John and Mary/them was two. Thus, the information conveyed by the numeral-classifier sequence is not affected by the negation, indicating that it is scopeless. Since scopelessness is a typical property of not-at-issueness (Potts 2005, Simons et al. 2010 a.o.), the numeral-classifier sequence introduces non-at-issue content. It should be pointed out that when numeral-classifier sequences modify common nouns, they are affected by negation, as shown in (9).

(9) Gakusei futa-ri-ga sono shigoto-o tantoo-shita wakedewanai.
student 2-CL-NOM that job-ACC in.charge-did it.is.not.the.case.that
'It is not the case that two students were in charge of that job.'

In (9), the proposition 'the cardinality of students are two' is not survived. The non-at-issue property suggests that the numeral-classifier sequences modifying proper names and pronouns should be analyzed differently from the ones that modify common nouns. The question is what this non-at-issue meaning is and how it is formally analyzed.

The goal of Chapter 4 is threefold: (i) to identify the type of non-at-issue meaning conveyed by numeral-classifier sequences that modify proper names and pronouns, (ii) to offer a formal analysis for it, and (iii) to explain the asymmetry. I argue that numeral-classifier sequences in this particular construction introduce conventional implicatures in the sense of Potts (2005). Following Potts, I offer a multidimensional analysis for the numeral-classifier sequences. Finally, I account for the asymmetry by establishing a general condition for being a modifier for proper names and pronouns. This whole investigation sheds new light on the syntax and semantics of numeral-classifier sequences in Japanese.

Chapter 2

Strong quantifiers

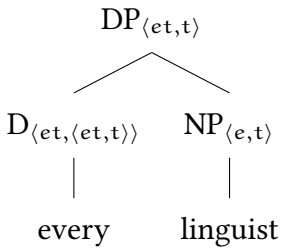
This chapter investigates the syntax and semantics of strong quantifiers in Japanese. The central question discussed in this chapter is to what extent Japanese strong quantifiers are similar to and are different from those in English and other languages. Japanese differs from English in many aspects. For example, Japanese does not have an overt article and does not have an obligatory distinction between singular and plural. Thus, it is not surprising that the syntax and semantics of strong quantifiers in Japanese differ from those in English. In this chapter, I adopt a particular analysis of quantifiers proposed by Matthewson (2001) and extend it to Japanese. The investigation shows that the degree of difference between Japanese and English in the syntax and semantic of strong quantifiers is small. However, we must postulate a peculiar syntactic property for Japanese strong quantifiers to account for word order variation that Japanese strong quantifiers show.

In Section 2.1, I introduce the analysis proposed in Matthewson (2001) regarding the syntax and semantic of strong quantifiers. In Section 2.2, I point out issues about analyzing strong quantifiers in Japanese. In Section 2.3, I investigate Japanese nominals to see to what extent they are syntactically and semantically equivalent to English definite DPs. I suggest that Japanese count nouns have the same syntax as in English except that a determiner is null. In Section 2.4, I proposed the syntax and semantics of Japanese strong quantifiers. I show that the internal composition of strong quantifiers in Japanese does not differ from that in English. However, one difference between the two languages is that in Japanese, strong quantifiers in Japanese may be located in two positions in the structure.

2.1 The 'basic' structure of quantification

The standard analysis of quantification such as Barwise & Cooper (1981) assumes that quantificational determiners such as *every* and *most* are of type $\langle e\text{t}, \langle e\text{t}, \text{t}\rangle\rangle$ and take common noun phrases (NPs) as their first argument. NPs are set expressions and whose type is $\langle e, \text{t}\rangle$. The combination of a quantifier determiner and an NP results in a generalized quantifier of type $\langle e\text{t}, \text{t}\rangle$ as shown in (1).

(1)



Matthewson (2001) proposes an alternative structure for quantifiers. Instead of assuming that quantifier determiners are of type $\langle e\text{t}, \langle e\text{t}, \text{t}\rangle\rangle$, she postulates that they are of type $\langle e, \langle e\text{t}, \text{t}\rangle\rangle$. Hence, quantifiers take an expression denoting an individual as the complement, not a set. Matthewson claims that this alternative type is the basics for strong quantifiers. In this section, we review Matthewson's analysis and discuss the plausibility of her analysis.

2.1.1 Matthewson (2001)

Matthewson's (2001) proposal is based on the examination of St'át'imcets (Lillooet Salish). In this language, all argumental phrases must appear with an overt discontinuous determiner *(t)i…a* and the lack of the determiner results in ungrammaticality as shown in the contrast in (2a) and (2b).

(2) a. q'wez-ílc [ti smúlhats-a]
dance-INTR [DET woman-DET]
'The/a woman danced.'

b. *q'wez-ílc [smúlhats]
dance-INTR [woman]

In (2a), the argument in subject position co-occur with the determiner. In contrast, in (2b), no determiner is present. The lack of determiners yields the ungrammaticality. In addition, all predicates must not come with determiners.

(3) a. kúkwpi7 [kw-s Rose]
chief [DET-NOM Rose]
'Rose is a chief.'

b. *[ti kúkwpi7-a] [kw-s Rose]
[DET chiefi-DET] [DET-NOM Rose]
'Rose is a/the chief.'

In (3), the noun *kúkwpi7* 'chief' functions as a nominal predicate. The nominal predicate cannot be modified by a determiner as the (3b) shows. (2) and (3) show that in St'át'imcets, arguments are DPs, whereas nominal predicates are NPs.

Turning now to quantifiers, Matthewson (2001) observes that quantifies inside arguments must appear with determiners as illustrated in (4).[1]

(4) a. léxlex [tákem i smelhmúlhats-a]
intelligent [all DET.PL woman(PL)-DET]
'All (of the) women are intelligent.'

b. [cw7it i smelhmúlhats-a] léxlex
[many DET.PL woman(PL)-DET] intelligent
'Many of the women are intelligent.' (Matthewson 2001: 150 (7))

If the determiners are omitted in the examples, the results are ungrammatical as shown in (6).

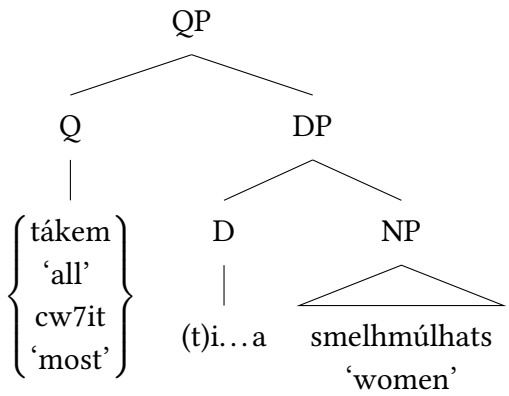
(5) a. *léxlex [tákem smelhmúlhats]
intelligent [all woman(PL)]
'All (of the) women are intelligent.'

b. *[cw7it smelhmúlhats] léxlex
[many woman(PL)] intelligent
'Many of the women are intelligent.' (ibid.: 150–1 (8))

1. Word order is irritant for the discussion. Matthewson (2001: 150, n.4) notes that the interpretation is not affected by the position of quantified nominals.

Given these observations, Matthewson (2001) proposes that quantifiers in St'át'imcets must combine with DP and not NP. Hence, the syntactic structure for the quantified nominal in (4) would be as follows:

(6)



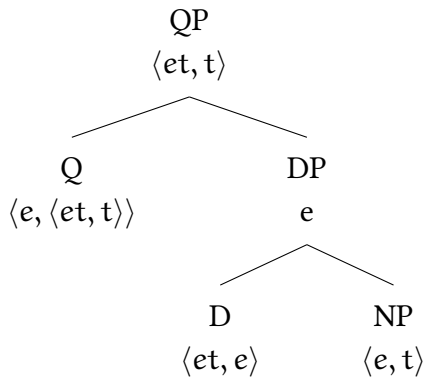
From semantic perspectives, following the standard assumption, Matthewson (2001) assumes that in this language, nouns are considered as denoting predicates of type $\langle e, t\rangle$. This is supported by a case where a noun functions as a predicate as in the example (3a) repeated below.

(7) kúkwpi7 [kw-s Rose]
chief [DET-NOM Rose]
'Rose is a chief.'

She argues then that the discontinuous determiner *(t)i…a* introduces a variable over choice functions.[2] Hence it is of type $\langle et, e\rangle$. The determiner takes an pluralized NP of type $\langle e, t\rangle$ and choose one plural individual of the individuals that satisfy the NP. Therefore, DPs which are composed of a determiner and an NP are of type e. Quantifiers combine with a DP and form generalized quantifiers. Thus, quantifiers are of type $\langle e, \langle et, t\rangle\rangle$. From the analysis of St'át'imcets, Matthewson (2001) proposes the following structure for quantifiers.

2. Matthewson (1999) proposes that all determiners in St'át'imcets are indefinites. She uses four paces of evidence: (i) they are possible in existential sentences; (ii) DPs never forces anaphoric readings; (iii) DPs do not carry a uniqueness entailment or presupposition; and (iv) sluicing is possible with DPs.

(8)



The creation of a generalized quantifier involves two steps. First, a non-quantifier determiner creates a DP of argumental type; second, a quantifier determiner takes this DP. Matthewson proposes that the first process is to narrow down the domain of the quantifier from the set denoted by the NP. The second process is to quantify over parts of the individual in the narrowed down domain.[3]

What is novel in Matthewson (2001) is the claim that the structure of quantifiers in (8) is basic for every language. That is, there is no crosslinguistic variation in the structure of quantifiers. She shows that quantifiers in English are analyzed in the same fashion as St'át'imcets. She first looks into the fact that many quantifiers in English admit partitive constructions. However, there is a requirement known as the Partitive Constraint that the complement of *of* should be a definite plural as shown in (9) (Abbott 1996, Jackendoff 1977, Reed 1996 , among others)

(9) a. most/many/some/three/few/all/both of **the women/his friends**

b. *most/many/some/three/few/all/both of
women/some women/many women/ten women/every women

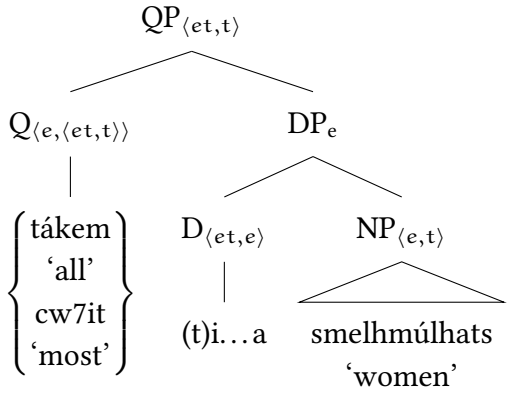
Further, Matthewson points out that *of* is optional in some cases.

(10) all/both/half (of) the women

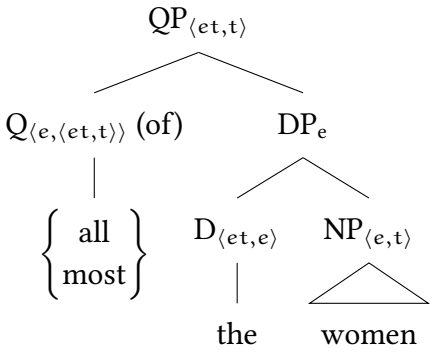
3. Matthewson (2001) assumes that a variable over choice functions which is introduced by the head of DP remains free and receives a value from the context as in Kratzer (1998). This is a way to restrict the domain of quantification relative to contexts. However, she also notes that an iota analysis of the determiner would work without affecting the discussion. In fact, she dose not make a choice function analysis for English definite determiners.

Reed (1996) notes that the interpretations with or without *of* such as (10) are identical. This optionality raises the question as to the denotation of *of*. Matthewson claims that *of* is semantically vacuous. The semantic vacuity analysis explains the identical interpretation between the *of* version and *of*-less version as in (10). That is, a quantifier takes a definite plural as its sister, namely, English quantifiers (with or without partitive *of*) have the [Q DP] structure. This analysis makes it possible to treat quantifiers in English and St'át'imcets uniformly as illustrated in (11).

(11) St'át'imcets



(12) English



The structure of QP in St'át'imcets in (11) is what we have seen before. The exactly same structure is applied to English quantifiers as in (12). Just like St'át'imcets, a quantifier takes a DP as its sister. Hence, the type of quantifier determiners is $\langle e, \langle et, t\rangle\rangle$.

We can see the direct parallel between the two languages. Further, the vacuity analysis predicts that the Partitive Constraint effects are more general, that is, they are not limited to the partitive constructions. In fact, Matthewson points out that St'át'imcets shows a similar effect even when an overt partitive construction is not used. The semantic vacuity analysis of Matthewson thus accounts for the structural parallelism between the partitive constructions with and without *of*, resulting in the identity of the meaning; and the structural parallelisms between English and St'át'imcets, which correctly predicts the existence of the Partitive Constraint in both languages. One may notice that *every* in English is problematic for the analysis. We will see later how Matthewson deals with *every*.

Matthewson's proposal is further supported by the data in which *all* and *most* appear with bare plurals and mass nouns. These quantifiers can combine with bare plurals and

mass nouns but not with singular count nouns.

(13) a. All/most linguists are millionaires.
b. *All/most linguist is millionaire.
c. All/most snow is white.

The examples in (13) show that *all* and *most* attach to argumental phrases. (14) illustrates this point. Bare plurals and mass nouns can stand alone as argumental of predicates

(14) a. Linguists are millionaires.
b. *Linguist is millionaire.
c. Snow is white.

Matthewson assumes that mass nouns and bare plurals denote kinds and therefore denote individuals (type e) (Carlson 1987, Chierchia 1998b).

Matthewson adds support for the analysis that *all* and *most* are not attaching to a predicate-denoting NP even when they combine with bare plurals as in (13a). Bare plurals allow either existential or generic readings. Matthewson adopts the analysis proposed in Chierchia (1998a,b), assuming that kind denotations are derived via the $\cap$ operation. Kind-denting bare plurals are interpreted existentially in certain contexts due to the application of Chierchia's (1998b) Derived Kind Predication as defined in (15). The up operation $^{\cup}$ is definite in (16).

(15) Derived Kind Predication (DKP)
If P is a predicate that selects for non-kind individuals, and k denotes a kind, then $P(k) = \exists x[^{\cup}k(x)\&P(x)]$ (Chierchia 1998b: 364)

(16) Let d be a kind. Then for any world/situation s,
$$^{\cup}d = \begin{cases} \lambda x[x \leqslant d_s], \text{if } d_s \text{ is defined} \\ \lambda x[\text{FALSE}], \text{otherwise} \end{cases}$$
where d_s is the plural individual that comprises all of the atomic members of the kind. (ibid.:350)

When a bare plural is attached to *all* or *most*, no existential reading of the bare plural is possible. For example, a sentence *All linguists are millionaires* does not have a reading 'All

of some linguists are millionaires'. Matthewson postulates that the lack of the existential reading of bare plurals is due to the unavailability of DKP. In Chierchia, type-shifting operations including DKP are only available as a last resort, that is, they are available when they are forced. In Matthewson's analysis of *all* and *most*, the strong quantifier is the right type to take a type-e kind-denoting noun and as a result, they quantify over a kind denoted by the noun. Since no type mismatch occurs when the strong quantifiers combine with a kind-denoting noun, nothing forces DKP to apply.

This analysis expects that when the strong quantifiers combine with a bare plural, the reading is obtained where the strong quantifiers quantify over a kind of the bare plurals. In fact, it has been observed that *all* + bare noun is felicitous in generic readings but not in episodic ones.

(17) a. All desks are brown.
b. #All pages in this book were torn. (Partee 1995: 583(49))

(18) a. All the girls went to the gym.
b. #All girls went to the gym. (Brisson 1998: 7 (17))

(19) a. I admire all linguists.
b. #I talked to all linguists.
c. I talked to all the linguists. (Matthewson 2001: 169(38))

Gil (1995: 352, fn. 2) notes that "NPs of the form *all* N generally entail a preference for generic contexts. As a result, sentences . . . with subject NP [*all* N] followed by an episodic past tense verb are judged to be somewhat awkward. In such contexts, a more appropriate construction is provided by NPs of the form *all the* N."

Quantifying-over-a-kind-readings are also found even when a relevant context explicitly is set up. Matthewson notes that the phrase *all NP* in English is infelicitous in the following examples.

(20) Last night I threw a party and a bunch of linguists and philosophers came.
#All linguists got drunk.
(ibid.: 170(39))

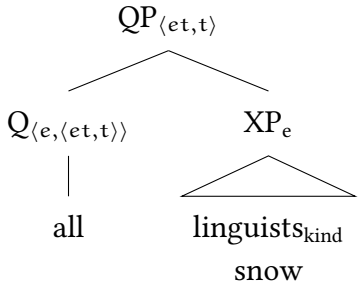
(21) There were 100 linguists and 100 philosophers at the party. We asked everyone, and we found out that . . .There were 100 linguists and 100 philosophers at the party. We asked everyone, and we found out that …

a. All of the linguists went to New Zealand for Christmas last year.

b. #All linguists went to New Zealand for Christmas last year. (ibid.:170(40))

We have seen that *all* combines with bare plurals or mass noun. Matthewson notes that *most* shows the same pattern as *all*. Since bare plurals and mass nouns are considered as type-*e* expressions, these observations are consistent with Matthewson's proposal that quantifiers take a phrase of type *e* as the complement. In this case, the strong quantifiers do not combine with a definite DP. Hence, English has another structure of quantifiers as in (22) which is similar to the one that we have seen in the sense that quantifiers take type-*e* expressions as their complement. In (22), following Szabolcsi (2010), I use XP for bare plurals and mass nouns.

(22)



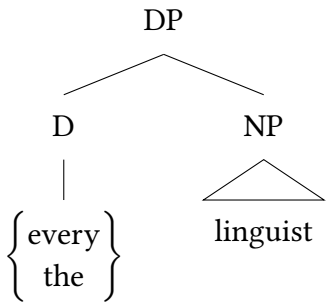
We have seen that the proposal by Matthewson accounts for the data in English as well. Her hypothesis that the structure of QP in St'át'imcets is basic would be supported. However, as mentioned before, the analysis is challenged by the quantifier *every*, which obviously does not fit the proposed structure. First, it cannot combine with a definite plurals, bare plurals but only with a singular count noun.

(23) a. *Every (of) (the) linguists got drunk.

b. Every linguist is a millionaire.

These examples suggest that *every* occupies a lower position, possibly in the D position just like the define article *the*.

(24)



Matthewson claims that *every* is not a typical quantifier. Recall that in Matthewson's analysis, generalized quantifiers are created in two steps: domain narrowing and quantification. She assumes that *every* does these two jobs. In this sense, *every* is exceptional. Matthewson quotes Gil (1995), who notes that "as for *every* and its equivalents, far from being prototypical, these are in fact among the most exceptional of quantifiers in their syntactic and semantic behavior"(321). If *every* is treated as exceptional, then *every* is not problematic for Matthewson's proposal.

2.1.2 Q-quantifiers vs. D-quantifiers

Later in Matthewson (2013), she proposes that typologically, strong quantifiers are divided into two types.[4] One is to attach to an argumental phrase just like English *all*. The other is to combine with a predicative phrase such as *every*. Strong quantifiers in the first type is of type $\langle e, \langle et, t\rangle\rangle$ and those in the second type is of type $\langle et, \langle et, t\rangle\rangle$. M. Landman (2016) calls the first type *Q-quantifiers* and the second type *D-quantifiers*, for Q-quantifiers are located in the head of QP and D-quantifier are in the head of DP.

Here I will highlight two properties of Q-quantifiers and D-quantifiers, which become relevant when we examine strong quantifiers in Japanese in Section 2.4.1 and Section 2.4.2. These two properties are stated in (25) (Gil 1995, Zimmermann 2014).

(25) a. Q-quantifiers can attach to mass nouns, whereas D-quantifiers cannot.

b. Q-quantifiers can have collective and distributive interpretations, whereas D-quantifiers can have distributive only.

4. Matthewson (2013) does not abandon her null hypothesis that there is no cross-linguistic variation on semantics of quantifier. Instead, she notes, "A null hypothesis is falsifiable and therefore allows one to admit that there is variation when language-internal facts require it" (24: n12).

Let us look at these two properties for English strong quantifiers. For the property (25a), we have already seen that the Q-quantifiers in English, *all* and *most*, can attach to mass nouns.

(26) a. { all / most } snow
b. { all / most } furniture

In contrast, the D-quantifier *every* and *each* cannot attach to mass nouns (Chierchia 1998b, Rothstein 2010 a.o).

(27) a. *{ every / each } snow
b. *{ every / each } furniture

In addition, as described in (25b), the two types of strong quantifiers differ in interpretive properties with respective to collective and distributive interpretations. Q-quantifiers show ambiguity between collective and distributive readings. This is illustrated by sentences containing what we call mixed predicates such as *lift up a table*, which are ambiguous between collective and distributive readings. Consider the following example.

(28) All (of) the men lifted up a table.
OK 'together, one table'
OK 'individually, possibly different tables' (Szabolcsi 2010: 118 (19))

The example is true on the collective reading in which all the men together lifted up a table. It is also true on the distributive reading in which all the men individually lifted up a table. In contrast, D-quantifiers such as *every* only allow the distributive reading, as shown in (29).

(29) Every man lifted up a table.
NG 'together, one table'
OK 'individually, possibly different tables'
(Szabolcsi 2010: 121 (35) with slight modification)

Moreover, a Q-quantifier *all* is compatible with collective predicates such as *gathered in the hall*, whereas the D-quantifiers *every* and *each* are not (Brisson 2003, Champollion 2013, Hallman 2016 a.o.), as shown in (30).

(30) a. { All / Most } of the students gathered in the hall.

b. *{ Every / Each } student gathered in the hall. (Brisson 2003: 130-131 (8), (9))

Lastly, a Q-quantifiers *all* can co-occur with the collective marker *together*, while a D-quantifier *every* cannot (Brisson (2003), Szabolcsi (2010) a.o).

(31) a. All the planes landed together.

b. *Every plane landed together.

(Brisson 2003: 176 (159-160) with slight modification)

We have see that Q-quantifiers and D-quantifiers show the differences. It is of interest to examine the distribution of these two types of strong quantifiers cross-linguistically and within a single languages. This is the topic of the rest of this chapter. I will investigate strong quantifiers in Japanese to see whether they are Q-quantifiers or D-quantifiers. The two properties that we have just seen are useful for the investigation because they do not rely on morphosyntactic aspects of nouns to which strong quantifiers attach. Since Japanese is an article-less language and no overt morphological distinction is made between singular and plural, these properties are expected to enable us to classify strong quantifiers in Japanese.

To sum up, in this section, we have reviewed an analysis proposed by Matthewson (2001). According to her analysis of strong quantifiers in St'át'imcets, a quantifier takes a entity and create a generalized quantifier. More precisely speaking, the creation of a generalized quantifier proceeds in two steps. First, a DP is created and the domain of quantification is restricted. Second, quantifier determiners take a DP and quantifies over the restricted domain. Thus, strong quantifiers are of $\langle e, \langle et, t\rangle\rangle$ not $\langle et, \langle et, t\rangle\rangle$. Matthewson proposes that this construction is basic and should be extendable to other languages. In fact, we have found that English *all* and *most* have the exactly same construction. The existence of an exceptional quantifier *every* leads to an interesting typological analysis in Matthewson (2013). Strong quantifiers are classified into two types: Q-quantifiers and D-quantifiers. We have seen that the two types of quantifiers show systematic differences.

2.2 Issues in Japanese quantifiers

The rest of this chapter is devoted to the investigation of strong quantifiers in Japanese. I adopt Matthewson's (2001) null hypothesis that there is no cross-linguistic variation in semantics of quantifiers. Specifically, I will examine whether her Q-quantifier analysis applies to strong quantifiers in Japanese. Before doing so, in this section, I point out issues regarding strong quantifiers in the language.

An issue is that morphosyntactic evidence for syntax/semantic types of nouns is not readily available to test whether strong quantifiers in Japanese are Q- or D-quantifiers. Consider the following example.

(32) John-ga ringo-o tabeta.
John-NOM apple-ACC ate
'John ate an apple/apples/the apple/the apples.'

The noun *ringo* 'apple' in object position can be interpreted as indefinite singular, indefinite plural, definite singular and definite plural. It is true that the noun in (32) is in argument position, it can be in predicate position as well, as demonstrated in (33).

(33) Kore-wa ringo-da.
this-TOP apple-COP
'Int. This is an apple.'

Since Japanese lacks an overt article and morphological distinction between definite and indefinite nouns, and between singular and plural, it is not obvious whether nouns to which strong quantifiers attach are argumental types (e) or predicative type ($\langle e, t \rangle$).

Another issue is that Japanese strong quantifiers show word order variation. In Japanese, strong quantifiers such as *subete* 'all' and *hotondo* 'most' can appear before or after a noun as shown in (34). When they come before a noun, a genitive maker *-no* links the quantifiers and a noun.

(34) a. *Postnominal strong quantifiers*
John-wa hon { subete-o / hotondo-o } yomi-oeta.
John-TOP book { all-ACC / most-ACC } read-finished
'John finished reading {all /most} (the) books.'

b. *Prenominal strong quantifiers*
John-wa { subete-no / hotondo-no } hon-o yomi-oeta.
John-TOP { all-GEN / most-GEN } book-ACC read-finished
'John finished reading {all /most} (the) books.'

In (34a), the quantifiers come after the head noun. In (34b), on the other hand, the quantifiers appear before the head noun. It seem that neither the Generalized Quantifier analysis nor Matthewson's (2001) analysis captures the word order variation straightforwardly. These analyses assume that strong quantifiers are located in a head position (i.e., Q or D). Since Japanese is a head-final language, strong quantifiers are expected to appear to the right of head nouns. The postnominal strong quantifiers seems to fit the analyses. On the other hand, it is not obvious how the prenominal strong quantifiers are analyzed.

To investigate whether Matthewson's (2001) proposal apples to Japanese, in the next section, I will examine the properties of nouns. Specifically, I will look at the definiteness of Japanese nouns and see whether Japanese nouns show the same pattern as English definite nouns. After establishing the syntax and semantics of Japanese nouns, I will inquire into the structure of quantified nouns containing strong quantifiers (Section 2.4). This inquiry involves an analysis of the word order variation and a compositional analysis.

2.3 Japanese nominals

The goal of this section is to examine the definite(-like) behavior of Japanese countable nouns and offer an analysis for it.[5] I examine the definite(-like) behavior with respect to three aspects: anaphoric use, scope and maximality. These diagnostics are taken from Gillon & Armoskaite (2012) and Gillon (2015). I show that Japanese countable nouns are just like definite nouns in English but differs in maximality. More specifically, Japanese countable nouns can be interpreted not only as definite nouns but also as specific indefinites. I postulate that Japanese countable nouns have a DP layer, in which the D position may be

5. The term *countable nouns* is adopted from Sudo (to appear). He argues against the view that Japanese nouns are not countable (Chierchia 1998a). He proposes that Japanese nouns such as *hon* 'book' have countable denotations just like count nouns in English. The reason that he uses the term *countable nouns* instead of *count nouns* is to emphasize the semantic distinction between countable vs. uncountable nouns. Unless otherwise specified, I use the term *nouns* to refer to countable nouns.

occupied by a covert definite determiner or a choice function variable.

2.3.1 Anaphoric use

The first test is to see whether countable nouns have anaphoric use. In English, while an indefinite noun is used in novel contexts, a definite noun can be used in familiar contexts, in which both the speaker and the hearer are aware of the referent of the definite noun.

(35) a. I saw a cat in the yard. (novel)
b. The cat jumped over the fence. (familiar)

In (35a), the indefinite noun *a cat* introduces a new referent into the discourse. In (35b), the definite noun *the cat* refers back to the referent in (35a), that is, the definite noun is used anaphorically. Anaphoric use is considered as a typical property of definite nouns.

Now, let us move on to Japanese nouns. Nominals in Japanese can be used in novel and familiar contexts.

(36) a. Kesa (watashi-wa) neko-o niwa-de mita. (novel)
this.morning (I-TOP) cat-ACC yard-in saw
I saw a cat in the yard.
b. Neko-wa fensu-o tobikoeta. (familiar)
cat-TOP fence-ACC jumped.over
'The cat jumped over the fence.'

In (36a), the noun *neko* 'cat' introduces a new referent in the context. In (36b), the noun refers back to the same cat in (36a). Thus, the anaphoric use in (36) shows that the bare noun is used as a definite noun. However, the anaphoric use of bare nouns may be possible due to the topic marker *-wa* (Kuno 1972, 1973). To see whether the anaphoric use is possible without the help of the topic marker, let us consider a case where the second occurrence of bare nouns is marked by an accusative marker *-o*.

(37) a. Mary-ga ringo-o motte-kita. (novel)
Mary-NOM apple-ACC bring-came
'Int. Mary bought an apple/apples.'

b. %John-wa ringo-o tabeta. (familiar)
John-TOP apple-ACC tabeta
'Int. John ate the apple.'

Unlike the case where a bare noun is marked with the topic marker as in (36b), the acceptability of the second sentence (37b) under the intended interpretation varies among native speakers who I consulted. For those who accept (37b), the bare noun *ringo* 'apple' refers to the apple in (37a). That is, the anaphoric relation is established. For those who do not accept (37b), the bare noun in (37b) cannot refer to the apple in the first sentence and it introduces a new referent in the discourse.

Interestingly, some modification to the example makes the judgmental variation consistent. When we change the verb to a telic verb-from *tabe-oeta* 'finished eating', the anaphoric interpretation becomes more salient, as (38) shows.[6]

(38) a. Mary-ga ringo-o motte-kita.
Mary-NOM apple-ACC bring-came
'Mary bought an apple/apples.'

b. John-wa ringo-o tabe-oeta.
John-TOP apple-ACC eat-finished
'Int. John finished eating the apple(s).'

In (38), the salient interpretation is where the bare noun in (38b) anaphorically interpreted. Another way to force an anaphoric interpretation is to add a demonstrative.

6. A similar interaction between definiteness of nouns and aspect of verbs is also found in article languages such as English and article-less languages such as Slavic languages (Filip 1997) and Mandarin Chinese (Sybesma 1999). For example, in English, *eat up* requires definite nouns.

(i) Susan ate up { *cake / the cake / *apples / the apples } (Swart de 2012: 755 (7))

Filip (1997) observes that in Czech, which is an article-less language, when a plural noun occurs with a perfective verb, it is interpreted as definite or specific and refers to a totality of specific plural individuals, as shown in (iia). No such interpretive requirement is forced when it occurs with a imperfective verb as seen in (iib).

(ii) a. Snědl ořechy.
PREF.ate.SG nuts.PL.ACC
'He ate (all) the nuts.'

b. Jedl ořechy.
ate.SG nuts.PL.ACC
'He was eating (the) nuts.'
(adopted from Filip 1997: 3 (2))

(39) a. Mary-ga ringo-o motte-kita.
Mary-NOM apple-ACC bring-came
'Mary bought an apple/apples.'

b. John-wa sono ringo-o tabeta.
John-TOP that apple-ACC ate
'lit. John ate the apple(s).'

In (39b), the noun with the demonstrative refers back to the referent (e.g., an apple/apples) introduced in (39a). Attaching a relevant modifier to a noun shows the same effect as adding a demonstrative.

(40) a. Mary-ga ringo-o motte-kita.
Mary-NOM apple-ACC bring-came
'Mary bought an apple/apples.'

b. John-wa [Mary-ga motte-kita] ringo-o tabeta.
John-TOP Mary-NOM bring-came apple-ACC ate
'Int. John ate the apple that Mary bought.'

The modified noun in (40b) has the anaphoric interpretation.

To summarize the discussion, we have seen that Japanese bare nouns are used anaphorically, though there is judgmental variation. When a telic-verb form is used, anaphoric readings become salient. Adding a demonstrative or a relevant modifier makes anaphoric readings obligatory. Since anaphoric interpretation is a typical property of definite nouns, the availability of anaphoric interpretation suggests that nouns in Japanese can be interpreted as definite nouns.

2.3.2 Scope

The ability of anaphoric use suggests that Japanese nouns have the properties of definite nouns. I will show that scope taking ability of bare nouns also shows that bare nouns in Japanese have definite interpretations. Nominals show different scope taking ability dependent on their types. For example, in English, definite nouns always take wide scope. In (41), there must be a unique cat in the context, and the DP *the cat* cannot take narrow scope with respect to negation.

(41) I didn't see the cat.

a. *NEG > THE CAT: I didn't see any cats.

b. THE CAT > NEG: there is a unique cat such that I didn't see.

Indefinite nouns headed by *a* in English take wide and narrow scope.

(42) I didn't see a cat.

a. NEG > A CAT: I didn't see any cats.

b. A CAT > NEG: there is a unique cat such that I didn't see.

Bare plurals in English obligatory take narrow scope (Carlson 1977).

(43) I didn't see cats.

a. NEG > CATS: I didn't see any cats.

b. *CATS > NEG: there are cats such that I didn't see.

Scope taking ability is correlated to the type of nominals: definite DPs take wide scope; bare plurals take narrow scope; and indefinite nouns take both narrow and wide scope. When indefinite nouns take wide scope, they can be specific indefinites (Enç 1991, Endriss 2009, Fodor & Sag 1982, Kratzer 1998 a.o.) Since Japanese bare nouns and modified nouns can be definite DPs, we expect that when they are used in a familiar context, that is, when they are used anaphorically, they take wide scope. In Japanese, bare nouns take narrow scope with respect to negation in out-of-the-blue contexts (K. Yoshida 2008).

(44) John-wa neko-o mi-nakat-ta.
John-TOP cat-ACC see-NEG-PAST

a. NEG > CAT: 'John didn't see any cats'

b. *CAT > NEG: 'There is a cat/cats such that John didn't see it/them.'

The obligatory narrow scope in a novel context suggests that Japanese bare nouns behave like English bare plurals. However, when a relevant context is provided, wide scope becomes possible.

(45) CONTEXT: John knows that Mary has a cat and wanted to see the cat. Today, John visited Mary, but …
John-wa neko-o mi-nakat-ta.
John-TOP cat-ACC see-NEG-PAST
a. ??NEG > CAT: 'John didn't see any cats'
b. CAT > NEG: 'There is a unique cat such that John didn't see it.'

I found that under the context, the wide scope reading is possible. The wide scope taking ability suggests that the bare noun is equivalent to English definite nouns. Since the narrow scope is marginally accepted, Japanese bare nouns can be definite nouns or specific indefinites.

As we have seen in the previous subsection, the presence of a relative clause and a demonstrative makes bare nouns unambiguously definite nouns. We expect that when a noun is modified by a relative clause, the modified noun takes wide scope. Consider the following example.

(46) CONTEXT: John knows that Mary has a cat and wanted to see the cat. Today, John visited Mary, but …
John-wa [Mary-ga katteiru] neko-o mi-nakat-ta.
John-TOP [Mary-NOM have] cat-ACC see-NEG-PAST
a. *NEG > CAT(S): 'John didn't see any cat(s) that Mary has.'
b. CAT(S) > NEG: 'There is a unique cat/unique cats such that Mary has it/them and John didn't see it/them.'

As expected, the modified noun takes wide scope. Similarly, when a demonstrative is added, nouns only take wide scope.

(47) CONTEXT: John knows that Mary has a cat and wanted to see the cat. Today, John visited Mary, but …
John-wa sono neko-o mi-nakat-ta.
John-TOP that cat-ACC see-NEG-PAST
a. *NEG > THAT CAT: 'John didn't see that cat.'
b. THAT CAT > NEG: 'There is a unique cat such that John didn't see it.'

When we change the verb to a telic verb such as *kizuku* 'notice', a bare noun takes wide scope.

(48) CONTEXT: John knows that Mary has a cat and wanted to see the cat. Today, John visited Mary, but …
John-wa neko-ni kizuk-anakat-ta.
John-TOP cat-ACC notice-NEG-PAST
a. *NEG > CAT: 'John didn't notice any cats'
b. CAT > NEG: 'There is a unique cat such that John didn't notice it.'

The observed scope taking ability indicates that Japanese bare nouns behave as definite nouns or specific indefinites, when a relevant context is set. When a relative clause or a demonstrative modify nouns and when a telic verb is used, only wide scope is possible, indicating that nouns are definite.

2.3.3 Maximality

We have seen that Japanese bare nominals have the properties of definite nouns or specific indefinites. In this section, we will examine whether bare nominals show maximality when they are used anaphorically. In English, definite nouns must refer to a maximal entity in the context. When a multiple entities are introduced in the context, a singular definite nouns cannot be used. Consider (49).

(49) CONTEXT: Yesterday, John bought five books and three magazines. And today, …
a. #John read the book.
b. John read the books.

Since in the context, five books are introduced, the use of the singular definite in (49a) is infelicitous. In (49b), the plural definite *the books* refers to the maximal individual in the context, namely, all the five books. Consequently, if John read only three of the books, (49b) is judged false.

If anaphoric bare nominals in Japanese encode maximality, they must refer to a maximal entity in the context. Consider the following example.

(50) CONTEXT: Yesterday, John bought five books and three magazines. And today, …
%John-wa hon-o yonda.
John-TOP book-ACC read
'Int. John read the books.'

The example in (50) can refer to the maximal entity. However, it is also judged as true if John read three of the books he bought yesterday. That is, the bare noun does not have to refer to the maximal entity. Note that (50) has judgmental variation. Some speakers do not have anaphoric interpretation.

When a telic verb-form is used, the example shows maximality.

(51) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa hon-o yomi-oeta.
John-TOP book-ACC read-finish
'Int. John have finish reading the books.'

The example (51) is judged true only when John read all of the five books.

When a modifier or a demonstrative is added, the noun can lack maximality when the simple verb form is used.[7]

(52) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa { so-no / [kinoo katta] } hon-o yonda.
John-TOP { that-GEN / yesterday bought } book-ACC read
'Int. John read {the books he bought yesterday /those books}.'

The example does not have to entail that John read all the five books, showing that no maximality is forced to be encoded.

Similar to the example with the bare noun in (51), the telicity affects maximality for sentences with a demonstrative or a modifier. In the following example, the telic verb-form is used. The example shows maximality.

(53) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa { so-no / [kinoo katta] } hon-o yomi-oeta.
John-TOP { that-GEN / yesterday bought } book-ACC read-finished
'Int. John finished reading {the books he bought yesterday /those books}.'

The observations suggest that Japanese nouns do not have to be associated with maximality when used with a simple verb-form. In contrast, when used with a telic verb-form, nouns are associated with maximality.

7. To the best of my knowledge, the lack of maximality of nouns with a demonstrative is first observed in Erlewine & Gould (2016).

2.3.4 Interim summary

We have seen that Japanese countable nouns are used anaphorically, suggesting that they may be interpreted as definite nouns. The pattern of scope supports this view. However, we have observed that anaphoric bare nouns do not always refer to a maximal entity. When a telic verb-form is used, anaphoric nouns show maximality. In other cases, anaphoric bare nouns may lack maximality.

I suggest that anaphoric bare nouns with maximality are equivalent to definite nouns in English. On the other hand, I postulate that anaphoric bare nouns without maximality are specific indefinites. In the next section, I offer an formal analysis for anaphoric bare nouns in Japanese based on this analysis.

2.3.5 Formal analysis

I adopt an analysis that Japanese countable nouns denote predicate of type $\langle e, t \rangle$ (a set of individuals) (Nomoto 2013, Sudo to appear, 2016, Tomioka 2003 , a.o.). Since countable nouns are properties, predicative use is possible. This is shown in (54).

(54) John-wa gakusei-da.
John-TOP student-COP
'John is a student.'

In (54), the noun *gakusei* 'student' functions as the predicate of the copular sentence. I assume that Japanese countable nouns such as *ringo* 'apple' and *neko* 'cat' have the same denotations as those in English except that the number is neutral or undefined.[8]

In formal terms, I follow the standard view and assume that the domain of individuals is structured as a complete atomic join-semilattice (Link 1983, F. Landman 1989). The domain contains both singular and plural individuals. For example, the complete atomic

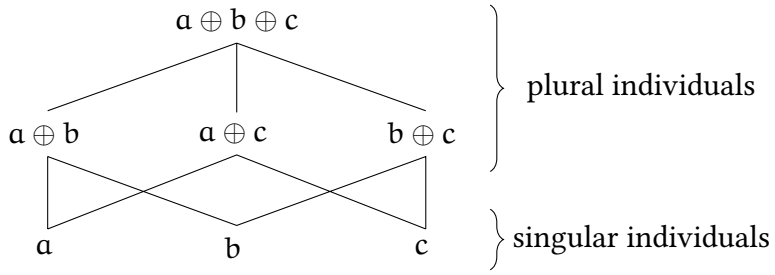
8. The number neutrality is only found in common nouns. Plural pronouns must have a plural markers.

(i) a. watashi(*-tachi)
I-PL
'I'

b. watashi*(-tachi)
I-PL
'we'

join semilattice with a, b, and c as singular individuals involves the atomic individuals a, b, c and the plural individuals $a \oplus b$, $a \oplus c$, $b \oplus c$ and $a \oplus b \oplus c$ as represented in (55).

(55)



The relations between individuals in the domain are ordered, which is represented by the part-of relation $\leqslant$.

(56) a. $a \leqslant a \oplus b$

b. $a \oplus b \leqslant a \oplus b \oplus c$

A predicate P may be closed under the sum formation $\oplus$ by the star-operator *. The denotation of *P is every possible sum of atoms in the denotation of P.

(57) a. $[\![P]\!] = \{a, b, c\}$

b. $[\![{}^*P]\!] = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

Since singular and plural individuals are contained, (57b) represents the number neutrality.

English singular nouns denote a set containing atomic entities. For example, the denotation of the noun *cat* is illustrated in (58a). On the other hand, I assume that the denotation of the Japanese noun *neko* 'cat' denotes a set containing atomic and plural cat entities, as shown in (58b), which can be written as (58c).

(58) a. $[\![\text{cat}]\!] = \{a, b, c\}$

b. $[\![\text{neko}]\!] = [\![{}^*\text{cat}]\!] = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

c. $[\![\text{neko}]\!] = \lambda x.{}^*\textsc{cat}(x)$

The noun *neko* 'cat' is true of both singular and plural entities consisting of cats.

Now we turn to an analysis of definite(-like) nouns in Japanese. We have seen that Japanese nouns show the definite-like behaviors in terms of anaphoric use and scope.

However, we have also found that Japanese nouns may lack maximality, when a simple verb-form is used. Japanese nouns show maximality when a telic verb-form is used. I postulate that anaphoric nouns with maximality are definite nouns as in English. On the other hand, I assume that anaphoric nouns without maximality are specific indefinites.

I suggest that anaphoric bare nouns in Japanese have a DP layer.[9] The D position may be occupied by two types of covert determiners. For nouns with maximality, I assume that covert D is a silent maximality operator defined in (59a), which is adopted from Gillon (2009).

(59) a. $[\![\varnothing_{\text{MAX}}]\!] = \lambda P_{\langle e,t\rangle}\colon \exists x P(x) = 1.\max(P)$

b. $\max(P) :=$ the unique x such that $P(x) = 1 \;\&\; \forall y[P(y) = 1 \rightarrow y \leqslant x]$

When the maximality operator applies to the noun *neko* 'cat', the application picks out the largest individual within the set, namely, $a \oplus b \oplus c$, as illustrated in (60b).

(60) a. $[\![\text{neko}]\!] = [\![\text{*cat}]\!] = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

b. $[\![\text{neko } \varnothing_{\text{MAX}}\,]\!] = \max(\{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}) = a \oplus b \oplus c$

The maximality operator is considered as the covert version of the English definite article (i.e., *the*). As in definite DPs in English, Japanese definite DPs with the covert maximality operator denote entities of type *e*.

For Japanese nouns which lack maximality, I follow analyses for determiners which lack maximality in St'át'imcets in Matthewson (1999), in Sḵwx̱wú7mesh in Gillon (2006) and in Lithuanian in Gillon & Armoskaite (2012), suggesting that anaphoric bare nouns in Japanese are associated with specific indefinites. In this interpretation, a covert D introduces variable over choice functions. I adopt Matthewson's (2001) analysis for determiners in St'át'imcets and postulate that Japanese covert D has the same denotation, as shown in (61).

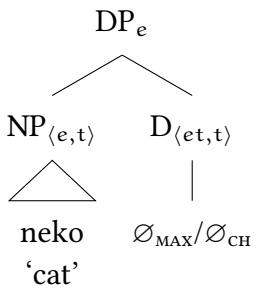
9. Alternatively, we may assume that Japanese nouns do not have a DP. Different interpretations are derived via independently motivated type-shifting operations (Tomioka 2003). For example, definite nouns with maximality is derived by an iota operation. It is not clear how specific indefinite reading is obtained. If we assume that the application of choice functions is also involved as a set of type-shifting operations (Danon 2001), specific indefinite interpretation may be derived. In this dissertation, I will not discuss which analysis, the proposed covert D analysis or the type-shifting analysis, is more plausible for Japanese nouns.

(61) $[\![\varnothing_{CF\ k}]\!]^g = \lambda f_{\langle e,t\rangle}.(g(k))(f)$

The index of the determiner specifies which choice function will be used; g is an assignment function from indices to choice functions. Thus, g(k) is a choice function of type $\langle et, e\rangle$. D($\varnothing_{CF}$) applies to NPs of type $\langle e, t\rangle$ and choose one (singular or plural) individual from the set denoted by the (modified) NP. Therefore, DPs are of type e. When a choice function applies to the noun *neko* 'cat' in (60a), the choice function will choose one individual from the set. Thus, depending on which choice function is used, the noun may refers to a non-maximal element such as a singular element (e.g., a), a plural one with two atoms (e.g., $a \oplus b$), or the maximal element ($a \oplus b \oplus c$).

This analysis will give the following structure for Japanese anaphoric bare nouns *neko* 'cat'.

(62)



When an NP combines with $\varnothing_{CF}$, the noun is interpreted as a specific indefinite.[10] It is anaphoric but lacks maximality. On the other hand, when an NP combine with $\varnothing_{MAX}$, the noun is interpreted just like a definite DP in English. As observed, the choice between $\varnothing_{CF}$ and $\varnothing_{MAX}$ depends on telicity of verbs. One way to account for this dependency is to assume that aspectual operators have a selectional constraint on the argument of verbs (e.g., Krifka 1992). In Japanese, we may thus assume that a telic verb selects a DP with $\varnothing_{MAX}$, whereas a atelic verb does not have a selectional restriction and both types of DPs are available. This selectional requirement results in the difference in maximality of nouns.

10. Satoshi Tomioka (p.s.) points out that if bare nouns in Japanese are interpreted via choice functions, they should take wide scope over negation. However, as we have seen in (44), bare nouns take narrow scope obligatorily. This scope fact indicates that choice-function interpretation is not always available for bare nouns in Japanese. The same issue arises for the covert maximal operator. I should leave for future research under what condition choice-function interpretation is available.

2.3.6 Kind-denoting nouns and mass nouns

So far, we have examined countable nouns. In this last subsection, kind-denoting nouns and mass nouns are analyzed. Japanese bare nouns can also denote kinds.

(63) a. Pan-wa 1543-nen-ni nihon-ni tsutae-rare-ta.
Bread-TOP 1543-year-in Japan-to introduce-be-PAST
'Bread was introduced in Japan in 1543.'

b. Ringo-wa chuuoo-ajia-de umare-ta.
apple-TOP central-Asia=in originate-PAST
'Apples originated in central Asia.' K. Yoshida (2008: 424(8))

(64) a. Pan-wa kona-to mizu-to iisuto-kara deki-ru.
bread-TOP flour-and water-and yeast-from be.made-PRES
'Bread is made from flour, water and yeast.'

b. Ringo-wa amai.
apple-TOP sweet-PRES
'Apples are sweet.' (ibid.: 424(9))

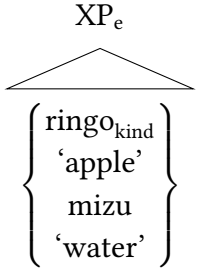
In addition, Japanese has mass nouns.

(65) John-wa mizu-o nonda.
John-TOP apple-ACC ate
'John drank water.'

In this dissertation, I follow (Carlson 1977, Chierchia 1998a) and assume that kind-denting nouns and mass nouns are type-e object.

The syntactic structure for kind-denoting nouns and mass nouns is represented in (66).

(66)



I adopt the notation used for English kind-denoting bare plurals and mass nouns, as seen in Section 2.1.1, where kind-denoting nouns and mass nouns are located under the category XPs.

2.4 Syntax and semantics of Japanese strong quantifiers

In this section, I propose the syntax of the structure containing the strong quantifiers in Japanese *subete* 'all' and *hotondo* 'most'. I will adopt Matthewson's (2001) null hypothesis that there is no crosslinguistic variation in quantification. We have seen that the syntax and semantics of English strong quantifiers *all* and *most* are the same as the one of St'át'imcets strong quantifier, namely, all of them are Q-quantifiers. If the null hypothesis is true, We thus expect that the strong quantifiers in Japanese have the same syntax and semantics. Specifically, the strong quantifiers in Japanese are also of type $\langle e, \langle et, t\rangle\rangle$ and their sisters should be of type e.

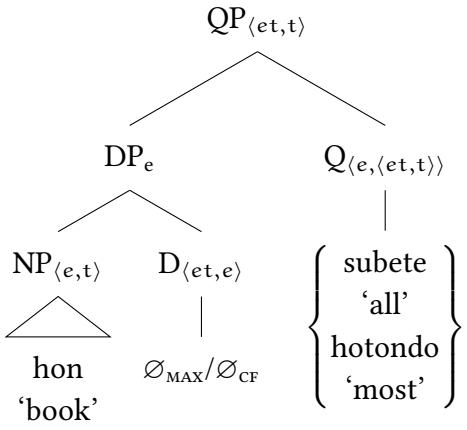
2.4.1 Postnominal strong quantifiers

This section examines Japanese postnominal strong quantifiers, *subete* 'all' and *hotondo* 'most', as exemplified in (67). The prenominal strong quantifiers will be analyzed in the next section (Section 2.4.2).

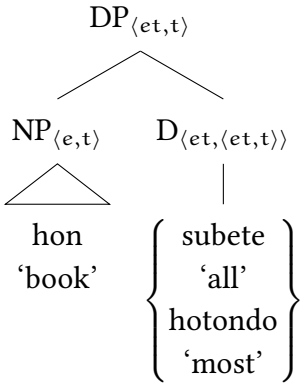
(67) John-wa hon { subete-o / hotondo-o } yomi-oeta.
John-TOP book { all-ACC / most-ACC } read-finish
'John finish reading {all /most} of the books.'

The question is whether the strong quantifiers in Japanese are Q-quantifiers or D-quantifiers. If they are Q-quantifiers, the quantified nominal in (67) would have the structure as represented in (68a). In contrast, if they are D-quantifiers, the quantified nominal would be represented in (68b).

(68) a. Q-quantifier analysis



b. D-quantifier analysis



The Q-quantifier analysis is compatible with the analysis of definite(-like) nouns in Japanese proposed in the previous section. That is, nouns in Japanese can be definite DPs or specific indefinite DPs. Since these DPs are of type e, the strong quantifiers are of type $\langle e, \langle et, t\rangle\rangle$. By contrast, the D-quantifier analysis is also possible. Since I assume that Japanese nouns are predicate of type $\langle e, t\rangle$, the strong quantifiers take these nouns to create a generalized quantifier just like *every* in English. Since Japanese does not have an overt determiner and no obligatory plural marker, there is no morphosyntactic evidence for both the analyses. Nevertheless, I argue that the strong quantifiers are Q-quantifiers.

In the previous section, I argued that the availability of anaphoric interpretations of nouns as evidence for definite or specific indefinite DPs. When a relevant context is provided, a bare noun in Japanese has an anaphoric reading, suggesting that it is a definite DP or specific indefinite. In (69), since a telic-verb form is used, the noun is interpreted as a definite DP and it is a type-e element.

(69) Context: Yesterday, John bought five books and three magazines. And today, …
John-wa hon { subete-o / hotondo-o } yomi-oeta.
John-top book { all-acc / most-acc } read-finish
‘John finished reading {all/most} of the books.’

In (69), the strong quantifiers are combined with the definite DP, they are Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$. We also observed that when a demonstrative or a relative clause modifies a noun, the noun has an anaphoric interpretation. Thus, in (70), the modified nouns are

argumental expressions of type *e*.

(70) CONTEXT: Yesterday, John bought five books and three magazines. And today, …

a. John-wa [kinoo katta] hon { subete-o / hotondo-o } yomi-oeta.
John-TOP yesterday bought book { all-ACC / most-ACC } read-finish
'John finished reading {all /most} the books that he bought yesterday.'

b. John-wa sono hon { subete-o / hotondo-o } yomi-oeta.
John-TOP that book { all-ACC / most-ACC } read-finish
'John finished reading {all/most} of these books.'

Since the strong quantifiers attach to the type-e nouns, they are of type $\langle e, \langle et, t\rangle\rangle$, namely, they are Q-quantifies.

We have used the anaphoric behavior of nouns to test whether the strong quantifiers are Q-quantifiers or D-quantifiers. The above analysis is compatible with the Q-quantifier analysis. However, the D-quantifier analysis is still possible. If we assume that just like *every* in English, the strong quantifiers in Japanese do the domain restriction and quantification at the same time without the help of determiners.

I now explore other aspects of the quantifiers. We have seen in (25) in Section 2.1.1, repeated below as (71), Q- and D-quantifiers show the differences.

(71) a. Q-quantifiers can attach to mass nouns, whereas D-quantifiers cannot.

b. Q-quantifiers can have collective and distributive interpretations, whereas D-quantifiers can have distributive only.

I will show that the pattern of the postnominal strong quantifiers in Japanese shows the properties of Q-quantifiers. First, the strong quantifies in Japanese can combine with mass nouns such as *mizu* 'water' or *ase* 'sweat', as exemplified in (72).

(72) a. John-wa mizu { subete-o / hotondo-o } nonda.
John-TOP water { all / most } drank
'John drank {all/most} water'

b. John-wa ase { subete-o / hotondo-o } fuita
John-TOP sweat { all-ACC / most-ACC } wiped
'John wiped {all/most} sweat'

Since mass nouns are considered as type-e expression, the strong quantifiers in Japanese take an argumental phrase, that is, they are of type $\langle e, \langle et, t\rangle\rangle$ just like English *all* and *most*.

In addition, similar to English *all the NPs*, the Japanese strong quantifiers exhibit ambiguity between collective and distributive readings. The ambiguity is shown in (73), in which the strong quantifiers appear with a predicate which is compatible with both collective and distributive readings.

(73) John-no gakusei { subete-ga / hotondo-ga } teeburu-o mochiageta.
John-GEN sutdent { all-NOM / most-NOM } table-ACC lifted.up
'{All/Most} of the students of John's lifted up a table.'
OK 'together, one table'
OK 'individually, possibly different tables

On the collective reading, (73) is true just in case all or most of the students of John's together lifted up a tale. On the distributive reading, (73) is true just in case each student individually lifted up a table. The predicate *teeburu-o mochiageru* 'lift up a table' is compatible with collective and distributive readings. The collective and distributive readings are available in (73). Moreover, just like English *all*, Japanese universal quantifiers are compatible with collective predicates such as *atsumaru* 'gather' as in (74).

(74) John-no gakusei { subete-ga / hotondo-ga } hooru-ni atsumatta.
John-GEN student { all-NOM / most-NOM } hall-DAT gathered
'{All/Most} of the students of John's gathered in the hall.'

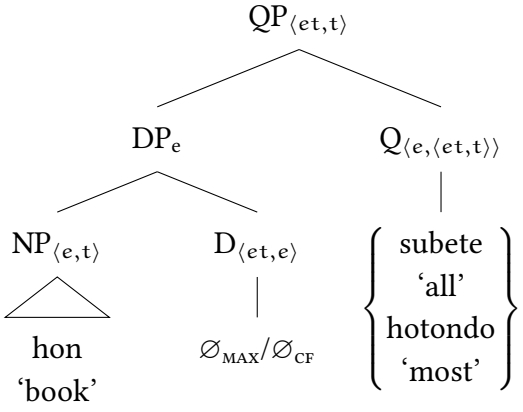
The quantifier can also co-occur with the collective marker *issho-ni* 'together' as the example (75) shows..

(75) John-no gakusei { subete-ga / hotondo-ga } piano-o *issho-ni*
John-GEN student { all-NOM / most-NOM } piano-ACC together-DAT
mochiageta.
lifted.up
'{All/Most} of the students of John's lifted up a piano together.'

Since the availability of collective interpretation is a typical interpretive property of Q-quantifiers, the examples above suggest that the postnominal strong quantifiers in Japanese are Q-quantifiers.

I have shown that the postnominal strong quantifiers in Japanese have the properties of Q-quantifiers. I conclude then that the postnominal strong quantifiers in Japanese are Q-quantifiers. This analysis gives the following structure for the Japanese postnominal strong quantifiers.

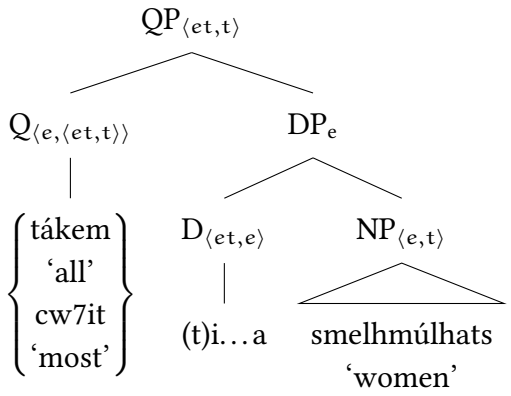
(76)



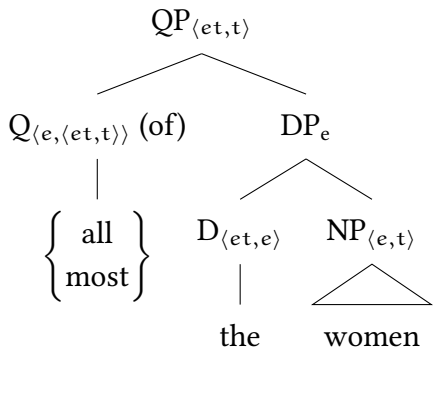
In (76), the NP combines with a covert D. Regardless of whether the covert D is a max operator or a choice function, a DP of type e is generated.[11] The strong quantifiers then attach to the DP. Thus, they are Q-quantifiers of $\langle e, \langle et, t\rangle\rangle$. The way of creating a generalized quantifier in Japanese is the exactly same as in English and St'át'imcets. The creation involves two steps: domain restriction and quantification over the restricted domain. Japanese covert determiners are responsible for domain restriction. The postnominal strong quantifiers quantify over the narrowed down domain. The proposed structure in (76) is just like the one in English and St'át'imcets except for the covert D and the head finality. The structures for these two languages are repeated below:

11. In Section 2.4.3, I discuss whether the domain of quantification is achieved by DPs headed by a choice function.

(77) St'át'imcets



(78) English



We have seen that Matthewson's (2001) Q-quantifier analysis can be extended to the construction with Japanese postnominal strong quantifiers. I will add a piece of evidence for the proposed structure. In the analysis of English *all* and *most*, Matthewson examines the partitive constructions and argues that *of* is semantically vacuous. This semantic vacuity analysis accounts for the identical meaning between the partitive and non-partitive constructions (e.g., *all of the students* and *all the students*, respectively) and indicates that the partitive and non-partitive constructions are identical in the syntactic and semantic structure. This analysis suggests a possibility that Japanese quantifiers appeared in the proposed structure will admit partitive interpretations. To see whether this is the case, let us first look at a typical partitive construction in Japanese and its meaning. Japanese partitives are shown in (79).

(79) John-wa [kinoo katta] hon-no { subete-o / hotondo-o } yonda.
John-TOP yesterday bought book-GEN { all-ACC / most-ACC } read
'John read {all/most} of the books that he bought yesterday.'
(Sauerland & Yatsushiro 2017: 1(1) with a slight modification)

The noun is marked by a genitive case *no* and followed by a quantifier. The characteristics of the partitive construction is found in *hotondo*. Sauerland & Yatsushiro (2004) observe that the example in (80) allows two partitive readings as shown in (80a) and (80b).

(80) John-wa [kinoo katta] hon-no hotondo-o yomi-oeta.
John-TOP yesterday bought book-GEN most-ACC read-finished

a. John has finished reading most pages of the book that he bought yesterday.'

b. John has finished reading most books of the books that he bought yesterday.'
(Sauerland & Yatsushiro 2004: 111(37-38) with a slight modification)

The difference between the two interpretations is the divided objects. In (80a), what is divided is a single book, whereas in (80b), it is a set of books. When the single-book reading is applied, *hotondo* quantifiers over parts of a book, that is, 'pages'.[12]

We predict that the proposed structure of quantifiers in Japanese will show the same two partitive readings just like the partitive construction in (80) allows. This prediction is in fact borne out. Sauerland & Yatsushiro (2004) point out that the non-partitive construction in (81), which is derived from the proposed QP structure, allows the same range of readings.

(81) John-wa [kinoo katta] hon hotondo-o yomi-oeta.
John-TOP yesterday bought book most-ACC read-finished
(ibid.: 111 (39) with a slight modification)

Example (81) can have the single-book reading as in (80a) and the multiple-book reading as in (80b). This observation supports the current analysis that the structure of quantifiers in Japanese is the same as the one in English and St'át'imcets. As found in English, the [Q DP] structure has the same range of interpretations as the [Q of DP] structure as proposed by Matthewson (2001).

So far, we have seen that the postnominal strong quantifiers in Japanese may attach to a DP just like English *all* and *most*. We have seen in English, when *all* combines with a bare plural, the resultant reading is the one in which the quantifier quantifies over a kind denoted by the bare plural. Consequently, the form of *all* + bare noun is felicitous in generic contexts but not in episodic context.

(82) a. I admire all linguists.

b. #I talked to all linguists.

c. I talked to all the linguists. (Matthewson 2001: 169(38))

I will show that the same pattern holds in Japanese. Consider the following examples, which is a Japanese counterpart of (82).

12. The single-book reading is known as mass partitive (e.g., Abbott 1996, Hoeksema 1996).

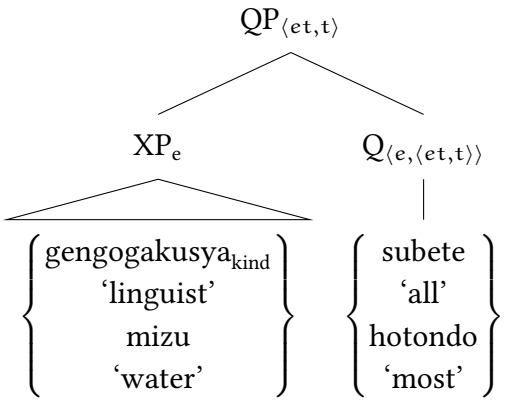
(83) a. Episodic context
#Watashi-wa gengogakusya { subete-to / hotondo-to } hanashita.
I-Top linguists { all-to / most-to } talked
'I talked to {all/ most} linguistics.'

b. Generic context
Watashi-wa gengogakusya { subete-o / hotondo-o } shoosansuru.
I-Top linguists { all-Acc / most-Acc } admire
'I admire {all/most} linguistics.'

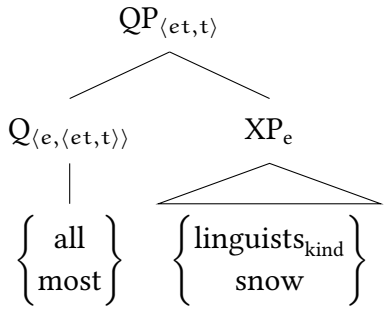
Example (83a) is in an episodic context. When (83a) is uttered in an out-of-blue context, it is judged infelicitous just like the English counterpart in (82b). This is because the noun *gengogakusya* 'linguist' is interrupted as a kind-denoting noun. Thus, (83a) is equivalent to *all* + bare noun in English. We expect then that the quantified noun is felicitous in generic contexts. This is shown in (83b), which is in a generic context. As expected, the example is acceptable. This contrast is expected if we assume that the strong quantifiers quantify over a kind when they combined with a bare noun.

The observations above show that the strong quantifiers may take a kind-denoting argumental phrase. Thus, the strong quantifiers in Japanese are always attached to an argumental phrase, that is, they are Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$. Given this discussion, just like the case in English, the strong quantifiers in Japanese have the following structure when they combine with a bare noun. Recall that since the strong quantifiers can attach to a mass noun, and mass nouns are considered as a type-e expression, the Q-quantifier analysis is applicable.

(84) a. Japanese



b. English



In this section, we have seen the application of the proposal by Matthewson. The results

show that the structure of QPs with the postnominal strong quantifiers in Japanese shows direct parallel with the structure in English and St'át'imcets. Unlike English and St'át'imcets, Japanese lacks overt articles and singular-plural distinction. Despite the differences, the analysis indicates that the structure of QPs with the strong quantifiers is the same among the three languages. Thus, we can conclude that Matthewson's null hypothesis that there is no cross-linguistic variation in semantics of quantification is supported.

2.4.2 Prenominal strong quantifiers

We have examined the structure of QPs with postnominal strong quantifiers in Japanese. This section moves on to the prenominal strong quantifiers, as in (85).

(85) John-wa { subete-no / hotondo-no } hon-o yomi-oeta.
John-TOP { all-GEN / most-GEN } book-ACC read-finished
'John finished reading {all/most} of the books.'

I will first demonstrate that the prenominal strong quantifiers show the typical properties of Q-quantifiers. I then move on to the syntax of the construction involving the prenominal strong quantifiers. Since they appear in front of the head noun, they must not be in the head of QP. I propose that the prenominal strong quantifiers are in the specifier of QP. This analysis explains the word order variation of the strong quantifies in Japanese.

Just like the postnominal strong quantifiers, the prenominal strong quantifiers attach to a noun which is interpreted as a definite DP.

(86) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa { subete-no / hotondo-no } hon yomi-oeta.
John-TOP { all-GEN / most-GEN } book read-finish
'John finished reading {all/most} of the books.'

Given the context, the noun is anaphorically interpreted. Since a telic form is used, the noun is a definite DP. The prenominal strong quantifiers combine with this definite DP, suggesting that they are Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$. The prenominal strong quantifies also attach to a noun modified by a relative clause or demonstrative. In (87), the noun is modified by a relative clause and since a telic-form is used, the noun is a definite DP.

(87) CONTEXT: Yesterday, John bought five books and three magazines. And today, …

a. ?John-wa { subete-no / hotondo-no } [kinoo katta] hon-o
John-TOP { all-GEN / most-GEN } yesterday bought book-ACC
yomi-oeta.
read-finished

b. John-wa [kinoo katta] { subete-no / hotondo-no } hon-o
John-TOP yesterday bought { all-GEN / most-GEN } book-ACC
yomi-oeta.
read-finished
'John finished reading {all/most} of the books that he bought yesterday.'

Note that the example is judged less acceptable when the relative clause comes immediately before the head noun and after the quantifier as in (87a), compared with the example in which the relative clause comes before the strong quantifiers as in (87b). A similar pattern is found in examples with demonstrative, as (88) shows.

(88) CONTEXT: Yesterday, John bought five books and three magazines. And today, …

a. ?John-wa { subete-no / hotondo-no } sono hon-o yomi-oeta.
John-TOP { all-GEN / most-GEN } that book-ACC read-finished

b. John-wa sono { subete-no / hotondo-no } hon-o yomi-oeta.
John-TOP that { all-GEN / most-GEN } book-ACC read-finished
'John finished reading {all/most} of that books.'

Although it is not clear to me why the relative order between the strong quantifiers and modifiers affects the acceptability, what is crucial here is that the prenominal strong quantifiers are combined with a type-e element. The observations suggest that the prenominal strong quantifiers are Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$.

In addition, the prenominal strong quantifiers can combine with mass nouns, as in (89).

(89) a. John-wa { subete-no / hotondo-no } mizu-o nonda.
John-TOP { all-GEN / most-GEN } water-ACC drank
'John drank {all/most} water'

b. John-wa { subete-no / hotondo-no } ase-o fuita
John-TOP { all-GEN / most-GEN } sweat-ACC wiped
'John wiped {all/most} sweat'

Since mass nouns are considered as argumental type (type e), just like the postnominal strong quantifiers, the prenominal strong quantifiers can take the type-e term as their argument, namely, they are Q-quantifiers.

Moreover, the prenominal strong quantifiers allows collective reading in addition to distributive one. In the following example, the prenominal strong quantifiers occur with a predicate *teeburu-o mochiageru* 'lift up a table', which allows collective-distributive ambiguity.

(90) John-no { subete-no / hotondo-no } gakusei-ga teeburu-o mochiageta.
John-GEN { all-GEN / most-GEN } sutdent-NOM table-ACC lifted.up
'{All/most} the students of John's lifted up a table.'
OK 'together, one table'
OK 'individually, possibly different tables

Further, as (91) illustrates, the strong quantifiers can appear with a collective predicate *atsumaru* 'gather'.

(91) John-no { subete-no / hotondo-no } gakusei-ga hooru-ni atsumatta.
John-GEN { all-GEN / most-GEN } student-NOM hall-DAT gathered
'{All/most} of the students of John's gathered in the hall.'

Furthermore, the quantifier can appear with the collective marker *issho-ni* 'together' as shown in (92).

(92) John-no { subete-no / hotondo-no } gakusei-ga piano-o *issho-ni*
John-GEN { all-GEN / most-GEN } student-NOM piano-ACC together-DAT
mochiageta.
lifted.up
'{All/most} of the students lifted up a piano together.'

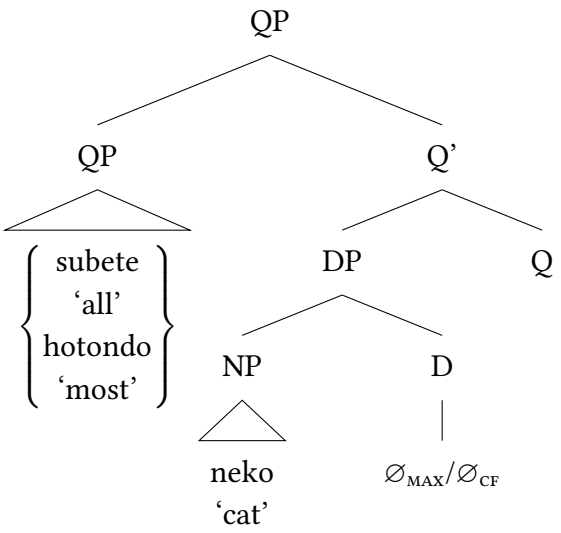
We have observed that collective reading as well as distributive reading is possible for the prenominal strong quantifiers. This observation is compatible with the analysis that the prenominal strong quantifiers are Q-quantifiers.

What we have seen so far is that the prenominal strong quantifiers in Japanese have the properties of Q-quantifiers. They are combined with a type-e object such as definite DPs

and amass nouns and they yields collective and distributive interpretations. Therefor, the prenominal strong quantifiers should also be Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$. However, the question arias as to where the prenominal strong quantifiers are located. Since Japanese is a head-final languages, the prenominal strong quantifiers cannot be in the head of QP. Neither of the Generalized Quantifier analysis nor Matthewson's (2001) expect a quantifier to appear other positions than a head position. Thus, the structure with the prenominal strong quantifiers raises issues for the analysis of quantifiers.

I propose that structures of QPs are more flexible than the Generalized Quantifier analysis or Matthewson's (2001) analysis assumes. Specifically, I postulate that the prenominal strong quantifiers are located in Spec,QP, as shown in (93).[13]

(93)

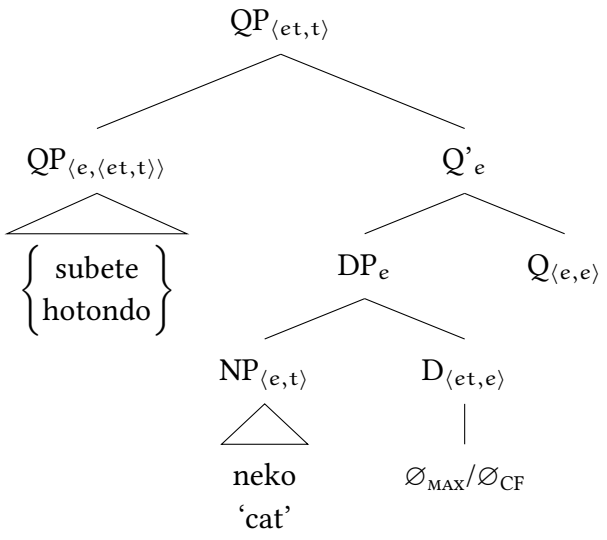


I suggest that the head Q selects a QP in its specifier position. I further assume that the head Q is phonologically and semantically vacuous. Since the D is responsible for the domain restriction, the strong quantifiers in Spec,QP can quantify over the restricted domain. This is the standard way to make a generalized quantifier, as Matthewson (2001) suggests.

13. It is not clear whether the English Q-quantifiers *all* and *most* can be in Spec,QP as well as in the head of QP. Borer (2005: 172-4), for example, proposes that *all* can be in a head or a specifier position. He postulates that *all* is a head when it occurs with bare plurals or mass nouns such as *all tables* or *all meat*. On the other hand, it is in a specifier when it appears with *the* or cardinals such as *all the tables* or *all three tables* . When it is in a specifier position, it functions a modifier. It should be noted that Borer does not assume QP projection and quantifiers are in general located in the head of DP. Since *all* can appear with *the*, which is also located in the head of DP, Borer claims that *all* must be in a different position from the head of DP, which is Spec,DP. Since I assume a different syntax from Borer, I must leave for future research whether the specifier analysis of *all* is extendable.

Semantically, as (94) illustrates, I assume that the prenominal strong quantifiers are just like the postnominal ones, except that the position of the strong quantifiers is Spec,QP and the Q head is semantically empty.

(94)



I postulate that for the structure of QPs with the prenominal strong quantifiers, the head of Q denotes an identity function. More detailed discussion of the semantics of the strong quantifiers will be given in Section 2.4.4.

In addition to the structure where the prenominal strong quantifiers attach to a DP, they can combine with a mass noun as shown in (89), repeated below.

(95) a. John-wa { subete-no / hotondo-no } mizu-o nonda.
John-TOP { all-GEN / most-GEN } water-ACC drank
'John drank {all/most} water'

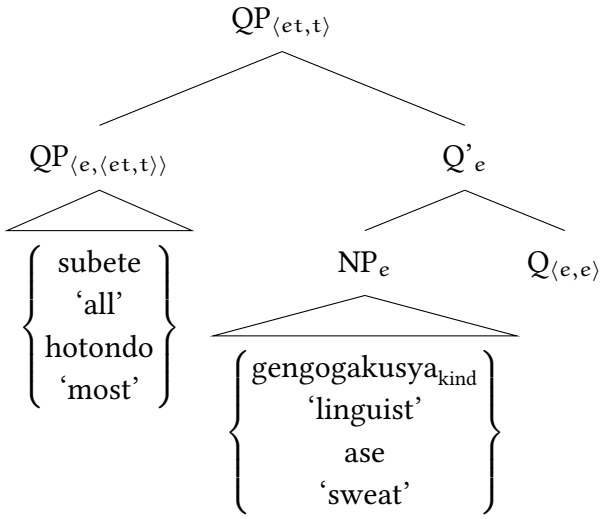
b. John-wa { subete-no / hotondo-no } ase-o fuita
John-TOP { all-GEN / most-GEN } sweat-ACC wiped
'John wiped {all/most} sweat'

They can also combine with a kind-denoting noun as illustrated in (96). In (96), the prenominal strong quantifiers admit generic readings, which shows that they quantify over a kind denoted by the bare noun.

(96) Watashi-wa {subete-no /hotondo-no} gengogakusha-o shoosansuru/sonkeisuru.
I-TOP {all-GEN /most-GEN} linguists-ACC admire
'I admire {all/most} linguists.'

Since both mass nouns and kind-denoting nouns are considered as argumental type (type e), just like the postnominal strong quantifiers, the prenominal strong quantifiers can take these types of nouns as their argument. That is, in addition to the structure in (94), the following structure is possible.

(97)



To summarize, we have examined the prenominal strong quantifiers in Japanese. Similar to the postnominal strong quantifiers, I have shown that the prenominal ones are also Q-quantifiers. The difference between the postnominal and prenominal strong quantifiers is that the former is in the head of QP, whereas the latter is in Spec,QP. Since Japanese allows the strong quantifiers to be in either the head of the specifier of QP, the language shows the word order variation, that is, the strong quantifiers can appear prenominally and postnominally. In this respect, Japanese differs from English and St'át'imcets. The proposed analysis captures this uniqueness in Japanese.

2.4.3 Domain of strong quantifiers and choice functions

I have assumed so far that the strong quantifiers in Japanese takes a DP headed by the maximal operator or a choice function. When the maximal operator is in the head of DP, the structure is similar to English strong quantifiers *all* and *most*. When, on the other hand, a choice function occupies the head of DP, the structure is like St'át'imcets as analyzed in Matthewson (2001). In this section, I discuss whether both the options are actually possible

in Japanese. The particular focus is on the case where DPs are headed by a choice function.[14] I have shown in Section 2.3.3 that anaphoric nouns do not always show maximality, as illustrated in (98).

(98) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa { ∅ / so-no / [kinoo katta] } hon-o yonda.
John-TOP { / that-GEN / yesterday bought } book-ACC read
'Int. John read {the books / the books he bought yesterday /those books}.'

Regardless of whether the noun is modified by the demonstrative or the relative clause, (98) is true if John read three of the books he bought yesterday. I postulated that in this case, the noun is interpreted as a specific indefinites, which is derived via the application of choice functions.

If the strong quantifiers take DPs headed by a choice function, the domain of quantification may be non-maximal individuals. For example, under the context in (98), a contextually salient choice function f chooses a non-maximal plural individual $a \oplus b \oplus c$.[15] When a strong quantifier *subete* 'all' combines with this DP, the selected non-maximal plural individual serves as the domain for quantification. In this situation, we predict that a sentence is true if John read all of the three books. To see whether this prediction is borne out, let us first consider the following example with the postnominal strong quantifiers.

(99) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa hon { subete-o / hotondo-o } yonda.
John-TOP book { all-ACC / most-ACC } read
a. *John read { all / most } of the three books which are chosen from the set of books John bought yesterday by the choice function.
b. John read { all / most } of the five books that John bought yesterday.

The sentence in (99) cannot be interpreted as (99a), where the domain of quantification contains the three books chosen by the choice function. It is interpreted as (99b), in which the

14. I thank Satoshi Tomioka (p.c.) for bringing this point to my attention.
15. Recall that I adopted Matthewson's (2001) definition of choice functions.
(i) $[\![\varnothing_{\text{CF } k}]\!]^g = \lambda f_{\langle e,t\rangle}.(g(k))(f)$
The index of the determiner specifies which choice function will be used; g is an assignment function from indices to choice functions.

domain contains all of the books that John bought yesterday. Next, examine the following sentence which has the prenominal strong quantifiers.

(100) CONTEXT: Yesterday, John bought five books and three magazines. And today, ...
John-wa { subete-no / hotondo-no } hon yonda.
John-TOP { all-GEN / most-GEN } book read

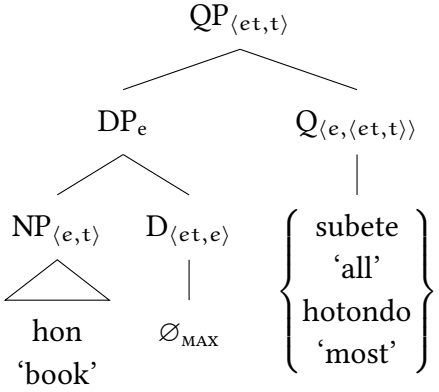
a. *John read { all / most } of the three books which are chosen from the set of books John bought yesterday by the choice function.

b. John read { all / most } of the five books that John bought yesterday.

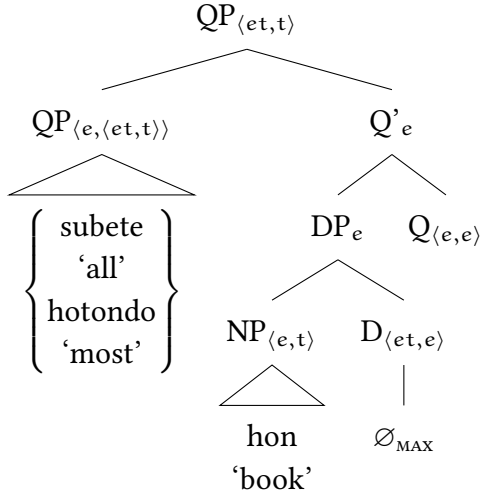
In (100), the exact same pattern holds as (99). The only possible interpretation is the one in (100b). The interpretation with the non-maximal individual in (100a) is not available.

The examination shows that the domain of quantification must contain the maximal individual in the context. This in turn suggests that the strong quantifiers do not combine with DPs headed by a choice function: they must be attached to DPs with the maximal operator. Thus, the structures of the strong quantifiers in Japanese should be the ones in (101) and (102).

(101) Postnominal



(102) Prenominal



It is not clear if the same analysis applies to other languages such as St'át'imcets, in which Matthewson (1999, 2001) proposes that determines of the language introduce choice functions. However, Matthewson (1999: 113) acknowledges a similar issue regarding the domain of for universal quantifiers when determiners introduce choice functions, but leaves it unsolved. Although further investigation is required, we can safely conclude that at least

in Japanese, the domain for the strong quantifiers must contain the maximal individual and therefore, the strong quantifiers should take DPs headed by the maximal operator.

2.4.4 Lexical entries for the strong quantifiers

I have developed an analysis that strong quantifiers in Japanese are Q-quantifier of type $\langle e, \langle et, t\rangle\rangle$, regardless of whether they are prenominal or postnominal. Thus, Japanese strong quantifies are akin to English *all* rather than *every*. The goal of this subsection is to establish the lexical entries of the strong quantifiers in Japanese *subete* 'all' and *hotondo* 'most', and to make a compositional analysis. In this section, I limit my discussion to the case where the strong quantifiers attach to countable nouns. I will not discuss the case where the strong quantifiers attach to kind-denoting and mass nouns.

We have seen in Section 2.1.1 that in English, *all* shows the ambiguity between collective and distributive readings and it is compatible with collective readings. This interpretive property of *all* contrasts with that that of *every* and *each*, which only show distributive interpretations. We also found that the strong quantifiers in Japanese show the same interpretive pattern as *all*. That is, Japanese universal quantifiers give rise to the ambiguity between collective and distributive readings and show the compatibility with collective readings. The relevant examples are repeated below.

(103) a. John-no gakusei { subete-ga / hotondo-ga } teeburu-o mochiageta.
John-GEN sutdent { all-NOM / most-NOM } table-ACC lifted.up
'{ All / Most } of the students of John's lifted up a table.'
OK 'together, one table'
OK 'individually, possibly different tables

b. John-no { subete-no / hotondo-no } gakusei-ga teeburu-o mochiageta.
John-GEN { all-GEN / most-GEN } sutdent-NOM table-ACC lifted.up
'{All/most} the students of John's lifted up a table.'
OK 'together, one table'
OK 'individually, possibly different tables

(104) a. John-no gakusei { subete-ga / hotondo-ga } hooru-ni atsumatta.
John-GEN student { all-NOM / most-NOM } hall-DAT gathered
'{ All / Most } of the students of John's gathered in the hall.'

b. John-no { subete-no / hotondo-no } gakusei-ga hooru-ni atsumatta.
John-GEN { all-GEN / most-GEN } student-NOM hall-DAT gathered
'{All/most} of the students of John's gathered in the hall.'

(105) a. John-no gakusei { subete-ga / hotondo-ga } piano-o *issho-ni*
John-GEN student { all-NOM / most-NOM } piano-ACC together-DAT
mochiageta.
lifted.up
'{ All / Most } of the students of John's lifted up a piano together.'

b. John-no { subete-no / hotondo-no } gakusei-ga piano-o *issho-ni*
John-GEN { all-GEN / most-GEN } student-NOM piano-ACC together-DAT
mochiageta.
lifted.up
'{All/most} of the students lifted up a piano together.'

This interpretive property suggests that a lexical entry for *subete* 'all' and *hotondo* 'most' must yield both collective and distributive interpretations. I propose that Japanese *subete* has the following lexical entry. This formalism is adopted from the lexical entry for *all* given in Zimmermann (2014), which is based on Matthewson (2001).

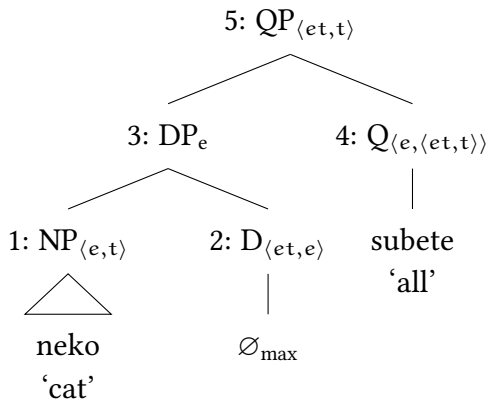
(106) $[\![\text{subete}]\!] = \lambda x \lambda P . \forall y [y \leqslant x \rightarrow P(y)]$

The denotation yields both distributive and collective interpretations, because *subete* quantifies over subparts ($y \leqslant x$) of the individual denoted by the DP. A distributive interpretation is obtained when the subparts are atomic. A collective interpretation is derived when there is only one subpart (i.e., $x = y$).

With this lexical entry, let us see a derivation of quantified nouns involving the strong quantifier in Japanese. The postnominal strong quantifier phrase in (107) has the LF in (108) and its derivation is illustrated in (109).

(107) neko subete
cat all
'all the cats'

(108)



(109) a. 1: $[\![\text{NP}]\!] = \lambda x.{}^{*}\textsc{cat}(x)$

b. 2: $[\![\text{D}]\!] = \lambda P.\ \max(P)$

c. 3: $[\![\text{DP}]\!] = \max(\lambda x.{}^{*}\textsc{cat}(x))$

d. 4: $[\![\text{Q}]\!] = \lambda x \lambda P. \forall y[y \leqslant x \rightarrow P(y)]$

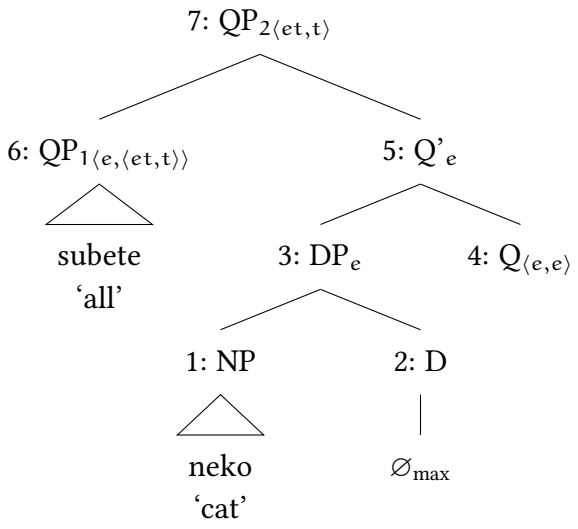
e. 5: $[\![\text{QP}]\!] = \lambda P. \forall y[y \leqslant \max(\lambda x.{}^{*}\textsc{cat}(x))] \rightarrow P(y)]$

The definite DP serves as a restricted domain for quantification. The quantifier takes this DP and creates the generalized quantifier (109e). In other words, the quantifier quantifies over the restricted domain. The generalized quantifier states that every subpart of the (plural) individuals composed of contextually salient cats satisfies the predicate.

For the prenominal case, I assume that the strong quantifier *subete* 'all' has the same lexical entry as the one in the postnominal case. A difference from the postnominal structure is in the head of QP. Let us look the LF for the quantified noun with the prenominal *subete* 'all' in (110), as illustrated in (111), and the derivation given in (112).

(110) subete-no neko
all-GEN cat
'all the cats'

(111)



(112) a. 1: $[\![\text{NP}]\!] = \lambda x.{}^{*}\textsc{cat}(x)$

b. 2: $[\![\text{D}]\!] = \lambda P.\ \max(P)$

c. 3: $[\![\text{DP}]\!] = \max(\lambda x.{}^{*}\textsc{cat}(x))$

d. 4: $[\![\text{Q}]\!] = \lambda x.x$

e. 5: $[\![\text{Q'}]\!] = \max(\lambda x.{}^{*}\textsc{cat}(x))$

f. 6: $[\![\text{QP}_1]\!] = \lambda x \lambda P.\forall y[y \leqslant x \rightarrow P(y)]$

g. 7 $[\![\text{QP}_2]\!] = \lambda P.\forall y[y \leqslant \max(\lambda x.{}^{*}\textsc{cat}(x))] \rightarrow P(y)]$

Unlike the postnominal counterpart, the head of QP denotes an identity function (112d). This means that the head plays no role in semantics (but in the next subsection, I will suggest that the Q head plays a role and revise the lexical entry). The prenominal strong quantifier in Spec,QP takes the Q' and results in the generalized quantifier. The final denotation is identical to that of the postnominal strong quantifier phrase. The way of creating the prenominal generalized quantifier is also a two-step process: domain restriction and quantification over the restricted domain.

When the QP with the postnominal and the one with the prenominal *subete* are combined with a predicate *nigeta* 'ran away', we have (113a) and (113b), respectively.

(113) Context: There were ten cats in the yard.

a. (Niwa-ni ita) Neko subete-ga nigeta.
yard-loc was cat all-nom ran.away
'All of the cats (in the yard) ran away. '

b. (Niwa-ni ita) Subete-no neko-ga nigeta.
yard-LOC was all-GEN cat-NOM ran.away

The interpretation of these two sentences is given in (114).

(114) $[\![(113a)]\!] = [\![(113b)]\!] = 1$
iff $\forall y[y \leqslant \max(\lambda x.{}^*\textsc{cat}(x)) \rightarrow \text{ran.away}(y)]$

The sentences state that every subpart of the plurality composed of the contextually salient cats ran away. This is exactly what (114a) and (114b) mean.

Let us turn to the lexical entry for the other strong quantifier *hotondo* 'most'. So far, I have glossed *hontondo* as 'most'. Grosu (2010), however, points out that the more accurate translation of Japanese *hotondo* would be 'nearly all' or 'an overwhelming majority of'. I agree with this,[16] and propose the following lexical entry for *hotondo*.[17,18]

(115) $[\![\text{hotondo}]\!] = \lambda x \lambda P.\exists y[y \leqslant x \wedge \frac{|y|}{|x|} > M_c \wedge P(y)]$ (where M_c is "large")

I define the meaning 'an overwhelming majority of' as using the notation "$\frac{|y|}{|x|} > M_c$". Here, "M_c" is a contextually determined proportion and is considered as 'large'. It could be 0.7 or 0.9, depending on contexts or people who judge. When M_c is set as 0.7, if the cardinality of y is more than 70% of the cardinality of x (e.g., eight out of ten) , y is considered as 'an overwhelming majority of' x. Given this lexical entry, let us look at the meaning of the following sentences (116a) and (116b), which have the interpretation in (116c).

16. For the sake of simplicity, I continue to gloss *hotondo* as 'most'.
17. Crnič (2010) proposes a similar lexical entry for *most*. A simplified version of his proposal is given in (i).
(i) $[\![\text{most}]\!] = \lambda x \lambda P.\exists y[y \leqslant x \wedge |y| > \frac{1}{2}|x| \wedge P(y)]$ (Crnič 2010: 122 (22a), simplified)

18. Alternatively, we can use a modified version of the standard set-theoretic notation of *most*. The standard set-theoretic notation of *most* is in (ia). I modify it to capture the meaning of *hotondo* by adopting the symbol "$\gg$" in Grosu (2010) with the meaning 'far greater than'.
(i) a. $[\![\text{most}]\!] = \lambda P \lambda Q.|P \cap Q| > |P - Q|$
b. $[\![\text{hotondo}]\!] =$
$\lambda x \lambda Q.|\{y\colon y \sqsubseteq_{\textsc{atomic}} x\} \cap \{y\colon Q(y) = 1)\}| \gg |\{y\colon y \sqsubseteq_{\textsc{atomic}} x\} - \{y\colon Q(y) = 1)\}|$

(116) CONTEXT: There were ten cats in the yard.

a. (Niwa-ni ita) Neko hotondo-ga nigeta.
yard-LOC was cat most-NOM ran.away
'Most the cats (in the yard) ran away. '

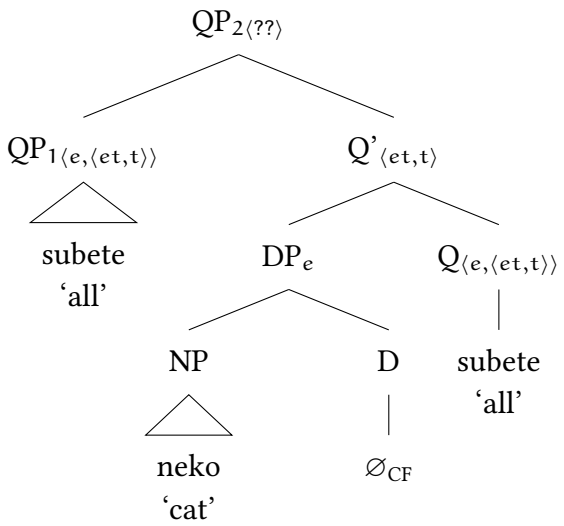
b. (Niwa-ni ita) Hotondo-no neko-ga nigeta.
yard-LOC was most-GEN cat-NOM ran.away

c. $[\![(116a)]\!] = [\![(116b)]\!] = 1$
iff $\exists y[y \leqslant \max(\lambda x.{}^{*}\textsc{cat}(x)) \wedge \frac{|y|}{|\max(\lambda x.{}^{*}\textsc{cat}(x))|} > M_c \wedge \text{run.away}(y)]$

The two sentences have the same interpretation: there is a plurality of cats that is a part of the contextually salient cats, and the cardinality of the plurality is understood to be large relative to the cardinality of the contextually salient cats, and the plurality of cats run away. The interpretation represented in (116c) matches the intuition: when $M_c = 0.7$, (116a) and (116b) are judged true when eight or nine of the cats run away.

Lastly, it should be noted that the proposed analysis predicts that a prenominal strong quantifier cannot co-occur with a postnominal strong quantifier due to a type mismatch. As the following diagram shows, the prenominal strong quantifier in Spec,QP of type $\langle e, \langle et, t\rangle\rangle$ does not compose with the Q' of type $\langle et, t\rangle$.

(117)



In fact, any combination of the strong quantifiers *subete* 'all' and *hotondo* 'hotondo' results in the unacceptability, as shown in (118).

(118) a. *[John-ga katteiru] subete-no neko subete-ga nigeta.
John-NOM have all-GEN cat all-NOM ran.away
'Lit. All of all of the cats that John has ran away. '

b. *[John-ga katteiru] subete-no neko hotondo-ga nigeta.
John-NOM have all-GEN cat most-NOM ran.away
'Lit. Most of all of the cats that John has ran away. '

c. *[John-ga katteiru] hotondo-no neko subete-ga nigeta.
John-NOM have most-GEN cat all-NOM ran.away
'Lit. All of most of the cats that John has ran away. '

d. *[John-ga katteiru] hotondo-no neko hotondo-ga nigeta.
John-NOM have most-GEN cat most-NOM ran.away
'Lit. Most of most of the cats that John has ran away. '

The examples show that the co-occurrence of the prenominal and postnominal strong quantifiers is prohibited, as predicted.

2.4.5 Plurality requirement

The proposed syntax and semantics capture the denotation of the prenominal and postnominal strong quantifier phrases. The results show that the two orders end up with the same interpretation, regardless of the positional difference. However, I will point out that the two orders show a difference in the possible interpretation. As we have seen, the postnominal strong quantifiers admit two types of partitive interpretations.

(119) John-wa kinoo katta hon hotondo-o yomi-oeta. (Postnominal)
John-TOP yesterday bought book most-ACC read-finished
a. John has finished reading most pages of the book that he bought yesterday.'
b. John has finished reading most books of the books that he bought yesterday.'
(Sauerland & Yatsushiro 2004: 111(39) with a slight modification)

In the reading in (119a), what is divided is a single book, whereas in the reading in (119b), what is divided is a set of books. In the former reading, *hotondo* 'most' quantifiers over parts of a single book, that is, 'pages'. However, the prenominal construction does not allow the mass partitive reading:

(120) John-wa kinoo katta hotond-no hon-o yomi-oeta. (Prenominal)
John-TOP yesterday bought most-GEN book-ACC read-finished

a. *'John has finished reading most pages of the book that he bought yesterday.'

b. 'John has finished reading most books of the books that he bought yesterday.'

(Sauerland & Yatsushiro 2004: 111(37) with a slight modification)

The same is also attested in the other strong quantifier *subete* 'all'. Let us first consider an example with the postnominal quantifier.

(121) John-wa ie-no kabe subete-o aoku nutta. (Postnominal)
John-TOP house-GEN wall all-ACC blue painted

a. 'John spread the blue paint all over the wall of the house.'

b. 'John painted all the walls of the house in blue.'

The example in (121) allows the two readings in (121a) and (121b). It is true when John painted all over a single wall and only painted that wall. In addition, it is also true when John painted all the walled of the house. That is, both the single-wall reading (121a) and the multiple-wall reading (121b) are available. Consider now an example with the prenominal quantifier.

(122) John-wa ie-no subete-no kabe-o nutta. (Prenominal)
John-TOP house-GEN all-GEN wall-ACC painted

a. *'John spread the blue paint all over the wall of the house.'

b. 'John painted all the walls of the house in blue.'

Unlike (121), the example in (122) only admits the multiple-wall reading. The single-wall reading is not allowed.

The generalization about the difference between the two orders is that the prenominal strong quantifiers must quantify over plural individuals, whereas the postnominal ones do not have to. I posit that the plural requirement is a presupposition introduced in the head of QP in the structure for the prenominal strong quantifiers.

(123) $[\![Q]\!] = \lambda x : \exists y[y <_{\text{ATOMIC}} x].x$

The presupposition introduced in the head of QP ensures that the first argument of the prenominal strong quantifiers must have an entity that are divisible to smaller parts, that is, pluralities. For examples, if the extension of the DP is $a \oplus b \oplus c$, it can be divided into the atomic subparts a, b, c. Thus, the presupposition of Q is satisfied. If the extension of the DP is a singularity a, it cannot be divisible to any smaller parts, because a is the atomic, which results in the presupposition failure. Thus, single-entity readings are not generated with the prenominal strong quantifiers.[19]

2.5 Summary

This chapter has examined the syntax and semantics of the strong quantifiers in Japanese. Specifically, we have adopted the analysis of Matthewson (2001) and seen how the analysis fits in with the Japanese data. I have argued that the Japanese strong quantifiers are Q-quantifiers of type $\langle e, \langle et, t\rangle\rangle$ and takes a type-e expression (a DP, a kind-denoting noun or a mass noun) to form generalized quantifiers. We have seen that there is no variation in the structure as well as the ranges of interpretations of quantifiers among English, St'át'imcets and Japanese, except that the prenominal strong quantifiers are not in the head of QP but in the specifier of QP. I have also offered a compositional analysis, which captures the difference between the prenominal and postnominal strong quantifiers in terms of plurality.

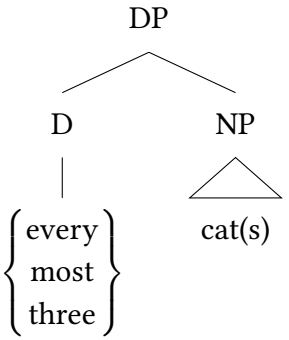
19. The presupposition analysis does not prevent mass nouns and kind-denoting nouns from combining with Q. Chierchia (2010) proposes that mass nouns have the same kind of denotations as plural count nouns, that is, they have atoms. The difference between mass nouns and plural count nouns is in that for mass nouns, the atomicity is inherently vague. Minimal elements are too vaguely specified to be counted. In the case of count nouns, minimal elements are sufficiently well defined and are able to be counted. Important for our discussion is that in both plural count nouns and mass nouns, the denotations contain atomics. Thus, mass nouns satisfy the plurality presupposition of Q. Kinds are also assumed to have atoms, given that they are "the totality of the manifestations of that kind in that words" (Chierchia 2010: 115). Thus, kind-denoting nouns also satisfy the presupposition.

Chapter 3

Numeral-classifier sequences

The goal of this chapter is to investigate the syntax and semantics of numeral-classifier sequences in Japanese. In the previous chapter, we examined the strong quantifiers in the language. I showed that unlike the traditional Generalized Quantifier analysis, the Japanese strong quantifiers are located higher than DP: the postnominal strong quantifiers are in the head of QP and the prenominal ones are in Spec,QP. The Generalized Quantifier analysis treats numerals as "quantifier determiners" and they are in D position just like other quantifiers.

(1)



Recent studies, however, have argued that numerals are not quantifier determiners and proposed that cardinal numerals are analyzed as adjectives of type $\langle e, t\rangle$ (F. Landman 2004, Rothstein 2016) or as modifiers of type $\langle et, et\rangle$ (Ionin & Matushansky 2006). or as denoting natural number of type n (Rothstein 2013, Scontras 2013b). The first question to be answered is whether numeral-classifiers sequences in Japanese should be treated differently from strong quantifiers. In Section 3.1, I adopt a numeral-as-adjective analysis and examine

whether the analysis is applicable to numeral-classifier sequences in Japanese. I demonstrate that the numeral-as-adjective analysis is valid: numeral-classifier sequences in Japanese actually differ from the strong quantifies and they are DP-internal elements.

The second question is about word order variation. As seen in the strong quantifiers, numeral-classifier sequences also show word order variation, as exemplified in (2).

(2) a. *Prenominal numeral-classifier construction*
John-ga san-satsu-no hon-o yonda.
John-NOM 3-CL-GEN book-ACC read
'John read three books.'

b. *Postnominal numeral-classifier construction*
John-ga hon san-satsu-o yonda.
John-NOM book 3-CL-ACC read
'John read three books.'

In (2a), the numeral-classifier sequence appear before the noun and in (2b), the one comes after the noun. I assume that the word order variation is tightly connected to the syntax and semantics of numeral-classifier sequences. Any analysis of numeral-classifier sequences should explain how and why the word order can be varied in Japanese. It should be noted that even though the word order differs, prenominal and postnominal numeral-classifier constructions have the same interpretation. Thus, any compositional analysis should account for how the identical interpretation is derived from different word orders. To explore the syntax and semantics of numeral-classifier sequences, Section 3.2 and Section 3.3 devote the examination of the role of classifiers, which will be a key for both the syntax and semantics of numeral-classifier constructions. In Section 3.4, I propose the syntax of the prenominal and the postnominal numeral-classifier constructions. In Section 3.5 and Section 3.6, I discussed alternative analyses. I then offer a compositional analysis in Section 3.7. In Section 3.8, I explore the optionality of classifiers in Japanese based on the proposed syntactic and semantic analysis.

3.1 Numeral-classifier sequences as adjectives

Recent studies analyze numerals differently from strong quantifiers. A widely assumed view is that numerals are not the head of DP but they are DP-internal elements (Danon 2012, Ionin & Matushansky 2018, F. Landman 2004, Matthewson 2013, Rothstein 2017 , a.o). Rothstein (2017) points out that the combination of a noun and a numeral behaves differently from generalized quantifiers. As indicated in (3), nouns modified by numerals appear as predicates of copular sentences, whereas nouns modified by quantifiers cannot.

(3) a. The inhabitants of the barn are four cats.
b. #The guests are most students / some students. (Rothstein 2017: 18 (10))

In (3a), the noun *four cats* is used as the predicate, denoting the set of plurality having the property of being four cats. In (3b), since the quantificational noun denotes a generalized quantifier, it cannot be in the predicate position of the copular sentence. If numerals are quantifiers just like *most* or *some*, we expect that nouns modified by numerals cannot function as predicates. The well-formedness in (3a) indicates that numerals are not quantifier determiners in the sense of the Generalized Quantifier analysis.

When we adopt an analysis which assumes that numerals are adjectives (F. Landman 2004, Rothstein 2013, 2017 , a.o.) , the predicative use in (3a) is accounted for. Following the standard analysis, let us assume that count nouns are of type $\langle e, t\rangle$. Assume also that adjectives denote properties and hence they are of type $\langle e, t\rangle$. If numerals are also adjectives, they also denote properties and are of type $\langle e, t\rangle$. When a noun and a numeral are composed via the Predicate Modification (Heim & Kratzer 1998), the combination of a noun and a numeral denotes a set that are both in the denotation of the noun and the numeral, and hence is of type $\langle e, t\rangle$. Since the combination of a noun and a numeral denotes properties, they can be used as predicates.

The numeral-as-adjective analysis is also supported by the observations that numerals behave like adjectives. First, adjectives appear as predicates in copular sentences as in (4).

(4) a. My reasons are clear.
b. The children are tall.

Numerals can also appear as predicates in copular sentences as shown in (5).

(5) a. My reasons are two.
b. The children were two. (Rothstein 2013: 179 (2))

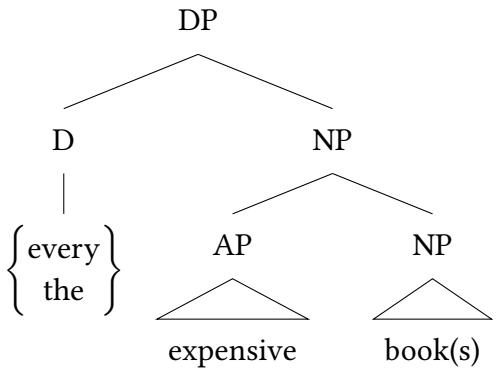
The examples in (5) indicate that the numerals function as predicates. In (5a), for example, the numeral *two* denotes the cardinality property of the reasons.

Second, attributive adjectives appear after *every* or a definite article *the*, as exemplified in (6).

(6) a. Every expensive book was stolen.
b. The expensive books were stolen.

Assuming that *every* and *the* are in D position and adjectives are NP-adjuncts, we have the following structure for the examples in (6).

(7)



Numerals can occur in attributive predicate position, which is after *every* and *the*.

(8) a. Every three book was stolen.
b. The three books were stolen.

These observations suggest that numerals are similar to adjectives syntactically and semantically. The examples in (8) also suggest that numerals are located lower than strong quantifiers are. It is, thus, reasonable to postulate that numerals do not occupy the head of DP (or QP given the discussion in the previous chapter) but a DP-internal position just like adjectives.

The question arises as to whether the numeral-as-adjective analysis is applicable to Japanese. Since Japanese is a classifier language and numerals cannot appear without classifiers, I will consider whether numeral-classifier sequences, instead of numerals, show similar behaviors as adjectives. Let us see whether (i) nouns modified by numeral-classifier sequences function as predicates, (ii) numeral-classifier sequences can appear as predicates in copular sentences and (iii) numeral-classifier sequences are located lower than strong quantifiers. First, as (9) shows, nouns modified by prenominal and postnominal numeral-classifier sequences can appear as predicates in copular sentences.

(9) a. Kyoo-no okyakusan-wa san-nin-no gengogakusya-da.
today-GEN guest-TOP 3-CL-GEN linguist-COP
'The guests are three linguistics.'

b. Kyoo-no okyakusan-wa gengogakusya san-nin-da.
today-GEN guest-TOP linguist 3-CL-COP
'The guests are three linguistics.'

In contrast, nouns modified by strong quantifiers cannot appear in the predicative position.

(10) a. *Kyoo-no okyakusan-wa {subete-no / hotondo-no} gengogakusya-da.
today-GEN guest-TOP {all-GEN / most-GEN} linguist-COP
'Lit. The guests are all the linguistics.'

b. *Kyoo-no okyakusan-wa gengogakusya {subete-da / hotondo-da}-da.
today-GEN guest-TOP linguist {all-COP / most-COP}
'Lit. The guests are all the linguistics.'

The contrast between (9) and (10) suggests that nouns modified by numeral-classifier sequences are predicates, whereas nouns modified by strong quantifiers are not. This observation is compatible with the analysis that numeral-classifiers are adjectives.

Second, adjectives function as predicates in copular sentences as in (11).

(11) a. Kyoo-no okyakusan-wa wakai.
today-GEN guest-TOP young
'The guest(s) are young.'

b. Katteiru doobutsu-wa ookii.
have.as.pets animal-TOP big
'The pet(s) I have is/are big.'

Numeral-classifier sequences in Japanese can also appear as predicates in copular sentences, as shown in (12).[1]

(12) a. Kyoo-no okyakusan-wa juu-ni-nin-da.
today-GEN guest-GEN number-TOP
'The guests are twelve today.'

b. Katteiru doobutsu-wa yon-hiki-da.
have.as.pets animal-TOP 4-CL-COP
'The pets I have are four.' (adopted from Sudo 2016: 8 (16-17))

Lastly, let us look at whether numeral-classifier sequences appear in attributive position. In Japanese, adjectives come before nouns but not after nouns.

(13) a. Kuroi neko-ga nigeta.
black cat -NOM
'(The/A) black cat ran away.'

b. *Neko kuroi-ga nigeta.
cat black-NOM ran.away
'Lit. (The/A) cat black ran away.'

In (13a), when the adjective is in front of the noun, the example is fine. In contrast, in (13b), when the adjective comes after the noun, the example is ungrammatical. It is irrelevant whether the nominal containing the adjective is in subject or object position. In (14), the nominal is in object position.

(14) a. Mary-wa kuroi neko-o nadeta.
Mary-TOP black cat-ACC stroked
'Mary stroked the/a black cat.'

b. *Mary-wa neko kuroi-o nadeta.
Mary-TOP cat black-ACC stroked
'Lit Mary stroked the/a cat black.'

Just like the examples in (13), the appearance of the adjectives after the noun makes the example ungrammatical.

1. In Chapter 4, I will point out that numeral-classifier sequences cannot appear in the predicate position of copular sentences when proper names or pronouns are in subject position.

Numeral-classifier sequences do not show the same pattern as adjectives in terms of the position relative to nouns, as we have already seen in (2).

(15) a. San-biki-no neko-ga nigeta.
3-CL-GEN cat-NOM ran.away
'(The) three cats ran away.'

b. Neko san-biki-ga nigeta.
cat 3-CL-NOM ran.away
'(The) three cats ran away.'

As illustrated in (15), the numeral-classifier sequence can appear before and after the head noun. This is also the case when the nominal is in object position.

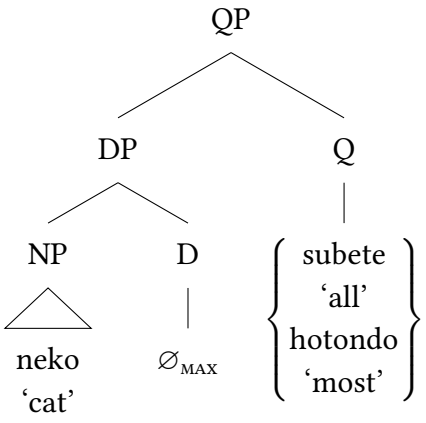
(16) a. Mary-wa san-biki-no neko-o nadeta.
Mary-TOP 3-CL-GEN cat-ACC stroked
'Mary stroked (the) three cats.'

b. Mary-wa neko san-biki-o nadeta.
Mary-TOP cat 3-CL-ACC stroked
'Mary stroked (the) three cats.'

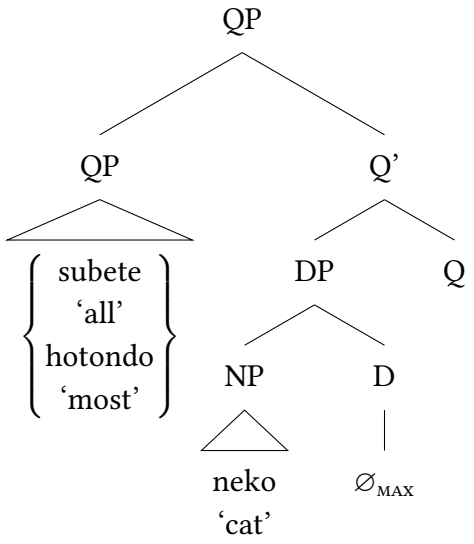
It is true that numeral-classifier sequences differ from adjectives in the syntactic behavior. However, semantically, numeral-classifier sequences are considered as predicative modifiers. For example, both in (16a) and (16b), the numeral-classifier sequence denotes the property having the cardinality of three.

In Chapter 2, I proposed that the strong quantifiers in Japanese *subete* 'all' and *hotondo* 'most' occupy the head of QP for the postnominal construction (17), whereas they are in Spec,QP for the prenominal construction (18).

(17) Postnominal

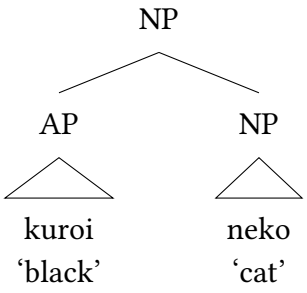


(18) Prenominal



Assume that just like in English, adjectives in Japanese are DP-internal elements, modifying an NP as represented in (19).

(19)



When an adjective co-occurs with a prenominal strong quantifier, we expect that the adjective must appear closer to the head noun than the strong quantifier, showing that the adjective is located lower than the strong quantifier. Consider the following examples.

(20) a. {Subete-no / Hotondo-no} kuroi neko-ga nigeta.
{all-GEN / most-GEN} black cat-NOM ran.away
‘All/Most of the black cats ran away.’

b. Mary-wa {subete-no / hotondo-no} kuroi neko-o nadeta.
Mary-TOP {all-GEN / most-GEN} black cat-ACC stroked
‘Mary stroked all/most of the black cats.’

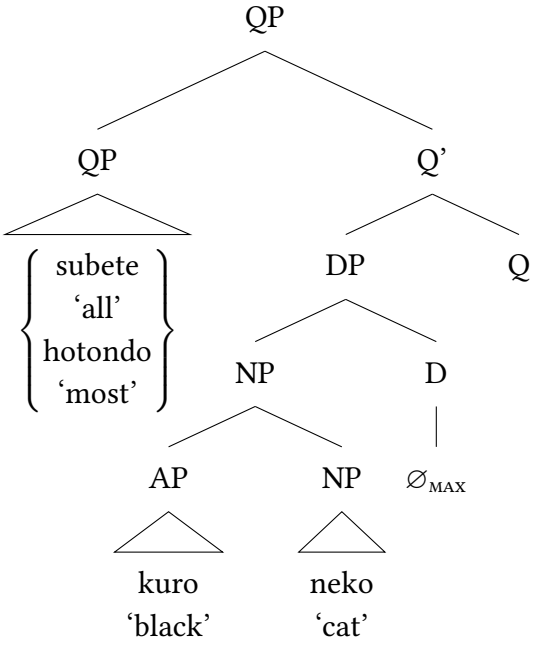
In (20), the adjective appears closer to the noun than the strong quantifiers. These examples are acceptable. When the order between the adjective and the strong quantifiers is reversed, the examples get ungrammatical, as demonstrated in (21).[2]

(21) a. */??Kuroi {subete-no / hotondo-no} neko-ga nigeta.
black {all-GEN / most-GEN} cat-NOM ran.away
'All/Most of the three cats ran away.'

b. */??Mary-wa kuroi {subete-no / hotondo-no} neko-o nadeta.
Mary-TOP black {all-GEN / most-GEN} cat-ACC stroked
'Mary stroked all/most of the black cats.'

The contrast between (20) and (21) suggests that the position of adjectives is lower than that of strong quantifiers, as represented in (22).

(22)



We also expect that an adjective can co-occur with a postnominal strong quantifier. This is shown in (23).

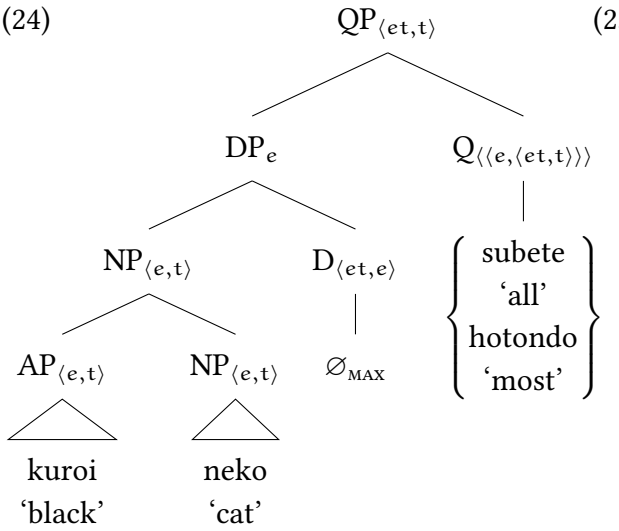
(23) a. Kuroi neko {subete-ga / hotondo-ga} nigeta.
black cat {all-NOM / most-NOM} ran.away
'All/Most of the black cats ran away.'

2. Whitman (1981) points out that sentences as in (21) are acceptable when the adjective preceding the strong quantifier is interpreted as a non-restrictive modifier.

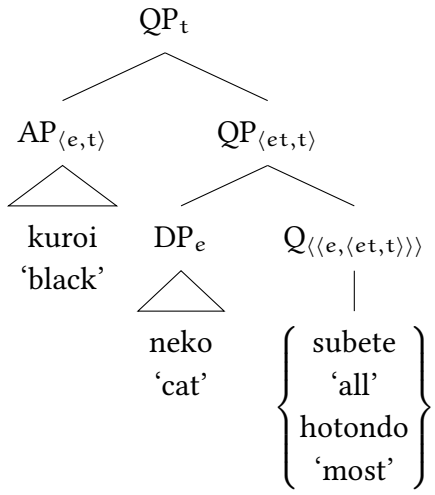
b. Mary-wa kuroi neko {subete-o / hotondo-o} nadeta.
Mary-TOP black cat {all-ACC / most-ACC} stroked
'Mary stroked all/most of the black cats.'

From the compositional point of view, the examples in (23) show that the adjective must be lower than the strong quantifier as indicated in (24). Compare an alternative structure in (25), in which the adjective is higher than the strong quantifier and modifies the QP.

(24)



(25)



Adjectives are restrictive modifiers and thus they are of type $\langle e, t\rangle$. I also assume that count nouns in Japanese are of type $\langle e, t\rangle$ (see the discussion in Chapter 2, Section 2.3). In (24), the adjective and the noun are combined and we have the $\langle e, t\rangle$-term. The derivation will succeed and the generalized quantifier is created. In contrast, as described in (25), if the adjective modifies the QP of type $\langle et, t\rangle$, the entire nominal becomes a t-type term. This must be incorrect. The nominal is in argument position and thus it must be an individual of type e or a generalized quantifier of type $\langle et, t\rangle$. Otherwise, the example will result in a type-clash. Given the assumption that adjectives are DP-internal elements and the proposed structure for the postnominal strong quantifier construction, the acceptability of (23) is straightforwardly captured.

Now, let us look at the relative height between numeral-classifier sequences and strong quantifiers. We will first see the case where a postnominal numeral-classifier sequence co-occurs with a postnominal strong quantifier. If the assumption that numeral-classifier sequences are adjectives and are located in a DP-internal position, we predict that a numeral-

classifier sequence must come closer to the head noun than a strong quantifier. T. Yoshida (1990) observes that a numeral-classifier sequence must come before a strong quantifier.

(26) a. John-no gakusei sanjuu-nin minna-ga Tokyo-e itta.
John-GEN student 30-CL all-NOM Tokyo-to went
'All the thirty students of John's went to Tokyo.'

b. Mary-wa John-no gakusei sanjuu-nin minna-o hometa.
Mary-TOP John-GEN student 30-CL all-ACC praised
'Mary praised all the thirty student of John's.' (T. Yoshida 1990: 322(4))

In the examples in (26), the numeral-classifier sequence *sanjuu-nin* comes right after the head noun *gakusei* 'student' followed by the strong quantifier *minna* 'all'. T. Yoshida points out that the postnominal elements must appear in this order. The reverse order results in ungrammaticality as shown in (27).

(27) a. *John-no gakusei minna sanjuu-nin-ga Tokyo-e itta.
John-GEN student 30-CL all-NOM Tokyo-to went
'All the thirty students of John's went to Tokyo.'

b. *Mary-wa John-no gakusei minna sanjuu-nin-o hometa.
Mary-TOP John-GEN student 30-CL all-ACC praised
'Mary praised all the thirty students of John's.'

The exact same pattern is found with other strong quantifiers such as *subete* 'all' and *hotondo* 'most'.

(28) a. Neko san-biki {subete-ga / hotondo-ga} nigeta.
cat 3-CL {all-NOM / most-NOM} ran.away
'All/Most of the three cats ran away.'

b. Mary-wa neko san-biki {subete-o / hotondo-o} nadeta.
Mary-TOP cat 3-CL {all-ACC / most-ACC} stroked
'Mary stroked all/most of the three cats.'

In (28), the numeral-classifier sequence comes before the strong quantifiers. The other order is not allowed as shown in (29).

(29) a. *Neko {subete / hotondo} san-biki-ga nigeta.
cat {all / most} 3-CL-NOM ran.away
'All/Most of the three cats ran away.'

b. *Mary-wa neko {subete / hotondo} san-biki-o nadeta.
Mary-TOP cat {all / most} 3-CL-ACC stroked
'Mary stroked all/most of the three cats.'

The ordering restriction suggests that postnominal numeral-classifier sequences are located at least lower than postnominal strong quantifiers.

When it comes to prenominal numeral-classifier sequences, they can co-occur with a postnominal strong quantifier as shown in (30).

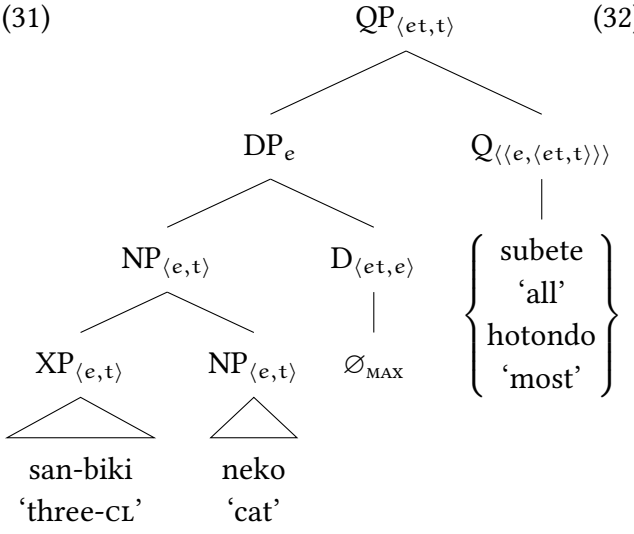
(30) a. San-biki-no neko {subete-ga / hotondo-ga} nigeta.
3-CL-GEN cat {all-NOM / most-NOM} ran.away
'All/Most of the three cats ran away.'

b. Mary-wa san-biki-no neko {subete-o / hotondo-o} nadeta.
Mary-TOP 3-CL-GEN cat {all-ACC / most-ACC} stroked
'Mary stroked all/most of the three cats.'

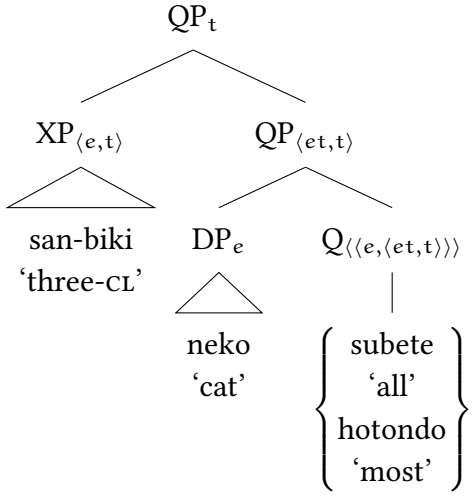
If we assume that the prenominal numeral-classifier sequence is an NP-modifier just like adjectives as indicated in (19), the acceptability of the examples in (30) is accounted for from the syntactic and compositional point of view, as demonstrated in (31) and (32).[3]

3. In Section 3.4, we will make a close examination of the position of prenominal numeral-classifier sequences. The examination shows that both numeral-classifier sequences and adjectives are DP-internal elements, but numeral-classifier sequences and adjectives are located in different position.

(31)



(32)



Just like the case where the adjective and the postnominal strong quantifier co-occur, the appropriate structure is (31). Again, (32) does not result in a right type.

It should be noted that a numeral-classifier sequence cannot co-occur with a prenominal strong quantifier regardless of the order between them. In (33), the prenominal strong quantifier occurs with the postnominal numeral-classifier sequence, which results in the unacceptability.

(33) a. *{Subete-no / Hotondo-no} neko san-biki-ga nigeta.
{all-GEN / most-GEN} cat 3-CL-NOM ran.away
‘All/Most of the three cats ran away.’

b. *Mary-wa {subete-no / hotondo-no} neko san-biki-o nadeta.
Mary-TOP {all-ACC / most-ACC} cat 3-CL-ACC stroked
‘Mary stroked all/most of the three cats.’

When both a numeral-classifier sequence and a strong quantifier appear prenominally, the examples are unacceptable in any order.

(34) a. *{Subete-no / Hotondo-no} san-biki-no neko-ga nigeta.
{all-GEN / most-GEN} 3-CL-GEN cat-NOM ran.away
‘All/Most of the three cats ran away.’

b. *Mary-wa {subete-no / hotondo-no} san-biki-no neko-o nadeta.
Mary-TOP {all-GEN / most-GEN} 3-CL-GEN cat-ACC stroked
‘Mary stroked all/most of the three cats.’

(35) a. *San-biki-no {subete-no / hotondo-no} neko-ga nigeta.
3-CL-GEN {all-GEN / most-GEN} cat-NOM ran.away
'All/Most of the three cats ran away.'

b. *Mary-wa san-biki-no {subete-no / hotondo-no} neko-o nadeta.
Mary-TOP 3-CL-GEN {all-GEN / most-GEN} cat-ACC stroked
'Mary stroked all/most of the three cats.'

The order in (34) should be allowed if numeral-classifier sequences behave like adjectives since adjectives can appear after a prenominal strong quantifier as we have seen in (20), repeated below as (36).

(36) a. {Subete-no / Hotondo-no} kuroi neko-ga nigeta.
{all-GEN / most-GEN} black cat-NOM ran.away
'All/Most of the black cats ran away.'

b. Mary-wa {subete-no / hotondo-no} kuroi neko-o nadeta.
Mary-TOP {all-GEN / most-GEN} black cat-ACC stroked
'Mary stroked all/most of the black cats.'

The ungrammaticality in (33)–(35) suggests that the co-occurrence of a numeral-classifier sequence and a prenominal strong quantifier is blocked for some independent reason. I will not investigate the ungrammaticality any further in this dissertation and leave this for future research.

We have seen that numeral-classifier sequences and adjectives in Japanese show similar syntactic and semantic properties, though the two expressions are not completely identical in the properties. In addition to this point that numeral-classifier sequences are predicative, a crucial observation is that numeral-classifier sequences are located lower than strong quantifiers. I will add one more observation that suggests that numeral-classifier sequences are DP-internal elements and they differs from strong quantifiers.

To see a further difference from strong quantifiers, we will look at whether domain restriction is required for numeral-classifier sequences in Japanese. In Chapter 2, we saw that the strong quantifies can quantify over restricted domain. This is achieved since the strong quantifiers take a DP and a determiner is responsible for the domain restriction. For example, in the examples in (37), the quantifier quantifies over the restricted domain, which involves a contextually salient set of apples.

(37) a. Mary-ga ringo subete-o tabe-owatta.
Mary-NOM apple all-ACC eat-finish
'Mary finish eating all the apples. '

b. Mary-ga subete-no ringo-o tabe-owatta.
Mary-NOM all-GEN apple-ACC eat-finish
'Mary finish eating all the apples. '

Due to the obligatoriness of the domain restriction in (37), the examples cannot be used in novel contexts where no set of apples are salient.

In contrast, bare nouns and nouns with adjectives can be used in novel contexts. Consider the following examples.[4]

(38) a. Mary-ga ringo-o tabeta
Mary-NOM apple all-ACC
'Mary ate an apple/apples. '

b. Mary-ga takai ringo-o tabeta
Mary-NOM expensive apple all-ACC
'Mary ate an expensive apple/expensive apples. '

In (38a), the noun is interpreted as an indefinite and introduces a new referent into the discourse. In other words, domain restriction is not involved and hence a DP is not projected. The same is true in (38b), where the adjective modifies the noun. This is an indication that adjectives are NP-modifiers.

If numeral-classifier sequences are NP-modifiers, we expect that nouns modified by numeral-classifier sequences can be used in familiar contexts. Let us examine the following examples.

(39) a. Mary-ga ringo san-ko-o motte-kita.
Mary-NOM apple 3-CL-ACC bring-came
'Mary bought three apples. '

b. Mary-ga sanko-no ringo-o motte-kita.
Mary-NOM 3-CL-Gen apple-ACC bring-came
'Int. Mary bought three apples.'

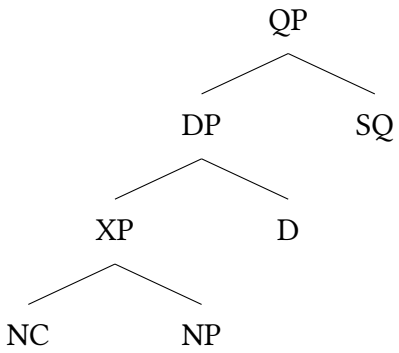
4. In (38), the simple verb-from *tabeta* 'ate' is used instead of the telic verb *tabe-owatta* 'finished eating'. This change aims to make an indefinite reading more salient. It should be noted that the use of the telic verb does not force an definite interpretation.

(39a) has the postnominal numeral-classifier sequence and (39b) involves the prenominal ones. Both of the examples can be used in novel contexts. The noun and numeral-classifier sequence *ringo sanko* and *sanko-no ringo* 'three apples' introduces a new referent into the discourse. This suggests that domain restriction is not obligatory. Thus, nouns modified by numeral-classifier sequences do not take a DP or modify a DP.

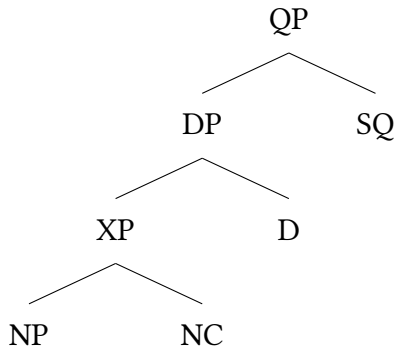
I have examined whether numeral-classifier sequences in Japanese can be analyzed as adjectives, following the observation made in Rothstein (2017) regarding numerals in English. We have seen that numeral-classifier sequences and adjectives are similar in three aspects, though the two show some differences.[5] Specifically, we have observed that (i) nouns modified by numeral-classifier sequences function as predicates, (ii) numeral-classifier constructions appear as predicates in copular sentences and (iii) numeral-classifier sequences are located in a DP-internal position.

Though detailed examination of the internal structure of numeral-classifier sequences has not made, a rough, schematic structure for nominals involving both strong quantifiers and numeral-classifier sequences would be represented in (40). SQ stands for a strong quantifier and NC a numeral-classifier sequence.

(40) a. A postnominal strong quantifier with a prenominal numeral-classifier sequence



b. A postnominal strong quantifier with a postnominal numeral-classifier sequence



I am not claiming here that prenominal and postnominal numeral-classifier sequences are sister of NPs. Crucial is the consequence that numeral-classifier sequences are located in a DP-internal position. A detailed analysis of the construction involving numeral-classifier sequences will be made in the reminder of the chapter.

5. I will show another difference between numeral-classifier sequences and adjectives in Section 3.6.

3.2 Background: the role of classifiers

To investigate the syntax and semantics of numeral-classifier constructions, it is vital to examine the role of classifiers. This is because depending on the role of classifiers of a language, how numerals, classifiers, and nouns are combined varies. Moreover, the semantics of classifiers is a reflection of the role of classifiers. In this section, I give theoretical background about the role of classifiers. Based on the background, in the next section (Section 3.3), I discuss the role of classifiers in Japanese.

Languages are divided into two types: classifier languages and non-classifier languages. Non-classifier languages allows numerals to modify nouns directly. For example, in English, numerals can directly combine with nouns, as illustrated in (41).

(41) a. three books
b. three students

In contrast, in classifier languages, numerals cannot directly modify a noun without a classifier.[6] For example, in Japanese, classifiers cannot be omitted when numerals are present.[7]

(42) Prenominal

a. san*(-satsu)-no hon
thee-CL-GEN book
'three books'

b. san*(-nin)-no gakusei
thee-CL-GEN student
'three students'

(43) Postnominal

a. hon san*(-satsu)
book thee-CL-GEN
'three books'

b. gakusei san*(-nin)-no
student thee-CL-GEN
'three students'

Neither the prenominal numeral-classifier construction in (42) nor the postnominal numeral-classifier construction in (43) allows the classifiers to be dropped.

The question arises as to why classifiers are required in classifier languages. There are two major proposals for the role of classifiers. Chierchia (1998a,b) claims that *classifiers are for nouns*: classifiers are required because of the property of nouns. In other words,

6. In some classifier languages, classifiers are optional. We will see optionality of classifiers in Section 3.2.3.
7. In Section 3.3.2, we will see exceptional cases where classifiers can be optional.

nouns in classifier languages are not compatible with the direct modification of numerals. They must change the property with the help of classifiers before numerals modify them. In contrast, Krifka (1995) argues that *classifiers are for numerals*: classifiers are required due to the property of numerals. In this analysis, numerals do not have an appropriate property for modifying nouns. Classifiers thus need to alter the property of numerals into a right type, which is able to modify nouns. Recent studies on the role of classifiers suggest that classifier languages are grouped into two types depending on the role of classifiers: for one type of languages, classifiers are for noun and for the other type, classifiers are for numerals (Bale & Coon 2014, Jenks 2011, Little, Moroney & Royer 2020). In the next two subsections, I will introduce the analyses by Chierchia (1998a,b) and Krifka (1995).

3.2.1 Chierchia (1998a,b)

Chierchia (1998a,b) argues that there is no difference in the interpretation of numerals between classifier and non-classifier languages. Classifier languages differ from non-classifier languages in the properties of nouns. According to Chierchia (1998a,b), non-classifier languages such as English have two types of nouns: one type has nouns that are directly combined with numerals (*count nouns*); the other type involves nouns that cannot be combined with numerals (*mass nouns*). Chierchia proposes that classifier languages have only one type of nouns which is similar to mass nouns in non-classifier languages. This type of nouns cannot be directly modifiable by numerals. In what follows, I adopt notation used in Bale & Coon (2014), which is a simplified version of Chierchia's (1998a,b). Also, I use English as a representative of non-classifier languages and Japanese classifier languages.[8]

Nominal interpretations in classifier and non-classifier languages are shown in (44).

(44) a. $[\![\text{table}]\!] = \{x\colon \textsc{atom}(x)\ \&\ \textsc{table}(x)\}$

b. $[\![\text{furniture}]\!] = {}^{\cap}\textsc{furniture}(\text{i.e., furniture-kind})$

c. $[\![\text{teeburu}]\!] = {}^{\cap}\textsc{table}(\text{i.e., table-kind})$

8. Chierchia (1998a,b) analyzes Mandarin Chinese. Since in his analysis, Japanese has the same property as Mandarin Chinese, his analysis can be extendable to Japanese.

The English count noun *table* denotes a set of atoms as in (44a). The English mass noun *furniture* in (44b) denotes a kind. The operator $\cap$ is a function from predicates to kinds.[9] The Japanese noun *teeburu* 'table' in (44c) also denotes a kind just like the English mass noun.

Chierchia (1998a,b) argues that counting requires that the extension of the object to be counted must be individuated or atomic, that is, it must be countable. In other words, nouns to be counted need to single out a set of atoms. According to Chierchia (1998a,b), count nouns can single out the relevant atoms, but kinds cannot. Thus, the direct modification by numerals is blocked for kind-denoting nouns. Chierchia suggests that kinds must be turned into atomic sets before numerals apply. This is what classifiers do: they convert kinds into sets of atoms, which is countable and thus numerals can apply. Denotations for a numeral *ni* 'two' and a classifier *ko* are shown in (45).

(45) a. $[\![\text{ni}]\!] = [\![\text{two}]\!] = \lambda P\colon \ \textsc{atomic}(P).\{x\colon {}^*P(x) \ \&\ \mu_{\#}(x) = 2\}$

b. $[\![\text{ko}]\!] = {}^{\cup}$ (i.e., the function from kinds to sets of atoms)

In (45), ATOMIC is a function true of predicates with atoms; $\mu_{\#}$ is a measure function from a group to the cardinality of that group; and * is a closure operator from a set of entities to the set of all sums that can be formed from those entities (Link 1983).[10] The numeral in (45a) denotes a function from atomic sets to sets of groups where each group consists of two individuals from the atomic set. The classifier *ko* in (45b) is a function from kinds to sets of atoms.[11]

9. The operator $\cap$ is defined in (i).

(i) For any property P and world or situation s ,
$^{\cap}P = \lambda s\ \iota P_s$, if $\lambda s\ \iota P_s$ is in K (the set of kinds)
undefined other wise
where P_s is the extension of P in s. (Chierchia 1998b: 351 (16))

(i) states that kinds are individual concepts, that is, "functions that at any world yield the totality of the manifestations of that kind in that world" (Chierchia 2010:115).

10. The following illustrates how the *-operator works. See also Chapter 2, Section 2.3.5.

(i) a. $[\![P]\!] = \{a, b, c\}$

b. $[\![{}^*P]\!] = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

11. In Chierchia's (1998a) original analysis, a kind is shifted to a complete semilattice via a operator π. A complete semilattice is mass and hence numerals cannot combine with it. A classifier maps a compete semilattice to atomic predicates. The $^{\cup}$ operator does these two jobs. Note also that $^{\cup}$ operator used in the discussion here differs from the one proposed in Chierchia's (1998b).

In classifier languages, the combination of a noun and a classifier is equal to count nouns in non-classifier language.

(46) $[\![\text{ko}]\!]([\![\text{teeburu}]\!]) = [\![\text{table}]\!] = \{x\colon \textsc{atom}(x)\ \&\ \textsc{table}(x)\}$

Since the noun *teeburu* 'table' denotes a kind, the classifier *ko* turns the noun into a countable object (i.e., a set of atoms). Thus, in Japanese, numerals can combine with a noun + classifier as shown in (47).

(47) $[\![\text{ni}]\!]([\![\text{ko}]\!]([\![\text{teeburu}]\!])) = [\![\text{two}]\!]([\![\text{table}]\!])$
$= \{x\colon x \in {}^*\{x\colon \textsc{atom}(x)\ \&\ \textsc{table}(x)\}\ \&\ \mu_{\#}(x) = 2\}$

(47) denotes a set of groups where each group consists of two tables. Note that since the noun *table* in English denotes a set of atoms and it is countable, a numeral can directly modify it.

In sum, in Chierchia (1998a,b), classifiers are for nouns: they are required to enable nouns to be countable and modifiable by numerals.

3.2.2 Krifka (1995)

Krifka (1995) proposes that the difference between classifier and non-classifier languages is not in nominals but in numerals. Thus, denotations of nominals in the two types of languages are equivalent as in (48). I continue to adopt Bale & Coon's (2014) simplified version of Krifka's (1995) analysis.[12]

(48) $[\![\text{teeburu}]\!] = [\![\text{table}]\!] = \{x\colon \textsc{atom}(x)\ \&\ \textsc{table}(x)\}$

In Krifka (1995), there are two types of numerals represented in (49a) and (49b).

(49) a. $[\![\text{two}]\!] = \lambda P\colon \textsc{atomic}(P).\{x\colon {}^*P(x)\ \&\ \mu_{\#}(x) = 2\}$
b. $[\![\text{ni}]\!] = \lambda m \lambda P\colon \textsc{atomic}(P).\{x\colon {}^*P(x)\ \&\ m(x) = 2\}$
c. $[\![\text{ko}]\!] = \mu_{\#}$

12. In Krifka's (1995) original analysis, nouns in English and Mandarin denote kinds. In the simplified version in Bale & Coon (2014) changes kind-denotations to atomic sets for simplicity.

As in the English numeral *two* in (49a), numerals in non-classifier languages have an incorporated measure function $\mu_{\#}$ and attache directly to nouns.[13] As shown in the Japanese numeral *ni* 'two' in (49b), numerals in classifier languages do not have a measure function in their lexical entries. They cannot combine with nouns due to the lack of a measure function. Numerals in classifier languages thus require a classifier which introduces a measure function as in (49c). In this analysis, a numeral + classifier combination in classifier languages is equivalent to a numeral in non-classifier languages, as demonstrated in (50).

(50) $[\![\text{ni}]\!]([\![\text{ko}]\!]) = [\![\text{two}]\!] = \lambda P\colon \textsc{atomic}(P).\{x\colon {}^{*}P(x)\ \&\ \mu_{\#}(x) = 2\}$

In (50), by attaching to the classifier *ko*, the numeral has the measure function. As a result, the numeral + classifier can combine with a noun as shown in (51).

(51) $([\![\text{ni}]\!]([\![\text{ko}]\!]))([\![\text{teeburu}]\!]) = [\![\text{two}]\!]([\![\text{table}]\!])$
$= \{x\colon x \in {}^{*}\{x\colon \textsc{atom}(x)\ \&\ \textsc{table}(x)\}\ \&\ \mu_{\#}(x) = 2\}$

In sum, in Krifka (1995), classifiers are for numerals: they are needed because numerals in classifier languages lack a measure function, without which there is no clue how numerals are applied to the denotation of nouns (see also Wilhelm 2008).

3.2.3 Idiosyncrasy

It has been known that in some classifier languages, the presence or absence of classifiers is completely optional such as Western Armenian (Bale & Khanjian 2009, Borer 2005). In other classifier languages, the presence or absence of classifiers is not completely optional such as Mi'gmaq (Algonquian), Chol (Mayan) and Dafing (Mande: Burkina Faso) (Bale & Coon 2014, Jenks 2017). Bale & Coon (2014) point out that Chierchia's (1998a,b) and Krifka's (1995) theories make different predictions for the distribution of classifiers within a single classifier language which shows partial optionality of classifiers. In Chierchia (1998a,b), since nouns require classifiers, it is possible that the presence/absence of classifiers depends on nouns. In other words, some nouns might not need classifiers and be able to be modified directly by numerals without classifiers. Thus, nouns behave idiosyncratically

13. In Krifka (1995), the measure function is represented by a different symbol, OU ('object unit').

with respect to the numeral modification: In Krifka (1995), on the contrary, since numerals require classifiers, there are possibilities that the presence/absence of classifiers depends on numerals: some numerals do not need classifiers when they modify nouns. That is, numerals show idiosyncratic patterns.

Bale & Coon (2014) examine data from Mi'gmaq (Algonquian) and Chol (Mayan) and show that the presence/absence of classifiers depends on numerals. Some numerals require classifiers, whereas some numerals cannot appear with classifiers. Thus, numerals in these languages behave idiosyncratically. For example, in Mi'gmaq, numerals 1–5 cannot co-occur with classifiers whereas numerals 6 and higher must.

(52) a. na'n (*te's)-ijig ji'nm-ug
five CL-AGR man-PL
'five men'

b. asugom *(te's)-ijig ji'nm-ug
six CL-AGR man-PL
'six men'

(Bale & Coon 2014: 700: (11-12))

Bale & Coon (2014) argue that this idiosyncrasy of numerals is compatible with Krifka's (1995) classifier-for-numeral analysis but not with Chierchia's (1998a,b) classifier-for-noun one. They also show that in Chol and Mi'gmaq, numerals and classifiers form a constituent to the exclusion of nouns. In Chol, classifiers are attached to numerals as suffixes. In Mi'gmaq, numerals and classifiers cannot be intervened by any element. These syntactic facts are compatible with Krifka's (1995) analysis.

Jenks (2017), on the other hand, observes that in Dafing (Mande: Burkina Faso), certain nouns are not compatible with classifiers. For example, while a classifier for non-humans *dèn* is optional for *wúrú* 'dog' as in (53a), it must be absent for *té:* 'day' as in (53b).

(53) a. wúrú (dèn) flá
dog CL two
'two dogs' (Jenks 2017: 2 (13a))

b. té: (*dèn) flá
day CL two
'two days' (ibid.: 5 (40b))

Similarly, a classifier for human *mɔ́* is obligatory, but it cannot occur with compounds made with the provenancal suffix *-kà*.[14]

(54) a. kɔ̂: *(mɔ́) ꜜflà
father CL two
'two fathers' (ibid.: 2 (13b))

b. bóbóó-ꜜkà (*mɔ́) flà
bobo-KA CL two
'two boboeses (people from Bobo)' (ibid.: 6 (41c))

Note that the plural marker *=ru* can be attached to *té:* 'day' and *bóbóó-kà,*, showing that they are nouns.[15]

(55) a. té:-rú
day-PL
'days' (ibid.: 5 (40a))

b. bóbóó-ꜜkà-rú
bobo-KA-PL
'boboses' (ibid.: 6 (41b))

Given the idiosyncratic patterns of nouns, Jenks (2017) argues that in Dafing, classifiers are for nouns, not for numerals, as predicted in Chierchia's (1998a,b) analysis.

The analyses of the three languages indicate a possibility that there are two kinds of classifier languages (Bale & Coon 2014, Jenks 2017, Little, Moroney & Royer 2020):

(56) a. Type 1: classifiers are for nouns (Daing)

b. Type 2: classifiers are for numerals (Mi'gma and Chol)

The two analyses, Chierchia (1998a,b) and Krifka (1995), correspond to each type. In this sense, both the analyses are on the right track.

14. Here, the provenancal suffix *-kà* is glossed as -KA.
15. Plural makers cannot occur with numerals or numeral classifiers.

(i) *wúrú dèn sába=ꜜŕu
dog CL three-PL
'three dogs' (ibid.: 4 (25c))

3.3 The role of classifiers in Japanese

Let us now discuss whether classifiers in Japanese are categorized as the classifier-for-noun type as in Chierchia (1998a,b) or the classifier-for-numeral type as in Krifka (1995). I argue that in Japanese, classifier are for numerals. The discussion is base on four points: (i) countability of nouns, (ii) idiosyncrasy of numerals, (iii) morphophological relation between numerals and classifiers and (iv) constituency between nouns and classifiers.

3.3.1 Countability

Chierchia's analysis is based on the assumption that Japanese nouns are mass nouns denoting kinds and they are not countable. I present three sets of data that show that Japanese nouns are countable. First, though Japanese is considered as an obligatory classifier language, classifiers can be optional under some environment. Generally speaking, in Japanese, numerals cannot modify nouns without classifiers. However, under some circumstance, classifiers can be omitted and numerals can directly modify nouns. Sudo (to appear) observes that classifiers tend to be optional with numerals expressing large numbers, as exemplified in (57).[16]

(57) Daitooryoo-wa shichoosha-kara yoserareta hyaku-(ko)-no shitsumon-ni
president-TOP viewer-from were.sent 100-(CL)-GEN question-to
kaitooshita.
answer
'The president answered 100 questions viewers asked.' (Sudo to appear: (8))

Largeness of numerals would be relativized to head nouns. Nomoto (2013) observes that when a numeral modifies *gengo* 'language', it can be relatively small such as *juu-go* 'fifteen' and the classifier can be omitted as in (58).[17]

16. I point out in Section 3.5.4 that the optionality of classifiers is restricted to the prenominal numeral-classifier construction.

17. For the noun 'language', it seems that numbers should be at least 10 to make the classifier optional.

(i) John-wa { *san / ??kyuu / juu }-no gengo-o shirabeta.
John-TOP { 3 / 9 / 10 }-GEN language investigated
'John investigated three languages'

(58) John-wa juu-go-(ko)-no gengo-o shirabeta.
John-TOP 10-5-(CL)-GEN language investigated
'John investigated fifteen languages'
(Nomoto 2013: 16 (16) with a slight modification)

In addition, classifiers can be optional for non-specific (or approximate) numbers. Again, the number can be small depending on the head noun, as shown in (59b) and (59c).

(59) a. Chikyuu-joo-ni-wa yaku sen-go-hyaku-(ko)-no kazan-ga aru.
earth-on-LOC-TOP about 1000-5-100-CL-GEN volcano-NOM exist
'There are about 1500 volcanoes on earth.' (Sudo to appear: (8))

b. John-wa ni san-(nin)-no gakusei-to hanashita.
John-TOP two three-CL-GEN student-with talked
'John talked with two or three students'
(Nomoto 2013: 16 (16) with a slight modification)

c. John-wa juu-suu-(ko)-no shima-o otozureta.
John-TOP 10-some-CL-GEN island-ACC visited
'John visited a dozen islands' (ibid.:16 (16) with a slight modification)

These examples show that the obligatoriness/optionality of classifiers depends on types of numerals.

The optionality of classifiers challenges the assumption that Japanese nouns are uncountable. If classifiers are required to make nouns countable, classifier-less nouns are still uncountable. Since numerals modify countable nouns, the classifier-less examples must not be generated. The fact that classifiers can be optional suggests that nouns have countable denotations and hence numerals can combine with nouns without classifiers. Therefore, the optionality of classifiers indicates that nouns have countable denotations.

One might suggest that the optionality of classifiers can be accounted for by assuming phonologically null classifiers. The optionality is just a apparent phenomena and there exist covert classifiers. In Section 3.8.3, I will come back this issue and argue that the null classifier analysis faces a difficulty.

Second, Sudo (to appear) provides another piece of evidence for the existence of countable nouns in Japanese. He points out that certain counting modifiers are only combined with countable nouns but not with uncountable nouns such as mass nouns. Consider the following

examples.

(60) a. *tasuu* 'many'
Kinou-no jiko-de-wa tassuu-no shisya-ga deta yooda.
yesterday-GEN accident-LOC-TOP many-GEN fatality-NOM came.out EVIDE
'It seems that the accident yesterday resulted in many fatalities.'

b. *shoosuu* 'a few'
Shoosuu-no yuufukuna hito-nomi-ga yuuguusareteiru.
a.few-GEN wealthy person-only-GEN be.treated.well
'Only a few wealthy people are treated well.'

c. *nan-byaku-to-iuu* 'hundreds' (lit. 'what-100-COMP-say')
Sono tookoo-ni nan-byaku-toiuu komento-ga tsuita.
that post-to what-100-say comment-NOM provided
'That post got hundreds of comments.' (Sudo to appear: (9))

These modifiers cannot combine with uncountable nouns such as *ase* 'sweat'.

(61) a. #Taro-wa tasuu-no ase-o kaita.
Taro-TOP many-GEN sweat-ACC secreted
'Int. Taro sweated a lot.'

b. #Taro-wa nan-byaku-toiuu ase-o kaita.
Taro-TOP what-100-say sweat-ACC secreted
'Int. Taro sweated a lot.' (ibid.(10))

c. #Taro-wa shoosuu-no ase-o kaita.
Taro-TOP many-GEN sweat-ACC secreted
'Int. Taro sweated a few.'

The contrast between (60) and (61) suggests that Japanese has a distinction between countable and uncountable nouns. Those nouns that the three types of modifiers attache to in (60) are nouns with countable denotations. In contrast, the nouns in (61) are uncountable.

Moreover, these modifiers cannot occur with classifiers. When a relevant classifier is inserted in the felicitous examples in (60), all the examples become unacceptable, as shown in (62).

(62) a. *tasuu* 'many'

*Kinou-no jiko-de-wa tassuu-**nin**-no shisya-ga deta
yesterday-GEN accident-LOC-TOP many-CL-GEN fatality-NOM came.out
yooda.
EVIDE
'It seems that the accident yesterday resulted in many fatalities.'

b. *shoosuu* 'a few'

*Shoosuu-**nin**-no yuufukuna hito-nomi-ga yuuguusareteiru.
a.few-CL-GEN wealthy person-only-GEN be.treated.well
'Only a few wealthy people are treated well.'

c. *nan-byaku-to-iuu* 'hundreds' (lit. 'what-100-COMP-say')

*Sono tookoo-ni nan-byaku-**ko**-toiuu komento-ga tsuita.
that post-to what-100-CL-say comment-NOM provided
'That post got hundreds of comments.'

Since classifiers must not be involved, what makes the nouns countable is not classifiers. Thus, countability must be encoded in the semantics of nouns.

One might assume that these modifiers encode a function that makes uncountable nouns countable or involve a null classifier. As pointed out by Sudo (to appear), this assumption raises the question why numerals need (overt) classifiers. It would be possible to assume that numerals also have a built-in classifier-like function. However, among modifiers of nouns, only numerals need classifiers. Therefore, we must stipulate that some modifiers contain a classifier-like function and others do not. If we postulate, instead, that Japanese nouns have countable denotations and classifiers are required due to the property of numerals, we can account for why the modifiers under the discussion do not need classifiers, whereas numerals need them.

The third set of data is regarding distributive quantifiers. English mass nouns, but not count nouns, are not compatible with a distributive quantifier *every* (Rothstein 2010).

(63) a. *every furniture

b. *every water

c. every book

Watanabe (2006) points out that Japanese shows the same pattern.

(64) a. John-wa dono hon-mo yonda.
John-TOP which book-MO read
'John read every book.'

b. *John-wa dono mizu-mo nonda.
John-TOP which water-MO drank
'Lit. John drank every water.'

The distributive quantifier consists of wh-word, noun and expression *mo*. In (64a), the noun is a countable noun *hon* 'book', whereas in (64b), the noun is a mass noun *mizu* 'water'. If all nouns in Japanese are associated with mass nouns, the contrast between (64a) and (64b) is not expected. In contrast, if Japanese distinguishes between count and mass nouns, and the denotation of countable nouns are equivalent to English count nouns, the pattern is not surprising. In addition, Watanabe (2006) notes that the distributive universal quantifier is not compatible with the presence of classifiers as indicated in (65).

(65) *John-wa dono-**satsu**-no hon-mo yonda.
John-TOP which-CL-GEN book-MO read
'John read every book.'

Watanabe (2017) argues that the example of the distributive universal quantifier indicates that classifiers in Japanese do not function as a converter from kinds to sets of atoms, namely, from uncountable nouns to countable ones. Cross-linguistically, distributive universal quantifiers require singular nouns (Gil 1995). If this generalization holds in Japanese, the distributive universal quantifier in Japanese combines with singular nouns. In Chierchia's analysis, classifiers is responsible for making singularity (i.e., countable denotations or sets of atoms). However, (64a) and (65) show that singularity is not created by classifiers. Thus, countable denotations must be encoded in the semantics of nouns.

The three sets of data that we have observed constitute evidence against Chierchia's analysis that classifiers are for nouns. Japanese nouns have countable nouns, and the countability is in the semantics of nouns. Thus, for numerals to modify nouns, the job of classifiers is not to make nouns countable, since they are already countable.

3.3.2 Idiosyncratic numerals

The second point is about idiosyncratic behaviors of numerals. As we have seen in the previous section (Section 3.3.1), the prenominal numeral-classifier construction shows the optionality of classifiers depending on the type of numerals. As shown in (57) and (58), repeated below as (66) and (67), classifiers can be omitted when numerals express large numbers.

(66) Daitooryoo-wa shichoosha-kara yoserareta hyaku-(ko)-no shitsumon-ni
president-TOP viewer-from were.sent 100-(CL)-GEN question-to
kaitooshita.
answer
'The president answered 100 questions viewers asked.' (Sudo to appear: (8))

(67) John-wa juu-go-(ko)-no gengo-o shirabeta.
John-TOP 10-5-(CL)-GEN language investigated
'John investigated fifteen languages'
(Nomoto 2013: 16 (16) with a slight modification)

Another case where classifiers can be optional is when numerals denote non-specific (or approximate) numbers, as (59), repeated as (68), illustrates.

(68) a. Chikyuu-joo-ni-wa yaku sen-go-hyaku-(ko)-no kazan-ga aru.
earth-on-LOC-TOP about 1000-5-100-CL-GEN volcano-NOM exist
'There are about 1500 volcanoes on earth.' (Sudo to appear: (8))

b. John-wa ni san-(nin)-no gakusei-to hanashita.
John-TOP two three-CL-GEN student-with talked
'John talked with two or three students'
(Nomoto 2013: 16 (16) with a slight modification)

c. John-wa juu-suu-(ko)-no shima-o otozureta.
John-TOP 10-some-CL-GEN island-ACC visited
'John visited a dozen islands' (ibid.:16 (16) with a slight modification)

Classifiers can be dropped when numerals express large numbers or non-specific numbers. This idiosyncratic pattern in Japanese is compatible with the classifier-for-numeral analysis. Since classifiers are required due to the property of numerals, some numerals need classifiers and others do not. This pattern is similar to the case in Mi'gmaq and Chol observed in Bale

& Coon (2014), where the optionality of classifiers is determined by the type of numerals. Thus, the optionality of classifier in Japanese indicates that classifiers are for numerals.

There is another kind of idiosyncrasy of numerals. In Japanese, there are two types of numerals: native and Sino-Japanese numerals as shown in Table 3.1.

	1	2	3	4	5	6	7	8	9	10
Native	hito-	futa-	mi-	yo(n)	itsu-	mu-	nana	ya-	kokono-	too
Sino-Japanese	ichi	ni	san	shi	go	roku	shichi	hachi	kyuu	juu

Table 3.1: Numerals in Native and Sino-Japanese

Native Japanese numerals, which are limited to number 1–10, cannot stand independently, except 4, 7 and 10. That is, they are bound morphemes. Although Sino-Japanese numerals can be used independently, native Japanese numerals would suggest that Japanese numerals are affixal in nature. On the one hand, Sino-Japanese numerals require classifiers. On the other hand, native Japanese numerals does not. Thus, the obligatoriness of classifiers depends on the types of numerals.

Furthermore, Japanese classifiers can be divided into native and Sino-Japanese classifiers. As pointed out by Nomoto (2013), a general tendency is that native Japanese numerals and native Japanese classifiers are combined, where as Sino-Japanese numerals and Sino-Japanese classifiers are combined. For example, a classifier *tsu* is a native Japanese classifiers, whereas *ko* is a Sino-Japanese one. The (un)acceptability depends on the combination, as illustrated in the following examples.

(69) native nume. + native cl.

a. hito-tsu
1-CL

b. huta-tsu
2-CL

(70) Sino-Jpn nume. + native cl.

a. *ichi-tsu
1-CL

b. *ni-tsu
2-CL

(71) native nume. + Sino-Jpn cl.

a. *hito-ko
1-CL

b. *huta-ko
2-CL

(72) Sino-Jpn nume. + Sino-Jpn cl.

a. ik-ko
1-CL

b. ni-ko
2-CL

The examples show the general pattern. Since which type of classifiers is required is determined by the type of numerals, this is also a kind of idiosyncrasy of numerals.

We have seen three sets of idiosyncratic patterns of numerals. The three sets of idiosyncrasy in Japanese are compatible with the classifier-for-numeral analysis.

3.3.3 Morpho-phonological effects

The third point is about morpho-phonological effects between numerals and classifiers. The combination of numerals and classifiers shows some morpho-phonological effects. For example, the form of some classifiers alters depending on the preceding numerals. Consider the following examples in which *hon*, a classifier for counting cylindrical objects such as pens or fingers, shows the alternations *pon* and *bon*.

(73) a. ichi + hon → ip-**p**on
1 CL

b. ni + hon → ni-hon
2 CL

c. san + hon → san-**b**on
3 CL

When the classifier is preceded by *ni* 'two', no alternation happens as in (73b). When it combines with *ichi* 'one', as in (73a), the *h* becomes the voiceless bilabial *p*. In addition, the preceding numeral changes the form. In (73c), a *rendaku*-type alternation is found, that is, *h* becomes the corresponding voiced bilabial *b*.

In addition to the alternation of the forms of classifiers, the forms of numerals also change depending on the following classifiers. The following examples are the combination of numerals 1, 6, 8 and 10 and a classifier *ko*, which is used to counts inanimate objects.

(74) a. ichi + ko → ik-ko
1 CL

b. roku + ko → rok-ko
6 CL

c. hachi + ko → hak-ko
8 CL

d. juu + ko → juk-ko
10 CL

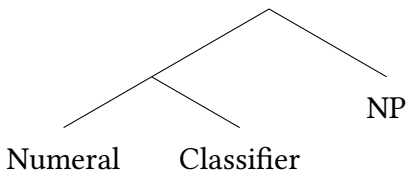
Similar to (73a), the forms of the numerals 1, 6, 8 and 10 assimilate the first consonant of the classifier, yielding geminates.

The morpho-phonological effects found in the combination of numerals and classifiers indicates the tight connection between numerals and classifiers. This tight connection is naturally accounted for by the classifier-for-numeral analysis, since numerals require classifiers. By contrast, it is not clear from the point of the classifier-for-noun analysis why such tight connection exists.

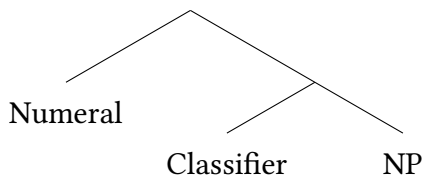
3.3.4 Constituency

The last point is about the constituency among nouns, numerals and classifiers. If we assume that there is a transparent relation between syntax and semantics (Bale & Coon 2014, Bale, Coon & Arcos 2019, Little, Moroney & Royer 2020), the classifier-for-numeral analysis expects that a classifier and a numeral form a constituent to the exclusion of a noun, as represented in (75a). On the other hand, the classifier-for-noun analysis predicts that a noun and a classifier form a constituent to the exclusion of a numeral, as illustrated in (75). For the following diagrams, head direction is irrelevant.

(75) a. Classifier-for-numeral



b. Classifier-for-noun



In some languages, the constituency of nouns and classifiers is visible in bare classifier constructions in which a classifier appears without a numeral, as (76) demonstrates.

(76) a. Cantonese
Zek gau gamjat dakbit tengwaa.
CL dog today special obedient
'The dog is specially obedient today.' (Cheng & Sybesma 1999: 511(4b))

b. Mandarin
Wo xiang kan ben shu.
I would.like read CL book
'I would like to read a book.' (ibid. (525(27a)))

c. Vietnamese
kEmera-Ta khub dami.
camera-CL very expensive
'The camera was/is expensive.' (Simpson, Soh & Nomoto 2011: 170(6))

d. Hmong
Lub koob thaij duab kim kim heev.
CL camera expensive expensive very
'The camera was/is expensive.' (Nomoto 2013: 138(9))

e. Thai
thúrian lûuk níi
durian CL this
'this durian' (Jenks 2011: 82 (27))

The bare classifier construction is naturally explained by the classifier-for-noun analysis.

In Japanese, however, there is no empirical evidence which suggests the constituency between nouns and classifiers. Japanese dose not allow the bare classifier construction.

(77) a. *Hiki-no neko-ga nigeta.
CL cat-GEN ran.away
'Lit. Cat(s) ran away.'

b. *Neko hiki-ga nigeta.
cat CL-NOM ran.away

(78) a. Ni-hiki-no neko-ga nigeta.
2-CL cat-GEN ran.away
'Lit. Two cats ran away.'

b. Neko ni-hiki-ga nigeta.
cat 2-CL-NOM ran.away

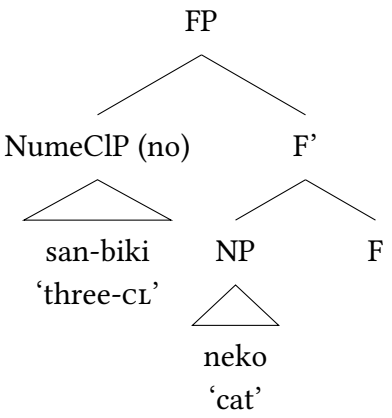
The unavailability of the bare classifier construction indicates that in Japanese, a noun and a classifier do not form a constituent to the exclusion of a numeral. The lack of the bare classifier construction is compatible with the classifier-for-numeral analysis, where what form a constituent is a numeral and a classifier.

In summary, the four empirical facts support the analysis that Japanese classifiers are for numerals and not nouns. Based on the discussion, in the next section, I will propose the syntax of Japanese numeral-classifier constructions.

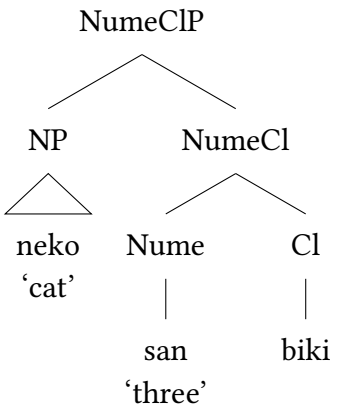
3.4 Syntax of numeral-classifier constructions in Japanese

This section explores the syntax of numeral-classifier constructions in Japanese. I first propose that a numeral and a classifier form a complex head NumeCl. I then propose that the prenominal and postnominal numeral-classifier constructions have a different structure. Specifically, I suggest that prenominal numeral-classifier sequences occupy a specifier position, whereas postnominal numeral-classifier sequences are heads that select an NP, as represented in (79).

(79) a. *Prenominal*



b. *Postnominal*



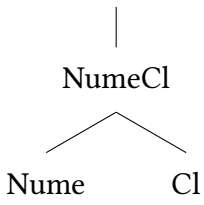
This analysis is based on the proposal in Danon (2012), who argues that the structure of numeral-noun constructions can vary within a single language and across languages. I will show that the analysis straightforwardly captures the word order variation in Japanese. In addition, it accounts for several asymmetries between the two orders, which is discussed in

Section 3.5.4.

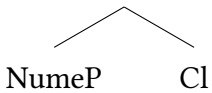
3.4.1 The complex head analysis

In the discussion of the role of classifiers in Japanese in the previous section (Section 3.3), I argued that a numeral and a classifier form a constituent (see also Bale & Coon 2014, Bale, Coon & Arcos 2019, Little, Moroney & Royer 2020). There are two possible structures that represent the constituency, as illustrated in (80).

(80) a.



b.



In the structure in (80a), a classifier and a numeral form a complex head and projects Numeral-Classifier Phrase (NumeClP) (cf. Kitahara 1993, Kawashima 1998). By contrast, in the structure in (80b), classifiers head the projection Classifier Phrase (ClP), which take a Numeral Phrase (NumeP) which is the projection of numerals (cf. Fukui & Takano 2000, Saito, Lin & Murasugi 2008).

The morpho-phonological effect and the affixal nature of numerals observed in the previous section can be naturally understood by assuming that a numeral and a classifier form a complex head, since in general affixation is considered as a process of head-head relation (Matushansky 2006). However, Embick & Noyer (2001) and Embick (2007) argue that affixation is possible between a phrase and a head when they are adjacent. The morpho-phonological effect, thus, is not a strong support for one structure over the other.

The complex-head analysis is particularly supported by the observations that modified numerals cannot appear in postnominal position, while they can appear in prenominal position. Consider the following examples, in which a superlative modifier *sukunakutomo* 'at least' is used (the example (81b) is adopted from Watanabe (2008: 535 n.2), though the judgment is my own).

(81) a. Sukunakutomo go-dai-no kuruma-ga nusuma-are-ta.
at.least 5-CL-GEN car-NOM steal-PASS-PAST
'At least five cars were stolen.'

b. */???kuruma sukunakutomo go-dai-ga nusuma-are-ta.
car at.least 5-CL-NOM steal-PASS-PAST
'At least five cars were stolen.'

In (81a), the modified numeral comes in the prenominal position. The example is well-formed without controversy. In contrast, in (81b), the modified numeral appear postnominally. The example is unacceptable or marginal at best.[18] The same pattern is found in approximate numerals which involves expressions such as *between* and *roughly*, as illustrated in (82) and (83), respectively.[19]

18. Watanabe (2008: 535 n.2) notes that the modified numeral can appear postnominally. However, all the native speaker I consulted do not agree with his judgments. When a short pause is inserted after the head noun *kuruma* 'car', the example becomes acceptable. I assume that the short pause makes the structure different from the one without such pause. It seems that the example with the pause has a partitive interpretation which is equivalent to the one generated in the following partitive construction in (ia). Compare (ia) and (ib) ('//' indicates a pause.) I added a relative clause to make the sentence natural.

(i) a. [John-no mise-de kazatteatta] kuruma-no sukunakutomo go-dai-ga nusuma-are-ta.
[John-GEN shop-at be.displayied] car-GEN at.least 5-CL-NOM steal-PASS-PAST
'At least five of the cars that were displayed at John's shop were stolen.'

b. [John-no mise-de kazatteatta] kuruma // sukunakutomo go-dai-ga nusuma-are-ta.
[John-GEN shop-at be.displayied] car at.least 5-CL-NOM steal-PASS-PAST

Note that a partitive interpretation is not available for unmodified numeral-classifier sequence even if a pause is added. Compare the partitive construction in (iia) and the plain numeral-classifier construction in (iib).

(ii) a. [John-no mise-de kazatteatta] kuruma-no go-dai-ga nusuma-are-ta.
[John-GEN shop-at be.displayied] car-GEN 5-CL-NOM steal-PASS-PAST
'Five of the cars that were displayed at John's shop were stolen.'

b. [John-no mise-de kazatteatta] kuruma (//) go-dai-ga nusuma-are-ta.
[John-GEN shop-at be.displayied] car 5-CL-NOM steal-PASS-PAST
'Five cars that were displayed at John's shop were stolen.'

I thus suggest that the superlative modifier cannot appear before a numeral-classifier sequence in the postnominal numeral-classifier construction.

It should be noted that the superlative modifier can appear in front of the head noun in the postnominal numeral-classifier construction.

(iii) Sukunakutomo neko san-biki-ga nigeta.
at.least cat 3-CL-NOM ran.away
'At least three cats ran away.'

19. Just like the superlative case, in (82)–(83), adding a short pause after the head noun makes the unacceptable postnominal constructions better.

(82) a. John-wa san-jut-too-kara yon-jut-too-no hitsuji-o katteiru.
John-TOP 3-10-CL-from 4-10-CL-GEN sheep-ACC has
'John has between thirteen and fourteen sheep.'

b. */??? John-wa hitsuji san-jut-too-kara yon-jut-too-o katteiru.
John-TOP sheep 3-10-CL-from 4-10-CL-ACC has
'John has between thirteen and fourteen sheep.'

(83) a. John-wa daitai yon-jut-too-no hitsuji-o katteiru.
John-TOP roughly 4-10-CL-GEN sheep-ACC has
'John has roughly fourteen sheep.'

b. */??? John-wa hitsuji daitai yon-jut-too-o katteiru.
John-TOP sheep roughly 4-10-CL-ACC has
'John has roughly fourteen sheep.'

In (82) and (83), the prenominal numeral-classifier sequence with the approximative modifier is fine, whereas the postnominal one is not.

Modified numerals are considered as phrasal elements. Generally speaking, maximal projections can contain a phrasal element, whereas (complex) heads cannot. If we assume that the postnominal numeral-classifier construction contains the complex head (80a), the impossibility of postnominal modified numerals is accounted for. Since a numeral and a classifier form a complex head, modified numerals cannot be contained in the complex head.

For the prenominal numeral-classifier construction, the availability of modified numerals as observed in (81)–(83) would imply that numerals should be phrasal. However,I will show that this does not have to be. Let us start with modified numerals in English. One analysis for modified numeral is to assume that modifiers attach to numerals, as demonstrated in (84).

(84) a. [[at least three] cats]

b. [[more than three] cats]

As the bracketing shows, the superlative and comparative modifiers form a constituent with a numeral and therefor it appears that modified numerals should be phrasal. Watanabe (2006), for example, claims that the same is also true in Japanese as shown in (85) (The comparative modifier in Japanese *ijo* is not subject to this structure, because it appears

between a numeral and a noun. *san-biki ijo-no neko* [3-CL more.than cat] 'more than or equal to three cats').

(85) a. sukunakutomo san-biki-no neko
at.least 3-CL-GEN cat
'at least three cats'
b. [[[sukunakutomo san]-biki-no] neko]

According to Watanabe, the superlative construction in (85a) is analyzed as in (85b). This is the motivation for assuming that the classifier combines with a phrasal category and not a head.

However, Krifka (1999) proposes that the modified numerals must combine with a phrase which consists of a numeral and a noun.[20]

(86) a. [at least [three cats]]
b. [more than [three cats]]

Ionin & Matushansky (2006, 2018) and Geurts & Nouwen (2007) also propose the same bracketing structure. When this constituent structure is applied to the Japanese superlative construction, the following constituency is obtained.

(87) [sukunakutomo [[san-biki]-no neko]]
at.least 3-CL -GEN cat
'at least three cats'

In (87), the superlative modifier is combined with the unit that consists of the numeral-classifier sequence and the noun. The modifier and the numeral do not form a constituent. This constituent structure suggests that the presence of modified numerals does not indicate that a numeral must be a phrasal category. It should be noted that the superlative modifier can appear in front of the head noun in the postnominal numeral-classifier construction, as shown in (88a).

20. Krifka's (1999) analysis accounts for the lack of scalar implicatures associated with modified numerals.

(88) a. Sukunakutomo neko san-biki-ga nigeta.
at.least cat 3-CL-NOM ran.away
'At least three cats ran away.'

b. [sukunakutomo [neko san-biki]]
at.least cat 3-CL
'at least three cats'

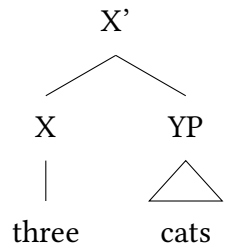
The presence of the superlative modifier in front to the head noun is compatible with the analysis that a noun and a numeral-classifier sequence form a constituency before a superlative modifier is combined, as illustrated in (88b). Thus, a classifier does not have to attach to a phrasal category (i.e., NumeP) and instead it can combine with a head (i.e., Nume). The above discussion leads us to conclude that the presence of modified numerals is not strong evidence for the analysis where a classifier form a constituent with a phrasal category, namely, NumeP.

Admittedly, for the prenominal numeral-classifier construction, it is difficult to decide one structure between the two in (80). In this dissertation, I adopt a unified treatment and postulate that the complex-head analysis is applied to both the prenominal and postnominal numeral-classifier constructions.

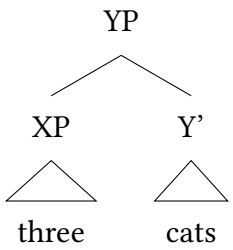
3.4.2 The two-structure analysis

Danon (2012) argues that crosslinguistically, numerals can combine with nouns in two ways, which results in two constructions, as represented in (89) and (90).

(89) *head-complement*



(90) *spec-head*



As in (89), in one construction, numerals are heads taking a projection of nouns (the *head-complement construction*). In the other construction as in (90), numerals are a maximal projection which is in a specifier position (the *spec-head construction*). Danon proposes that

it depends on languages which construction numeral can take. However, he also argues that a single language may have both the constructions. For example, he points out that Hebrew is such a language. The language has two types of numerals and they differ in morphophological pattern: one is a free form and the other is a bound form.

(91) a. šlošá (sfarim)
three(FREE) books
'three (books)'

b. šlóšet *(ha-sfarim)
three(BOUND) the-books
'the three books' (Danon 2012: 1283 (1))

This difference is a reflection of the positional difference. Danon points out that free numerals can be syntactically complex and therefore they cannot be heads. In contrast, bound numerals show properties of nominal heads. He thus postulates that free numerals are a maximal projection, occupying in a specifier position. On the other hand, bound numerals are heads, taking a nominal projection.

One compelling argument that Danon makes for the two-structure analysis is from the relation between head-directionality and the order between numerals and nouns.

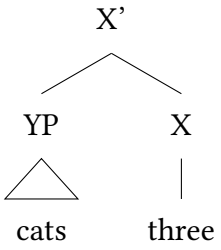
In particular, the order in head-final languages suggests that both the constructions should be available. Dryer (1992: 118) notes, "the two orders of numeral and noun are equally common among OV languages." For example, in Supyire, numerals precede nouns (92a). On the other hand, in Turkish, numerals are preceded by nouns (92b).

(92) a. Supyire
cyèe kɛ̀
women ten:POSSESSED.TONE
'ten women' (Donohue 2005: 18 (26))

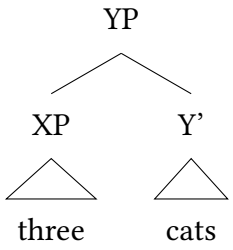
b. Turkish
on kitap
ten book
'ten books' (Norris 2014: 67 (120))

The variability of the order between numerals and nouns is captured by Danon's two-structure analysis. In (93) and (94), schematic structures of noun-numeral constructions in head-final languages are illustrated.

(93) *head-complement*



(94) *spec-head*



In the head-complement construction, numerals are preceded by nouns. In contrast, in the spec-head construction, numerals precede nouns. For example, Supyire is consider to take the head-complement construction, whereas Turkish the spec-head construction. The choice results in the order variability.

Danon proposes the two-structure analysis based on non-classifier languages. I propose that the two-structure analysis is extendable to Japanese, a classifier language. As we have seen in Section 3.1, in Japanese, numeral-classifier sequences show the word order variation.

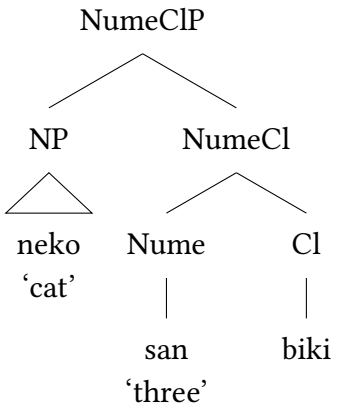
(95) (= (15))

a. San-biki-no neko-ga nigeta.
   3-CL-GEN cat-NOM ran.away
   '(The) three cats ran away.'

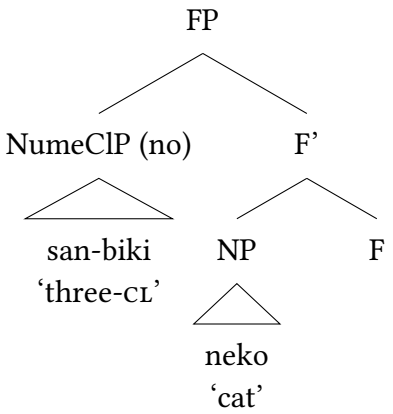
b. Neko san-biki-ga nigeta.
   cat 3-CL-NOM ran.away
   '(The) three cats ran away.'

Given Danon's two-structure analysis, the word order variation suggests that that Japanese has both the head-complement and the spec-head constructions. With the complex-head analysis that I propose in the previous section (Section 3.4.1), I postulate that Japanese has the following two structures for the numeral-classifier constructions (these are appeared in (79)).

(96) a. *head-complement*



b. *spec-head*



In the head-complement construction (96a), numeral-classifier sequences are heads and take an NP. In contrast, in the spec-head construction (96b), the maximal projection of numeral-classifier sequences is in a specifier position. Since Japanese is a head-final language, the two constructions yield the variability of the word order between numerals and nouns. In the head-complement structure, numeral-classifier sequences are preceded by nouns, namely, they are in postnominal position. By contrast, in the spec-head structure, numeral-classifier sequences precede nouns, namely, they are in prenominal position.

I have proposed the two-structure analysis. The analysis is an extension of Danon proposal. The two-structure analysis accounts for the word order variation of numeral-classifier sequences straightforwardly. In the next section, I discuss an alternative analysis for the two-structure analysis. I will suggests that the two-structure analysis captures the properties of Japanese numeral-classifier sequences more simply than the alternative.

3.5 Alternative 1: the transformational approach

In this and the next section, I discuss alternative analyses for the numeral-classifier constructions in Japanese. The focus of this section is on an alternative analysis for the two-structure analysis. The focus of the next section is on an alternative for the syntax of the prenominal numeral-classifier construction.

In this subsection, I discuss an alternative analysis proposed by Watanabe (2006, 2008) and

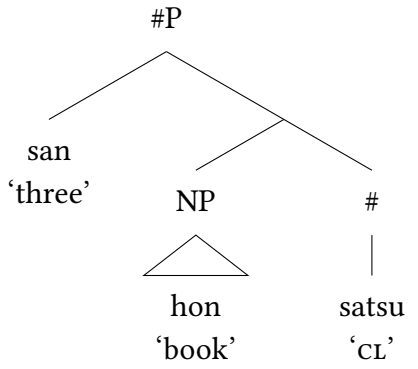
Huang & Ochi (2014). As we will see in Section 3.5.1, Watanabe proposes a transformational analysis, in which the two orders are derived by some movement operation. I will point out that two issues of the transformational analysis.

Watanabe's analysis has an advantage. One advantage to posit these structures as an underlying structure for the postnominal numeral-classifier construction in Japanese is that we can assume a structure with some degree of universality for classifier languages.

3.5.1 The transformational approach

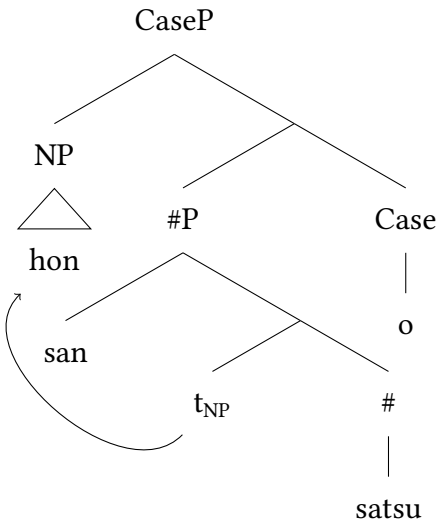
One approach to the word order variation of numeral-classifier sequences in Japanese is to assume that the two orders are derived from an underlying structure via some transformational operations. Watanabe (2006, 2008) proposes that massive remnant movement derives the two constructions. He follows Li (1999) and proposes the structure in (97) as the underlying structure. In his analysis, a numeral is in the specifier of the number phrase (#P) and $\#^0$ takes an NP as its complement. A classifier occupies the head of #P.

(97)



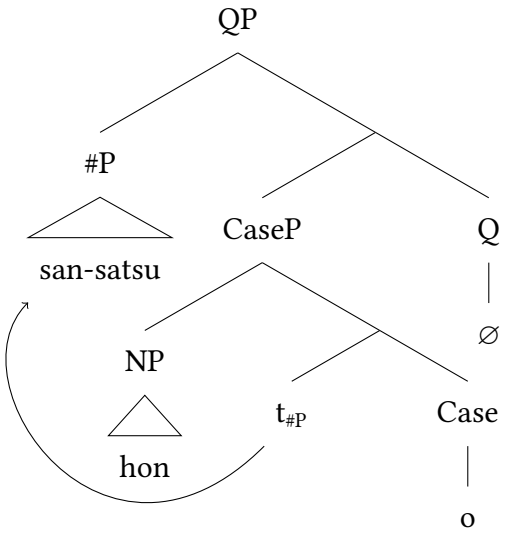
As illustrated in (98), the NP undergoes obligatory movement to Spec,CaseP triggered by an EPP feature on the Case head. The EPP feature requires Spec,CaseP must be filled. Consequently, the NP raises to Spec,CaseP.

(98)



This movement derives the postnominal construction *hon san-satsu* [book 3-CL] 'three books'. If #P moves to Spec,QP as in (99), the prenominal construction *san-satsu-no hon* [3-CL-GEN book] is obtained (*-no* is inserted later).[21]

(99)



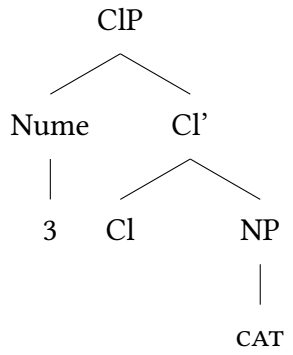
Watanabe's transformational analysis is appealing in that it can relate different word orders of numeral-classifier sequences. In addition, it claims that all the word orders of numeral-classifier sequences in Japanese are derived from one structure and this underlying structure seems universal in classifier languages. However, there are some issues on this analysis. I point out three challenges for the transformational analysis.

21. Watanabe (2006, 2008) assumes that if CaseP is raised, the floating construction *hon-o san-satsu* [book-ACC 3-CL] is generated.

3.5.2 Challenge I: constituency

The underlying structure in (97) shares syntactic properties with the analyses for numeral-classifier constructions in other classifier languages. For example, the structure in (100a) is postulated by Li (1999) for Mandarin and by Jenks (2011) for Thai. (100) is the head-initial version of (97).

(100)



Though the details are different between (97) and (100) in several aspects such as labels of functional heads, what is common is that a functional head hosting a classifier takes an NP and numerals are in the specifier of the functional projection. It is attractive to postulate that there exists a limited set of structural possibilities for numeral-classifier constructions, even though surface orders differ among classifier languages. It is also appealing to hypothesize that a limited set of possibilities is shared with non-classifier languages. In fact, a similar syntactic structure has been proposed for numeral-noun constructions in non-classifier languages (Jackendoff 1977, Scontras 2013a, 2014 ,a.o.)

However, I will point out the transformational analysis for the numeral-classifier constructions in Japanese has an issue on constituency of nouns and classifiers. A downside is that the transformational analysis is not compatible with the classifier-for-numeral analysis that I put forward in this dissertation. I argued that in Japanese, classifiers are required to make it possible for numerals to modify nouns and assumed that a numeral and a noun form a constituent to the exclusion of nouns. In the transformational analysis, as the diagram in (97) shows, a noun and a classifier form a constituent. As discussed in Section 3.3.4, in Japanese, the bare classifier construction, in which a NP and a classifier appear without a numeral, is not allowed, as illustrated below:

(101) a. *Hiki-no neko-ga nigeta.
cl cat-gen ran.away
'Lit. Cat(s) ran away.'

b. *Neko hiki-ga nigeta.
cat cl-nom ran.away

(102) a. Ni-hiki-no neko-ga nigeta.
2-cl cat-gen ran.away
'Lit. Two cats ran away.'

b. Neko ni-hiki-ga nigeta.
cat 2-cl-nom ran.away

In contrast, bare classifier constructions are found in, for example, Cantonese, Mandarin, Vietnamese, Hmong and Thai. The examples are repeated below as (103).

(103) a. Cantonese
Zek gau gamjat dakbit tengwaa.
cl dog today special obedient
'The dog is specially obedient today.' (Cheng & Sybesma 1999: 511(4b))

b. Mandarin
Wo xiang kan ben shu.
I would.like read cl book
'I would like to read a book.' (ibid. (525(27a)))

c. Vietnamese
kEmera-Ta khub dami.
camera-cl very expensive
'The camera was/is expensive.' (Simpson, Soh & Nomoto 2011: 170(6))

d. Hmong
Lub koob thaij duab kim kim heev.
cl camera expensive expensive very
'The camera was/is expensive.' (Nomoto 2013: 138(9))

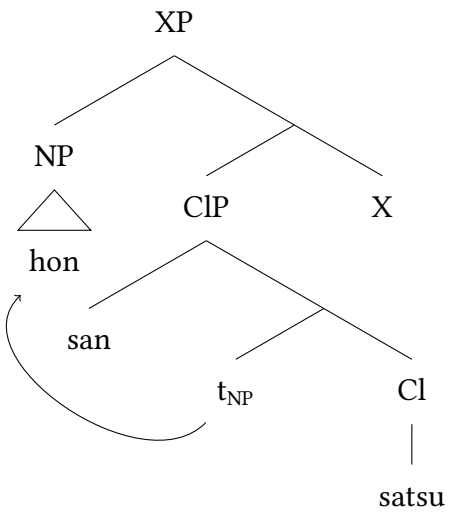
e. Thai
thúrian lûuk níi
durian cl this
'this durian' (Jenks 2011: 82 (27))

The bare classifier constructions support the noun-classifier constituent. In contrast, it is not clear why a classifier takes an NP as its complement, particularly in Japanese, since there is no bare classifier constructions and there is no empirical support for the constituency.

3.5.3 Challenge II: motivation for NP-movement

The second issue of the transformational analysis is the motivation for the NP movement. In Watanabe's proposal, the movement is triggered by an EPP feature on the Case head. However, it is not clear why the Case head has to have the EPP feature and Watanabe does not elaborate it. Adopting the essential of the structure proposed by Watanabe (2006), Huang & Ochi (2014) claim that NP is moved because of a formal requirement.[22] They slightly modify Watanabe's (2006) structure as shown in (104), in which classifiers head Classifier Phrase (ClP) instead of #P and NP undergoes movement to Spec,XP.

(104)



Huang & Ochi claim that the driving force of NP movement is a formal requirement in (105).

(105) N needs to be visible (i.e., accessible) from outside the extended nominal domain (for the purpose of selection and/or Case). (Huang & Ochi 2014: 67(33))

The requirement says that NP cannot be proved by T or *v* when NP remains inside a nominal domain (ClP or XP). Consequently, NP must move to the edge of the nominal domain to be visible from outside the nominal domain.

Huang & Ochi further argue for the NP movement from their observation that the postnominal numeral-classifier sequence admits only specific readings. To account for the specificity, they claim the size condition in terms of specificity as follows:

22. Huang & Ochi (2014) propose that the prenominal and postnominal numeral-classifier constructions have a different structure. They adopt Watanabe's transformational analysis for the postnominal numeral-classifier construction.

(106) A specific indefinite nominal has a larger structure than a non-specific indefinite nominal. (ibid.: 60 (19))

According to Huang & Ochi, the lack of the non-specific reading in the postnominal numeral-classifier sequence is attributed to either (or both) of the following two factors: (i) the inherently [+specific] nature of X of the XP, or (ii) the size of the postnominal numeral-classifier sequence being sufficiently large. Since in the postnominal numeral-classifier construction, the presence of XP is obligatory, the NP movement to Spec,XP is also obligatory given the formal requirement in (105). Therefore, the postnominal numeral-classifier sequence is always specific.

However, the judgments of Huang & Ochi are not uncontroversial. That is, the postnominal numeral-classifier construction does admit non-specific readings as well. I will demonstrate this. I will use a particular noun phrase to evaluate the (non-)specificity: a noun with a plural marker *-tachi*.[23]

First, the postnomial numeral-classifier sequence can take narrow scope with respect to an intensional verb, especially when a relevant context is set up. It has been observed that unlike plain bare nouns as in (107a), *-tachi* plurals take wide scope with respect to intensional verbs as in (107b) (Nakanishi & Tomioka 2004).

(107) a. Sono bjooin-wa kangofu-o sagashi-teiru.
that hospital-TOP nurse-ACC look.for-PROG
i. ✓look-for > nurse(s): 'The hospital looking for a nurse/nurses (to hire).'
ii. ??nurse(s) > look-for: 'There is a nurse/are nurses that hospital is looking for.'

b. Sono bjooin-wa kangofu-tachi-o sagashi-teiru.
that hospital-TOP nurse-PL-ACC look.for-PROG
i. *?look-for > nurses: 'The hospital looking for nurses (to hire).'
ii. ✓nurses > look-for: 'There are nurses that hospital is looking for.'
(Nakanishi & Tomioka 2004: 115 (4))

While (107a) prefers the non-specific reading of the noun *kangofu* 'nurse(s)', (107b) the specific/definite reading.

23. The patterns shown by a noun with *-tachi* in this section holds in a noun with *aru* 'certain' as in *aru gakusei* 'a certain student', which is specific just like *a certain NP* in English (Portner & Yabushita 2001). In this section, I will only use a noun with *-tachi*, though.

If a context forces non-specific interpretations, then we expect that under such a context, sentences with a *-tachi* plural is infelicitous. Consider the following example.

(108) #Senshuu san-nin-no kangoshi-ga yameta node,
last.week 3-CL-GEN nurse-NOM quit because,
sono bjooin-wa kawari-no kangoshi-tachi-o sagashiteiru.
that hospital substitute-GEN nurse-PL-ACC look.for
'Last week, three nurses quite, so the hospital looks for substitute nurses.'

In the context described in (108), the position-filling interpretation (i.e., look-for > nurses) is strongly invited. Since the position-filling interpretation is not compatible with the wide scope preference of *tachi* plurals, as expected, the sentence is not felicitous under the context. Thus, we can confirm that the context forces non-specific readings of nouns.

Now, by using the same context, let us see whether the postnominal numeral-classifier sequence does or does not admit non-specific readings. Consider the following sentence in which the *tachi* plural in (108) is replaced with a postnominal numeral-classifier sequence.

(109) Senshuu san-nin-no kangoshi-ga yameta node,
last.week 3-CL-GEN nurse-NOM quit because,
sono bjooin-wa kawari-no kangoshi san-nin-o sagashiteiru.
that hospital substitute-GEN nurse three-CL-ACC look.for
'Last week, three nurses quite, so the hospital looks for three substitute nurses.'

This sentence is felicitous, suggesting that the postnominal numeral-classifier sequence has non-specific readings. The same holds with another intensional verb *iru* 'to need'. Compare the sentence with a *-tachi* plural as in (110a) and one with a postnominal numeral-classifier sequence as in (110b).

(110) a. (Hikkoshi-no tetsudai-ni) gakusei-tachi-ga iru.
moving-GEN help-DAT student-PL-NOM need
i. *need > students: 'I need students who can help me move.'
ii. ✓ students > need: 'There is a group of students such that I need them for helping me move.'

b. (Hikkoshi-no tetsudai-ni) gakusei san-nin–ga iru.
moving-GEN help-DAT student 3-CL-NOM need
i. ✓ need > students: 'I need three students who can help me move.'

ii. ✓ students > need: 'There is a group of three students such that I need them for helping me move.'

As shown in (110a), the noun with *-tachi* takes wide scope over the intensional verb and the narrow scope reading is not available. In contrast, as in (110b), the noun with the postnominal numeral-classifier sequence takes both wide and narrow scope with respect to the intensional verb. That is, the postnominal numeral-classifier sequence admits non-specific readings.

Second, Huang & Ochi point out that the postnominal numeral-classifier sequence is not acceptable under a context which forces non-specific readings. However, their generalization does not hold as shown in the comparison with the behavior of *tachi* plurals.

(111) a. #/??Maitoshi Yamada-kyooju-wa yonensei-tachi-o gakuchoo-shoo-ni
every.year Yamada-professor-TOP senior-PL-ACC president-award-DAT
suisensuru.
nominate
'Lit. Each year, Prof. Yamada nominate seniors for the president award.'

b. Maitoshi Yamada-kyooju-wa yonensei san-nin-o gakuchoo-shoo-ni
every.year Yamada-professor-TOP senior 3-CL-ACC president-award-DAT
suisensuru.
nominate
'Each year, Prof. Yamada nominate three seniors for the president award.'

The sentence with *-tachi* plural in (111a) is infelicitous, whereas the one with the postnominal numeral-classifier sequence in (111b) is fine.

Third, although Huang & Ochi observe that the postnominal numeral-classifier sequence is not compatible with a locational verb expressing a possessive relation, as shown in (112a), it seems that there are some issues on the judgments. First, when a sentence is embedded, the acceptability improves, though it is not perfectly natural as shown in (112b).

(112) a. ??Itoko 3-nin-ga iru hito-wa te-o agete kudasai.
cousin 3-CL-NOM have person-TOP hand-ACC raise please
'Those of you who have three cousins, please raise your hand.'

b. John-ni itoko san-nin-ga iru koto(-wa shirarete-inai.)
John-DAT cousin 3-CL-NOM have fact-TOP be.known-NEG
'The fact that John has three cousins (is not known.)'

It is not clear why the sentence becomes acceptable when it is embedded in *koto* clause. It is, however, worth noting that this improvement is not found in sentences with strong quantifiers and a demonstrative, as illustrated in (113).

(113) *John-ni {sono / hotondo-no / subete-no} itoko-ga iru koto(-wa
John-DAT {that / most-GEN / all-GEN} cousin-NOM have fact-TOP
shirarete-inai.)
be.known-NEG
'Lit.The fact that John has that/most/all cousins (is not known.)'

If, as Huang & Ochi argue, the postnominal numeral-classifier sequence only admits specific readings and behaves just like strong quantifiers, the contrast between (112b) and (113) is unexpected. The acceptability of (112b) thus suggests that the postnominal numeral-classifier sequence should not be grouped into strong quantifiers and that importantly it has non-specific readings.

So far we have seen that the postnominal numeral-classifier sequence can have non-specific readings by re-examining the three observations made by Huang & Ochi. There is further supporting evidence for the availability of non-specific reading in the postnominal numeral-classifier sequence.

In English, plural numeral indefinites can take scope outside of an island when they get specific readings as in (114a) (Geurts 2010, Reinhart 1997, Winter 1997)

(114) If three relatives of mine die, I will inherit a house.

a. ✓ 3 > if: There are three specific relatives of mine such that, if they all die, I will inherit a house.

b. ✓ if > 3: If any three relatives of mine die, I will inherit a house.

This sentence also has the non-specific reading, namely, the narrow-scope reading as shown in (114b). The same holds in the postnominal numeral-classifier sequence construction in Japanese.

(115) Shinseki san-nin-ga shinda-ra watashi-wa ie-o soozoku-suru.
relative 3-CL-NOM die-if I-TOP house-ACC inherit-do
' If three relatives of mine die, I will inherit a house.'

a. ✓ 3 > if: There are three specific relatives of mine such that, if they all die, I will inherit a house.= (114a)

b. ✓ if > 3: If any three relatives of mine die, I will inherit a house. = (114b)

It should be noted that the floating numeral-classifier sequence, which is always non-specific, does not admit a wide scope reading (116a), whereas a bare noun with *-tachi* only allows the wide scope reading (116b).

(116) a. Shinseki-ga san-nin shinda-ra watashi-wa ie-o soozoku-suru.
relative-NOM three-CL die-if I-TOP house-ACC inherit-do
'If three relatives of mine die, I will inherit a house.'
(*3 > if, if > 3)

b. Shinseki-tachi-ga shinda-ra watashi-wa ie-o soozoku-suru.
relative-PL-NOM die-if I-TOP house-ACC inherit-do
'If the relatives of mine die, I will inherit a house.'
(relatives > if, *if > relatives)

The examples in (115) and (116) show that the postnominal numeral-classifier sequence has non-specific readings.

The observations made in this section indicate that postnominal numeral-classifier sequences admit non-specific readings, contrary to the observation in Huang & Ochi (2014). This conclusion suggests that specificity is not an inherent property of the postnominal numeral-classifier construction and importantly it does not support the NP-movement in Huang & Ochi. Thus, specificity alone is not conclusive evidence for the NP-movement.

3.5.4 Challenge III: asymmetries

Watanabe's transformational analysis predicts that there is no syntactic difference between the prenominal and postnominal numeral-classifier constructions. Since the prenominal numeral-classifier construction is derived from the postnominal numeral-classifier construction, acceptability of the two constructions should be the same. However, this prediction is not borne out. I present three sets of data that show that the two orders have different behaviors.

The first set of data is regarding the optionality of classifiers. We have seen in Section 3.3.1 and Section 3.3.2 that classifiers can be optional when numerals express large or non-

specific numbers. Let us review the examples. In the following examples, numerals express large numbers. In this condition, classifiers can be omitted.

(117) (= (57))
Daitooryoo-wa shichoosha-kara yoserareta hyaku-(ko)-no shitsumon-ni
president-TOP viewer-from were.sent 100-(CL)-GEN question-to
kaitooshita.
answer
'The president answered 100 questions viewers asked.' (Sudo to appear: (8))

(118) (= (58))
John-wa juu-go-(ko)-no gengo-o shirabeta.
John-TOP 10-5-(CL)-GEN language investigated
'John investigated fifteen languages'
(Nomoto 2013: 16 (16) with a slight modification)

Classifiers can also be optional when numerals denote non-specific (or approximate) numbers.

(119) (= (59))

a. Chikyuu-joo-ni-wa yaku sen-go-hyaku-(ko)-no kazan-ga aru.
earth-on-LOC-TOP about 1000-5-100-CL-GEN volcano-NOM exist
'There are about 1500 volcanoes on earth.' (Sudo to appear: (8))

b. John-wa ni san-(nin)-no gakusei-to hanashita.
John-TOP two three-CL-GEN student-with talked
'John talked with two or three students'
(Nomoto 2013: 16 (16) with a slight modification)

c. John-wa juu-suu-(ko)-no shima-o otozureta.
John-TOP 10-some-CL-GEN island-ACC visited
'John visited a dozen islands' (ibid.:16 (16) with a slight modification)

So far we have seen the optionality of classifiers in the prenominal numeral-classifier construction. The optionality of classifiers, however, does not hold in the postnominal numeral-classifier construction. In the postnominal numeral-classifier construction, classifiers are obligatory. Consider the following examples, all of which are the same as (117)–(119) except the position of the numeral-classifier sequences.

(120) a. Daitooryoo-wa shichoosha-kara yoserareta shitsumon hyaku-*(ko)-ni
president-TOP viewer-from were.sent question hundred-CL-to
kaitooshita.
answered
'The president answered 100 questions viewers asked.'

b. John-wa gengo juu-go-*(ko)-o shirabeta.
John-TOP language 10-5-CLinvestigated
'John investigated fifteen languages'

(121) a. Chikyuu-joo-ni-wa kazan yaku sen-go-hyaku-*(ko)-ga aru.
earth-on-LOC-TOP volcano about thousand-five-hundred-NOM exist
'There are about 1500 volcanoes on earth.'

b. John-wa gakusei ni san-*(nin)-to hanashita.
John-TOP student two three-CL-with talked
'two or three students'

c. John-wa shima juu-suu-*(ko)-o otozureta.
John-TOP island ten-some-CL-ACC visited
'John visited a dozen islands'

In the examples in (120), which contain large numbers, the classifiers cannot be omitted.[24] Similarly, in the examples in (121), the non-specific numbers cannot appear without the classifiers.[25]

As we have seen, on the one hand, the prenominal numeral-classifier construction allows classifiers to be optional. The postnominal numeral-classifier construction, on the other

24. Yasutada Sudo (p.c.) pointed out that classifiers can be omitted in the postnominal construction as in (i).

(i) John-wa hohei sen-o hiki-tsureta.
John-TOP foot.soldier 1000-ACC took
'John took 1000 foot soldiers.'

Tomoyuki Yoshida (p.c.) also pointed out to me that the acceptability of the example in (120b) is improved when we add a relative clause to the noun as in (ii).

(ii) John-wa [mottomo hanashite-no ooi] gengo juu-go-(ko)-o shirabeta.
John-TOP [most speaker-GEN many] language 10-5-CLinvestigated
'John investigated the fifteen most spoken languages.'

I do not completely agree with these judgments and it seems that the judgment varies among speakers. However, it should be pointed out that when a prosodic pause is put after the head noun, the acceptability is improved. Since such pause is not needed when a classifier appears, we need to be careful about the treatment of the case such as in (ii). I should leave this issue for another occasion.

25. Tomoyuki Yoshida (p.c.) pointed out to me that when *ijoo* 'greater than or equal to' is attached, a classifier may be omitted.

hand, does not admit the optionality of classifiers. Thus, the numeral-classifier constructions show the asymmetry of the optionality of classifiers.[26]

The second set of examples contain wh-phrases. The examples in (122) are wh-questions.[27]

(122) Context: On the table, we have five books. The speaker knows that John read three of them but does not know which three and asks:

a. John-wa dono san-satsu-no hon-o yonda no?
John-TOP which 3-CL-GEN book-ACC read Q
'Which three books did John read?'

b. *John-wa dono hon san-satsu-o yonda no?
John-TOP which book 3-CL-ACC read Q
'Which three books did John read?'

In (122a), the prenominal numeral-classifier sequence can be used appropriately in the wh-question, asking which three books John read. By contrast, in (122b), the postnominal numeral-classifier sequence is not allowed to be used in the following wh-questions. A similar pattern is shown in (123).

(123) a. John-wa mit-tsu-no nani-o katta no?
John-TOP 3-CL-GEN what-ACC bought Q
'Lit. John bought three what?'

b. *John-wa nani mit-tsu-o katta no?
John-TOP what 3-CL-ACC bought Q
'Lit. John bought three what?'

(i) Daitooryoo-wa shichoosha-kara yoserareta shitsumon hyaku-(ko)-ijoo-ni
president-TOP viewer-from were.sent question hundred-CL-greater.than.or.equal.to-to
kaitooshita.
answered
'The president answered greater than or equal to 100 questions viewers asked.'

I must leave the question why this should be for future research.

26. In the floating construction, when classifiers are omitted, the acceptability varies among speakers.

(i) a. John-wa gengo-o juu-go-?/??(ko) shirabeta.
John-TOP language-ACC 10-5-CLinvestigated
'John investigated fifteen languages'

b. John-wa gengogaku-no gakusei-o ni san-?/??(nin) mita.
John-TOP linguistics-GEN student-ACC two three-CLsaw
'John saw two or three students of linguistics'

27. Nakanishi (2007: 129 (40)) observes the ungrammaticality of a similar example to (122b).

As shown in (123a), the prenominal numeral-classifier sequence is acceptable in the wh-question. In contrast, as (123b) shows, the postnominal numeral-classifier sequence cannot be used.

In addition, there is an asymmetry in a construction involving an indeterminate pronoun (wh-word) and a particle *mo*. When an indeterminate pronoun appears with *mo*, it gives rise to a universal quantifier reading as exemplified in (124) (Kuroda 1965, Nishigauchi 1990, Shimoyama 2006 a.o)

(124) Dono hon-mo omoshirokatta.
which book-MO was.interesting
'Every book was interesting.'

In such constructions, prenominal numeral-classifier sequences can appear as in (125a), whereas postnominal ones cannot as in (125b).

(125) a. Dono san-satsu-no hon-mo omoshirokatta.
which 3-CL-GEN book-MO was.interesting
'Every three books were interesting.'

b. *Dono hon san-satsu-mo omoshirokatta.
which book 3-CL-MO was.interesting
'Every three books were interesting.'

Lastly, as we have seen in Section 3.4.1, the prenominal and postnominal numeral-classifier constructions show a difference with regard to modified numerals. Consider again the following examples, which are repeated from (81)–(83)

(126) a. Sukunakutomo go-dai-no kuruma-ga nusuma-are-ta.
at.least 5-CL-GEN car-NOM steal-PASS-PAST
'At least five cars were stolen.'

b. */???kuruma sukunakutomo go-dai-ga nusuma-are-ta.
car at.least 5-CL-NOM steal-PASS-PAST
'At least five cars were stolen.'

(127) a. John-wa san-jut-too-kara yon-jut-too-no hitsuji-o katteiru.
John-TOP 3-10-CL-from 4-10-CL-GEN sheep-ACC has
'John has between thirteen and fourteen sheep.'

b. */??? John-wa hitsuji san-jut-too-kara yon-jut-too-o katteiru.
John-TOP sheep 3-10-CL-from 4-10-CL-ACC has
'John has between thirteen and fourteen sheep.'

(128) a. John-wa daitai yon-jut-too-no hitsuji-o katteiru.
John-TOP roughly 4-10-CL-GEN sheep-ACC has
'John has roughly fourteen sheep.'

b. */??? John-wa hitsuji daitai yon-jut-too-o katteiru.
John-TOP sheep roughly 4-10-CL-ACC has
'John has roughly fourteen sheep.'

All the examples show that while modified numerals can appear in the prenominal numeral-classifier construction, they cannot in the postnominal numeral-classifier construction.

We have observed three sets of data that show the contrast between the prenominal numeral-classifier construction and the postnominal one. These asymmetries should not be generated in Watanabe's transformational analysis and it is not easy to account for the asymmetries. For example, as we have seen, classifiers are optional for some numerals in the prenominal construction, whereas obligatory in the postnominal construction. Thus, we need to hypothesize that a classifier can be dropped only in the prenominal construction. It is not straightforward to defend this hypothesis in principled manner. The same difficulty holds for the other two asymmetries (the case with wh-phrases and the case with modified numerals). In these two cases, the pattern is that the prenominal numeral-classifier construction is acceptable, whereas the postnominal numeral-classifier one is not. We need to explain why the postnominal numeral-classifier construction is ill-formed and the prenominal numeral-classifier construction, which is derived from the postnominal one, is well-formed. To explain these asymmetries, we need to postulate some constraint that only block the derivation of the postnominal numeral-classifier construction.[28]

If we assume that the two constructions have a different structure and they are not

28. As pointed out by Saito, Lin & Murasugi (2008), in Watanabe's (2006) analysis, it is not clear how numeral classifier sequences are formed since a trace (or copy) of NP intervenes between a numeral and a classifier.

transformationally related, the asymmetries can be captured. For example, as I have argued, in the postnominal numeral-classifier construction, the complex head takes an NP. Thus, modified numerals cannot appear after the head noun. In contrast, if we assume that, for example, superlatives are in a specifier position of the nominal projection and they can attache to a combination of numeral-classifier sequences and nouns, they can appear in prenominal position. It is not surprising that some constraint only targets one structure. In Section 3.8, I will account for the asymmetry of optionality of classifiers by postulating that there is a syntactic constraint on the postnominal, which prevents classifiers from being dropped.

3.5.5 Summary

I have discussed an alternative analysis for the two-structure analysis that I proposed. I have pointed out three issues for the transformational analysis. Admittedly, this is not a knockdown argument against the transformational analysis. Particularly, it should be pointed out that for some cases of the asymmetries, the judgments are not so robust and individual variation is found. As mentioned, the transformational analysis has appealing features. If the motivation of the NP-movement is established and if the asymmetries can be captured in principled fashion, the transformational approach becomes plausible.[29]

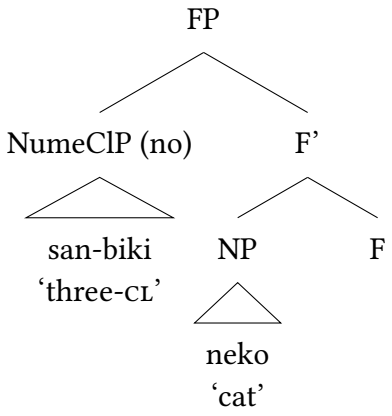
3.6 Alternative 2: prenominal numeral-classifier sequences as adjuncts

This section discusses an alternative for the syntax of the prenominal numeral-classifier construction. I have proposed that in the prenominal numeral-classifier construction, the maximal projection of numeral-classifier sequences (i.e., NumeClP) is in a specifier position,

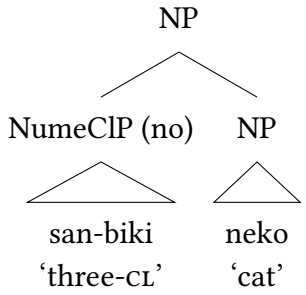
29. Another question is how the word order variation of the strong quantifiers is accounted for. Is the variability of the strong quantifiers derived by a similar transformational operation? Watanabe (2006) does not examine universal quantifiers such as *subete* 'all' "because of their crosslinguistic peculiarities" (251 n.6). In Chapter 2 Section 2.4.2, I proposed that the word order variation of the strong quantifiers is due to the structural differences. A strong quantifier may be in Spec,QP or Q^0, resulting in the variation. This analysis is similar to the one for the word order variation of the numeral-classifier sequences. Although, as I pointed out in Section 3.1, the strong quantifiers and numeral-classifier sequences differ syntactically and semantically, the factor of the word order variation is similar between the two types of quantificational expressions.

as illustrated in (129). There is another possibility for the location of NumeClP: it is in an adjunct of NPs, as shown in (130).

(129) NumeClP as Specifier



(130) NumeClP as Adjunct



The adjunct analysis is compatible with the observations made in Section 3.1 that numeral-classifier sequences in Japanese show similar behaviors to adjectives. However, even though numeral-classifier sequences and adjectives are similar, the adjunct analysis is challenged by the fact that Japanese numeral-classifier sequences show a stricter positional restriction than adjectives and modifiers in general. Adjectives in Japanese can be ordered freely.

(131) a. chiisana kuroi neko
small black cat
'a small black cat'

b. kuroi chiisana neko
black small cat
'a black small cat'

In (131), either of the orders is fine. However, the order between a prenominal numeral-classifier sequence and an adjective is not free. Whitman (1981) points out that a numeral-classifier sequence can appear in front of an adjective but the reverse order is not possible.[30]

(132) a. san-biki-no kuroi neko
3-CL-GEN black cat
'three black cats'

30. Whitman (1981) notes that (132b) is acceptable when the adjective is interpreted non-restrictively.

b. *kuroi san-biki-no neko
black 3-CL-GEN cat
'Lit. black three cats'

A similar point is made by Hiraiwa (2016), where property-denoting modifiers such as *nisen-shiishii* '2000cc' or *ni-rittoru* '2 litres' cannot appear in front of numeral-classifier sequences[31]

(133) a. San-dai-no nisen-shiishii-no kuroma-o katta.
3-CL-GEN 2000-cc-GEN car-ACC bought
'I bought three 2000cc cars.'

b. *Nisen-shiishii-no san-dai-no kuruma-o katta.
2000-cc-GEN 3-CL-GEN car-ACC bought
'I bought three 2000cc cars.'

c. San-bon-no ni-rittoru-no bin-o katta.
3-CL-GEN 2-litre-GEN bottle-ACC bought
'I bought three 2-litres bottles.'

d. *Ni-rittoru-no san-bon-no bin-o katta.
2-litre-GEN 3-CL-GEN bottle-ACC bought
'I bought three 2-litres bottles.' (Hiraiwa 2016: 1365 (56))

In (133a) and (133c), each numeral-classifier sequence *san-dai* and *san-bon* is preceded by the property-denoting modifier *2000cc* and *ni-rittoru*, respectively. When the order is reversed, the sentence is ungrammatical as shown in (133b) and (133d). This ordering restriction indicates that a numeral-classifier sequence is structurally higher than a property-denoting modifier.

Hiraiwa (2016) further shows the hierarchical difference between numeral-classifier sequences and other property-denoting modifiers by examining NP-ellipsis. Let us begin by the basics on NP-ellipsis in Japanese using the following examples.

(134) a. akai kuruma
red car
'a red car/red cars'

b. akai no
red LN(THINGS)

31. Hiraiwa (2016) adopted the examples from Kamio (1983).

When the noun modified by the adjective in (134a) undergoes NP-ellipsis, the noun is pronominalized by a light noun. In (134b), the NP *kurama* 'car' is pronominalized by the light noun *no*. In contrast, demonstratives cannot license NP-ellipsis (Kamio 1983). When (135a) undergoes NP-ellipsis, we have (135b).

(135) a. A-no hon-wa omoshiroi.
that book-GEN-TOP interesting
'That book is interesting.'

b. *A-<no> no-wa omoshiroi.
that-GEN LN(THINGS)-TOP interesting
'That one is interesting.'

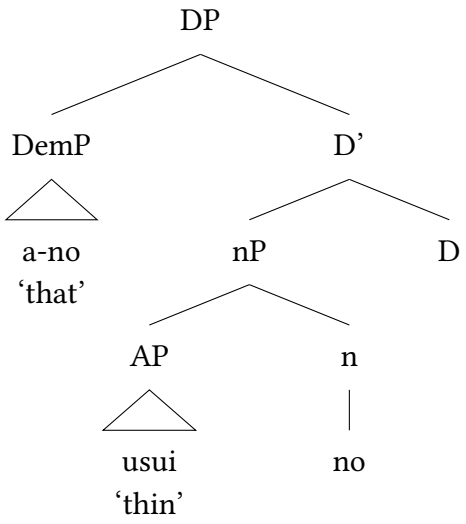
According Kamio (1983) and Hiraiwa (2016), NP-ellipsis involves pronominalization by the light noun *no* followed by haplology. In (135b), the genetive marker *no* is deleted, which is indicated by angle bracket (< >).

Following Kamio (1983), Hiraiwa (2016) proposes that a light noun must have a modifier within its projection to be licensed. In (134b), since the adjective is assumed to be in the projection of the light noun, it licenses the light noun. In (135b), on the contrary, since the demonstrative is not located in the projection of the light noun, the light noun is not licensed and as a result, the example is ungrammatical. When an adjective is added to (135b), as shown in (136), the example becomes grammatical, since the adjective can license the light noun.

(136) A-no usui-no-wa omoshiroi.
that-GEN thin-LN(THINGS)-TOP interesting
'That shin one is interesting.'

Following Hiraiwa's analysis, the example (136) would have the following structure.

(137)



In (137), the adjective is within the projection of the light noun, whereas the demonstrative is not. The presence of the adjective license the light noun.

With this basics about NP-ellipsis in Japanese, let us now turn to numeral-classifier constructions. Kamio (1983) observes that a noun with a prenominal numeral-classifier sequence shows two-way ambiguity, as exemplified in (138).[32]

(138) San-satsu-no hon-o katta.
3-CL-GEN book-ACC bought
a. 'I bought three books.' (cardinal-interpretation)
b. 'I bought a three-volume set.' (property-interpretation)
(Hiraiwa 2016: 1363 (48a))

One interpretation (138a) is about the cardinality, which is an ordinary interpretation of numerals. This interpretation is referred to as a cardinal-interpretation. The other interpretation (138b) is about some property of nouns. For example, in (138), the numeral denotes the property of being a three-volume set. I will refer to this interpretation as a property-interpretation. The ambiguity disappears with NP-ellipsis as shown in (138).

(139) San-satsu-<no> no-o katta.
3-CL-GEN LN(THINGS)-ACC bought
a. *'I bought three books.' (*cardinal-interpretation)

32. In the remainder of this dissertation, the term 'numeral-classifier sequences' refers to cardinality-denoting numeral-classifier sequences, unless otherwise noted.

b. 'I bought a three-volume set.' (property-interpretation)
(ibid. (1363 (48b)))

Here the NP *hon* is pronominalized by the light noun *no*. The cardinal-interpretation becomes unavailable. The grammaticality of (139) shows that the numeral-classifier sequence licenses the light noun, indicating that they are located within the projection of the light noun. The fact that only the property-interpretation is available in the NP-ellipsis example suggests that the numeral-classifier sequence within the projection of the light noun denotes property-interpretation. This in turn indicates that numeral-classifier sequences denoting cardinal-interpretations are located outside the projection of the light noun. Since they cannot license the light noun, the cardinal-interpretation is not available. When an adjective is added to (139), the otherwise unavailable cardinal-interpretation becomes possible, since the adjective can license the light noun.

(140) San-satsu-no mijikai-no-o katta.
3-CL-GEN short-LN(THINGS)-ACC bought
'I bought three short ones (three short books).' (cardinal-interpretation)
(ibid. (1367 (61) with a slight modification))

This observation indicates that the kind of denotations of numeral-classifier sequences depends on the hierarchical position in the structure. In addition, numeral-classifier sequences denoting cardinal-interpretations differ in the hierarchical position from other property-denoting modifiers including adjectives.

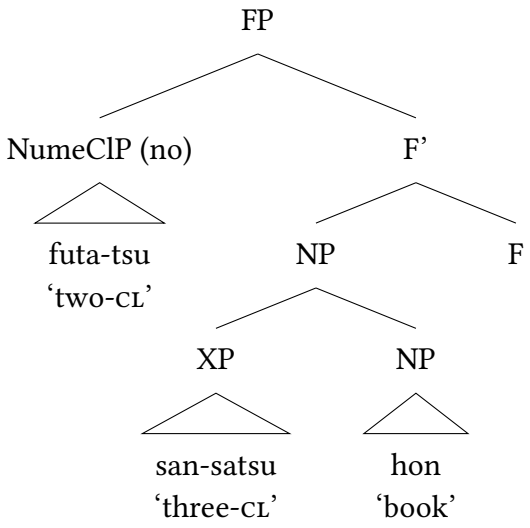
Since a cardinality-denoting numeral and a property-denoting numeral differ in the position, Hiraiwa's analysis predicts that two numeral-classifier sequences can co-occur and modify a noun, in which one of them denotes a cardinal-interpretation and the other a property-interpretation. This prediction is borne out. Consider (141).

(141) Futa-tsu-no san-satsu-no hon-o katta.
2-CL-GEN 3-CL-GEN book-ACC bought
'Lit. I bought 2 three-volume sets.'

In (141), the numeral-classifier sequence *san-satsu* closer to the noun is interpreted as a property-denoting numeral, while the leftmost one *futa-tsu* denotes a cardinal-interpretation,

that is, the cardinality of three-volume set. A structure for the example in (141) would be something like (142).

(142)



I assume here that the property-denoting numeral-classifier sequence is adjoined to the NP. In (142), the cardinality-denoting numeral-classifier sequence is in a higher position (Spec,FP), which is not in the projection of NP. On the other hand, the property-denoting numeral-classifier sequence is in a lower position. Crucial for the discussion is the assumption that there are two positions for numeral-classifier sequences within a nominal. The interpretation of numeral-classifier sequences depends on these positions.

The rigidity of the interpretation is indicated in (143), where the order of the two numeral-classifier sequences in (142) is reversed.

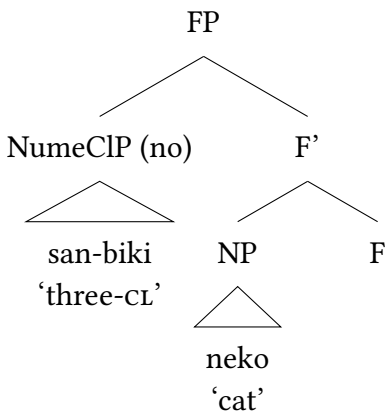
(143) *San-satsu-no futa-tsu-no hon-o katta.
3-CL-GEN 2-CL-GENbook-ACC bought
'Int. I bought 2 three-volume set.'

If the interpretation of a numeral-classifier sequence does not depend on the position, we expect that (143) has the same interpretation as (141). However, the example in (143) is unacceptable. This unacceptability is due to the fact that the leftmost numeral-classifier sequence cannot have the property-interpretation and the rightmost numeral-classifier sequence cannot have the cardinal-interpretation. In other words, the leftmost numeral-classifier sequence denotes the cardinal-interpretation and the rightmost one denotes the

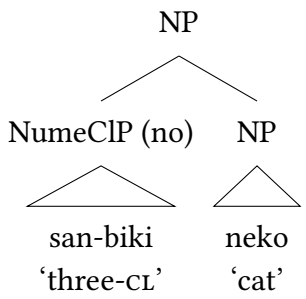
property-interpretation. The rightmost numeral-classifier sequence *futa-tsu* has a classifier *-tsu*, which is used to count general inanimate objects. However, this classifier *-tsu* cannot be used to count books; instead the classifier *-satsu* should be used in this case (i.e., **futa-tsu-no hon* 'two-CL-GEN books': cf. *ni-satsu-no hon*). As a result, the example (143) is infelicitous.

Let us now turn back to the discussion of the possible structures for the prenominal numeral-classifier construction. The two possible structures are repeated below as (144) and (145).

(144) NumeClP as Specifier

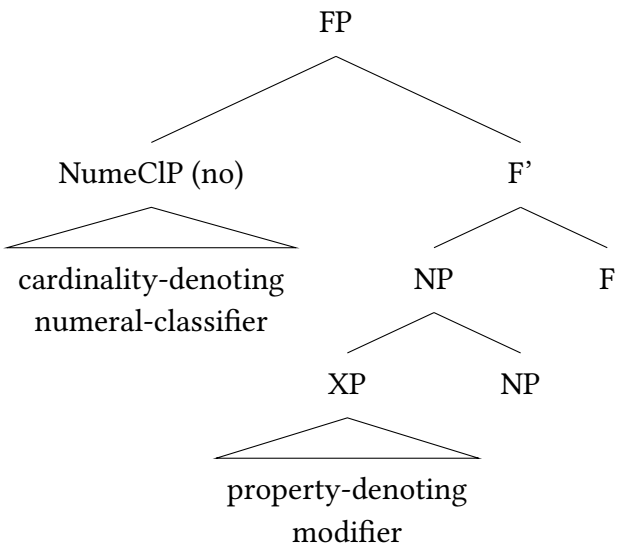


(145) NumeClP as Adjunct



We are interested in where cardinality-denoting numeral-classifier sequences are located. Of the two options, the structure (144) where NumeClP in the Spec,FP is compatible with the analysis above, in particular, it is compatible with the structure in (142). The structure (144) can distinguish cardinal-denoting numeral-classifier sequences from property-denoting ones and other property-denoting modifiers including adjectives The following structure is a generalized version of (142).

(146)



Since NumeClP is in Spec,FP and property-denoting modifiers are NP-adjuncts, the order between them cannot be reversed, generating the ordering restriction between cardinality-denoting numeral-classifier sequences and property-denoting modifiers. In addition, those modifiers that are NP-adjuncts can license a light noun. Since property-denoting numeral-classifier sequences are NP-adjuncts, property-interpretation is possible in NP-ellipsis construction. In contrast, numeral-classifier sequences denoting cardinal-interpretations cannot license a light noun since they are not NP-adjuncts.

By contrast, the NumeClP-as-adjunct structure (145) cannot account for the difference between numeral-classifier sequences and other modifiers in principled manner. We need to postulate, for example, that among NP-modifiers, numeral-classifier sequences denoting cardinal-interpretations are always higher than others modifier. Moreover, it is difficult for the NumeClP-as-adjunct analysis to explain why the cardinal-interpretation is not available when NP-ellipsis occurs. In the adjunct analysis, since numeral-classifier sequences are considered as NP-adjuncts, it is natural to assume that they can license a light noun just like other property-denoting modifiers, and the cardinal-interpretation as well as the property-interpretation should be possible.

The discussion leads me to conclude that the NumeClP-as-specifier analysis (144) is more plausible. I, therefore, propose that the prenominal numeral-classifier construction has the structure where NumeClP is in Spec,FP. The functional head F selects and hosts NumeClP in its specifier. I have not identified what is the functional projection FP. One possibility

is that it is a number phrase (NumP), which is responsible for number distinction (e.g., singular/plural). It has been proposed that cross-linguistically numerals are in Spec,NumP (e.g., Danon 2012). In Section 3.1, we have seen that numerals in English and numeral-classifier sequences in Japanese show similar behaviors. Thus, it is plausible that NumeClP is in Spec,NumP. Alternatively, as Scontras (2014) assumes, NumeClP would be in the specifier of NumeralP, a projection of numerals. At this moment, I leave open the identity of the functional projection FP.

3.7 Semantics of numeral-classifier sequences

In this section, I offer a semantic analysis for the numeral-classifier constructions. I analyze the Japanese data based on Rothstein (2013, 2017) and Sudo (2016). In Section 3.7.1, I introduces the semantic analysis of numerals and numeral-classifier sequences proposed by Rothstein (2013, 2017) and Sudo (2016), respectively. In Section 3.7.2, the prenominal numeral-classifier construction is analyzed and in Section 3.7.3, the postnominal numeral-classifier construction is investigated. In each section, a compositional analysis will be offered.

3.7.1 Property theory and numeral-classifier sequences

Rothstein (2013, 2017) proposes that numerals are analyzed as properties. In property theory as in Chierchia (1985), properties have multiple functions which are related via type-shifting operations. For example, property expressions such as *wise* in (147) can be used as predicates and they are adjectives.

(147) a. John is wise.
b. John is a wise person.

Properties also have nominal forms such as *wisdom*, which can be subjects of predication as (148) shows.

(148) Wisdom is valuable.

According to property theory, properties are associated with predicate interpretation of type $\langle e, t\rangle$, which denote functions from individuals into truth values, as shown in (149).

(149) $[\![\text{wise}_{\langle e,t\rangle}]\!] = \lambda x.\textsc{wise}(x)$

Properties are also associated with an individual correlate, which is of type of individuals π. Two modes are related via two operations $^{\cap}$ and $^{\cup}$. $^{\cap}$ applies to predicative type of $\langle e, t\rangle$ and derives individual correlate of type π. On the other hand, $^{\cup}$ applies to individual property of type π and derives the predicative correlate of type $\langle e, t\rangle$, as illustrated in (150)(The type-π property of *wise* is pronounced as *wisdom*).

(150) a. $[\![\text{wise}_{\pi}]\!] =^{\cap} \lambda x.\textsc{wise}(x)$

b. $^{\cup\cap}\lambda x.\textsc{wise}(x) = \lambda x.\textsc{wise}(x)$

Rothstein (2013, 2017) extends the property theory to numerals. Numerals can be used as predicates as shown in (151).

(151) a. My reasons are two.

b. The inhabitants of the barn are four cats.

Numerals can also be used as arguments as in (152).

(152) a. Two is a prime number.

b. Two plus two is four. (Rothstein 2017: 25 (26))

The numerals in (152) are subject of predicates, denoting abstract objects or numbers. Thus, numerals are names for numbers equivalent to proper names which denote individuals. The examples in (151) and (152) indicate that numerals have the duel uses. Just like adjectival uses of properties, numerals are predicated of arguments and in this case, numerals are of type $\langle e, t\rangle$ as in (153a) with the cardinality function defined in (153b) and x ranges over plural individuals.

(153) a. $[\![\text{three}_{\langle e,t\rangle}]\!] = \lambda x.|x| = 3$
'the set of objects whose cardinality is 3'

b. $|x| = n \leftrightarrow |\{y : y \sqsubseteq_{\text{ATOMIC}} x\}| = n$
'The cardinality of object x is n if the cardinality of the set of the atomic parts of x is n.'

The $\langle e, t\rangle$ mode of numerals are used in (151).

Predicates have the corresponding individual property correlate of the set in (153a). Thus, numerals are also of type n, a type of numbers. This is derived by the $^{\cap}$ operation.

(154) $[\![\text{three}_n]\!] = 3 = {}^{\cap}(\lambda x.|x| = 3)$

Type-n objects can fill argument positions as in (152) On the other hand, the $^{\cup}$ operator can apply to type-n objects, deriving the corresponding predicates of type $\langle e, t\rangle$.

(155) ${}^{\cup}3 = {}^{\cup\cap}(\lambda x.|x| = 3) = \lambda x.|x| = 3$

Having said that, let us turn to the Japanese data. In Sudo (2016), denotations of countable nominals in Japanese are equivalent to English count nouns, except the number specification. They contain both singular and plural individuals. Plural individuals are sums of singular individuals (e.g, Link 1983, Sauerland 2005). Thus, the noun *gakusei* 'student' is true of both singular and plural entities consisting of students as indicated by the *-operator.

(156) $[\![\text{gakusei}]\!] = [\![\text{students}]\!] = \lambda x.{}^{*}\textsc{student}(x)$

If a, b and c are students, the extension of *gakusei* 'student' is in (157).

(157) $[\![\text{gakusei}]\!] = \lambda x.{}^{*}\textsc{student}(x) = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$

Sudo (2016) assumes that the default type of numerals is of type n.

(158) $[\![\text{san}_n]\!] = 3$

Numerals cannot directly modify nouns since they are type-n objects. Sudo (2016) proposes that the role of classifiers is to turn the type-n object into a modifier of type $\langle e, t\rangle$. In addition, each classifier has a sortal restriction. For example, *-nin* is used for counting humans and humans only. This sortal restriction is assumed to be a presupposition.

(159) $[\![\text{nin}]\!] = \lambda n.\lambda x\colon {}^{*}\textsc{human}(x).|x| = n$

Due to the sortal presupposition, the classifier *-nin* ensures that x is a single human or an individual-sum consisting of humans and counts the number of singular humans in x. A classifier and a numeral are combined via Functional Application, resulting in a function of type $\langle e, t\rangle$.

(160) $[\![\text{san-nin}]\!] = \lambda x\colon {}^{*}\textsc{human}(x).|x| = 3$

The numeral-classifier sequence, then, combines with a noun via Predicate Modification. Thus, the denotation of *san-nin-no gakusie* and *gakusei san-nin* 'three students' is given in (161).

(161) $[\![\text{san-nin-no gakusei / gakusei san-nin}]\!] = \lambda x.|x| = 3 \;\&\; {}^{*}\textsc{student}(x)$

This is the function characterizing the set of pluralities of students whose cardinality is three.

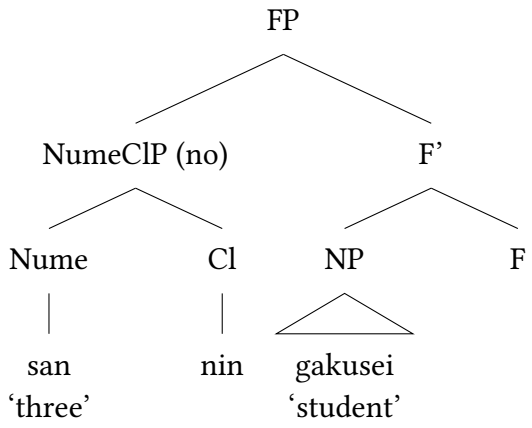
It is worth noting that Sudo's analysis is compatible with the classifier-for-numeral analysis that I have argued in Section 3.3. Classifiers are required because the default type of numerals cannot modify nouns. Classifiers make it possible for numerals to modify nouns by shifting type-n object into a modifier of type $\langle e, t\rangle$.

With this semantics, Section 3.7.2 examines the semantics of the prenominal numeral-classifier construction and Section 3.7.3 the semantics of the postnominal numeral-classifier construction.

3.7.2 The prenominal numeral-classifier construction

In Section 3.4 , I proposed that the syntactic structure of the prenominal numeral-classifier construction is as follows:

(162)

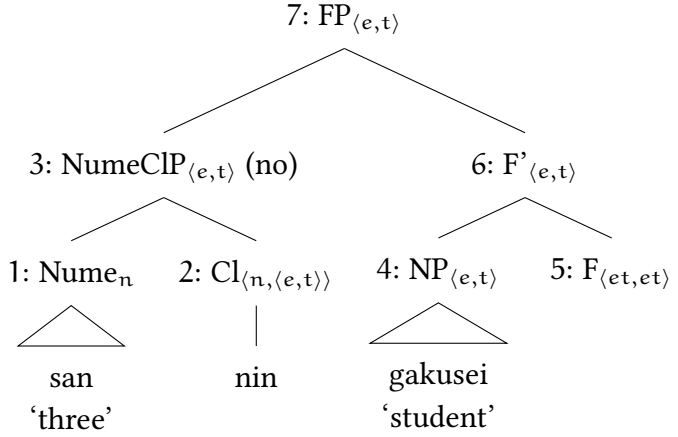


I suggested that the functional head F selects and hosts NumeClP in its specifier. Semantically, however, I propose that F does not play a role. It passes up the tree the denotation of its sister, namely, NP. Thus, F is considered as a identity function.

(163) $[\![F]\!] = \lambda P.P$

Together with the analysis of numerals and classifiers in the previous subsection, let us see the derivation of the prenominal numeral-classifier construction. The LF for a prenominal numeral-classifier construction is given in (164) and the derivation in (165).

(164)



(165) a. $1 : [\![\text{Nume}]\!] = [\![\text{san}]\!] = 3$

b. $2 : [\![\text{Cl}]\!] = [\![\text{nin}]\!] = \lambda n.\lambda x\colon {}^*\textsc{human}(x).|x| = n$

c. $3 : [\![\text{NumeClP}]\!] = [\![\text{san-nin}]\!] = \lambda x\colon {}^*\textsc{human}(x).|x| = 3$

d. $4 : [\![\text{NP}]\!] = [\![\text{gakusei}]\!] = \lambda x.{}^*\textsc{student}(x)$

e. $5 : [\![F]\!] = \lambda P.P$

f. $6 : [\![\text{F'}]\!] = [\![\text{NP}]\!] = [\![\text{gakusei}]\!] = \lambda x.{}^{*}\textsc{student}(x)$

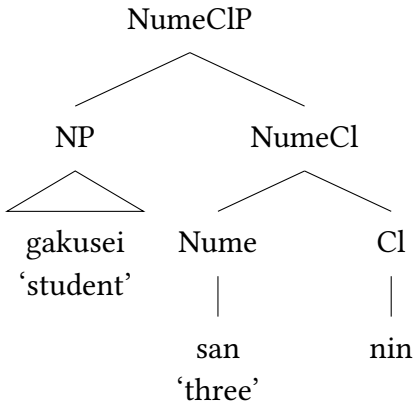
g. $7 : [\![\text{FP}]\!] = [\![\text{san-nin-no gakusei}]\!] = \lambda x.|x| = 3 \;\&\; {}^{*}\textsc{student}(x)$

The numeral starts with a type n in (165a). At node 3, the classifier turns the type-n object into a predicate (165c). The denotation of the noun is passed up due to the identify function at node 5 (165f). at node 7, the numeral-classifier sequence and the noun are composed via the Predicate Modification and we have (165g). At node 7, the presupposition of NumeClP is satisfied. The resulting denotation of the prenominal numeral-classifier construction is the set of pluralities of students whose cardinality is three.

3.7.3 The postnominal numeral-classifier construction

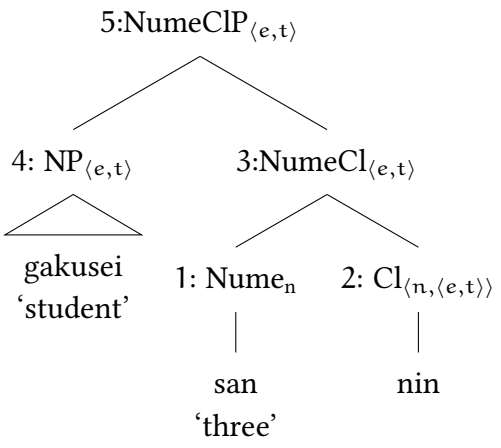
In Section 3.4, I proposed that the following complex head analysis for the syntax of postnominal numeral-classifier construction.

(166)



Recall that the denotation of the postnominal numeral-classifier construction does not differ from that of the prenominal numeral-classifier construction. I will show that the different structure will yield the same denotation. This is demonstrated by the derivation for (167), which is given in (168). Except for the syntax, all the lexical entries are identical between the prenominal and postnominal numeral-classifier constructions.

(167)



(168) a. $1 : [\![\text{Nume}]\!] = [\![\text{san}]\!] = 3$

b. $2 : [\![\text{Cl}]\!] = [\![\text{nin}]\!] = \lambda n.\lambda x\colon {}^{*}\textsc{human}(x).|x| = n$

c. $3 : [\![\text{NumeClP}]\!] = [\![\text{san-nin}]\!] = \lambda x\colon {}^{*}\textsc{human}(x).|x| = 3$

d. $4 : [\![\text{NP}]\!] = [\![\text{gakusei}]\!] = \lambda x.{}^{*}\textsc{student}(x)$

e. $5 : [\![\text{NumeClP}]\!] = [\![\text{gakusei san-nin }]\!] = \lambda x.|x| = 3 \;\&\; {}^{*}\textsc{student}(x)$

The numeral starts with its default type n, which is changed into type $\langle e, t\rangle$ at node 3 due to the classifier (168c). Unlike the prenominal construction, the complex head NumeCl takes the NP. The resultant denotation (168e) is identical to the one of the prenominal construction, the set of plural individuals of students with the cardinality of three. We have seen that even the structure is different, the two numeral-classifier constructions have the same denotation.

3.8 Optionality of classifiers

In this section, I demonstrate how the optionality of classifiers in the prenominal numeral-classifier construction in Japanese are yielded. I also explain the asymmetry of the optionality, by appealing to the syntactic difference between the prenominal and postnominal numeral-classifier constructions.

3.8.1 The prenominal numeral-classifier construction

Now let us examine how the optionality of classifiers in Japanese is accounted for within the analysis of Sudo (2016). Recall that in the prenominal numeral-classifier construction, the

classifiers become optional when numerals express large numbers or non-specific numbers, as discussed in Section 3.3.1, Section 3.3.2 and Section 3.5.4. Relevant examples are repeated below:

(169) Daitooryoo-wa shichoosha-kara yoserareta hyaku-(ko)-no shitsumon-ni
president-TOP viewer-from were.sent 100-(CL)-GEN question-to
kaitooshita.
answer
'The president answered 100 questions viewers asked.' (Sudo to appear: (8))

(170) John-wa juu-go-(ko)-no gengo-o shirabeta.
John-TOP 10-5-(CL)-GEN language investigated
'John investigated fifteen languages'
(Nomoto 2013: 16 (16) with a slight modification)

(171) a. Chikyuu-joo-ni-wa yaku sen-go-hyaku-(ko)-no kazan-ga aru.
earth-on-LOC-TOP about 1000-5-100-CL-GEN volcano-NOM exist
'There are about 1500 volcanoes on earth.' (Sudo to appear: (8))

b. John-wa ni san-(nin)-no gakusei-to hanashita.
John-TOP two three-CL-GEN student-with talked
'John talked with two or three students'

c. John-wa juu-suu-(ko)-no shima-o otozureta.
John-TOP 10-some-CL-GEN island-ACC visited
'John visited a dozen islands'
(Nomoto 2013: 16 (16) with a slight modification)

I will analyze how classifiers can be optional. In Sudo's (2016) analysis as introduced in Section 3.7.1, the default type of numerals is of type n. To modify a noun, in Japanese, a classifier is required to turn the type-n object into a predicate of type $\langle e, t \rangle$. This is shown in (172).

(172) a. $[\![\text{san}_n]\!] = 3$

b. $[\![\text{nin}]\!] = \lambda n.\lambda x\colon {}^*\textsc{human}(x).|x| = n$

c. $[\![\text{san-nin}]\!] = \lambda x\colon {}^*\textsc{human}(x).|x| = 3$

In non-classifier languages such as English, instead of using classifiers, the $\cup$ operator is applicable to turn the type-n object into a predicate, as illustrated in (173a). Numerals as adjectives can modify a noun directly (173c).

(173) a. $^{\cup}[\![\text{three}_{n}]\!] = [\![\text{three}_{\langle e,t\rangle}]\!] = \lambda x.|x| = 3$

b. $[\![\text{student}]\!] = \lambda x.{}^{*}\textsc{student}(x)$

c. $[\![\text{three students}]\!] = \lambda x.|x| = 3 \;\&\; {}^{*}\textsc{student}(x)$

Sudo (2016) follows Chierchia (1998a,b) and claims that the $\cup$ operation is considered as a last resort option. When a language has overt lexical items whose function is equivalent to the $\cup$ operator, the use of such lexical items is mandatory and consequently the application of the $\cup$ operation is blocked. As we have seen, classifiers do the job of the $\cup$ operator. Thus, in classifier languages, due to the existence of classifiers, the $\cup$ operation is blocked.

Regarding optionality of classifiers, Sudo (2016) acknowledges that his analysis cannot straightforwardly account for languages in which classifiers are optional. He notes that in optional classifier languages, the application of the $\cup$ operator is not blocked, though it remains unanswered how this works. In particular, the application of the $\cup$ operator should not be free. If the $\cup$ operator is freely applicable, Japanese will be a complete optional classifier language, which is not the case. Thus, we need to restrict the application.

To capture the optionality in Japanese, I suggest in Oho (2019b) that the $\cup$ operation is applicable in Japanese, contra Sudo (2016).[33] The application of $\cup$ is, however, restricted to a subset of numerals. As seen, classifiers become optional for large numbers and non-specific numbers. As mentioned, it is still not clear exact when classifiers are optional, but it is safe to say that the $\cup$ operation is applicable to those numerals that express large numbers and non-specific numbers. To distinguish from the ordinary $\cup$, I introduce $^{\Cup}$, a partial function version of $\cup$, defined in (174).[34]

(174) Let n be a number in the domain of type n. $^{\Cup}n$ is defined only if n expresses a "large" number or a "non-specific" number.
If defined, $^{\Cup}n = \lambda x.|x| = n$

33. Recently, however, Yasutada Sudo (p.c.) has noted that the type-shifting with $\cup$ should be available in Japanese.

34. An alternative analysis is proposed in Bale & Coon (2014), in which those numerals that do not require classifiers would be ambiguous between the two modes: type n and type $\langle e, t\rangle$.

Let us see a concrete example. The numeral *hyaku* 'hundred' can combine directly with a noun without a classifier (as in (169)). Thus, when it combines with a noun *hon* 'book', two forms are possible: without a classifier (*hyaku-no hon*) and with a classifier *-satsu* (*hyaku-satsu-no hon*). Compare the derivations of the two forms. First, the derivation of the case with the classifier is given in (175).

(175) a. $[\![\text{hyaku}_{\mathrm{n}}]\!] = 100$

b. $[\![\text{-satsu}]\!] = \lambda n.\lambda x\colon {}^{*}\textsc{book}(x).|x| = n$

c. $[\![\text{hyaku}_{\mathrm{n}}\text{-satsu}]\!] = \lambda x\colon {}^{*}\textsc{book}(x).|x| = 100$

d. $[\![\text{hon}]\!] = \lambda x.{}^{*}\textsc{book}(x)$

e. $[\![\text{hyaku}_{\mathrm{n}}\text{-satsu-no hon}]\!] = \lambda x.|x| = 100 \;\&\; {}^{*}\textsc{book}(x)$

The numeral of type n forms a constituent with the classifier *-satsu* (175c) and modifies the noun *book* as shown in (175e). The derivation of the case without the classifier is shown in (176).

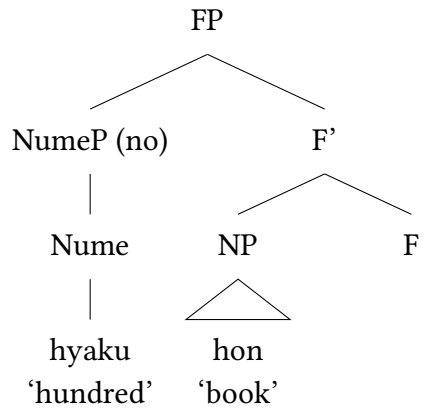
(176) a. ${}^{\cup}[\![\text{hyaku}_{\mathrm{n}}]\!] = [\![\text{hyaku}_{\langle e,t\rangle}]\!] = \lambda x.|x| = 100$

b. $[\![\text{hyaku}_{\langle e,t\rangle}\text{-no hon}]\!] = \lambda x.|x| = 100 \;\&\; {}^{*}\textsc{book}(x)$

When the numeral modifies the noun without the classifier, the $^{\cup}$ operator must apply to the numeral of type n and the corresponding predicate of type $\langle e, t\rangle$ is derived, as shown in (176a), with the assumption that the $^{\cup}$ operation is defined for *hyaku*. The numeral can combine with the noun without the classifier as in (176b).

When $^{\cup}$ is applied, I assume that NumeClP is not projected, since Cl is not needed. Instead, Nume projects NumeP, which combines with NP just in non-classifier languages. I propose that the functional head F can host either NumeClP or NumeP. Thus, the following structure is generated.

(177)



I have argued that how the optionality of classifiers is accounted for. I have suggested that the optionality of classifiers is possible because of the $^{\cup}$ operator.

For non-large and non-non-specific numerals, the $^{\cup}$ operation is undefined and hence the corresponding predicts are not derived. Thus, those numerals always require classifiers to modify nouns. Further, type-shifted numerals cannot combine with classifiers as illustrated in (178).

(178) $[\![\text{hyaku}_{\langle e,t\rangle}\text{-satsu}_{\langle n,\langle e,t\rangle\rangle}]\!] \rightarrow$ type mismatch

The combination results in a type mismatch. As a result, when a classifier appears, the only possible way to modify a noun is to use a numeral of the default type (type n) which a classifier turns into predicates.

3.8.2 The postnominal numeral-classifier construction

The postnominal numeral-classifier construction differs from the prenominal numeral-classifier construction in that it does not allow classifiers to be optional. Even though numerals express large numbers or non-specific numbers, classifiers cannot be omitted. The examples are repeated below:

(179) a. Daitooryoo-wa shichoosha-kara yoserareta shitsumon hyaku-*(ko)-ni
president-TOP viewer-from were.sent question hundred-CL-to
kaitooshita.
answered
'The president answered 100 questions viewers asked.'

b. John-wa gengo juu-go-*(ko)-o shirabeta.
John-TOP language 10-5-CLinvestigated
'John investigated fifteen languages'

(180) a. Chikyuu-joo-ni-wa kazan yaku sen-go-hyaku-*(ko)-ga aru.
earth-on-LOC-TOP volcano about thousand-five-hundred-NOM exist
'There are about 1500 volcanoes on earth.'

b. John-wa gakusei ni san-*(nin)-to hanashita.
John-TOP student two three-CL-with talked
'two or three students'

c. John-wa shima juu-suu-*(ko)-o otozureta.
John-TOP island ten-some-CL-ACC visited
'John visited a dozen islands'

For the prenominal numeral-classifier construction, I proposed that the type-shifting operator $^{\cup}$ is applicable to prenominal numerals and the numerals can modify a noun without a classifier. For the postnominal numeral-classifier construction, I propose that the syntactic constraint makes the application of $^{\cup}$ inappropriate. I postulate that the simplex head Nume does not select NP. It is the complex head NumeCl that selects NP. Since the head Nume alone cannot select NP, a numeral cannot appear without a classifier in the postnominal numeral-classifier construction: whenever numerals are present, classifiers are present. It should be noted that nothing in the postnominal numeral-classifier construction prevents the type shifting operation $^{\cup}$ from applying to numerals. However, what would happen is a type mismatch. Consider the case in which a type-shifted numeral combines with a classifier as in (181).

(181) $[\![\text{hyaku}_{\langle e,t\rangle}\text{-satsu}_{\langle n,\langle e,t\rangle\rangle}]\!] \rightarrow$ type mismatch

The combination ends up with a type mismatch and the computation cannot go further. As in the prenominal numeral-classifier construction, the only way to modify a noun when a classifier appears is to use a numeral of the default type.

This analysis is amount to saying that the asymmetry of the optionality of classifiers between the prenominal and postnominal numeral-classifier constructions is due to the syntactic differences between them. I noted that for the prenominal numeral-classifier

construction, the functional head F can host not only NumeClP but also NumeP. In contrast, for the postnominal numeral-classifier construction, no such variation is admitted: only the complex head NumeCl selects NP, whereas the simplex NumeP cannot. As a result, classifiers cannot be omitted in the postnominal numeral-classifier construction.

3.8.3 Discussion of a null classifier analysis

In the previous subsection, the asymmetry of the optionality of classifiers found in the two numeral classifier constructions in Japanese is accounted for by the syntactic differences between the two constructions. This subsection briefly discusses issues in an alternate analyses that appeals to null classifiers.

In the analysis put forward in the section, the optionality in the prenominal construction is captured by the use of the $^{\cup}$ operator applicable to some kinds of numerals of type n which makes the corresponding predicate of type $\langle e, t\rangle$. Alternatively, it would be possible to explain the optionality by postulating a phonologically null classifier in the structure. In this analysis, numerals are of type n and a null classifier turns them into predicates of type $\langle e, t\rangle$ just like overt classifiers do. The difference is whether a classifier is phonologically null or not. An issue of this analysis is that the asymmetry of the optionality is not straightforwardly captured. We need to postulate that null classifiers are only allowed in the prenominal constructions but not in the postnominal construction. Since I proposed the complex head analysis for both the constructions, it is difficult to make an principled explanation for why a null classifier is allowed in the prenominal numeral-classifier construction and not in the postnominal numeral-classifier construction.

3.9 Summary

In this chapter, I have examined the syntax and semantics of the numeral-classifier constructions in Japanese. This chapter started with the examination of differences between numeral-classifier sequences and the strong quantifiers. I argued that numeral-classifier sequences are similar to adjectives, functioning as predicates. In addition, they are DP-internal elements. The analysis of the role of classifiers in Japanese indicated that Japanese should be

analyzed as a classifier-for-numeral language. The property of nouns, the idiosyncrasy, the morpho-phonological relation between numerals and classifiers and the lack of bare classifier constructions support this analysis. The classifier-for-numeral analysis suggests that a numeral and a classifier form a constituent to the exclusion of a noun. Given this analysis, I proposed the complex head analysis for both the prenominal and postnominal numeral-classifier constructions. In addition, adopting the proposal by Danon (2012), I proposed the syntax of the numeral-classifier constructions. Numeral-classifier sequences may occupy a specifier position or a head. This two-structure analysis explains the word order variation. I also discussed how the asymmetry of the optionality of classifiers is captured. Based on the proposed semantics, I suggested that for the prenominal numeral-classifier construction, the type-shifting operation is applicable and the syntax allows not only NumeClP but also NumeP to appear in Spec,FP, whereas for the postnominal numeral-classifier construction, the complex head NumeClP takes NP but the simplex head Nume alone cannot.

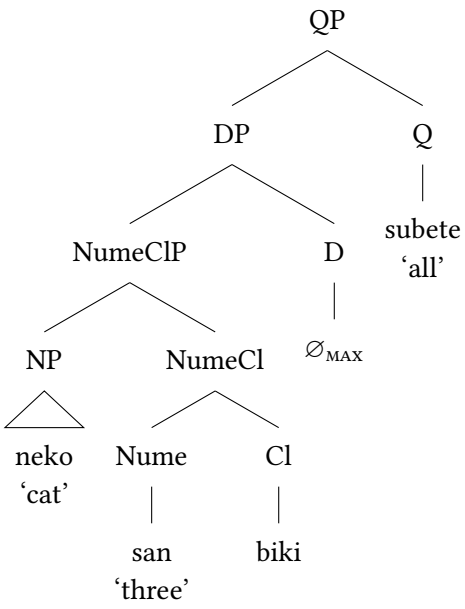
Finally, I end this chapter by showing a structure of Japanese nominals based on the discussion so far. Given the analysis for the strong quantifiers in the previous chapter and the analysis for the numeral-classifier construction made in this chapter, we can show the complete structure for the cases where both a strong quantifier and a numeral-classifier sequence appear in a sentence as in (182).

(182) a. John-no neko san-biki subete-ga nigeta.
John-GEN cat 3-CL all-NOM ran.away
'All of the three cats of John's ran away.'

b. John-no san-biki-no neko subete-ga nigeta.
John-GEN 3-CL-GEN cat all-NOM ran.away
'All of the three cats of John's ran away.'

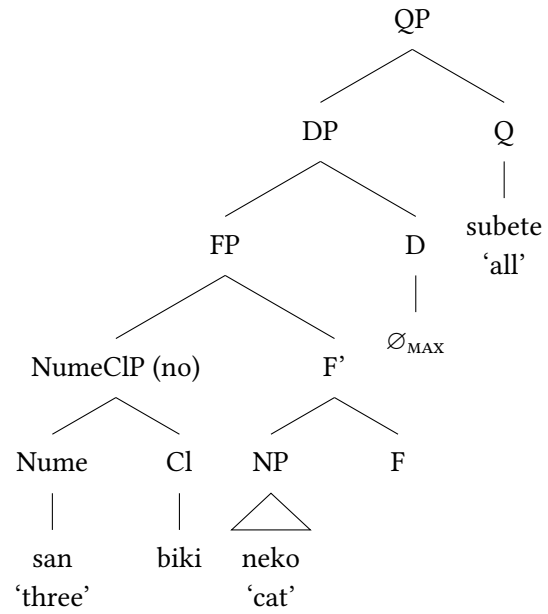
The diagram in (183) represents the structure for (182a), in which the postnominal numeral-classifier sequence comes before the prenominal strong quantifier. I omit the possessive phrase *John-no* 'John's' in the structure for sake of simplicity.

(183)



The structure in (184) is for (182b), where the prenominal numeral-classifier sequence and the postnominal strong quantifier co-occur. Again, the possessive phrase *John-no* 'John's' is not represented.

(184)



In both the structures, several functional projections are involved. Some of them has a null head (D and F), some have a non-null one (Nume, Cl and Q). Japanese does not differ from other languages in that several functional layers exits in the nominal domain, even though some are not overtly realized.

Chapter 4

Numeral-classifier constructions with proper names and pronouns

In the previous chapter, we looked at the case where numeral-classifier sequences modify common nouns. This chapter examines a particular kind of numeral-classifier constructions, in which numeral-classifier sequences modify proper names and pronouns. It shows hitherto unnoticed interpretive functions of numeral-classifier sequences in Japanese.

In Section 4.1, I present data and point out issues. I point out that there is an asymmetry between prenominal and postnominal numeral-classifier sequences. I further suggests that postnominal numeral-classifier sequence modifying proper names and pronouns introduce non-at-issue content. In Section 4.2, I investigate the postnominal numeral-classifier construction. I argue that numeral-classifier sequences that modify proper names and pronouns introduce conventional implicatures in the sense of Potts (2005). I give a multidimensional analysis based on the framework in Potts. In Section 4.3, I consider the asymmetry. I account for the asymmetry by establishing a general condition for being modifiers of proper names and pronouns. Section 4.4 makes a brief comment on what it calls pronoun-noun constructions, which are similar to the postnominal numeral-classifier construction with proper names and pronouns.

4.1 Data and issues

In the previous chapter, we saw that Japanese allows numeral-classifier sequences that denote cardinality to appear prenominally and postnominally.

(1) a. *Prenominal*
Futa-ri-no gakusei-ga sono shigoto-o tantoo-shita.
2-CL-GEN student-NOM that job-ACC in.charge-did
'Two students were in charge of that job.'

b. *Postnominal*
Gakusei futa-ri-ga sono shigoto-o tantoo-shita.
student 2-CL-NOM that job-ACC in.charge-did
'Two students were in charge of that job.'

However, when it comes to modification of proper names and pronouns, numeral-classifier sequences show an asymmetry. Consider the following examples.

(2) a. John hito-ri-ga sono shigoto-o tantoo-shita.
John 1-CL-NOM that job-ACC in.charge-did
'Lit. John one was in charge of that job.'

b. Kare hito-ri-ga sono shigoto-o tantoo-shita.
He 1-CL-NOM that job-ACC in.charge-did
'Lit. He one was in charge of that job.'

c. Watashi hito-ri-ga sono shigoto-o tantoo-shita.
I 1-CL-NOM that job-ACC in.charge-did
'Lit. I one was in charge of that job.'

(3) a. *Hito-ri-no John-ga sono shigoto-o tantoo-shita.
1-CL-GEN John-NOM that job-ACC in.charge-did
'Lit. One John was in charge of that job.'

b. *Hito-ri-no kare-ga sono shigoto-o tantoo-shita.
1-CL-GEN he-NOM that job-ACC in.charge-did
'Lit. One he was in charge of that job.'

c. *Hito-ri-no watashi-ga sono shigoto-o tantoo-shita.
1-CL-GEN I-NOM that job-ACC in.charge-did
'Lit. One I was in charge of that job.'

As (2) shows, the numeral-classifier sequences can modify the proper name or the pronouns in postnominal position. In contrast, as shown in (3), the numeral-classifier sequences cannot come in prenominal position.[1] (Note that when prenominal numeral-classifier sequences are interpreted as property-denoting modifiers, they can modify proper names and pronouns. We will come back to this case later in Section 4.3.4. Note that property-interpretation of numeral-classifier sequences was introduced in Chapter 3, Section 3.6).

The same is true for the plural counterparts where proper names are conjoined or pronouns are modified by a plural marker *-ra* or *-tachi*. [2]

(4) a. John to Mary futa-ri-ga sono shigoto-o tantoo-shita.
John and Mary 2-CL-NOM that job-ACC in.charge-did
'Lit. John and Mary Two were in charge of that job.'

b. Kare-ra futa-ri-ga sono shigoto-o tantoo-shita.
he-PL 2-CL-NOM that job-ACC in.charge-did
'Lit. They two were in charge of that job.'

c. Watashi-tachi futa-ri-ga sono shigoto-o tantoo-shita.
I-PL 2-CL-NOM that job-ACC in.charge-did
'Lit. We two were in charge of that job.'

(5) a. *Futa-ri-no John to Mary-ga sono shigoto-o tantoo-shita.
2-CL-GEN John and Mary-NOM that job-ACC in.charge-did
'Lit. Two John and Mary were in charge of that job.'

b. *Futa-ri-no kare-ra-ga sono shigoto-o tantoo-shita.
2-CL-GEN he-PL-NOM that job-ACC in.charge-did
'Lit. Two they were in charge of that job.'

c. *Futa-ri-no watashi-tachi-ga sono shigoto-o tantoo-shita.
2-CL-GEN I-PL-NOM that job-ACC in.charge-did
'Lit. Two we were in charge of that job.'

Just like the singular cases, while the postnominal numeral-classifier sequences can modify the proper name and the pronouns, the prenominal ones cannot.

1. (3a) has a licit reading in which among several individuals named 'John', one of them was in charge of the task. In this reading, *John* is used as a predicate denoting the property of being named 'John'. In this paper, I will limit my discussion to non-predicational uses of proper names.
2. A similar observation is made in Furuya (2009) and Inokuma (2009).

Here we have an asymmetry The postnominal numeral-classifier sequences can modify proper names and pronouns, whereas the prenominal ones cannot. This asymmetry is puzzling, because no such asymmetry is found when numeral-classifier sequences modify common nouns. There should be something special when numeral-classifier sequences modify proper names and pronouns. In the remainder of this chapter, I will account for this asymmetry.

In addition to the presence of the asymmetry, there is another intriguing aspect in this construction. I observe that for the acceptable postnominal numeral-classifier constructions with proper names or pronouns as in (2) and (4), the numeral-classifier sequences do not contribute to at-issue meaning. Take (4) for example, the numeral-classifier sequence *futa-ri* '2-CL' conveys the information that the cardinality of the noun that it modifies is two. This information is projected under negation. Consider (6).

(6) { John to Mary / Kare-ra / Watashi-tachi } futa-ri-ga sono shigoto-o
{ John and Mary / he-PL / I-PL } 2-CL-NOM that job-ACC
tantoo-shita wakedewanai.
in.charge-did it.is.not.the.case.that
'Lit. It is not the case that { John and Mary / they / we } two were in charge of that job.'

In (7), the information conveyed by the numeral-classifier sequence 'the cardinality of John and Mary/them/us' is not affected by the negation. It is known that non-at-issue content are scopeless with respect to semantic operators (Simons et al. 2010, Potts 2005 a.o.). The scopelessness found in (6) suggests that the numeral-classifier sequence introduces non-at-issue content. Two questions arise. The first question is what this non-at-issue content is. The second one is how compositionally the way that numeral-classifier sequences introduce this non-at-issue content is analyzed.

In the remind of this chapter, I will identify the type of non-at-issue content introduced by numeral-classifier sequences and offer an analysis which captures how the non-at-issue meaning is compositionally derived. I then discuss why only prenominal numeral-classifier sequences cannot modify proper names and pronouns.

4.2 Postnominal numeral-classifier sequences

The goal of this section is to identify the type of non-at-issue content that numeral-classifier sequences express and to offer a formal analysis. I suggests that numeral-classifier sequences that modify proper names and pronouns are conventional implicatures. I model this using a multidimensional model proposed in Potts (2005). I also discuss whether the non-at-issue interpretation is available when postnominal numeral-classifier sequences modify common nouns. Finally, I point out an issue of the analysis and discuss a solution.

4.2.1 Numeral-classifier sequences as conventional implicatures

To analyze the postnominal numeral-classifier construction with a proper name or a pronoun, let us first examine the interpretive property of the numeral-classifier sequence in this construction. As I pointed out in Section 4.1, postnominal numeral-classifier sequences modifying a proper name or a pronoun produce not-at-issue contents. They add supplementary information about cardinality of proper names or pronouns that they modify. For example, (7a) has the at-issue meaning (7a) and non-at-issue meaning (7b).

(7) Kare hito-ri-ga sono shigoto-o tantoo-shita.
he 1-CL-NOM that job-ACC in.charge-did
a. At-issue: He was in charge of that job.
b. Non-at-issue: The cardinality of he is one.

Similarly, (8), in which a conjoined proper name is modified by a prenominal numeral-classifier sequence, has the at-issue meaning (8a) and non-at-issue meaning (8b).

(8) John to Mary futa-ri-ga sono shigoto-o tantoo-shita.
John and Mary 2-CL-NOM that job-ACC in.charge-did
a. At-issue: John and Mary were in charge of that job.
b. Non-at-issue: The cardinality of John and Mary is two.

Among non-at-issue expressions, I argue that postnominal numeral-classifier sequences modifying a proper name or a pronoun are conventional implicatures (CIs) in the sense of

Potts (2005).[3] I will refer to numeral-classifier sequences that modify proper names and pronouns as *supplementary numeral-classifier sequences*. To test the interpretive property of the supplementary numeral-classifier sequences, I adopt the tests for CIs introduced in McCready (2010).

The first test is about scopelessness. CIs are not affected by semantic operators. Consider the following examples, in which a nominal appositive and an expressive adjective *damn* in English are used as representative cases for CIs (Potts 2005).

(9) a. It is false that John, the swimmer, is a good dancer.
b. If John, the swimmer, comes to the party, everyone will have a good time.
(McCready 2010: 6 (5))

(10) a. That damn John didn't come to the party.
b. If that damn John comes to the party, no one will have a good time.
(ibid.: 6 (6))

In (9), the information conveyed by the nominal appositive is not affected by the negation or by the conditional. For example, (9a) and (9b) entail the proposition that John is the swimmer. The same is true for the expressive content in (10). The scopelessness is also found in presupposition. However, CIs differ from presuppositions in that they cannot be bound. McCready (2010: 7) notes: "'Binding' refers to the situation in which a conditional antecedent (or other universal construction) entails the content of a presupposition which appears in the consequent. In this situation, no presupposition is projected." Consider (11).

(11) If John has a daughter, John's daughter must be pretty. (ibid.: 7 (7))

In (11), the conditional antecedent entails the presupposition of the consequent (i.e., John has a daughter). (11) does not presuppose that John has a daughter. This binding property differs in CIs.

3. Downing (1996) analyzes postnominal numeral-classifier sequences as appositives. In her analysis, the meaning of numeral-classifier sequences is treated as backgrounding information and as presuppositional. As we have seen in Chapter 3, however, the use of postnominal numeral-classifier sequences is not limited to non-at-issue use. In addition, as we will see shortly in this section, the postnominal numeral-classifier sequences that modify proper name or pronouns are not presuppositions.

(12) a. #If John is a swimmer, then John, a swimmer, came to the party
b. #If I hate John, then that damn John came to the party. (ibid.: 7 (8))

In (12), the content of the appositive (i.e., John is a swimmer) in (12a) and that of the expressive adjective (i.e., John is in some way bad) in (12b) are projected, even though it is entailed by the conditional antecedent. McCready accounts for the infelicity of the examples by pointing out that since the speaker indicates that John is a swimmer or that John is in some way bad, it is odd to conditionalize this information, resulting in a sense of redundancy.

The third test is about the behaviour of CIs under denial. Denials can target the at-issue content of a sentence.

(13) a. A: John came to the party last night.
B: That's not true/That's false.
b. 'John didn't *come to the party*.'
'John didn't come to the party *last night*.' etc. (ibid.: 7 (9))

Possible interpretations of B's denial in (13a) are given in (13b). The denial targets the VP part *come to the party* or the temporal adverb *last night*, both of which are at-issue contents. When it comes to the CI meaning of the nominal appositive or the expressive adjective, denials cannot target it.

(14) a. A: John, a swimmer, came to the party last night.
B: That's not true/That's false.
b. ≠'John is not a swimmer.' (ibid.: 7 (10))

(15) a. A: That damn John came to the party last night.
B: That's not true/That's false.
b. ≠'There's nothing wrong with John.' (ibid.: 7 (11))

B's denial in (14a) and (15a) does not have the interpretation in (14b) and (15b), respectively, showing that the CI content cannot be denied.

Now let us apply the tests to supplementary numeral-classifier sequences. First, we will see whether postnominal supplementary numeral-classifier sequences are scopeless. Consider the following example.

(16) { John to Mary / Kare-ra / Watashi-tachi } futa-ri-ga sono shigoto-o
{ John and Mary / he-PL / I-PL } 2-CL-NOM that job-ACC
tantoo-shita wakedewanai.
in.charge-did it.is.not.the.case.that
'Lit. It is not the case that { John and Mary / they / we } two were in charge of that job.'

The example in (16) entails that the cardinality of the subject (i.e., John and Mary / they / we) is two. The information conveyed by the numeral-classifier sequence is not in the scope of negation. Similarly, as indicated in (17), when the numeral-classifier construction is the antecedent of conditionals, the meaning of the numeral-classifier sequence survives.

(17) Moshi { John to Mary / Kare-ra / Watashi-tachi } futa-ri-ga sono shigoto-o
if { John and Mary / he-PL / I-PL } 2-CL-NOM that job-ACC
tantoo-shita-ra, minna-wa yorokobu-daroo.
in.charge-COND, everyone-TOP happy-will
'Lit. If { John and Mary/ They / We } two were in charge of that job, everyone will be happy.'

Example (16) and (17) suggest that the meaning of the postnominal numeral-classifier sequence is not affected by the semantic operators, namely, it is scopeless. The scopelessness indicates that the meaning of postnominal numeral-classifier sequence is a non-at-issue component.

At this point, supplementary numeral-classifier sequence are at least presuppositions. If they are presuppositions, we expect that they can be bound in conditional sentences. In other words, if an antecedent of a conditional entails the information conveyed by a supplementary numeral-classifier sequence, the information will not be projected. With this in mind, consider the following example.

(18) #Moshi kare-ra-no ninzuu-ga go-nin-datta-ra, kare-ra go-nin-wa
if he-PL-GEN number-NOM 5-CL-be.PAST-COND, he-PL 5-CL-TOP
shiai-ni kate-ta.
game-DAT can.win-PAST
'Lit. If the number of them was five, they five could win the game.'

In (18), the antecedent of the conditional entails the information 'the cardinality of them is five' which is conveyed by the numeral-classifier construction *kare-ra go-nin* 'they five'. This information is indeed projected from the consequence of the conditional, resulting in redundancy. This binding test suggests that the numeral-classifier sequence is not a presupposition and but a CI.

Let us turn to the denial test. If the content of a supplementary numeral-classifier sequence is a CI, it cannot be a target of denial. Consider the following example.

(19) A: Kare-ra futa-ri-ga sono shigoto-o tantoo-shita.
he-PL 2-CL-NOM that job-ACC in.charge-did
'Lit. They two were in charge of that job.'

B: Sore-wa hontoo janai/Sore-wa uso-da
that-TOP truth COP.NEG/that-TOP lie-COP
'That's not true./That's a lie.'

(20) a. (19B) = 'They were not in charge of *that job*.'

b. (19B) ≠ 'The cardinality of them is not two.'

B's denial in (19) can be interpreted as (20a) but not as (20b). The interpretation of (20a) is the denial of the at-issue content of A's utterance (e.g., it is not *that job* that they were in charge of.). This at-issue content is called into question, as expected. The interpretation of (20b) is the intended denial of the meaning of the numeral-classifier sequence. However, this interpretation is not obtained by B's denial. The result of this denial test is consistent with the analysis that the information conveyed by the supplementary numeral-classifier sequence is a CI.

So far, we have used McCready's (2010) tests. In addition to the binding property, presuppositions and CIs differ in that CIs, but not presuppositions, introduce new information. However, it is not straightforward to test whether supplementary numeral-classifier sequences express new information. When a numeral-classifier sequence appears with a (conjoined) proper name, the cardinality of the proper name is not presupposed. Let us look at (21).

(21) John to Mary futa-ri-ga sono shigoto-o tantoo-shita.
John and Mary 2-CL-NOM that job-ACC in.charge-did
a. At-issue: John and Mary were in charge of that job.
b. Non-at-issue: The cardinality of John and Mary is two.

To utter the sentence, the speaker does not presuppose the cardinality of John and Mary. However, the non-at-issue meaning does not seem new. The cardinality of John and Mary is evoked immediately by using the conjoined proper name. In other words, the information of the cardinality is already involved in the conjoined proper name. What the numeral-classifier sequence does is to make this information of the cardinality explicit. Thus, it is hard to tell whether the content of the numeral-classifier sequence modifying the proper name is new information and it is actually a CI. Nevertheless, I suggest that the supplementary numeral-classifier sequence introduces new information and hence it is a CI.

Unlike proper names, the cardinality of plural pronouns is not evident. In the case where a numeral-classifier sequence modifies a plural pronoun, if the cardinality is conventionally implicated, the numeral-classifier sequence can be used without assuming that the cardinality is in the common ground. Let us consider the following example and assume that it is uttered in an out-of-blue context.[4]

(22) Gakusei-ga mise-ni haittekita. Kare-ra go-nin-wa koohii-o chuumonshita.
student-NOM store-LOC entered he-PL 5-CL-TOP coffee-ACC ordered
'Lit. Students came into the store. They five ordered coffee.'

The plural pronoun in the second sentence refers to the student in the first sentence. The cardinality of the plural pronoun is not introduced until be the second sentence and hence it is not presupposed when the second sentence is uttered. However, the use of the postnominal numeral-classifier sequence is felicitous, suggesting that the content of the numeral-classifier sequence is new information. It should be noted that when one tries to deny the second sentence of (22) by uttering *that's not true*, the meaning expressed by the numeral-classifier sequence cannot be denied. In other words, the proposition that the cardinality of them is five cannot be called into question, which indicates that the information of the numeral-

4. I thank Tomoyuki Yoshida (p.c.) for raising this example.

classifier sequence in the second sentence is a CI. Since the denial only targets the at-issue component, it has an interpretation that they didn't order *coffee*, for example.

Question-answer pairs also show that supplementary numeral-classifier sequences introduce new information. In general, answers to questions must convey new information from the point of the questioner (McCready 2004). Consider (23).

(23) CONTEXT: A and B are talking about students of several professors. A knows nothing about Prof. Smith's students. She believes that B knows them well and asks:

A: Smith-sensei-no gakusei-nitsuite nanimo shiranai-no dakedo,
Smith-prof-GEN student-about nothing know-NMN but,
kare-ra-nitsuite oshiete kureru?
he-PL-about tell give
'I know nothing about Prof. Smith's students. Could you tell me about them?'

B: Kare-ra san-nin-wa totemo yuushuu-da-yo.
he-PL 3-CL-TOP really excellent-COP-SFP
'They three are really excellent.'

A's question explicitly states that A does not know anything about Prof. Smith's students. This suggests that B does not assume that the cardinality of Prof. Smith's students is in the common ground. In this context, B's answer to A's question is felicitous, suggesting that the answer conveys new information and consequently, the numeral-classifier sequence introduces new information. Note also that just like (22), when one tries to deny B's answer in (23), the information expressed by the numeral-classifier sequence cannot be denied, showing that it is a CI component.

In addition to the property that CIs introduce new information, Potts (2005) claims that CIs must not be backgrounded. For example, when a meaning introduced by a nominative appositive is in the common ground, the use of the nominative appositive results in infelicity due to the sense of redundancy.

(24) a. Lance Armstrong survived cancer.

b. #When reporters interview Lance, a cancer survivor, he often talks about the disease. (Potts 2005: 112 (4.46))

(24a) introduces the proposition into the common ground. It entails the content of the nominal appositive in (24b). In this situation, (24b) is infelicitous due to redundancy. Thus, CI-meanings must not be in the common ground. Potts calls this property the *antibackgrounding effect*.

We expect that the content of supplementary numeral-classifier sequences also shows the antibackgrounding effect. However, a postnominal numeral-classifier sequence can appear, even if the cardinality of the noun is overtly introduced before. (25a) is followed by (25b).

(25) a. Go-nin-no gakusei-ga mise-ni haittekita.
5-CL-GEN student-NOM store-LOC entered
'Five students came into the store.'

b. Kare-ra go-nin-wa koohii-o chuumonshita.
he-PL 5-CL-TOP coffee-ACC ordered
'Lit. They five ordered coffee.'

If the numeral-classifier sequence is a CI component and introduces new information, (25b) would result in redundancy. The felicitous use of (25b) seems contradictory to the property of CIs and to the proposed analysis. However, I assume that the use of the numeral-classifier sequence in (25b) is different from the one in (22). Specifically, it is an anphoric use of numeral-classifier sequences (see also Downing 1996). (25a) can be followed by a numeral-classifier sequence alone (26a) as well as a pronoun (26b).

(26) a. Go-nin-wa koohii-o chuumonshita.
5-CL-TOP coffee-ACC ordered
'Lit. Five ordered coffee.'

b. Kare-ra-wa koohii-o chuumonshita.
he-PL-TOP coffee-ACC ordered
'They ordered coffee.'

The numeral-classifier sequence alone in (26a) refers to the five students in (25a), just like the plural pronoun in (26b). I suggest that the pronoun + numeral-classifier sequence in (25b) under the context is the maximal realization of anaphoric pronoun and numeral-classifier sequence. In this usage, the numeral-classifier sequence does not introduce new information.

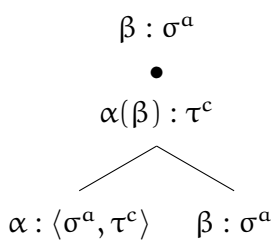
This anaphoric usage must be distinguished from the one in (22) and the supplementary numeral-classifier sequences that we have looked at so far. It seems that the availability of anaphoric use of numeral-classifier sequences conceals the antibackgrounding effect. Nonetheless, I assume that the tests that we used and the observations that the numeral-classifier sequence introduces new information are conclusive to show that the content of numeral-classifier sequences modifying a proper name or a pronoun is a CI, even though the antibackgrounding property is difficult to detect.

In summary, I have argued that supplementary numeral-classifier sequences are CIs. I have shown by using the tests that they are scopeless and they cannot be a target of denial. In addition, the binding test indicates that supplementary numeral-classifier sequences are not presuppositions. Moreover, I have demonstrated that the information conveyed by supplementary numeral-classifier sequences is new. These observed properties are compatible with the analysis that supplementary numeral-classifier sequences are CIs. In next section, I will offer an formal compositional analysis by adopting Potts's (2005) multidimensional analysis of CIs.

4.2.2 Multidimensional analysis

Potts (2005) proposes that meanings of natural language compose of two independent dimensions: at-issue and CI dimensions. At-issue dimension represents ordinary truth-conditional meanings. CI dimension is for conventional implicature, which is a secondary meaning and independent of at-issue meaning. In Potts's system, at-issue meaning and CI meaning are computed separately. The system introduces an enriched type theory which has at-issue types (e^a, t^a, etc.) and CI types (e^c, t^c, etc.). In addition, it has a rule 'Cl Application' (27).

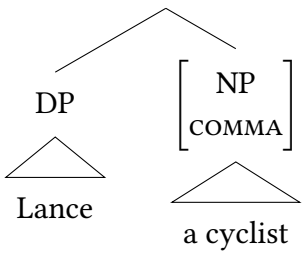
(27) CI application



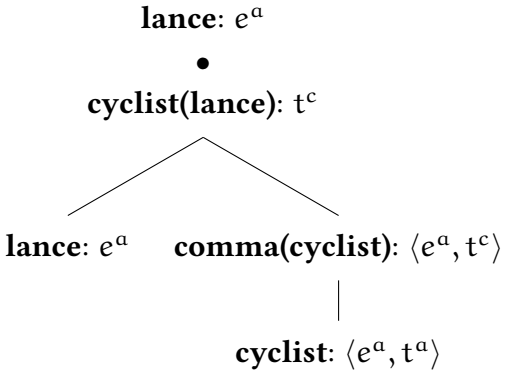
A crucial feature of the CI application is that a CI meaning applies to an at-issue meaning, yielding a CI meaning. At the same time, the original at-issue meaning is passed up to the mother node. Consequently, the composed CI meaning is paired with the original at-issue meaning, which is represented by the bullet •. Given this rule, an at-issue term is "duplicated". It is consumed as an argument of a CI meaning and will be used later in the derivation.

How the CI application works is illustrated below. A DP with a nominal appositive *Lance, a cyclist* is represented syntactically in (28a) and semantically in (28b).

(28) a.



b.



The predicate *cyclist* starts as an at-issue modifier (type $\langle e^a, t^a \rangle$). Potts suggests that the comma intonation, which characterizes appositives and supplements in English, is responsible for the shift from the at-issue dimension into the CI dimension. The syntactic feature of COMMA is translated in (29): it takes at-issue property-types to CI property-types.

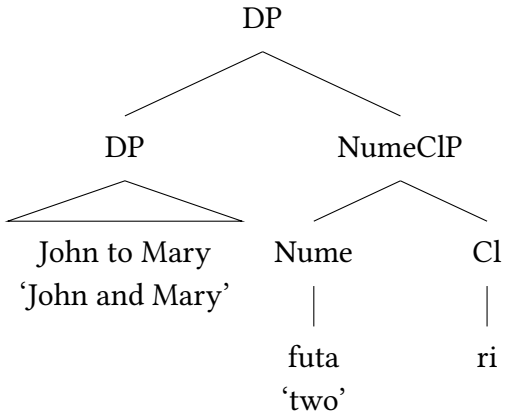
(29) $\text{COMMA} \rightsquigarrow \lambda f \lambda x.f(x) : \langle \langle e^a, t^a \rangle, \langle e^a, t^c \rangle \rangle$

The application of COMMA to the predicate *cyclist* yields the CI meaning (type $\langle e^a, t^c \rangle$). Due to the CI application, the CI predicate composes with the argument *lance* in the CI dimension, resulting in the CI proposition that Lance is a cyclist. The argument is passed up and is available for further composition. The resultant pair of the at-issue and CI meanings is indicated by the • in (28b) The DP, thus, means 'Lance' in the at-issue dimension and the proposition 'Lance is a cyclist' in the CI dimension.

I adopt Potts's multidimensional model and analyze the construction containing sup-

plementary numeral-classifier sequences. The postnominal numeral-classifier construction with a conjoined proper name in (30a) will have the syntactic structure (30b).

(30) a. John to Mary futa-ri
John and Mary 2-CL
'Lit. John and Mary two'

b. 

I assume that the NumeClP right-adjoins to a DP. I further suggest that a shifting operation from at-issue dimension to CI dimension, which is equivalent to COMMA, is available in the postnominal numeral-classifier construction.

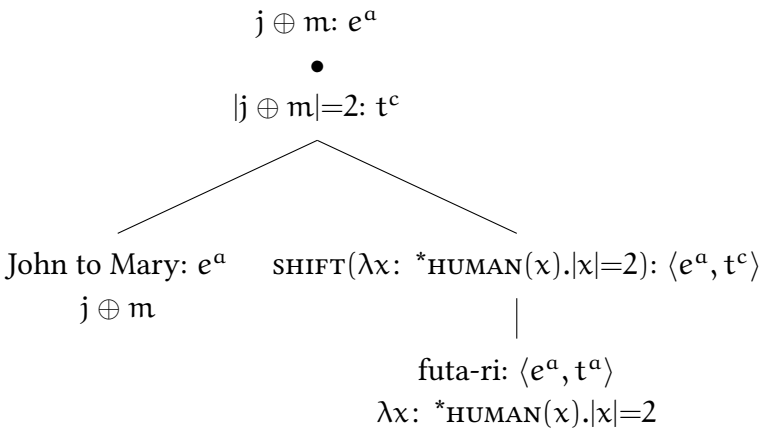
(31) $\textsc{shift} \rightsquigarrow \lambda f \lambda x.f(x) : \langle\langle e^{a}, t^{a}\rangle, \langle e^{a}, t^{c}\rangle\rangle$

This type-shifting is considered as a last resort operation in the sense of Chierchia (1998a,b). The covert type-shifting operation (31) is legitimate in Japanese, since the language does not have an overt item for the shift from at-issue dimension to CI dimension. In contrast, in English, the comma intonation is the overt marker for the shift and hence, the covert type shifter cannot be used. When this type shifter applies to an at-issue numeral-classifier sequence (32a), its CI meaning (32b) is obtained.

(32) a. $[\![\text{futa-ri}]\!] = \lambda x\colon {}^{*}\textsc{human}(x).|x| = 2\colon \langle e^{a}, t^{a}\rangle$
b. $[\![\textsc{shift}(\text{futa-ri})]\!] = \lambda x\colon {}^{*}\textsc{human}(x).|x| = 2\colon \langle e^{a}, t^{c}\rangle$

With this type-shiftier, the DP in (30a) is analyzed as in (33)

(33) John to Mary futa-ri 'John and Mary two'



The top node shows that in the at-issue dimension, the DP means 'John and Mary' and in the CI dimension, it means 'the cardinality of John and Mary is two'. This analysis captures the interpretive property of the postnominal numeral-classifier construction involving a proper name or pronoun. Specifically, the supplementary postnominal numeral-classifier sequence in this construction contributes to the non-at-issue meaning, namely, the CI meaning.

The proposed analysis correctly accounts for the interpretive aspect of postnominal supplementary numeral-classifier sequences. What is remaining is the question why this use is limited to postnominal numeral-classifier sequences. In Section 4.3 discusses this remaining question.

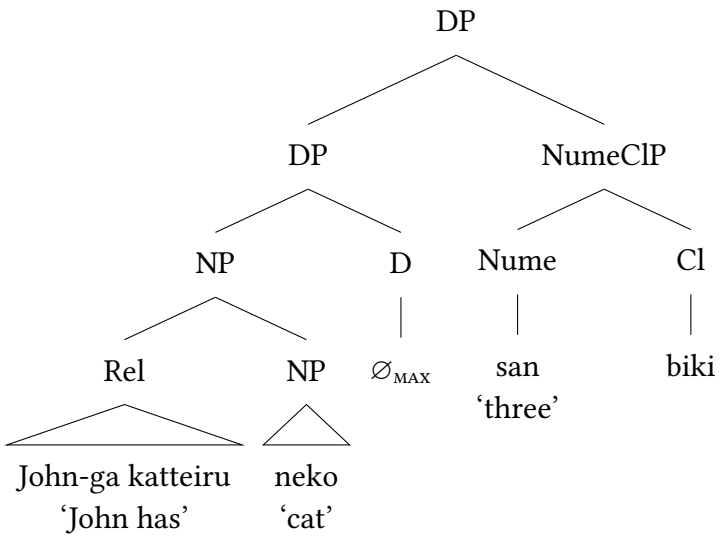
4.2.3 Supplementary use of numeral-classifier sequences with common nouns

We have discussed the case where numeral-classifier sequences modify proper names and pronouns. I have proposed that supplementary numeral-classifiers right-adjoin to a DP and introduce CI meanings. This subsection examines whether this right-adjoined structure is assigned only to numeral-classifier sequences after a proper name or a pronoun. In other words, it will see whether the conventionally interpreted meaning is available when postnominal numeral-classifier sequences co-occur with common nouns such as in (34).

(34) [John-ga katteiru] neko san-biki-ga nigeta.
John-NOM has cat 3-CL-NOM ran.away
'(The) three cats that John has ran away.'

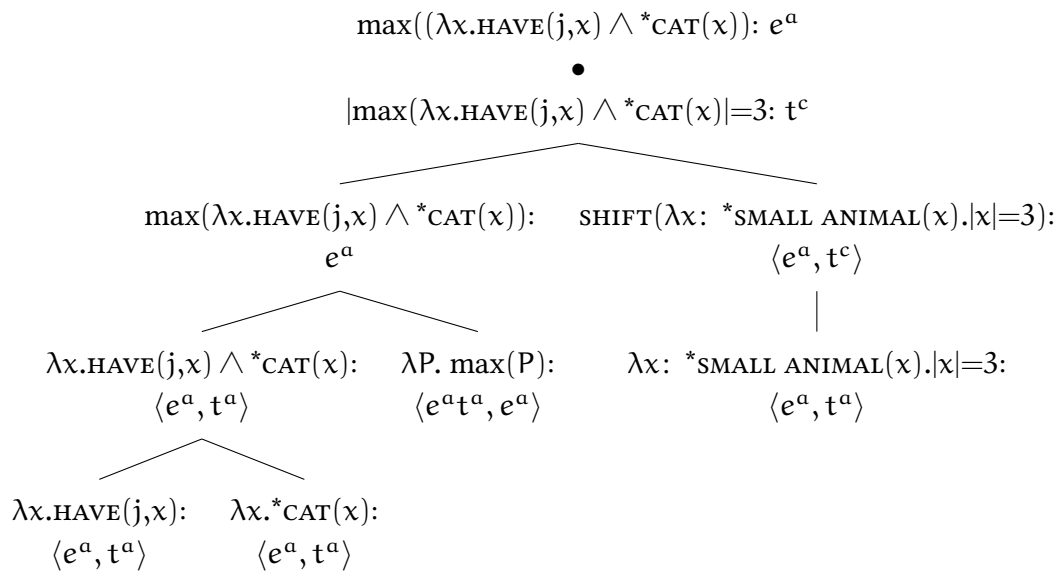
As I argued in Chapter 3, Section 3.7, when a numeral-classifier sequence modifies a common noun, it may be interpreted as a restrictive modifier. In this case, a numeral-classifier sequence contributes to at-issue meaning. The question is whether the same string shows ambiguity and has a CI-meaning. In (34), the head noun *neko* 'cat' is modified by the relative clause and the postnominal numeral-classifier sequence. In Chapter 2, I argued that common nouns in Japanese are interpreted as definite and can have a DP projection. If the right-adjoined structure is available to DPs in general, the nominal in (34) would have the DP-adjoined structure as in (35).

(35)



Just like the structure for supplemental numeral-classifier sequences, the numeral-classifier sequence is right-adjoined to the DP. A difference from the supplementary numeral-classifier construction is that in (35), the DP is composed of a common noun, not of a proper name or a pronoun. The semantics for (35) is illustrated in (36).

(36)



In the at-issue dimension, the nominal denotes the individual 'the cats that John has'. In the CI dimension, on the other hand, it means the cardinality of the cats that John has is three. If this analysis is on the right track, we expect that the numeral-classifier sequence in (34) shows the same behavior as supplementary numeral-classifier sequences. To test the behavior, we will examine scopelessness, nondeniability, binding behavior and antibackgrounding property.

The first test is to see scopelessness. If the numeral-classifier sequence is interpreted as a CI, the content of it is not affected by semantic operators. Consider the following examples.

(37) [John-ga katteiru] neko san-biki-ga nigeta wakedewanai.
John-NOM has cat 3-CL-NOM ran.away it.is.not.the.case.that
'It is not that case that the three cats that John has ran away.'

(38) Moshi [John-ga katteiru] neko san-biki-ga nigeta-ra, kare-wa naku daroo.
if John-NOM has cat 3-CL-NOM ran.away-COND he-TOP cry would
'If the three cats that John has ran away, he would cry.'

The negation in (37) and the conditional in (38) do not affect the content of the numeral-classifier sequence 'the cardinality of the cats that John has is three'. Under the negation and the condition, the content of the numeral-classifier sequence survives, showing the scopelessness.

The denial test also shows that the numeral-classifier sequence contributes to non-at-issue meanings.

(39) A: [John-ga katteiru] neko san-biki-ga nigeta. (= (34))
John-NOM has cat 3-CL-NOM ran.away
'(The) three cats that John has ran away.'

B: Sore-wa hontoo janai/Sore-wa uso-da.
that-TOP truth COP.NEG/that-TOP lie-COP
'That's not true./That's a lie.'

(40) a. (39B) = 'The cats that John has did not *ran away*.'

b. (39B) ≠ 'The cardinality of the cats that John has is not three.'

A possible interpretation of B's denial in (39) is in (40a), in which the at-issue content is denied. The denial in (39) does not have the interpretation in (40b), in which it targets the content of the numeral-classifier sequence.

The binding test also supports the analysis that the numeral-classifier sequence introduces a CI meaning. Consider (41).

(41) #Moshi John-ga katteiru neko-no kazu-ga san-biki-datta-ra, [John-ga
if John-NOM have cat-GEN number-NOM 3-CL-be.PAST-COND, John-NOM
katteiru] neko san-biki-wa issho-ni asobu daroo
has cat 3-CL-TOP together-DAT play would
'If the number of the cats that John has is three, the three cats that John has would play together. '

Though the conditional antecedent entails the content of the numeral-classifier sequence, the content is projected. The result of the binding test indicates that the numeral-classifier sequence is a CI and not a presupposition.

In addition, the numeral-classifier sequence shows the antibackgrounding property.

(42) a. John-ga katteiru neko-no kazu-wa san-biki-desu.
John-NOM have cat-GEN number-NOM 3-CL-COP
'The number of the cats that John has is three.

b. #[John-ga katteiru] neko san-biki-ga nigeta toki, John-wa naita
John-NOM has cat 3-CL-NOM ran.away when, John-TOP cried
'When the three cats that John has ran away, John cried.'

Example (42a) set up a context. Under this context, (42b) is infelicitous. This is because the content of the numeral-classifier sequence is in the common ground due to (42a) and because the content of the numeral-classifier sequence has the antibackgrounding property. As a result, (42b) is infectious due to redundancy. The infelicity suggests that the numeral-classifier sequence is a CI.

We have tested whether or not the numeral-classifier sequence that appears with a common noun is a CI. The results of the tests suggest that the numeral-classifier sequence introduces a CI-meaning. Thus, the examination reveals that the right-adjoined structure is not limited to a case where numeral-classifier sequences modify proper names and pronouns.

4.2.4 At-issueness of supplementary numeral-classifier sequences

I have argued that supplementary numeral-classifier sequences are CIs. They show the properties of CIs such as scopelessness, nondeniability, nonboundability and antibackgrounding property. Satoshi Tomioka (p.c.) points out to me that numeral-classifier sequences show at-issueness, even though they appear with a proper name or a pronoun. Consider the following question-answer pair.

(43) A: Ano shiken-ni nan-nin gookakushita ka shitteru?
that exam-DAT what-CL passed-Q know
'Do you know how many people passed that exam?'

B: John to Mary futa-ri-ga gookakushita yo.
John and Mary 2-CL-NOM passed SFP
'Lit. John and Mary two passed that exam.'

A's question in (43) is asking the number of people who passed the exam. B's answer should be fine just giving the number *futa-ri* 'two people'. However, B's answer contains more information than is required. B actually answers with additional information about 'who those two people are'. Nevertheless, this answer is totally felicitous. It has been pointed out that CI-content cannot serve as answers to questions (AnderBois, Brasoveanu & Henderson 2015, Simons et al. 2010). The felicity of B's answer to the question suggests that the numeral-classifier sequence introduces at-issue content. This is puzzling, given the discussion in

Section 4.2.1 and Section 4.2.2. The question arises as to how the numeral-classifier sequence as in (43) should be analyzed.

One possible solution is to assume that the non-at-issue status of supplementary numeral-classifier sequences may be shifted to at-issue status. Koev (2013) claims that appositive relatives in English can become at issue when they occur in sentence-final position (see Syrett & Koev 2015 for experimental support for Koev's claim and see also AnderBois, Brasoveanu & Henderson 2015 for a similar claim). If this shifting to at-issue is also possible for supplementary numeral-classifier sequences in Japanese, the at-issuness observed in (43) is captured. A number of further questions remain unclear, however. For example, under what condition is this shifting available? How does the shifting actually happen in supplementary numeral-classifier sequences? I should leave these questions for future research.

4.3 The asymmetry

This section focuses on the asymmetry in numeral-classifier construction with proper names and pronouns, as demonstrated in (2)–(5) in Section 4.1. The examples are repeated below.

(44) a. {John / Kare / Watashi} hito-ri-ga sono shigoto-o tantoo-shita.
{John / he / I} 1-CL-NOM that job-ACC in.charge-did
'Lit. {John / he / I} one was in charge of that job.'

b. *Hito-ri-no {John / kare / watashi}-ga sono shigoto-o tantoo-shita.
1-CL-GEN {John / He / I}-NOM that job-ACC in.charge-did
'Lit. One {John / he / I} was in charge of that job.'

(45) a. {John to Mary / Kare-ra / Watashi-tachi} futa-ri-ga sono shigoto-o
{John and Mary / he-PL / I-PL} 2-CL-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. {John and Mary / they / we} two were in charge of that job.'

b. *Futa-ri-no {John to Mary / kare-ra / watashi-tachi}-ga sono shigoto-o
2-CL-GEN {John and Mary / he-PL / I-PL}-PL-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. Two {John and Mary / they / we} were in charge of that job.'

As in the a-examples, postnominal numeral-classifier sequence can modify proper names and pronouns, whereas as in the b-examples, prenominal numeral-classifier sequences cannot

In this section, I consider why and how prenominal numeral-classifier sequences cannot modify proper names and pronouns. I account for the reason by looking at cases where proper names and pronouns are legitimately modified by prenominal modifiers. I then compare those cases with the case of prenominal numeral-classifier sequences. To do so, I first examine prenominal modifiers such as adjectives and nouns that can appropriately modify proper names and pronouns (Section 4.3.1) and establish a general condition for being modifiers of proper names and pronouns (Section 4.3.2). I suggest that these prenominal modifiers are appositives and are analyzed as CIs, just like English nominal appositives as (Potts 2005) analyzes. I then show that that numeral-classifier sequences cannot satisfy the general condition for being appositives, which accounts for the impossibility that numeral-classifier sequences modify proper names and pronouns from prenominal position (Section 4.3.3). Finally, I look at a case where property-denoting numeral-classifier sequences modify proper names and pronouns, which further supports the analysis.

4.3.1 Modification of proper names and pronouns

The purpose of this subsection is to establish a general condition for modification of proper names and pronouns. I begin by examine the properties of adjectives and nouns, which modify proper names and pronouns. Adjectives can modify proper names and pronouns from prenominal position, as illustrated in (46).[5]

5. English has a equivalent expression *poor John* or *poor me*, in which the adjective adds supplementary information. Modified proper names and pronouns in Japanese are regarded as equivalent to these English expressions (Elbourne 2005).

(46) a. Wakai John-ga sono shigoto-o tantoo-shita.
Young John-NOM that job-ACC in.charge-did
'Lit. Young John was in charge of that job.'

b. Wakai kare-ga sono shigoto-o tantoo-shita.
Young he-NOM that job-ACC in.charge-did
'Lit. Young he was in charge of that job.'

c. Wakai watashi-ga sono shigoto-o tantoo-shita.
Young I-NOM that job-ACC in.charge-did
'Lit. Young I was in charge of that job.'

Conjoined proper names and plural pronouns can also be modified by adjectives.

(47) a. Wakai John to Mary-ga sono shigoto-o tantoo-shita.
Young John and Mary-NOM that job-ACC in.charge-did
'Lit. Young John and Mary were in charge of that job.'

b. Wakai kare-ra-ga sono shigoto-o tantoo-shita.
Young he-PL-NOM that job-ACC in.charge-did
'Lit. Young they were in charge of that job.'

c. Wakai watashi-tachi-ga sono shigoto-o tantoo-shita.
Young I-PL-NOM that job-ACC in.charge-did
'Lit. Young we were in charge of that job.'

Not only adjectives but also nouns can modify proper names and pronouns. In this case, a morpheme *-no* is inserted between a modifying noun and a proper name or a pronoun. Example (48) shows the case of single proper names and pronouns and example (49) the case of conjoined proper names and plural pronouns.

(48) a. Amerikajin-no John-ga sono shigoto-o tantoo-shita.
Amenrican-GEN John-NOM that job-ACC in.charge-did
'Lit. Young John was in charge of that job.'

b. Amerikajin-no kare-ga sono shigoto-o tantoo-shita.
American-GEN he-NOM that job-ACC in.charge-did
'Lit. American he was in charge of that job.'

c. Amerikajin-no watashi-ga sono shigoto-o tantoo-shita.
American-GEN I-NOM that job-ACC in.charge-did
'Lit. American I was in charge of that job.'

(49) a. Amerikajin-no John to Mary-ga sono shigoto-o tantoo-shita.
American-GEN John and Mary-NOM that job-ACC in.charge-did
'Lit. American John and Mary were in charge of that job.'

b. Amerikajin-no kare-ra-ga sono shigoto-o tantoo-shita.
American-GEN he-PL-NOM that job-ACC in.charge-did
'Lit. American they were in charge of that job.'

c. Amerikajin-no watashi-tachi-ga sono shigoto-o tantoo-shita.
American-GEN I-PL-NOM that job-ACC in.charge-did
'Lit. American we were in charge of that job.'

Next, let us examine the semantic property of adjectives and nouns that appear in front of proper names and pronouns. Adjectives and nouns modifying proper names and pronouns show appositive-like behaviors. They are considered as non-restrictive modifiers, that is, they do not intersectively modify proper names and pronouns but add supplementary information.[6] For example, the examples in (46), which are repeated and merged here as (50), have the supplementary information in (50b).

(50) a. Wakai {John / kare / watashi}-ga sono shigoto-o tantoo-shita.
Young {John / he / I}-NOM that job-ACC in.charge-did
'Lit. Young {John / he / I} was in charge of that job.'

b. {John / Kare / Watashi}-wa/ga wakai.
{John / He / I}-TOP/NOM young
'{John / He / I} is/am young.'

Similarly, the plural counterpart in (51) (= (47)) contains the information as shown in (51b).

(51) a. Wakai {John to Mary / kare-ra / watashi-tachi}-ga sono shigoto-o
Young {John and Mary / he-PL / I-PL}-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. Young {John and Mary / they / we} was in charge of that job.'

6. When proper names are interpreted as denoting predicates, modifiers such as adjectives and nouns function as restrictive modifiers.

(i) wakai John
young John
'Int. x is named John and x is young.'

b. { John to Mary / kare-ra / watashi-tachi }-wa/ga wakai.
{ John and Mary / They / We }-TOP/NOM young
'{ John and Mary / they / we } are young.'

The same holds in the examples containing the noun as a modifier, as illustrated in (52) (= (48)) and (53) (= (49))

(52) a. Amerikajin-no { John / kare / watashi }-ga sono shigoto-o tantoo-shita.
American-GEN { John / he / I }-NOM that job-ACC in.charge-did
'Lit. American {John / he / I } was in charge of that job.'

b. { John / Kare / Watashi }-wa/ga amerikajin-da.
{ John / He / I }-TOP/NOM American-COP
'{ John / He / I } is/am American.'

(53) a. Amerikajin-no { John to Mary / kare-ra / watashi-tachi }-ga sono
Amerikajin-GEN { John and Mary / he-PL / I-PL }-NOM that
shigoto-o tantoo-shita.
job-ACC in.charge-did
'Lit. American { John and Mary / they / we } was in charge of that job.'

b. { John to Mary / Kare-ra / Watashi-tachi }-wa/ga wakai.
{ John and Mary / they / we }-TOP/NOM young
'{ John and Mary / they / we } are American.'

Here, the information expressed by the adjective-proper name/pronoun combination in (50) and (51) and the noun-proper name/pronoun combination in (52) and (53) is equivalent to predicative copular clauses, in which the adjectives and nouns function as predicates. Those copular clauses are the supplementary information about the subject of the main assertion. Hereafter, I call adjectives and nouns that modify proper names and pronouns *supplementary modifiers*.

According to Potts (2005), appositives in English are analyzed as CIs. We can test whether supplementary modifiers in Japanese are just like English appositives by using McCready's (2010) tests that we used to test supplementary numeral-classifier sequences in Section 4.2.1: the scopelessness test, the denial test and the binding test.

The first test is about scopelessness. Semantic operators such as negation and conditionals do not affect the interpretation of supplementary modifiers.

(54) a. Wakai {John / kare}-ga sono shigoto-o tantoo-shita wakedewanai.
Young {John / he}-NOM that job-ACC in.charge-did it.is.not.the.case.that
'Lit. It is not the case that young {John / he} was in charge of that job.'

b. Amerikajin-no {John / kare}-ga sono shigoto-o tantoo-shita
American-GEN {John / he}-NOM that job-ACC in.charge-did
wakedewanai.
it.is.not.the.case.that
'Lit. It is not the case that American {John / he} was in charge of that job.'

The examples in (54) entail that John/he is young/American. The information expressed by the supplementary modifiers is escaped from negation. The scopelessness is also found in conditional sentences as in (55).

(55) a. Moshi wakai {John / kare}-ga sono shigoto-o tantoo-shita-ra,
if young {John / he}-NOM that job-ACC in.charge-COND,
minna-wa yorokobu-daroo.
everyone-TOP happy-will
'Lit. If young {John / he} is in charge of that job, everyone will be happy.'

b. Moshi amerikajin-no {John / kare}-ga sono shigoto-o tantoo-shita-ra,
if American-GEN {John / he}-NOM that job-ACC in.charge-COND,
minna-wa yorokobu-daroo.
everyone-TOP happy-will
'Lit. If American {John / he} is in charge of that job, everyone will be happy.'

The information that John/he is young/American survives in the conditional sentences, indicating its scopelessness. The scopeless property observed in (54) and (55) suggests that the supplementary modifiers are non-at-issue components.

The denial test also shows that the supplementary modifiers contribute to non-at-issue meanings.

(56) A: Wakai {John / kare}-ga sono shigoto-o tantoo-shita.
young {John / he}-NOM that job-ACC in.charge-did
'Lit. Young {John / he} was in charge of that job.'

B: Sore-wa hontoo janai/Sore-wa uso-da.
that-TOP truth COP.NEG/that-TOP lie-COP
'That's not true./That's a lie.'

(57) a. (56B) = 'Young {John / he } was not in charge of *that job*.'

b. (56B) ≠ '{ John / He } isn't young.'

B's denial in (56) has an interpretation as in (57a), in which it denies an at-issue content (e.g., *that job*). It does not have the interpretation in (57b), which is the denial of the information conveyed by the adjective. The same pattern holds for a sentence with a noun modifying a proper name or a pronoun, as illustrated in (58). The interpretations of B's denial are in (59).

(58) A: Amerikajin-no { John / kare }-ga sono shigoto-o tantoo-shita.
American-GEN { John / he }-NOM that job-ACC in.charge-did
'Lit. American { John / he } was in charge of that job.'

B: Sore-wa hontoo janai/Sore-wa uso-da.
that-TOP truth COP.NEG/that-TOP lie-COP
'That's not true./That's a lie.'

(59) a. (58B) = 'American {John / he } was not in charge of *that job*.'

b. (58B) ≠ '{ John / He } isn't American.'

The results of the scopelessness test and the denial test show that the supplementary modifiers are either CIs or presuppositions.

We now use the binding test to see which they are. I here assume that a paraphrase of adjective/noun + proper name/pronoun is a predicative copular sentence, in which adjective/noun is predicated of the proper name/pronoun.

(60) #Moshi { John / kare }-ga waka-kereba, wakai { John / kare }-ga sono shigoto-o
if { John / he }-NOM young-COND, young { John / he }-NOM that job-ACC
tantoo-shita daroo
in.charge-did would
'Lit. If { John / he } is young, young { John / he } would be in charge of that job.'

In (60), the conditional antecedent entails the meaning contributed by the numeral-classifier sequence. Even so, the meaning is projected, results in the sense of redundancy. The same pattern holds for nouns.

(61) #Moshi {John / kare}-ga amerikajin-nara, wakai {John / kare}-ga sono
if {John / he}-NOM young-COND, American {John / he}-NOM that
shigoto-o tantoo-shita daroo
job-ACC in.charge-did would
'Lit. If {John / he} is American, young {John / he} would be in charge of that job.'

Since the content of the adjective and noun in (60) and (61) is projected, this suggests that the supplementary modifiers are CIs and not presuppositions.

In addition, supplementary modifiers show the antibackgrounding effect. Let us consider the following examples.

(62) a. {John / kare}-wa wakai-desu.
{John / he}-TOP young-COP.POL
'{John / he} is young.

b. #Wakai {John / kare}-ga sono shigoto-o tantoo-shita toki, kare-wa
young {John / he}-NOM that job-ACC in.charge-did when, he-TOP
yorokobi-mashita
happy-POL.PAST
'Lit. When young {John / he} was in charge of that job, he was happy.'

(63) a. {John / kare}-wa amerikajin-desu.
{John / he}-TOP American-COP.POL
'{John / he} is American.

b. #Amerikajin-no {John / kare}-ga sono shigoto-o tantoo-shita toki,
American-GEN {John / he}-NOM that job-ACC in.charge-did when,
kare-wa yorokobi-mashita
he-TOP happy-POL.PAST
'Lit. When American {John / he} was in charge of that job, he was happy.'

The a-examples introduce the content of the supplementary modifiers into the common ground. In this context, the b-examples, which involve the supplementary modifiers, are infelicitous. Thus, the information conveyed by the supplementary modifiers cannot be backgrounded. The observed antibackgrounding property accords with the analysis that supplementary modifiers are CIs.

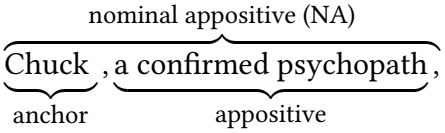
We have seen that supplementary modifiers are CIs, just like nominal appositives in English. Thus, I treat these modifiers in Japanese as appositives. In next section, we will

establish a general condition for being appositives in Japanese.

4.3.2 The condition for appositives

Potts (2005) suggests a generalization about being appositives. He points out that there is a parallelism between appositives and copular sentences and makes the following generalization in (64). The terms used in Potts for nominal appositives are given in (65).

(64) *Potts's Generalization*
An expression *E* can appear as the predicate in a predicative copular sequence if and only if *E* can appear in an NA's appositive position. (Potts 2005: 132)

(65) 

(ibid.: 93 (5))

Let us see how this generalization captures appositives in English. First, consider a felicitous example as in (66).

(66) a. Lance, a cyclist, is training.
b. Lance is a cyclist.

In (66a), the noun *a cyclist* is in the appositive position. As shown in (66b), this noun appears as the predicate in the predicative copular sentence. This example shows that the noun meets the Potts's generalization.

Next, let us see a case where an expression cannot appear in appositive position. In English, quantifiers such as *every* and *most* do not have predicate interpretations, and as a result, they cannot be in the predicate position of copular sentences, as shown in (67).[7]

(67) a. *Abe, Bonnie, and Chimp are/is every chimpanzee in the zoo.
b. *Abe, Bonnie, and Chimp are most chimpanzees in the zoo.
(Heringa 2012b: 76 (39))

7. Partee (1987) uses the verb *consider* to test whether a quantifier can have a predicate interpretation.

(i) Mary considers that an island / two islands / many islands / the prettiest island / the harbor / *every island / *most islands / *this island / *?Schiermonnikoog / Utopia. (ibid.: 361 (10))

These quantifiers cannot be appositives, as demonstrated in (68).

(68) a. *We saw Abe, Bonnie, and Chimp, every chimpanzee in the zoo.

b. *Abe, Bonnie, and Chimp, most chimpanzees in the zoo, were out in the sun. (ibid.: 76 (40))

Potts points out that some quantifiers can appear in appositive position of nominal appositives when they can appear in predicate position. Compare the examples in (69) and (70).

(69) a. Hillary is no amateur climber.

b. Ed's house was at one time every color of the rainbow.

c. Tanya is everything to everyone around here. (ibid.: 77 (41))

(70) a. We spoke with Hillary, no amateur climber, about the dangers.

b. Ed's house, at one time every color of the rainbow, now has aluminum siding.

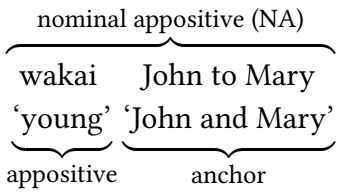
c. We spoke with Tanya, everything to everyone around here, about the broken printer. (Potts 2005: 131 (96))

The quantifiers that function as nominal predicates in the copular sentences in (69) can also function as the appositives in (70).

Potts's generalization suggests that appositives must function as the predicate of the anchor (see also Heringa 2012a). Being appositives requires to meet this condition. Since the quantifiers in (67) and (68) do not meet this condition, they cannot be used as appositives. In contrast, the quantifiers in (69) and (70) satisfy the condition and as a result, they can function as appositives.

We have seen that in Japanese, the modifiers of proper names and pronouns show the behavior of appositives. If the assumption that those modifiers are appositives is on the right track, and if we treat supplementary modifiers in Japanese on a par with nominal appositives in English as illustrated in (71) (Japanese does not have a comma intonation), the licit modification of proper names and pronouns by adjectives and nouns should accord with Potts's generalization.

(71)



As we have already seen in (50)–(53), the supplementary modifiers can be the predicates of predicative copular sentences. The examples are repeated below.

(72) a. Wakai {John / kare / watashi}-ga sono shigoto-o tantoo-shita.
Young {John / he / I}-NOM that job-ACC in.charge-did
'Lit. Young {John / he / I} was in charge of that job.'

b. {John / Kare / Watashi}-wa/ga wakai.
{John / He / I}-TOP/NOM young
'{John / He / I} is/am young.'

(73) a. Wakai {John to Mary / kare-ra / watashi-tachi}-ga sono shigoto-o
Young {John and Mary / he-PL / I-PL}-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. Young {John and Mary / they / we} was in charge of that job.'

b. {John to Mary / kare-ra / watashi-tachi}-wa/ga wakai.
{John and Mary / They / We}-TOP/NOM young
'{John and Mary / They / We} are young.'

(74) a. Amerikajin {John / kare / watashi}-ga sono shigoto-o tantoo-shita.
American {John / he / I}-NOM that job-ACC in.charge-did
'Lit. American {John / he / I} was in charge of that job.'

b. {John / Kare / Watashi}-wa/ga amerikajin-da.
{John / He / I}-TOP/NOM American-COP
'{John / He / I} is/am American.'

(75) a. Amerikajin-no {John to Mary / kare-ra / watashi-tachi}-ga sono
Amerikajin-GEN {John and Mary / he-PL / I-PL}-NOM that
shigoto-o tantoo-shita.
job-ACC in.charge-did
'Lit. American {John and Mary / they / we} was in charge of that job.'

b. {John to Mary / Kare-ra / Watashi-tachi}-wa/ga wakai.
{John and Mary / they / we}-TOP/NOM young
'{John and Mary / They / We} are American.'

The examples show that the modifiers of proper names and pronouns can appear in the predicate position of copular clauses and function as predicates. Given Potts's generalization, since the supplementary modifiers appear as the predicates of the predicative copular sentences, their modification of proper names and pronouns is legitimate. The condition for appositives (in Japanese) is given in (76).

(76) *Condition for appositives in Japanese* (first version)
An expression *E* is an appositive if and only if it meets Potts's generalization.

(77) *Potts's Generalization*
An expression *E* can appear as the predicate in a predicative copular sequence if and only if *E* can appear in an NA's appositive position. (Potts 2005: 132)

The condition in (76) does not identify where the appositive position in Japanese is. This is the last topic of this section. As seen, supplementary modifiers in Japanese appear to the left of proper names and pronouns. They cannot appear after a singular proper name and a pronoun as in (78) and after a conjoined proper name and plural pronoun as in (79).

(78) *{John / Kare / Watashi} wakai-ga sono shigoto-o tantoo-shita.
{John / he / I} young-NOM that job-ACC in.charge-did
'Lit. {John / He / I} young was in charge of that job.'

(79) *{John to Mary / Kare-ra / Watashi-tachi} wakai-ga sono shigoto-o
{John and Mary / he-PL / I-PL} young-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. {John and Mary / They / We} young was in charge of that job.'

Likewise, nouns cannot appear after a singular proper name and pronoun, either, as in (80).

(80) *{John / Kare / Watashi} ameirkajin-ga sono shigoto-o tantoo-shita.
{John / he / I} American-NOM that job-ACC in.charge-did
'Lit. {John / He / I} American was in charge of that job.'

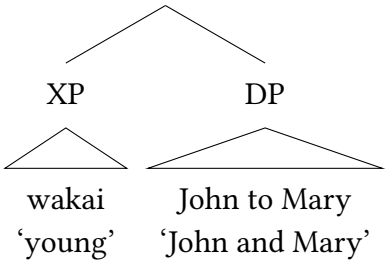
A bit different patter is found when nouns appear after plural pronouns. While they cannot appear after a conjoined proper name, they can appear after plural pronouns, as shown in (82).

(81) {*John to Mary / Kare-ra / Watashi-tachi} amerikajin-ga sono shigoto-o
{ John and Mary / he-PL / I-PL } American-NOM that job-ACC
tantoo-shita.
in.charge-did
'Lit. { John and Mary / They / We } American was in charge of that job.'

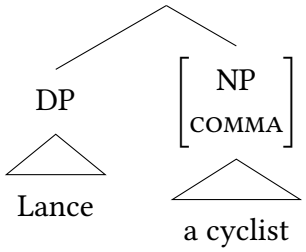
I assume that the plural pronoun + noun pattern differs from ordinary appositive and treat them as exceptional. I will discuss this peculiar pattern in Section 4.4.

From these observations, I suggest that supplementary modifiers in Japanese are left-adjoined to a DP as illustrated in (82). This structure is a mirror image of English nominal appositives proposed in Potts (2005: 66 (43)) as shown in (83) (the structure is slightly modified from Potts's original one).

(82)



(83)



The structure in (82) states that the left-adjoined position is the position of appositives in Japanese.

Now, I offer the final version of the condition for appositives in Japanese.

(84) *Condition for appositives in Japanese* (final version)
a. An expression *E* is an appositive if and only if it meets Potts's generalization.
b. The appositive position is the left-adjoined position of DPs.

If a modifier appears in the left-adjoined position, it is expected to appear as the predicate in a copular sentence, and vice versa.

In summary, in Japanese, supplementary modifiers are subject to Potts's generalization. They can appear as predicates in predicate copular sentences and they can appear in the appositive position, which is the left-adjoined position of DPs. Assuming that this is the condition for the modification of proper names and pronouns in Japanese, we will look at

numeral-classifier sequences to see why numeral-classifier sequences cannot modify proper names and pronouns from the prenominal position.

4.3.3 Numeral-classifier sequences and the condition

Now, let us examine numeral-classifier sequences with respect to the condition for appositives in Japanese, which I offered the previous section, as repeated below.

(85) *Condition for appositives in Japanese*

a. An expression *E* is an appositive if and only if it meets Potts's generalization.

b. The appositive position is the left-adjoined position of DPs.

As observed, prenominal numeral-classifier sequences cannot modify proper names and pronouns.

(86) a. *Hito-ri-no {John / kare / watashi}-ga sono shigoto-o tantoo-shita.
1-CL-GEN {John / He / I}-NOM that job-ACC in.charge-did
'Lit. One {John / he / I} was in charge of that job.'

b. *Futa-ri-no {John to Mary / kare-ra / watashi-tachi}-ga sono shigoto-o tantoo-shita.
2-CL-GEN {John and Mary / he-PL / I-PL}-PL-NOM that job-ACC in.charge-did
'Lit. Two {John and Mary / they / we} were in charge of that job.'

The question is why this pattern holds. I suggest that numeral-classifier sequences which appear in prenominal position must also satisfy the condition for appositives, since they are modifiers of proper names and pronouns. Let us see whether numeral-classifier sequences can appear as the predicates in predicative copular sentences. Consider the following examples.

(87) a. *{John / kare / watashi}-wa hito-ri-da.
{John / He / I}-TOP 1-CL-COP
'Lit. {John / He / I} is/am one.'
'Int. The cardinality of {John / he / I} is one.'

b. *{ John to Mary / Kare-ra / Watashi-tachi }-wa futa-ri-da.
{ John and Mary / he-PL / I-PL }-TOP 2-CL-COP
'Lit. { John and Mary / They / We } are two'
'Int. The cardinality of { John and Mary / they / we } is two.'

In (87), when the numeral-classifier sequences come in the predicate position of the copular sentences, the examples are unacceptable under the intended cardinality-interpretation.[8] This unacceptability shows that numeral-classifier sequences cannot meet the condition for appositives in Japanese. Since numeral-classifier sequences cannot function as the predicate of individual-denoting subjects, they cannot function as appositives and cannot appear in the appositive position, which is the left-adjoined position of DPs. I suggest that this is a reason that numeral-classifier sequences cannot modify proper names and pronouns.

One may wonder why numeral-classifier sequences can modify proper names and pronouns from postnominal position, even though they do not satisfy the condition for appositives in Japanese. This is indeed puzzling. A simple answer would be that postnominal numeral-classifier sequences that modify proper names and pronouns are not (true) appositives. I postulate that the grammar treats numeral-classifier sequences differently from other modifiers such as adjectives and nouns. Recall that the right-adjoined position is only available to numeral-classifier sequences. Other supplementary modifiers cannot appear in postnominal position. Moreover, we saw other differences between numeral-classifier sequences and adjectives in Chapter 3. In Section 3.1, I showed the numeral-classifier sequences are similar but not identical to adjectives: they show the word order variation, whereas adjectives does not. In Section 3.6, we saw that numeral-classifier sequences are two readings: cardinality-denoting and property-denoting. Cardinality-denoting numeral-classifier sequences differ in the syntactic position from property-denoting numeral-classifier sequences. Property-denoting numeral-classifier sequences, in turn, are just like adjectives. Therefore, the difference in the modification of proper names and pronouns is an instance of the grammatical difference between numeral-classifier sequences and other modifiers. Thus, it is not surprising that numeral-classifier sequences differ from other modifiers in

8. We will examine the case in which the copular sentence is acceptable under property-interpretation where the numeral-classifier sequence denote a property of being single or alone in Section 4.3.4.

the modification of proper names and pronouns. Since numeral-classifier sequence are subject to a different grammatical restriction, they modify proper names and pronouns from postnominal position and without satisfying the condition for appositives.

We have examined the reason why prenominal numeral-classifier sequences cannot modify proper names and pronouns. Being appositives requires that expressions must function as the predicates of the anchor. However, numeral-classifier sequences cannot function as the predicate of individual-denoting subjects, which is illustrated by the unacceptability of copular sentences. For this reason, they cannot appear in the appositive position. I suggested that numeral-classifier sequences are treated differently in terms of the supplementary use. Thus, they are restricted to appear in the right-adjoined position and are not subject to the general condition for appositives in Japanese.

4.3.4 Property-denoting numeral-classifier sequences

In Section 4.1, I pointed out that the prenominal numeral-classifier construction with proper names and pronouns is acceptable when numeral-classifier sequences are property-denoting modifiers. Recall that prenominal numeral-classifier sequences show ambiguity between cardinal-interpretation and property-interpretation (see Chapter 3, Section 3.6).

(88) San-satsu-no hon-o katta.
3-CL-GEN book-ACC bought
a. 'I bought three books.' (cardinal-interpretation)
b. 'I bought a three-volume set.' (property-interpretation)
(Hiraiwa 2016: 1363 (48a))

As shown in the English translation, under the property-interpretation, a set of books is concerned, and the numeral-classifier sequence identifies how many books are in the set.

Property-denoting numerals show the exact same pattern as modifiers of nouns such as adjectives and nouns. For example, they license the light noun, which is a distinctive property of property-denoting modifiers.

(89) a. *A-no-o katta.
that-LN(THINGS)-ACC bought
'Int. I bought that thing(s).'

b. A-no { akai / amerika }-no-o katta.
that-GEN { red / American }-LN(THINGS)-ACC bought
'I bought that { read / American } thing(s).'

c. A-no san-satsu-no-o katta.
that-GEN 3-GEN-LN(THINGS)-ACC bought
i. *'I bought that three books.' (cardinal-interpretation)
ii. 'I bought that three-volume set.' (property-interpretation)

In (89a), the demonstrative alone cannot license the light noun. In (89b), when the adjective or the noun is added, the example becomes grammatical. Similarly, in (89c), the numeral-classifier sequence under the property-interpretation can license the light noun. Importantly, in this case, the numeral-classifier sequence cannot have a cardinal-interpretation.

The data indicates that property-denoting numeral-classifier sequences form a natural class with modifiers of nouns such as adjectives and nouns. Regarding modification of proper names and pronouns, we have seen that adjectives and nouns can modify proper names and pronouns. It is thus natural that property-denoting numeral-classifier sequences can also modify proper names and pronouns.

To make the interpretation clearer, consider the following example.

(90) (Odoroita-koto-ni) Futa-ri-no kare-ra-ga go-nin-no watashi-tachi-ni
(surprise.PAST-thing-for) 2-CL-GEN he-PL-NOM 5-CL-GEN I-PL-DAT
katta.
won
'(To the surprise of many people) They beat us and they were a group of two and we were a group of five.' (property-interpretation)

In (90), the prenominal numeral-classifier sequence is used legitimately as modifiers of pronouns. It denotes a property of the pronouns. The subject *futa-ri-no kare-ra* is interpreted as being a group or a team made up of two people. The numeral-classifier sequence adds the information that they are a group and the numeral-classifier denotes how many people are in the group. When a prenominal numeral-classifier sequence modifies a conjoined proper name, the property-interpretation is marginally acceptable.

(91) (Odoroita-koto-ni) Futa-ri-no John to Mary-ga go-nin-no
(surprise.PAST-thing-for) 2-CL-GEN John and Mary-NOM 5-CL-GEN
watashi-tachi-ni katta.
I-PL-DAT won
??'(To the surprise of many people) John and Mary beat us and they were a group of two and we were a group of five.' (property-interpretation)

The two examples (90) and (91) show that when the prenominal numeral-classifier sequence modifies proper names and pronouns, the property-interpretation, but not the cardinal-interpretation, is possible. The property-interpretation implies that the plural referents are a group. When it comes to modified singular proper names and pronouns, a similar pattern holds. One difference from the modified conjoined proper names and plural pronouns is that a group-reading is no longer available. A numeral-classifier sequence denotes a different type of property of the referent. Consider the following example.

(92) Mary-wa paatonaa-to ryokoo-ni itta ga, hitori-no {John / kare /
Mary-TOP partner-with trip-to went and 1-CL-GEN {John / he /
watashi}-wa tomodachi-to kyanpu-ni itta.
I}-wa friend-with camp-to went
'Mary went on a trip with her partner and {John / he / I} went camping with friends and {John / he / I} is/am single/alone,.' (property-interpretation)

Under the property-interpretation, the numeral-classifier sequence denotes the property of being single or alone.

The observations in (90)–(92) show that when numeral-classifier sequences are used as property-denoting modifiers, they can modify proper names and pronouns just like adjectives and nouns. We thus expect that property-denoting numeral-classifier sequences satisfy the condition of appositives in Japanese, which is repeated below.

(93) *Condition for appositives in Japanese*
a. An expression *E* is an appositive if and only if it meets Potts's generalization.
b. The appositive position is the left-adjoined position of DPs.

As expected, they can appear as the predicate in a copular sentence.

(94) a. { John / Kare / Watashi }-wa hito-ri-da.
{ John / He / I }-TOP 1-CL-COP
'{ John / He / I } is/am single/alone.' (property-interpretation)

b. { John to Mary / Kare-ra / Watashi-tachi }-wa futa-ri-da.
{ John and Mary / he-PL / I-PL }-TOP 2-CL-COP
'{ John and Mary / They / We } are a group of two.' (property-interpretation)

The examples show that the property-denoting numeral-classifier sequence functions as the predicate. This observation indicates that the property-denoting numeral-classifier sequence satisfies the condition for being appositives in (93). Thus, the property-denoting numeral-classifier sequence can appear in the appositive position.

It should be pointed out that unlike prenominal numeral-classifier sequences, postnominal numeral-classifier sequences do not have property-denoting interpretations.

(95) Hon san-satsu-o katta.
book 3-CL-ACC bought
a. 'I bought three books.' (cardinal-interpretation)
b. *'I bought a three-volume set.' (property-interpretation)

Thus, when prenominal numeral-classifier sequences modify proper names or pronouns, no property-denoting interpretation is available. In (96), a postnominal numeral-classifier sequence *hito-ri* 'one-CL' modifies a singular proper name and pronoun.

(96) { John / Kare / Watashi } hito-ri-ga sono shigoto-o tantoo-shita.
{ John / he / I } 1-CL-NOM that job-ACC in.charge-did
a. cardinal-interpretation:
'{ John / He / I } was in charge of that job and the cardinality of { John / he / I } was one.'
b. *property-interpretation:
'{ John / He / I } was in charge of that job and { John / he / I } was single/alone.'

In (96), the cardinal-interpretation is obtained, in which the cardinality of the referent is concerned. In contrast, the property-interpretation, which denotes the property of being single/alone, is not acceptable. A similar acceptability pattern is also found in a sentence with conjoined proper names and plural pronouns in (97).

(97) { John to Mary / Kare-ra / Watashi-tachi } futa-ri-ga sono shigoto-o
{ John and Mary / he-PL / I-PL } 2-CL-NOM that job-ACC
tantoo-shita.
in.charge-did

a. cardinal-interpretation:
'{ John and Mary/ They / We } were in charge of that job and the cardinality of { John and Mary/ they / we } was two.'

b. *property-interpretation:
'{ John and Mary/ They / We } were in charge of that job and { John and Mary/ they / we } were a group of two.'

In (97), the cardinal-interpretation is available, whereas the property-interpretation is not where the referent is interpreted as a group of two people.

We have seen the case where a prenominal numeral-classifier sequence modifies a proper name or a pronoun. The observations show that a prenominal numeral-classifier sequence can legitimately modify a proper name or a pronoun only when it acts as a property-denoting modifier. Property-denoting numeral-classifier sequences differ from cardinality-denoting ones in their ability to be the predicate of individual-denoting subjects. They are just like adjectives and nouns that modify nouns. Thus, we can conclude that prenominal modifiers that are allowed to modify proper names and pronouns must be property-denoting modifiers.

4.4 A note on pronoun-noun constructions

The postnominal numeral-classifier construction with a proper names or a pronoun is similar to so-called pronoun-noun constructions as exemplified in (98) (see Furuya 2008, Inokuma 2009, Noguchi 1997 for the analyses for this construction in Japanese).[9]

(98) a. Watashi-tachi gakusei-ga sono shigoto-o tantoo-shita.
I-PL student-NOM that job-ACC in.charge-did
'We students were in charge of that job.'

b. Kare-ra gakusei-ga sono shigoto-o tantoo-shita.
He-PL student-NOM that job-ACC in.charge-did
'Lit. They students were in charge of that job.'

9. We have seen a similar example in (81) in Section 4.3.2.

In the pronoun-noun construction, a pronoun is followed by a common noun. The combination of the two serves as an argument.

At first glance, the pronoun-noun construction is just like the postnominal numeral-classifier construction, particularly when a plural pronoun is followed by a numeral-classifier sequence. Furuya (2008) does not distinguish the two constructions, analyzing that a common noun and a numeral-classifier sequence, which appear after a plural pronoun, do the same function, a nominal predication. She proposes the following structure for the noun-pronoun construction in Japanese (an NQ stands for a numeral-classifier sequence).[10]

(99) $[_{DP}$ null Operator $[_{D'}$ (null head D) $[_{SC}$ pronoun NP/NQ]]]
(Furuya 2008: 154 (17), slightly modified)

In this structure, common nouns and numeral-classifier sequence are located in a small clause, and a pronoun is predicated of the common noun/numeral-classifier sequence. Can the postnominal numeral-classifier construction converge into the pronoun-noun construction? Although the two structures appear to be similar, I point out that there are two differences between the two.

The first difference is that the pronoun-noun construction is restricted to plural pronouns, whereas there is no such restriction in the numeral-classifier construction. Compare the a-examples with the b-examples in the following pairs.

(100) a. *Watashi gakusei-ga sono shigoto-o tantoo-shita.
I student-NOM that job-ACC in.charge-did
'Lit. I student was in charge of that job.'

b. Watashi hito-ri-ga sono shigoto-o tantoo-shita.
I 1-CL-NOM that job-ACC in.charge-did
'Lit. I one was in charge of that job.'

10. Furuya's (2008) analysis is based on the proposal for English definite noun phrases by Campbell (1996, 1998).

(101) a. *Kare gakusei-ga sono shigoto-o tantoo-shita.
He student-NOM that job-ACC in.charge-did
'Lit. He student was in charge of that job.'

b. Kare hito-ri-ga sono shigoto-o tantoo-shita.
He 1-CL-NOM that job-ACC in.charge-did
'Lit. He one was in charge of that job.'

As shown in the a-examples, a common noun cannot appear after a singular pronoun, whereas as in the b-examples, a numeral-classifier sequence can.

Moreover, a common nouns cannot be followed by proper names, whereas numeral-classifier sequences can, as shown in (102).[11]

(102) a. *John gakusei-ga sono shigoto-o tantoo-shita.
John student-NOM that job-ACC in.charge-did
'Lit. John student was in charge of that job.'

b. John hito-ri-ga sono shigoto-o tantoo-shita.
John 1-CL-NOM that job-ACC in.charge-did
'Lit. John one was in charge of that job.'

Similarly, a common noun cannot appear after a conjoined proper name, whereas a numeral-classifier sequence can.

(103) a. *John to Mary gakusei-ga sono shigoto-o tantoo-shita.
John and Mary student-NOM that job-ACC in.charge-did
'Lit. John and Mary students were in charge of that job.'

b. John to Mary futa-ri-ga sono shigoto-o tantoo-shita.
John and Mary 2-CL-NOM that job-ACC in.charge-did
'Lit. John and Mary two were in charge of that job.'

11. In the pronoun-noun construction, expressions other than pronouns can appear in front of common nouns. As shown in (ia), a proper name can be followed by a common noun when it combines with a plural marker. When a proper name is modified by a plural marker, it gives an associative interpretation (e.g., *John-tachi* 'John-PL' means "the group represented by John".) As in (ib), a numeral-classifier sequence can also appear after an associative proper name.

(i) a. John-tachi gakusei-ga sono shigoto-o tantoo-shita.
John-PL student-NOM that job-ACC in.charge-did
'The group represented by John was in charge of that job.'

b. John-tachi futa-ri-ga sono shigoto-o tantoo-shita.
John-PL 2-CL-NOM that job-ACC in.charge-did
'The group represented by John was in charge of that job and the number of the group is two.'

The observations show that the pronoun-noun construction is more restricted than the postnominal numeral-classifier construction with respect to the element that precedes a common noun.

There is another difference between the pronoun-noun construction and the postnominal numeral-classifier construction with a proper name or a pronoun. In the pronoun-noun construction, a plural pronoun form a predication relation with a following common noun. A pronoun in the pronoun-noun construction is the subject of the nominal predication. This predication relation is shown in the copular sentence in (104b) and (105b).

(104) a. Watashi-tachi gakusei
I-PL student
'we students'

b. Watashi-tachi-wa gakusei-da.
I-PL-TOP student-COP
'We are students.'

(105) a. Kare-ra gakusei
He-PL student
'Lit. they students'

b. Kare-ra-wa gakusei-da.
He-PL-TOP student-COP
'They are students.'

By contrast, as witnessed in (87) , repeated below as (106), no predication relation is established between a proper name or pronoun and a cardinality-denoting numeral-classifier sequence.[12]

12. We have found that when a numeral-classifier sequence is interpreted as property-denoting, a predication relation is established between the numeral-classifier sequence and a proper name or a pronoun. If a predication relation is assumed as a required condition for the pronoun-noun construction, as in Furuya's (2008) small clause analysis, we expect a property-denoting numeral-classifier sequence to appear in the pronoun-noun construction because a predication relation is established. However, a postnominal numeral-classifier sequence never has a property-interpretation. A possible analysis for the impossibility is that just like adjectives, property-denoting numeral-classifier sequences cannot appear in the postnominal position in the pronoun-noun construction. In other words, the position is limited to common nouns.

(106) a. *{ John / Kare / Watashi }-wa hito-ri-da.
{ John / he / I }-TOP 1-CL-COP
'Lit. { John / He / I } is/am one.'
'Int. The cardinality of { John / he / I } is one.'

b. *{ John to Mary / Kare-ra / Watashi-tachi }-wa futa-ri-da.
{ John and Mary / he-PL / I-PL }-TOP 2-CL-COP
'Lit. { John and Mary / They / We } are two'
'Int. The cardinality of { John and Mary / they / we } is two.'

The data show that while the common noun in the pronoun-noun construction functions as the nominal predicate, the postnominal numeral-classifier sequence does not.

We have seen that the pronoun-noun construction differs from the postnominal numeral-classifier construction with a proper name or a pronoun.[13] The distribution of common nouns is more restricted than that of numeral-classifier sequences. While common nouns can appear after a plural pronoun, numeral-classifier sequences can appear after singular pronoun, plural pronouns, proper names and conjoined proper names. In addition, in the pronoun-noun construction, there is a predication relation between pronouns and common nouns. In contrast, in the postnominal numeral-classifier construction with a proper name or a pronoun, there is no predication relation between proper names/pronouns and numeral-classifier sequences.

The observations suggest that it is less plausible to equate the two constructions. Otherwise, the differences between the two cannot be accounted for. In particular, since numeral-classifier sequences cannot function as nominal predicates, it is not plausible for them to be

13. It is worth mentioning that there is an interpretive difference between the supplementary modifier and the pronoun-noun construction.

(i) a. Supplementary modifier construction
Itariajin-no watashi-tachi-wa yooki-da
Italian-GEN we-PL-TOP cheerful-COP
*Generic: 'Lit. Italian we are cheerful.'

b. Pronoun-noun construction
Watashi-tachi Itariajin-wa yooki-da
we-PL Italian-TOP cheerful-COP
✓Generic: 'Lit. We Italian are cheerful.'

The supplementary modifier construction (ia) cannot have the generic interpretation, where as the pronoun-noun construction (ib) can. It is not clear to me why this difference arises. However, the difference indicates that the pronoun-noun construction is not just an inverted version of the supplementary construction. I leave this issue for future research.

located in the same position as common nouns. Thus, as the analysis proposed in Section 4.3.3 shows, postnominal numeral-classifier sequences that appear after a proper name or a pronoun require a special treatment.

4.5 Summary

In this chapter, we have considered a particular kind of numeral-classifier constructions, in which numeral-classifier sequences modify proper names and pronouns. I have argued that postnominal numeral-classifier sequences that appropriately modify proper names and pronouns (i.e., supplementary numeral-classifier sequences) introduce conventional implicatures. Following Potts (2005), I have offered a multidimensional analysis, which shows how compositionally CI interpretations are derived. Another central topic of this chapter is the asymmetry between prenominal and postnominal numeral-classifier sequences in terms of modification of proper names and pronouns. While postnominal numeral-classifier sequences can modify proper names and pronouns, prenominal numeral-classifier sequences cannot. I have accounted for this asymmetry by establishing the condition for appositives. I have shown that numeral-classifier sequences do not satisfy the condition and consequently, they cannot appear in the left-adjoined appositive position.

To conclude the chapter, I note some cross-linguistic aspects related to the construction where numeral-classifier sequences modify proper names and pronouns. Particular, I focus on the modification of proper names by numerals or numeral-classifier sequences. To the best of my knowledge, few studies have conducted regarding this modification pattern. In addition, it appears that not many languages have a construction where numerals or numeral-classifier sequences modify proper names.[14] I only have data in Korean, which shows the exactly same pattern as in Japanese. Shin (2009) observes that in Korean, just like in Japanese, proper names must be followed by numerals.

(107) a. *na-nun twu myeng-uy [cheli-wa mini]-lul man-ass-ta (Korean)
I-TOP 2 CL-GEN [Cheli-CONJ Mini]-ACC meet-PAST-DEC

14. In contrast, the modification of pronouns by numerals or numeral-classifier sequences is widely attested. See Oho (2019a) for the relevant data.

b. na-nun [cheli-wa mini] twu myeng-lul man-ass-ta
I-TOP [Cheli-CONJ Mini] 2 CL-ACC meet-PAST-DEC
'I met the two of Cheli and Mini.' (Shin 2009: 136 (9))

Since Korean has the same construction, this modification pattern is not unique to Japanese. However, it is an empirical question whether the modification of proper names has been attested in other languages and how common/rare this type of modifications is. In addition, it is of interest to examine whether numerals or numeral-classifier sequences that modify proper names can universally be analyzed as CIs. (Shin (2009) does not mention the interpretive property of (107).) Thus, we cannot say for certain to what extent the syntax and semantics of the numeral-classifier sequences that modify proper names are universal and to what extent they are language-specific. Further cross-linguistic investigations are required.

Chapter 5

Conclusion

To conclude this dissertation, let us go back to the overarching question of this dissertation, as shown in (1).

(1) To what extent is the internal composition of quantifier phrases universal and to what extent is it language-specific?

To answer this question, this thesis investigated the syntax and semantic of Japanese quantification in nominal domain.

In Chapter 2, I examined strong quantifiers. I argued that the Japanese strong quantifiers *subete* 'all' and *hotondo* 'most' are of type $\langle e, \langle et, t\rangle\rangle$, namely, Q-quantifiers. Based on the investigation of the property of nouns, I showed that the way of creating generalized quantifiers involve two-step process: domain restriction and quantification over the restricted domain. The analysis suggested that the internal composition of the strong quantifiers in Japanese is identical to that in English and St'át'imcets. This conclusion supports Matthewson's (2001) null hypothesis that there is no cross-linguistic variation in semantics of quantifiers. Japanese differs from English and St'át'imcets in one obvious respect: Japanese lacks overt determiners. Nevertheless, the three languages share the way that generalized quantifiers are created. On the other hand, I pointed out that there is a language-specific aspect. In Japanese, the strong quantifiers may appear not only in the head of QP, but also in the specifier of QP. The availability of the two positions results in the word order variation.

In Chapter 3, numeral-classifier sequences are investigated. I showed that just like English, they differ from strong quantifiers in that they are predicative and DP-internal elements. In this respect, Japanese numeral-classifier sequences and numerals in English are alike. I showed that the role of classifier is tightly connected to the syntax and semantics of numeral-classifier constructions. I argued that classifiers in Japanese are required for numerals but not for nouns. The results of this analysis indicates that numerals and nouns form a constituency. I thus proposed that numerals and nouns form a complex head. As for semantics, I followed Sudo (2016) and postulated that the role of classifiers is to turn type-n objects into modifiers of type $\langle e, t \rangle$. Danon's (2012) analysis of numerals makes it possible to consider the universal and language-specific aspects of Japanese numeral-classifier constructions. In his framework, cross-linguistically, there are three options for the position of numerals: numerals may be in a head position, a specifier position or both. The choice depends on languages. The word order variation in Japanese indicates that numeral-classifier sequence in Japanese may be in a head and a specifier position.

In Chapter 4, I examined a numeral-classifier construction in which numeral-classifier sequences modify proper names or pronouns. I argued that numeral-classifier sequences introduce a conventional implicature. They convey as new information the cardinality of nouns that they modify but this information is at non-at-issue dimension. I offered a multidimensional analysis based on Potts (2005). To account for the impossibility that prenominal numeral-classifier sequences cannot modify proper names and pronouns, I established a condition for being appositives in Japanese. I showed that numeral-classifier sequences do not satisfy the condition for being appositives and hence they cannot appear in the appositive position, which is the left-adjoined position of DPs This analysis further suggested that postnominal numeral-classifier sequences that modify proper names or pronouns are exceptional as modifiers of proper names and pronouns. This peculiar property is reflected in the fact that only numeral-classifier sequences can appear in the right-adjoined position of DPs to modify proper names and pronouns. As for the universality and language-specificity, further cross-linguistic research is needed to determine whether the introduction of conventional implicatures by numeral-classifier sequences found in Japanese is specific

to the language or not, since few studies have discussed the interpretive property of the numeral(-classifier) constructions that involve proper names or pronouns. In addition, I have no access to empirical data in other languages, particularly about the case where proper names are modified by numerals or numeral-classifier sequences, I have to leave the assessment for future research. As I pointed out in the chapter, however, at least Korean has similar constructions, suggesting that some languages allow numeral-classifier sequences to modify proper names.

All in all, this dissertation revealed the syntax and semantic properties of quantification in nominal domain in Japanese. It showed the universality and the language-specificity of quantification in the language. It suggested that the language-specificity of Japanese quantification is limited to some small area such as the position of strong quantifiers and numeral-classifier sequences. Even though the language have properties that not many languages have, it is subject to a limited set of possibilities that UG allows.

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