

Lexical Decomposition and Comparative Structures for Japanese Determiners

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1. Introduction

This paper is about the interpretation of Japanese *ooku-no* and *takusan-no*, which seem to share the same meaning. Both of these items are roughly translated as *many* in English.

- (1) a. John-wa **ooku-no** hon-wo yon-da
 John-Nom many-Gen book-Acc read-Past
 b. John-wa **takusan-no** hon-wo yon-da
 John-Nom many-Gen book-Acc read-Past
 ‘John read many books’

In English, *many* is used in non-comparative constructions, and *more* is used in comparative constructions as shown in (2). In Japanese, however, *ooku-no* and *takusan-no* can be used in both comparatives and non-comparatives, as shown in (3).

- (2) a. John read **many** books
 b. John read **more** books than Mary did.
 c. *John read **many** books than Mary did.
- (3) a. John-wa Mary yorimo **ooku-no** hon-wo yon-da
 John-Nom Mary than many-Gen books-Acc read-Past
 ‘John read more books than Mary did.’
 b. John-wa Mary yorimo **takusan-no** hon-wo yon-da
 John-Nom Mary than many-Gen books-Acc read-Past
 ‘John read more books than Mary did.’¹

In the rest of the paper, I will show that the Japanese lexical items *ooku-no* and *takusan-no* actually have different meanings and they appear in different

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¹-no of *ooku-no* and *takusan-no* can be omitted. Traditionally, *ooku* and *takusan* have been assumed as manner adverbs. We will put aside these variant forms in this paper.

structures. The differences between them are especially clear in three types of comparative sentences: cardinal comparative (0), proportional comparative (0), and differential comparative (0). I argue that roughly, the difference between *ooku-no* and *takusan-no* is this: *ooku-no* always appears in comparative constructions, even when the meaning is non-comparative, and *takusan-no* always requires a relatively large degree. To capture this difference, I rely on previous analyses of ‘many’ and of comparative constructions. In particular, I suggest that there is a proportional d-*many* which appears in constructions with a proportional reading, akin to the cardinal d-*many* which has been suggested in the literature.

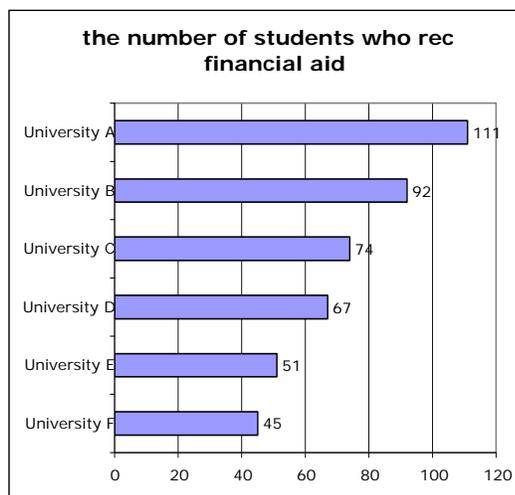
2. Data

In some particular situations, *ooku-no* and *takusan-no* in comparative sentences give rise to different interpretations. We will look at the data showing the differences one by one.

2.1. Cardinal Comparatives

First, consider the situation described in (4). This is a list of the numbers of students who receive financial aid (FA, henceforth) in 6 universities. For example, 111 students receive financial aid in University A, 92 in University B, and so on.

(4) Situation A-1



Given this situation, the salient interpretation of (5) is the following: the number of students with financial aid in University A, 111, can be perceived as “large,” but the number of such students in University F, 45, cannot². Here both *ooku-no* and *takusan-no* give rise to the same judgment in the same situation in non-comparative “*many* P Q” configurations. This judgment relies on the numbers of students with financial aid in the universities. This reading is called the cardinal reading (Barwise and Cooper 1981, Partee 1988, a.o.)

²See Tanaka (2005) for discussion of the contextual factors that influence salience.

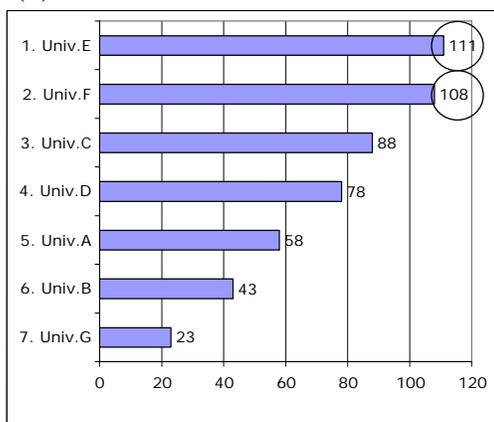
- (5) a. A daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univ. A in many-Gen students-Nom FA-Acc receive
 b. A daigaku de-wa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. A in many-Gen students-Nom FA-Acc receive
 ‘In University A, many students receive financial aid’
- (6) a. #F daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univ. F in many-Gen students-Nom FA-Acc receive
 b. #F daigaku de-wa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. F in many-Gen students-Nom FA-Acc receive
 ‘In University F, many students receive financial aid’

In comparative sentences, however, these two items give rise to different truth conditions. Under situation A-1 in (4) above where the difference between the number of students with financial aid in University E (51) and the one in University F (45) is relatively small (just 6), *ooku-no* is available for the comparative sentence in (7a), but *takusan-no* is not available for the one in (7b).

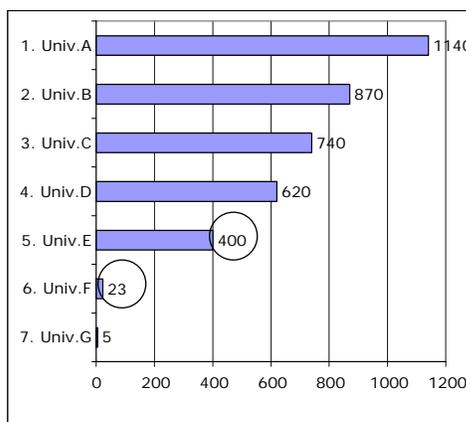
- (7) Cardinal comparative
 a. E daigaku dewa F daigaku yorimo
 Univ. E in Univ. F than
ooku-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 b. #E daigaku de-wa F daigaku yorimo
 Univ. E in Univ. F than
takusan-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 ‘More students receive financial aid in Univ. E than in Univ. F.’

Consider other situations where the comparative sentences in (7) are judged. The judgments are represented as the table in (9).

(8) a. Situation A-2



b. Situation A-3



(9) Judgments of the comparatives in (7) under situations A-1, A-2, and A-3

	Situation A-1	Situation A-2	Situation A-3
(11a) with <i>ooku-no</i>	✓	✓	✓
(11b) with <i>takusan-no</i>	#	#	✓

A comparative sentence with *takusan-no* is allowed only in situation A-3 in (8) where the difference between the two relevant numbers is “large.” To explain this, we tentatively assume (10) as the condition on the acceptability of *takusan-no* in cardinal comparatives.

(10) Cardinal comparatives with *takusan-no* require that the difference of two compared numbers be “large” in a given context.

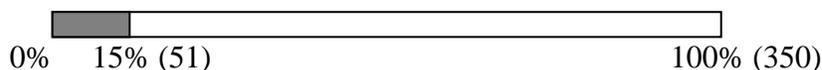
What we should do is explain where (10) comes from.

2.2. Proportional Comparatives

The English determiner *many* has another reading: the proportional reading (Partee (1988), de Hoop (1996), a.o.), and Japanese *ooku-no* and *takusan-no* have it as well. To consider this reading, think of the situation in (11). In this situation, 51 students in University E receive financial aid, but this is a big university with no less than 350 students. The percentage of students with financial aid is just 15%. On the other hand, 45 students receive financial aid in University F, but this university is small with only 52 students. The percentage of students with financial aid is 90% in this university.

(11) Situation B

a. University E: $\frac{|\text{students with financial aid}|}{|\text{total number of students}|} = \frac{51}{350} \cong 15\%$



b. University F: $\frac{|\text{students with financial aid}|}{|\text{total number of students}|} = \frac{45}{52} \cong 90\%$



Given this situation, University E does not seem to have a large proportion of students with financial aid in (12), but the proportion in University F is judged as “large” in (13).

- (12) a. #E daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univ. E in many-Gen students-Nom FA-Acc receive
 b. #E daigaku dewa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. E in many-Gen students-Nom FA-Acc receive
 ‘In University E, many students receive financial aid’

- (13) a. F daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univ. F in many-Gen students-Nom FA-Acc receive
 b. F daigaku dewa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. F in many-Gen students-Nom FA-Acc receive
 ‘In University F, many students receive financial aid’

Pay attention to the fact that the judgments are the other way around in (6) and (13) even though the number of students with financial aid is the same. Judgments for (6) are based on a cardinal reading; the crucial thing here is the number of students with financial aid, 45. For the judgment of (13), however, the proportion of students with financial aid, 90%, is relevant. The contrast between (12) and (13) shows that both *ooku-no* and *takusan-no* permit a proportional reading.

However, only *takusan-no* allows comparative sentences with a proportional reading. To compare the two proportions in University E (15%) and University F (90%) under the situation in (11), a proportional comparative with *takusan-no* can be used, but not with *ooku-no*. (14a) itself is grammatical, but it provides only a cardinal reading, not a proportional one.

- (14) Proportional comparative
 a. #F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
ooku-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 b. F daigaku de-wa E daigaku yorimo
 Univ. F in Univ. E than
takusan-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 ‘More students receive financial aid in Univ. F than in Univ. E.’

2.3. Differential Comparatives

Next, we will look at data with differential comparatives. The typical example of a differential comparative is (15), which mentions that the difference of tallness of John and Mary is one inch.

- (15) John is one inch taller than Mary

There are two types of differential comparatives with respect to the distinction between cardinal and proportional readings. In cardinal differential constructions, only *ooku-no* is allowed. Let us take situation B in (11), where the difference between University E and F is 6.

- (16) a. E daigaku dewa F daigaku yorimo
 Univ. E in Univ. F than
6-nin ooku-no gakusei-ga syougakukin-wo moratteiru
 6-CL many-Gen students-Nom FA-Acc receive
 b.* E daigaku dewa F daigaku yorimo
 Univ. E in Univ. F than
6-nin takusan-no gakusei-ga syougakukin-wo moratteiru
 6-CL many-Gen students-Nom FA-Acc receive
 ‘6 more students receive financial aid in Univ. E than in Univ. F.’

As for proportional differential constructions, on the other hand, neither *ooku-no* nor *takusan-no* are allowed.

- (17) a. #F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
75% ooku-no gakusei-ga syougakukin-wo moratteiru
 75% many-Gen students-Nom FA-Acc receive
- b.* F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
75% takusan-no gakusei-ga syougakukin-wo moratteiru
 75% many-Gen students-Nom FA-Acc receive
 ‘The percentage of students with financial aid in University F is 75% larger than the one in University E’

(17a) is not ungrammatical, but it does not describe situation B in (11); it means that the number of students with financial aid in University F is larger than the one in University E by 75% of 51 (≈ 39). In short, (17a) means that “90 students receive financial aid in University F.” This is not the intended reading. The proportional differential comparative construction here compares the two proportions, 15% and 90%.

Following the judgments of (7a), (14a), (16a), and (17a), let us assume (18) as the condition on the acceptability of *ooku-no*.

- (18) In comparative sentences, *ooku-no* is compatible with a cardinal comparative interpretation, but not with a proportional comparative interpretation.

Based on our three types of observations represented above, we will investigate the following questions about the difference between *ooku-no* and *takusan-no*.

- (19) a. Why does (7b) with *takusan-no* sound odd in situation A-1 in (4)?, i.e., why does a comparative sentence with *takusan-no* require the difference of two compared numbers to be “large” (the condition in (10))?
- b. Why cannot (14a) with *ooku-no* describe situation B in (11)?, i.e., why does *ooku-no* prohibit a proportional comparative reading (the condition in (18))?
- c. Why does *ooku-no* permit cardinal differential comparatives, but *takusan-no* does not ((16))? Why is it the case that both of them do not allow proportional differential comparatives ((17))?

3. Theoretical Background

In this section, we will review the theoretical background needed to answer the questions in (19). Mainly, we will see previous treatments of comparative construction, and of the determiner *many* in English.

3.1. Comparative constructions

It has been suggested in the literature that there are two types of comparative constructions: non-differential comparative and differential comparative (cf. von Stechow 1984, Rullmann 1995, Hackl 2000, Heim 2000, Nakanishi 2004, among many others). Depending on the type of comparative, two types of comparative morphemes *-er* have been suggested. Let us call the non-differential comparative *-er₁*, and differential comparative *-er₂*.

3.1.1. Non-differential Comparative: *-er₁*

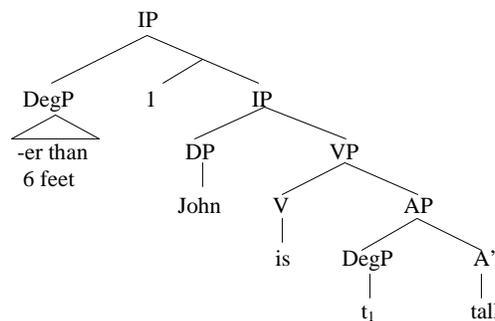
The denotation of the comparative morpheme for ordinary comparatives is (20). The maximality in the denotation is defined as (21).

- (20) $\llbracket -er_1 \rrbracket := \lambda D'_{dt} \lambda D_{dt} . \max(D) > \max(D')$
 (21) $\max(D) = \text{id} . D(d) = 1 \wedge \forall d' [D(d') = 1 \rightarrow d' \leq d]$ (Heim 2000)

Based on this semantics, the truth conditions of the comparative sentence in (22) are given in (22b), following the LF in (23).

- (22) a. John is taller than six feet
 b. $\max\{d: \text{tall}(j, d)\} > 6'$

- (23) LF of (22a)



3.1.2. Differential comparative: *-er₂*

In addition to non-differential comparatives such as (22a), there is another type of comparative sentence: differential comparative. (24) is a typical example of a differential comparative.

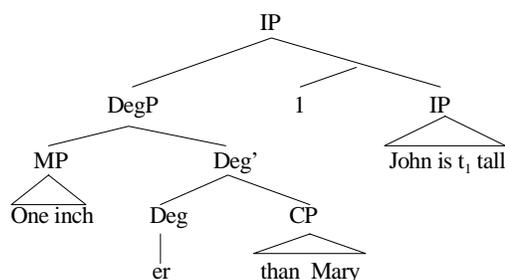
- (24) John is one inch taller than Mary

The comparative morpheme *-er₁*, which we have already seen in (20), cannot describe the appropriate truth conditions for the sentence because it does not contain the argument slot for the difference of two degrees, *one inch*. We need another comparative morpheme for differential comparatives, which is formalized in (25).

- (25) $\llbracket -er_2 \rrbracket := \lambda D'_{dt} \lambda d_d \lambda D_{dt} . \max(D) - \max(D') = d$

Based on this comparative morpheme, the LF and truth condition of (24) would be (26) and (27), respectively.

(26) LF of (24)



(27) $\max \{d: \text{tall}(j, d)\} - \max \{d: \text{tall}(m, d)\} = 1$

3.2. Determiner *many*

Regarding the semantics of *many*, several kinds of analyses have been suggested. In these analyses, we will see two types of semantics of *many*: the traditional determiner *many* whose type is $\langle et, \langle et, t \rangle \rangle$, and the comparative abstract *d-many* whose type is $\langle d, \langle et, \langle et, t \rangle \rangle$. Let us call the former *many*₁, and the latter *many*₂. The determiner *many*₁ further has two types of variants: cardinal reading *many*_{1C} and proportional reading *many*_{1P}.

3.2.1. *many*₁: the traditional determiner of $\langle et, \langle et, t \rangle \rangle$ type

Barwise and Cooper (1981) argue that the type of natural language determiners, for example, *every*, *no*, or *some*, is $\langle et, \langle et, t \rangle \rangle$.

- (28) a. $\llbracket \text{every} \rrbracket = [\lambda p_{et} \lambda q_{et}. p \subseteq q]$
 b. $\llbracket \text{no} \rrbracket = [\lambda p_{et} \lambda q_{et}. p \cap q = \emptyset]$
 c. $\llbracket \text{some} \rrbracket = [\lambda p_{et} \lambda q_{et}. p \cap q \neq \emptyset]$

They argue that the determiner *many* has the same type even though the interpretation of *many* is slightly different from the one of other determiners in (28), in that its truth conditions depend on the conversational background.

(29) $\llbracket \text{many}_{1\text{-Cardinal}} \rrbracket = [\lambda p_{et} \lambda q_{et}. |p \cap q| > \rho, \text{ where } \rho \text{ is a "large" number}]$

- (30) a. Many linguists are lazy
 b. $|\{x: x \text{ is a linguist}\} \cap \{x: x \text{ is lazy}\}|$ is "large"

The interpretation of (30a) with *many* in (29) is based on the number of lazy linguists. This *many* for the cardinal reading has been discussed in the literature (Barwise and Cooper 1981, Partee 1988, de Hoop and Solà. 1996, a.o.).

It has been said that *many* has another reading: proportional reading (Partee 1988, Cohen 2001, among many others). In this reading, the number of

individuals is not relevant to the interpretation, but it is crucial that the proportion of individuals who satisfy the property described with the predicate out of total number of individual be large. The denotation of proportional *many* is represented as (31).

$$(31) \quad \llbracket many_{1\text{-Proportional}} \rrbracket = [\lambda p_{et} \cdot \lambda q_{et} \cdot \frac{|p \cap q|}{|p|} > \rho, \text{ where } \rho \text{ is "large"}]$$

Here let us suppose that there are 1000 linguists, and 800 are lazy linguists. Whether 800 is large or not is decided by the context in the cardinal reading. In the proportional reading, however, the number 800 itself does not matter; the proportion of 80% is relevant to the truth conditions. The proportion of 80% can be seen as a “large” proportion, rendering (30a) true in the context. Hence, (30a) would be true even in a situation where there are only 20 lazy linguists, if the total number of linguists were just 22, for example.

3.2.2. *many*₂: the comparative *d-many* of $\langle d, \langle et, \langle et, t \rangle \rangle$ type

Different from *many*₁, another type of *many* has been suggested: comparative *d-many*. In a comparative construction like (32a), the interpretation is paraphrased as (32b).

- (32) a. John is taller than 6 feet
 b. There is a degree *d* st. John is tall to that degree and *d* is greater than 6ft.
 c. [-er than 6 feet]₁ [John is *d*₁-tall]
- 

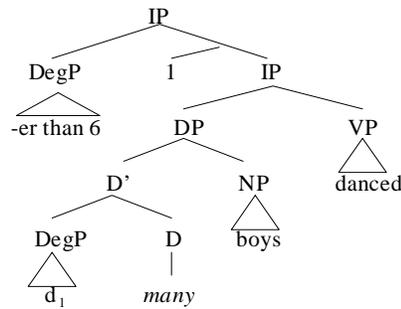
According to the paraphrase, there are three essential pieces to comparative constructions: a gradable predicate, an expression referring to a degree that provides the standard of comparison, and a comparative relation. The paraphrased interpretation in (32b) means that an integral part of comparatives is a quantifier that ranges over degrees. This degree quantifier is base-generated in the degree argument position of the gradable predicate, and moves up to a clausal node to yield an interpretable structure as shown in (32c) (cf. Heim 2000. We will see the details of comparative constructions later on).

Hackl (2000) extends the analysis to the interpretation of sentences with *more*. Based on the assumption that *more* is lexically decomposed into *many* and *-er* (cf. Ross 1967, Bresnan 1973), Hackl argues that the denotation of comparative *d-many* is represented as (33), and a sentence in (34a) is paraphrased as (34b). The LF of (34a) would be (35).

$$(33) \quad \llbracket many_2 \rrbracket = \lambda d \lambda P \lambda Q. \exists x[|x| = d \wedge P(x) \wedge Q(x)]$$

- (34) a. More than six boys danced.
 b. The maximal degree *d* st. *d*-many boys danced exceeds six.

(35) LF of (34a).



Based on the analysis, the truth conditions of (34a) are: $\max\{d: \exists y [*boy(y) \wedge |y|=d \wedge *dance(y)]\} > 6$.

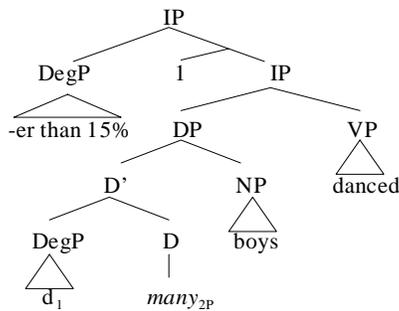
What has to be noticed is that comparative *d-many* in the previous literature appears only in the cardinal reading. There is no reason to assume that it has no proportional counterpart. I suggest that there is a proportional *d-many* which can be represented as in (36), which we will call *many*_{2P}.

(36) $\llbracket many_{2P} \rrbracket := \lambda d \lambda P \lambda Q. \frac{|P \cap Q|}{|P|} = d$ (Proportional *d-many*)

Let us think about the sentence in (37), for example. The LF and interpretation of the sentence is represented in (38) with *many*_{2P}. In this case, the degree argument is not for a cardinal number, but a proportion of dancing boys out of total boys in question.

(37) More than 15% of the boys danced.

(38) a. LF of (37)



b. Truth condition of (37)

$\llbracket (38a) \rrbracket = 1$ iff
 $\max\{d: \frac{|\{x: boy(x)\} \cap \{x: dance(x)\}|}{|\{x: boy(x)\}|} = d\} > 15\%$

‘The maximal degree of proportion of dancing boys exceeds 15%’

3.3. Covert degree morpheme *LARGE*

A degree morpheme plays an important role for comparative *d-many* (i.e., *many*₂ in our terminology). A cardinal number or proportion would be the argument for

degree. In addition, I suggest that there is a default degree morpheme *LARGE*, which is phonologically covert³.

$$(39) \quad \llbracket \text{LARGE} \rrbracket^{C, g} := \lambda d. d \text{ is "large" in } C$$

This covert degree morpheme satisfies the condition in (10); cardinal comparatives with *takusan-no* require that the difference of two compared numbers should be “large” in a given context.

4. Proposal

In this section I describe my proposal for Japanese *ooku-no* and *takusan-no* using the analyses of abstract *many* and of comparative constructions. The basic assumption is that Japanese *ooku-no* and *takusan-no* can be lexically decomposed in several ways, depending on the construction. These two items are not single lexical items, but they consist of some lexical components. The difference between *ooku-no* and *takusan-no* lies in which items compose them, and how they combine with each other.

The following are the building blocks to compose Japanese determiners *ooku-no* and *takusan-no*.

$$(40) \quad \text{many}$$

- a. $\llbracket \text{many}_{1C} \rrbracket := \lambda P \lambda Q. |P \cap Q| \text{ is "large" (cardinal)}$
- b. $\llbracket \text{many}_{1P} \rrbracket := \lambda P \lambda Q. \frac{|P \cap Q|}{|P|} \text{ is "large" (proportional)}$
- c. $\llbracket \text{many}_{2C} \rrbracket := \lambda d \lambda P \lambda Q. \frac{|P \cap Q|}{|P|} = d \text{ (Comparative cardinal)}$
- d. $\llbracket \text{many}_{2P} \rrbracket := \lambda d \lambda P \lambda Q. \frac{|P \cap Q|}{|P|} = d \text{ (Comparative proportional)}$

$$(41) \quad \text{-er}$$

- a. $\llbracket \text{-er}_1 \rrbracket := \lambda D'_{dt} \lambda D_{dt}. \max(D) > \max(D') \text{ (Non-differential)}$
- b. $\llbracket \text{-er}_2 \rrbracket := \lambda D'_{dt} \lambda d_d \lambda D_{dt}. \max(D) - \max(D') = d \text{ (Differential)}$

$$(42) \quad \text{LARGE}$$

$$\llbracket \text{LARGE} \rrbracket^{C, g} := \lambda d. d \text{ is "large" in } C$$

Ooku-no and *takusan-no* consist of these elements. Here let us suppose that their lexical decompositions should follow the principles in (43).

- (43) a. *Ooku-no* has to appear in a cardinal comparative structure even in non-comparative sentences. (i.e., only *many*_{2C} in (40c) is available for *ooku-no*).
- b. *Takusan-no* has to take the default degree morpheme *LARGE* in any case.

³Measure phrases can be interpreted either as a degree argument or as a set of degrees (Hackl, 2000)

(i) $\llbracket \text{six feet} \rrbracket = 6'$ (ii) $\llbracket \text{six feet} \rrbracket := \lambda d. d = 6'$
 $\{d: d = 6'\}$ is a singleton $\{6'\}$, hence $\max\{d: d = 6'\}$ is equal to $6'$

(43a) implies that the LF of a non-comparative sentence with *ooku-no* ((5a), for example) is a comparative structure. (43b) is for the effect of (10): *takusan-no* requires that the difference of two compared numbers should be “large” in a given context.

The lexical decomposition of *ooku-no* and *takusan-no* varies depending on the structures they appear in. Their decompositions are represented as follows.

(44) Lexical decomposition of *ooku-no* and *takusan-no*.

	<i>Ooku-no</i>	<i>Takusan-no</i>
(a) Cardinal Non-Comparative	Many _{2C} + <i>LARGE</i> + -er ₁	Many _{2C} + <i>LARGE</i>
(b) Cardinal Comparative	Many _{2C} + -er ₁	Many _{2C} + <i>LARGE</i> + -er ₂
(c) Cardinal Differential Comparative	Many _{2C} + (numeral) + -er ₂	*
(d) Proportional Non-Comparative	Many _{2C} + <i>LARGE</i> + -er ₁	Many _{2P} + <i>LARGE</i>
(e) Proportional Comparative	*	Many _{2P} + <i>LARGE</i> + -er ₂
(f) Proportional Differential Comparative	*	*

All lexical decomposing involves *many*_{2C}, which means that *many*₁ (<et, <et, t>> type) is not available in Japanese *ooku-no* and *takusan-no*. The table reveals that *ooku-no* always appears in a comparative construction, lexically decomposed into *many*_{2C} and -er, and comparative sentences with *takusan-no* are always differential comparatives with *LARGE* and -er₂. We will see the specific implementation of these lexical decompositions in the next section, and answer the questions posed in (19).

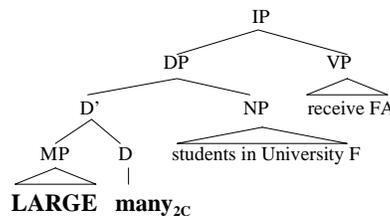
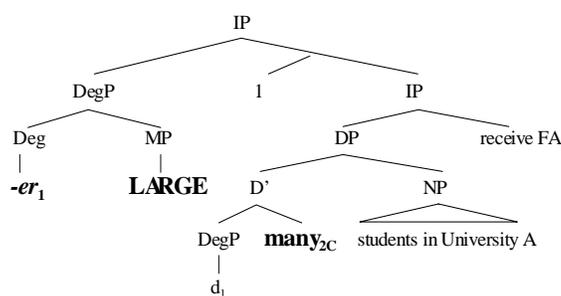
5. Implementations

5.1. Cardinal Non-Comparatives

First, we will look at non-comparative sentences under a cardinal reading as in (45) (=5). In situation A-1 in (4), both sentences are judged as true. Their LFs and interpretations are given in (46).

- (45) a. A daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univ. A in many-Gen students-Nom FA-Acc receive
 b. A daigaku de-wa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. A in many-Gen students-Nom FA-Acc receive
 “In University A, many students receive financial aid” (=5)

- (46) a. *ooku-no* ((45a)) b. *takusan-no* ((45b))



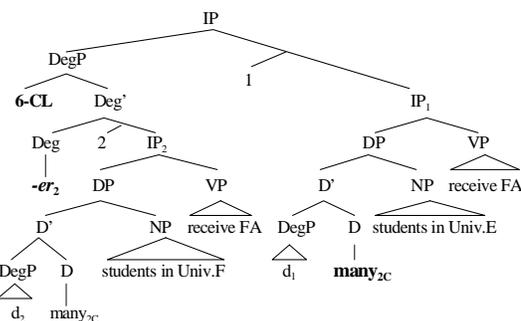
be ‘large’ because of the default degree morpheme *LARGE*. This is not satisfied in the situation in (4), where the difference between the two universities is not relatively ‘large.’

5.3. Cardinal Differential Comparatives

Next are the cardinal differential comparatives in (49)(=(16)) in the situation in (4). *Takusan-no* gives rise to an unacceptable, which is relevant to our question of (19c): why does *ooku-no* permit cardinal differential comparatives, but *takusan-no* does not?

- (49) a. E daigaku dewa F daigaku yorimo
 Univ. E in Univ. F than
6-nin ooku-no gakusei-ga syougakukin-wo moratteiru
 6-CL many-Gen students-Nom FA-Acc receive
 b.* E daigaku dewa F daigaku yorimo
 Univ. E in Univ. F than
6-nin takusan-no gakusei-ga syougakukin-wo moratteiru
 6-CL many-Gen students-Nom FA-Acc receive
 ‘6 more students receive financial aid in Univ. E than in Univ. F.’

- (50) a. *Ooku-no* ((49a)) b. **Takusan-no* ((49b))



The default morpheme *LARGE* and a numeral degree morpheme conflict

$$\llbracket (50a) \rrbracket = 1 \text{ iff } \max\{d:d=\|\{x: x \text{ is a stdt with FA in Univ. E}\}\} - \max\{d:d=\|\{x: x \text{ is a stdt with FA in Univ. F}\}\} = 6$$

In the case of *ooku-no*, *-er₂* takes the degree morpheme ‘6’ as its argument to describe the difference between the two universities. *Takusan-no*, however, should take the default degree morpheme *LARGE*, and it cannot take any more degree morphemes. These two degree morphemes compete for the same slot in the tree. This is the answer to one of our questions in (19c).

5.4. Proportional Non-Comparatives

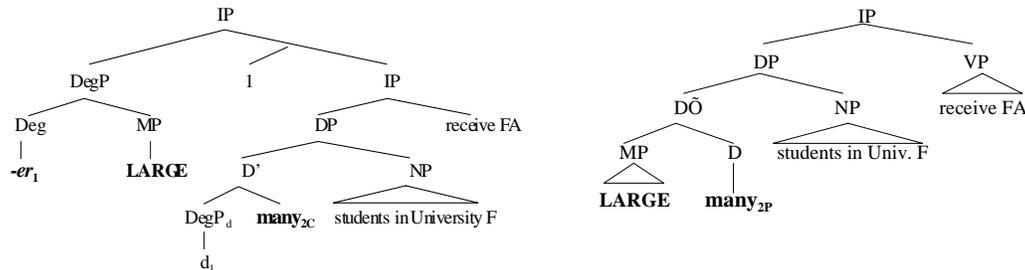
Now let us turn to the proportional reading. (51a,b) (=13)) are examples of proportional non-comparative sentences under the situation in (11), where the proportion in University F is 90%, which is regarded as ‘large.’

- (51) a. F daigaku dewa **ooku-no** gakusei-ga FA-wo moratteiru
 Univer. F in many-Gen students-Nom FA-Acc receive
 b. F daigaku dewa **takusan-no** gakusei-ga FA-wo moratteiru
 Univ. F in many-Gen students-Nom FA-Acc receive
 ‘In University F, many students receive financial aid’

Following the restriction in (43) and the decomposition options in (44), *ooku-no* cannot involve the proportional *many_P*, and the proportional reading should be given indirectly⁴. The structure of (51a) is comparative, even though the sentence is non-comparative. The number of students with FA is compared with the ‘large’ number in the given context. On the other hand, *takusan-no* can consist of *many_P* for the proportional reading, and the proportional reading is available.

(52) a. *ooku-no* ((51a))

b. *takusan-no* ((51b))



[(52a)] = 1 iff $\max\{d:d=|\{x: x \text{ is a stdt with FA in Univ.F}\}|\} > \text{“large”}$

[(52b)] = 1 iff $\frac{|\{x: x \text{ is a stdt with FA in Univ.F}\}|}{|\{x: x \text{ is a stdt in Univ.F}\}|}$ is “large”

5.5. Proportional Comparatives

Our question in (19b) was about proportional comparatives: *ooku-no* is not compatible with proportional comparatives.

- (53) Proportional reading under the situation in (11)
 a. # F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
ooku-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 b. F daigaku de-wa E daigaku yorimo

⁴This analysis is supported by the following examples of proportional readings with mass nouns. *Takusan-no* allows a proportional reading for mass nouns, but *Ooku-no* does not.

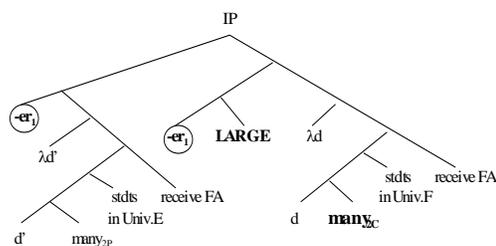
Kono damu ! niwa {***ooku-no** / **takusan-no**} mizu-ga aru
 This dam in much/many water-Nom exist
 ‘There is a lot of water in the dam’

This is because the material described with mass noun cannot be counted. Hence the *many_{2c}* for cardinal reading of *ooku-no* does not work. This shows that *ooku-no* cannot provide a proportional reading directly.

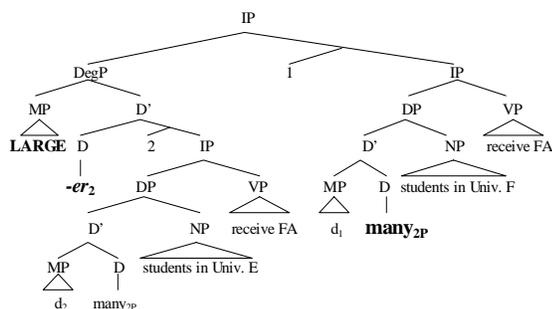
Univ. F in Univ. E than
takusan-no gakusei-ga syougakukin-wo moratteiru
 many-Gen students-Nom FA-Acc receive
 ‘More students receive financial aid in Univ. F than in Univ. E.’

These structures and interpretations are represented in (54).

(54) a. **ooku-no* ((53a))



b. *takusan-no* ((53b))



$$\llbracket (54b) \rrbracket = 1 \text{ iff } \max \left\{ d: d = \frac{|\{x: x \text{ is a stdt with FA in Univ. F}\}|}{|\{x: x \text{ is a stdt in Univ. F}\}|} \right\} - \max \left\{ d: d = \frac{|\{x: x \text{ is a stdt with FA in Univ. E}\}|}{|\{x: x \text{ is a stdt in Univ. E}\}|} \right\} = \text{“large”}$$

As we have seen in (52a), the proportional reading of *ooku-no* is given by a comparative construction. Therefore, a proportional comparative requires one more comparative morpheme $-er_1$. In the structure in (54a), the inside $-er_1$ is for the proportional reading, and the outside $-er_1$ is for the comparative. Such ‘double standard’ for comparatives, however, should be prohibited. This is why *ooku-no* is not compatible with a proportional comparative reading.

5.6. Proportional Differential Comparatives

Finally, let us look at examples of proportional differential comparatives. Neither *ooku-no* nor *takusan-no* allow this reading, which was our second question in (19c).

(55) Proportional Differential Comparative under the situation (11)

a. #F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
75% ooku-no gakusei-ga syougakukin-wo moratteiru
 75% many-Gen students-Nom FA-Acc receive

- b.* F daigaku dewa E daigaku yorimo
 Univ. F in Univ. E than
75% takusan-no gakusei-ga syougakukin-wo moratteiru
 75% many-Gen students-Nom FA-Acc receive
 ‘The percentage of students with financial aid in University F is 75%
 larger than the one in University E’ (= (17))

In section 0, we saw that *ooku-no* does not allow proportional comparative readings because of the double standard prohibition. It means that *ooku-no* is not compatible with proportional differential comparatives, which is a kind of proportional comparative. As for *takusan-no*, it does not allow differential comparative readings because of the default degree morpheme *LARGE* as we have seen in (50). This is the reason why proportional differential reading not allowed. In (55), the degree morpheme ‘75%’ and the default degree morpheme *LARGE* compete the argument status of $-er_2$.

6. Conclusion

Japanese *ooku-no* and *takusan-no* seem to share the same meaning in non-comparative sentences, but they actually have different meanings in comparative constructions. I suggest that neither of them is the traditional Barwise & Cooper style determiner *many* (<et,<et, t>> type determiner). Both items are lexically decomposed into a number of elements depending on the structure in question. *Ooku-no* takes cardinal comparative d-*many* and always shows up in comparative constructions. *Takusan-no*, on the other hand, must take the ‘default’ degree morpheme *LARGE*. The comparative d-*many* has been suggested for cardinal reading in previous literature. I suggested that there is a proportional d-*many* as well. Based on this *many* we can account for the structure and interpretation of proportional comparative sentences with *takusan-no* in Japanese.

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