1 Introduction

In languages like Chinese and Japanese, nouns can be used in argument position without (in)definite articles or plural markers, and they are interpreted as definite, indefinite, singular or plural, depending on contexts. A Japanese example is given in (1).

1 (1) John-ga hon-o yon-da.
   -Nom book-Acc read-Past
   ‘John read a book/some books/the book(s).’

It is also well known that those languages have rich classifier systems. When the number of the individuals that a noun denotes is indicated, the number is not attached directly to the noun but it is used with a classifier, as shown in (2).

(2) John-ga ni-satsu(-no) hon-o / *ni hon-o yon-da.
   -Nom two-Cl-Gen book-Acc two book-Acc read-Past
   ‘John read two books.’

These facts contrast with languages in which plural morphemes are productive and nouns are used with (in)definite articles. In order to capture the systematic differences with respect to nominal systems, Chierchia 1998a, b proposes the semantic parameter called the Nominal Mapping Parameter, as given in (3).

(3) The Nominal Mapping Parameter: N ⇒ [±argument, ±predicate]
   a. N ⇒ [+arg, -pred]: (e.g. Chinese/Japanese)
      Nouns can be of type e, cannot be of type <e, t>.
   b. N ⇒ [+arg, +pred]: (e.g. English)
      Nouns can be of type e, can be type <e, t>.
   c. N ⇒ [-arg, +pred]: (e.g. French)
      Nouns cannot be of type e, can be of <e, t>.

A syntactic category N is mapped onto either semantic type e or type <e, t>, and the mapping relation between syntactic categories and semantic types are represented as the features [±argument, ±predicate]. According to the Nominal Mapping Parameter, in languages like Chinese and Japanese, every common noun has [+arg, -pred] and mapped onto type e, while in languages like French, every common noun has [-arg, +pred] and interpreted as predicate. In English, the mapping is determined item by item. For instance, desk is of type <e, t> whereas furniture is of type e.

It has been often pointed out, however, that Chinese and Japanese do have plural markers although they are not productive. In both languages, the plural markers are used with [+human] nouns and some plural markers are also used with pronouns and demonstratives. Japanese has two plural markers -tachi and -ra, and both can be used with [+human] nouns but

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1 In the course of presentation, I will mainly show the data from Japanese, but we can observe the same phenomena in Chinese, too.
only the latter can be used with pronouns. As we will see later, the antecedents of these pronouns with -ra can be either [+human] or [-human] nouns.\(^2\)

(4) a. gakusee-tachi, gakusee-ra  
    student-PL  student-PL

b. sore-ra, kore-ra, are-ra  
   it-PL (= they/them) this-PL (= these) that-PL (= those)

The questions that immediately arise are: (i) Are the plural markers in Chinese and Japanese the same as the English plural morpheme -s? and (ii) Is Chierchia’s Nominal Mapping Parameter correct? This paper will argue that the Chinese/Japanese plural markers are the same as the English -s with respect to the semantics of plurality but they also have the definite interpretation. Concerning the second question, it will be argued that Chierchia’s parameter is basically correct and Chinese and Japanese have the stratum in the lexicon.

2 Definiteness of the Japanese Plural Markers

2.1 Common Nouns with Plural Markers

A crucial difference between the Japanese plural markers and English -s is that the former tend to be interpreted as definites. The relation between plurality and definiteness in Japanese has been pointed out by Kawasaki 1989 through the study of reflexive pronouns with -tachi. She describes the contribution of -tachi as follows:

When -tachi is attached to a common noun, the resulting expression makes a definite description for a non-atomic entity. For example, gakuse[e]-tachi (student-Plural) means ‘the students.’ It denotes an individual sum all of whose atomic individual parts are students, and it presupposes that the speaker and the hearer know which group of students is being referred to. (Kawasaki: 1989, section 1.1)

In a sentence like (5), a noun with a plural marker is interpreted as denoting the individuals who the speaker and the listener know.

    -Top student-PL/PL-Dat meet-Past  
    ‘John met the students.’

   -Nom thief-PL/PL-Acc catch-Pre maybe  
   ‘Maybe John will catch the thieves.’

A piece of evidence for the definiteness of a common noun followed by a plural marker comes from the fact that such nouns cannot be used as predicates, as shown in (6).

\(^2\) The Japanese plural morphemes are also used with names such as John-tachi, which means “John and others, a group represented by John.” I do not discuss this use of the plural markers, assuming that the semantics of this type of use is different from the one discussed in the text. See Nakanishi and Tomioka 2001 for an approach trying to unify the two uses.
Q: John-to-Mary-wa nani-o shi-tei-ru-no-desu-ka?
and -Top what-Acc do-Prog-Pres-Comp-Cop.Pres-Q
‘What are John and Mary doing?/What are John and Mary?’

A: Kare-ra-wa gakusee(*-tachi/*-ra) desu.
he-Pl-Top student -Pl/-Pl Cop.Pres
‘They are (*the) students.’

Another piece of evidence is, as Nakanishi an Tomioka 2001 point out, that a common noun with a plural marker takes wide scope over an intensional predicate, as shown in (7b).

(7) a. Sono byooin-wa kangohu-o sagashi-tei-ru.
that hospital-Top Nurse-Acc seek-Prog-Pres
‘That hospital is looking for a nurse.’
??‘There is a nurse that hospital is looking for.’

b. Sono byooin-wa kangohu-tachi/-ra-o sagashi-tei-ru.
that hospital-Top Nurse-PL/-PL-Acc seek-Prog-Pres
‘That hospital is looking for the nurses.’

If the object of the intensional verb is bare as in (7a), the most natural interpretation of it is a non-specific reading, and it is very difficult to interpret it as having wide scope over the verb. On the other hand, if the object NP is followed by a plural marker, it gets wide scope overt the verb as given in (7b). Nakanish and Tomioka give the NP a specific interpretation such that there are group of nurses that hospital is looking for, but I would like to interpreted it as definite.

2.2 Pronouns with Plural Markers
The claim that Japanese plural morphemes are not just plural markers is also supported by the facts concerning pronouns. Japanese has the null/overt contrast of pronouns, and the distributions of them are different. Overt pronouns cannot be used in so-called paycheck sentences and bathroom sentences, as given in (8a) and (8b), respectively.

(8) a. John igai-no dare-mo-ga jibun-no kurejittokaad01-o tsuma-ni
give-Past -Top self-Gen credit.card-Acc wife-to
give-Past -Top mistress give-Past
‘Everyone but John gave a credit card of his to his wife. John gave one of his to his mistress.’

b. Kono tatemono-ni toirei-ga na-i ka, øi/sorei-ga
this building-in bathroom-Nom Neg-Pres or
henna tokoro-ni a-ru ka-no dochiraka-dea-ru.
exist-Pres or-Cop which-Q Cop-Pres
‘It is the case either that this building does not have a bathroom or that it is in a funny place.’

As is argued by Chierchia 1995 among others, pronouns in these contexts are interpreted as E-type pronouns. Thus, the fact in (8) demonstrates that the null pronoun can be interpreted as E-type while the overt pronoun cannot in Japanese.

3 Definiteness of the Chinese plural marker -men has also been pointed by Iljic 1994 and Yang 2001.
The anti-E-type character of the overt pronoun suggests that they translate into variables. In fact, the bound variable reading is available when they are c-commanded by their antecedents, as shown in (9).

(9) a. Dono ronbun-mo sorei-ga keesais-are-ru zasshi-no shoshiki-ni
    which paper-∀ that-Nom publish-Pass-Pres journal-Gen format-Dat
    follow-must-Pros
    ‘Every paper must follow the format of the journal in which it appears.’

    b. Dono doroboo-mo soitsu-i-ga nusun-da shina-o jimanshi-ta.
    which thief-∀ that.guy-Nom steal-Past thing-Acc boast.of-Past
    ‘Every thief boasted of what he stole.’

*Sore* in (9a) and *soitsu* in (9b) are c-commanded by their universally quantified antecedents and they are interpreted as bound variables. When they are not c-commanded by their antecedents, they cannot be interpreted as bound variables, as in (10).

(10) a. John-wa sono chuukoshaya-no dono kuruma-i-ni-mo
    -Top that used.car.shop-Gen which car-Dat-∀
    notte-mi-ta. Yosoo-ijooni *sore-i-wa yoku hashit-ta.
    drive-try-Past expectation-more.than it-Top well run-Past
    ‘John tried driving every car in the used car shop. It ran better than expected.’

    b. Dono doroboo-mo soitsu-i kono machi-no doko-ka-ni kakure-tei-ru.
    which thief-∀ this town-Gen where-∃ in hide-Prog-Pre
    Keesatsu-wa *soitsu-i-o sagashi-tei-ru.
    police-Top that.guy-Acc search.for-Prog-Pres
    ‘Every thief is hiding somewhere in this town. The police are searching for him.’

If the overt pronoun is followed by the plural marker -ra, however, the anaphoric link between the pronoun and the universally quantified antecedent can be established.

(11) a. John-wa sono chuukoshaya-no dono kuruma-i-ni-mo
    -Top that used.car.shop-Gen which car-Dat-∀
    drive-try-Past expectation-more.than it-Pl-Top well run-Past
    ‘John tried driving every car in the used car shop. They ran better than expected.’

    b. Dono doroboo-mo soitsu-ra i kono machi-no doko-ka-ni kakure-tei-ru.
    which thief-∀ this town-Gen where-∃ in hide-Prog-Pre
    Keesatsu-wa soitsu-ra-i-o sagashi-tei-ru.
    police-Top that.guy-Pl-Acc search.for-Prog-Pres
    ‘Every thief is hiding somewhere in this town. The police are searching for them.’

This parallels with the singular/plural contrast in English as observed in (12).

(12) Every boyi walked in. *Hei/Theyi sat down.
The singular pronoun cannot be linked to the non-c-commanding, universally quantified antecedent while the plural pronoun can. As claimed in Chierchia 1995 among many others, the plural pronoun in contexts like (12) is interpreted as E-type, and if the E-type analysis of plural pronouns is correct, then the overt pronoun with the plural marker in Japanese like (11) also should be interpreted as E-type. Here is an interesting situation. We observed that overt pronouns without a plural marker are not interpreted as E-type, but those with a plural marker are interpreted as E-type. This fact suggests that the E-type interpretation comes from the semantics of the plural marker. I would like to propose that the plural marker has the Cooperian definite description meaning, which gives the definite interpretation, as illustrated in (13) (the formal definition will be given in section 3.4.).

(13) Cooperian definite description

\[
\begin{array}{c}
\text{sore} \quad \text{variable} \\
\downarrow \quad \uparrow \\
\text{-ra} \\
\end{array}
\]

The definite description function of -ra is also observed in (14).

(14) Oozee no gyangu-ga futa kumi-ni wakare-ta. Many-Gen gangster-Nom two group-into separate-Past

#Soshite soitsu-ra-wa soitsu-ra-o naguri-hajime-ta. and that.guy-Pl-Top that.guy-Pl-Acc hit-begin-Past

‘Many gangsters separated into two groups. And they started hitting them.’

If the pronoun with -ra is interpreted as definite, it should obey the uniqueness/maximality requirement. And in fact it does. The intended reading of (14) is that the first soitsu-ra refers to a group of gangsters and the second to the other group of gangsters. But the context does not supply enough information to tell one from the other. As a result, these overt pronouns refer to parts of the gangsters, which violates the uniqueness/maximality requirement.

3 The Semantics of Plural Markers in Japanese

In the previous section, we have seen that the Japanese plural morphemes function as definite markers. In this section, we will give the formal definition of the plural markers.

3.1 The Semantics of Plurality

Let us first consider the semantics of bare nouns in Japanese. Following Krifka 1995 and Chierchia 1998a,b, I will assume that Japanese bare nouns are mass/kind-denoting expressions of type \(e\).\(^4\) I will also follow Chierchia’s 1998a theory of plurality, which inherits the basic insights from Link’s 1983 that the domain of individuals has an internal structure. It forms a complete join semilattice, as illustrated in (15).

\(^4\) The idea that bare NPs in determiner-less languages are kind denoting expressions was first proposed by Porterfield and Srivastav 1988. According to them, Hindi bare NPs are interpreted either as definite or as kind-denoting, but not as indefinite.
The domain of individuals consists of singular individuals and plural ones. In (15) $\text{At}$ is a set of singular individuals. $\{a, b\}$ is, for example, a plural individual formed by $a$ and $b$. The relations between individuals in the domain are expressed by means of a `component-of' relation, represented as $\leq$. In $A \leq B$, $A$ can be a member of or a subset of $B$.

(16) a. $a \leq \{a, b, c\}$  
b. $\{a, b\} \leq \{a, b, c\}$.

The sum operation $\cup$ is defined with $\leq$.

(17) For any elements $A, B$ in $U$, $A \cup B$ is the smallest element in which $A$ and $B$ are both components.

Examples:
- $a \cup b = \{a, b\}$
- $\{a, b\} \cup \{c, d\} = \{a, b, c, d\}$
- $a \cup \{b, c\} = \{a, b, c\}$

In terms of $\cup$, we can define the supremum operator, which gives us the sum of all the elements of $X$, as in (18).

(18) For any $X \subseteq U$, $\cup X = \{u \in \text{At}: \text{For some } u' \in X, u = u' \text{ or } u \in u'\}$

Examples:
- $\cup \{a, \{a, b\}\} = \{a, b\}$
- $\cup \{\{a, b\}, c\} = \{a, b, c\}$
- $\cup \{a, b\} = \{a, b\}$

An operator that selects the greatest element of a set is defined as in (19).

(19) For any $X \subseteq U$, $\text{Max}(X) = \cup X$, if $\cup X \in X$; otherwise undefined.

Example:
- $\text{Max}(\{a, \{a, b\}\}) = \{a, b\}$
- $\text{Max}(\{a, b\})$: undefined

And also in terms of $\cup$, the closure is defined as in (20).

(20) For any $X \subseteq U$, $\ast X$ is the closure of $X$ under $\cup$, i.e. the set of all sums of elements of $X$: $\ast X = \{\cup Y: Y \subseteq X\}$.

Example:
\*\{a, b, c\} = \{\{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}

Given a domain of individuals like (20), pluralization can be expressed as mapping a set of atoms into the set of pluralities constituted by those atoms. This can be formalized as in (21).

\[(21) \quad \text{For any set of atoms } A \subseteq U, \text{PL}(A) = \*A - A\]

If we have \(A = \{a, b, c\}\) as a set of atoms, the pluralization function PL, which corresponds to Link’s \(\*\), takes it as its domain, and gives us the set of pluralities \(\text{PL}(A) = \{\{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}\). Note that here we are assuming that \(\{a\} = a\), which Schwarzschild 1996 calls Quine’s innovation.

So far we have seen the semantics of plurality. The semantics of mass terms is also explained by means of lattice theory. In Link 1983, in addition to the domain of (singular and plural) individuals, there is a set whose internal structure is a complete, but not necessarily atomic, join-semilattice, which serves as a domain of the denotation of mass nouns. On the other hand, in Chierchia 1998a, the domain of mass nouns has the same internal structure as that of count nouns. And he claims that mass nouns are lexically pluralized. This is called the Inherent Plurality Hypothesis. Denotation of mass nouns can be expressed by means of the \(U\)-closure. Suppose we have chair a and table b in world w. Then ‘a is a piece of furniture’, ‘b is a piece of furniture’, ‘a and b are pieces of furniture’ are all true in w. This shows that the denotation of ‘furniture’ contains both atoms and pluralities, which is pictured as in (22).

\[(22) \quad \|\text{furniture}_w\| = \text{\{\{a, b\}\} = \|\text{pieces of furniture}_w\|}
\]

\[\text{\{a, b\} = \|\text{piece of furniture}_w\|}\]

Formally, the domain of mass nouns corresponds to the \(U\)-closed atomic subsets of U. And this means that mass nouns are plurals in that they denote pluralities. The difference between mass nouns and plural count nouns is then that the latter exclude atoms while the former contains atoms but they are sometimes vague (i.e., ‘water’).

3.2 The Semantics of Kind-Denoting Terms

Let us see the semantics of kind denoting expressions. As is extensively discussed in Chierchia 1984, kinds are “nominalized” counterparts of predicates. Extensionally, the furniture-kind in w in (22) denotes the greatest element in w, namely, \(\{a, b\}\). The relation between properties and kinds is illustrated in (23), where the \(\cap\)-operator changes properties into individuals, and the \(\cup\)-operator “predicativizes” individuals. So, for any properties P, \(\cap P\) is a kind, and for any kinds k, \(\cup k\) is a property.
More formally, kinds and properties are defined based on the domain designed for pluralities above, as in (24).

(24)  
  a.  \( U \) is a join atomic semilattice  
  b.  \( \text{AT} \) is the atoms of \( U \)  
  c.  \( S \) is the set of worlds/situations  
  d.  \( \mathcal{K} \subseteq U^S \) is the set of kinds  
  e.  \( \mathcal{K} \subseteq \text{AT} \)  

(25)  
Let \( k \) be a kind. Then for any world/situation \( s \),  
\[
\forall k = \lambda x [x \leq k_s], \text{if } k_s \text{ is defined,}
\]
where \( k_s \) is the plural individual that comprises all of the atomic members of the kind in \( s \);  
otherwise undefined.

(26)  
For any property \( P \), and world/situation \( s \)  
\[
\forall P = \lambda s \text{ MAX}(P_s), \text{if } \lambda s \text{ MAX}(P_s) \text{ is in } \mathcal{K},
\]
where \( P_s \) is the extension of \( P \) in \( s \);  
otherwise undefined.

With these notions, mass and kind denoting nouns in English are treated as follows.

(27)  
  a.  Gold is rare.  \( \rightarrow \) rare'\( (\text{GOLD}) \)  
  b.  Dogs are widespread.  \( \rightarrow \) widespread'\( (\cap \text{dogs}) \)

Both \textit{rare} and \textit{widespread} are kind-selecting predicates. Mass nouns like \textit{gold} is a kind-denoting expression, so that it translates into \text{GOLD}. Plural count nouns like \textit{dogs} are “nominalized” by the \( \cap \)-operator. Plural count nouns are also interpreted as existential if used with object-level predicates, as in (28). Following Carlson’s 1977 idea that the lexical semantics of predicates forces the operation from kind to instances of the kind, Chierchia 1998b proposes a rule, called Derived Kind Predicate (DKP), formulated in (29).

(28)  
Lions are ruining my garden.

(29)  
Derived Kind Predication  
If \( P \) applies to objects and \( k \) denotes a kind, then  
\[
P(\ldots, k, \ldots) = \exists x [\forall k(x) \land P(\ldots, x, \ldots)]
\]
Given DKP, the existential reading in (28) is derived as shown in (30).

(30)  
ruining-my-garden’(∩ lions)  
via DKP  
$\exists x[\neg-\cap lions(x) \land ruining-my-garden'(x)]$

3.3 The Semantics of Japanese Common Nouns

Now let us go to Japanese bare/common nouns. Take a world $w$ in which there are three books, say $a$, $b$, $c$, as shown in (31). The elements of the $U$-closed set are $a$, $b$, $c$, $\{a, b\}$, $\{a, c\}$, $\{b, c\}$, and $\{a, b, c\}$, and they all can be interpreted as extensions of a bare noun $hon$ ‘book’ in $w$. This means that Japanese bare nouns should be treated as mass.

(31)
$$|| hon_w || = \begin{align*}  
\{a, b, c\} & \quad \{a, b\} \quad \{a, c\} \quad \{b, c\} \\
\{a\} & \quad \{b\} \quad \{c\} \\
a & \quad b \quad c
\end{align*}$$

So just like furniture in English, $hon$ is kind-denoting and translates into BOOK, and (32) is represented as (33).

(32)  
John-ga hon-o yon-da.  
-Nom book-Acc read-Past  
(33)  
read'(BOOK)(j)

Here read' applies to objects while BOOK denotes the book-kind, so via the DKP (34) is derived.

(34)  
$\exists x[\neg-\cap BOOK(x) \land read'(x)(j)]$

Our intuition that Japanese bare nouns are kind-denoting and they are interpreted as existential can now be captured by DKP.

Now let us look at the semantics of classifiers. The theory of classifiers I follow here is basically Krifka 1995. The logical representation of a sentence with a classifier like (35), for example, is represented as in (36).

(35)  
John-wa san satsu-no hon-o yon-da.  
-Top three Cl-Gen book-Acc read-Past  
‘John read three books.’
(36)  
$\exists x[\neg-\cap BOOK(x) \land CL'(x) = 3 \land read'(x)(j)]$

The translation of the classifier itself is given (37).\(^5\)

(37)  
classifier: $\lambda n \lambda P \lambda x[P(x) \land CL'(x) = n]$, where $n$ is number.

\(^5\)  
$CL'$ in (37) corresponds to Krifka’s 1995 OU(k), where OU ‘object unit’ applies to kinds $k$ and OU$(k)$ applies to individuals.
(37) requires a predicate, so that the host noun BOOK of type $e$ must be lifted into $<e, t>$. In other words, the classifier triggers the type lifting. This is the job of the $\cup$-operator. The computation of the whole object of the example in (35) is illustrated in (38), where I assume that the genitive case marker -no is semantically vacuous.

A few comments should be given. First the object NP with the classifier is of type $<e, t>$ because of the translation of classifiers given in (37). The type of the transitive verb yonda ‘read’ is $<e, t>$. So function application doesn’t apply. Following Bittner 1994 among others, I assume that type mismatch triggers LF movement. In (38) the object NP moves and adjoins to IP. The lower IP translates into $\lambda x[\text{read}'(x)(j)]$ of type $<e, t>$, which again cannot combine with the moved NP. To salvage this type mismatch, a type-lifting operation dubbed $\exists$ applies as shown in 9 (cf. Partee 1987 and Bittner 1994 for further discussion on type shifting operations). Via this type lifting operation, the existential quantifier is introduced.

### 3.4 The Definition of Japanese Plural Markers

In section 2, we observed that the Japanese plural morphemes function as definite markers. I propose they translate as in (39).

\[
\begin{array}{ccc}
\text{Lexical Item} & \text{Translation} & \text{Type} \\
-tachi, -ra & \sigma x[\text{PL}(P_i)(x)] & e \\
\end{array}
\]

(40) $\| \sigma_0 \phi \|_\phi$ denotes the greatest element $v$ which satisfies $\| \phi \|^{g[u/v]}$; Otherwise undefined.

As given in (39), besides the pluralization function PL, the translation of the Japanese plural morphemes has two more components. ‘$P_i$’ is the Cooperian property variable, which denotes
the most salient property in the context. The definiteness of the plural morphemes comes from
the σ-operator.
Given these assumptions and definitions, let’s see for example how the overt pronoun in
(11a), repeated as (41), is interpreted.

(41) John-wa sono chuukoshaya-no dono kuruma-ni-mo
      -Top that used.car.shop-Gen which car-Dat-∀
drive-try-Past expectation-more.than it-Pl-Top well run-Past
‘John tried driving every car in the used car shop. They ran better than
expected.’

The computation of the overt pronoun followed by the plural morpheme is given in (42).

(42)         DP:4
            NP:2,3       D:1
             |             |
sore       -ra
             it       -Pl

1.  σx[PL(P_i)(x)]
2.  x  e
3.  λxx  <e, e>
4.  λxx(σx[PL(P_i)(x)])
    = σx[PL(P_i)(x)]  e

The important point in the derivation of (42) is that sore translates into a variable just like the
cases where no plural maker is used. Without a plural marker, it has to be dynamically bound.
If it is followed by a plural marker, on the other hand, it has to be bound by the λ-operator to
complete function application, as in 3. Giving the denotation of the contextually specified
property variable P_i, the whole DP refers to the maximal sum x such that x were products and
carefully inspected, namely ‘the products that were carefully checked’. So, the E-type-like
behavior of overt plural pronouns is accounted for without appealing to the E-type strategy.

How about the computation of a common noun followed by -ra? The fact that the plural
morphemes can be used with gakusee ‘student’ seems to be a serious problem for our approach
, for we assume that Japanese common nouns such as hon ‘book’ are mass terms/kind denoting
expressions like English furniture, and they cannot be pluralized by a plural marker for the
same reason as furniture cannot be pluralized. More precisely, they cannot be pluralized
because they are inherently pluralized (Chierchia’s 1998a Inherent Plurality Hypothesis). How
ever, it is also a fact that common nouns like gakusee ‘student’ can be pluralized with -ra or
-tachi, as we have seen above. The generalization thus should be that all Japanese common
nouns can be mass terms/kind denoting expressions, that is, they can be used in their bare forms
, but some of them can also be followed by a plural marker: in other words, they can also be
interpreted as countable common nouns the extensions of which are sets of atoms. This
generalization will shed a new light on the notion of “semantic parameter” of Chierchia 1998a.

With the assumption that gakusee ‘student’ is an atom denoting property, translating into
student' of type <e, t>, like English student, the common noun followed by -ra is computed as in (43).
(43)  

\[
\begin{array}{c}
\text{DP:4} \\
\text{NP:3} \quad \text{D:1,2} \\
gakusee \quad -ra \\
\text{student} \quad -\text{Pl}
\end{array}
\]

1. \(\sigma x[\text{PL}(P_i)(x)]\)  
2. \(\lambda P_i[\sigma x[\text{PL}(P_i)(x)]]\)  
3. \(\text{student}'\)  
4. \(\lambda P_i[\sigma x[\text{PL}(P_i)(x)](\text{student}')\)  
   = \(\sigma x[\text{PL}(\text{student}')'(x)]\)

The point of this derivation is that the Cooperian property variable \(P_i\) is \(\lambda\)-bound, and the resulting representation combines with \(\text{student}'\).

For the sake of exposition, I will show why treating \textit{gakusee} as mass term doesn’t work.

(44)  

\[
\begin{array}{c}
\text{DP:5} \\
\text{NP:3, 4-} \quad \text{D:1,2} \\
gakusee \quad -ra \\
\text{student} \quad -\text{Pl}
\end{array}
\]

1. \(\sigma x[\text{PL}(P_i)(x)]\)  
2. \(\lambda P_i[\sigma x[\text{PL}(P_i)(x)]]\)  
3. \(\text{STUDENT}\)  
4. \(\cup\text{STUDENT}\)  
5. \(\lambda P_i[\sigma x[\text{PL}(P_i)(x)](\cup\text{STUDENT})\)  
   = \(\sigma x[\text{PL}(\cup\text{STUDENT})(x)]\)

As shown in (44), type-theoretically, function application is completed. Semantically, however, \(\text{PL}(\cup\text{STUDENT})\) makes the whole DP uninterpretable, since mass terms cannot be pluralized. As we saw in chapter 1, for any set of atoms \(A\), \(\text{PL}(A) = *A - A\). The extension of \(\cup\text{STUDENT}\) \((= \lambda x[x \le \text{STUDENT}_s]\) is the \(U\)-closed set of atoms of being a student in \(s\), namely \(*\cup\text{STUDENT}\). So \(\text{PL}(\cup\text{STUDENT}) = *\cup\text{STUDENT} - *\cup\text{STUDENT} = \emptyset\). This is the Inherent Plurality Hypothesis’s account of why mass terms/kind denoting expressions cannot be pluralized.

Now let us consider classifiers. In the view of Krifka 1995 and Chierchia 1998a, classifiers are usually available in Chinese/Japanese-type languages, because their bare nouns denote kinds or mass, which are not countable, and in order to count we have to use classifiers. Interestingly enough, if [+human] common nouns are pluralized by a plural morpheme, they resist classifiers both in Chinese and in Japanese. As shown in (45), in Chinese the use of classifier with the plural marker makes the expression ungrammatical. This suggests that common nouns followed by a plural marker is countable.

(45) a. san-ge xueshen  
    three-Cl student  
    ‘three students’
Japanese also show the contrast between pluralized common nouns with classifiers and those without them, but the difference with respect to grammaticality is subtle. (46a) is an example in which a classifier is used with a common noun. In (46b) the common noun is pluralized, but no classifier is used. These two examples are perfectly OK. On the other hand, if we use both the classifier and the plural markers, the sentence is degraded as shown in (46c).

(46) a. [San-nin-no gakusee]-ga tsukamat-ta.  
   three-Cl-Gen student-Nom be.caught-Past  
   ‘Three students were arrested.’

b. [Gakusee-tachi/-ra]-ga tsukamat-ta.  
   student -Pl/-Pl-Nom be.caught-Past  
   ‘The students were arrested.’

c. ??[San-nin-no gakusee-tachi/-ra]-ga tsukamat-ta.  
   three-Cl-Gen student -Pl/-Pl-Nom be.caught-Past  
   ‘(The) three students were arrested.’

These examples support the claim that a common noun followed by a plural marker is countable in Chinese and Japanese.

One might argue against the claim, pointing out that common nouns in Chinese and Japanese cannot be used with numerals, either, as in (47) and (48), respectively.

(47) a. *san xueshen-men  
   three student-Pl

b. *san xueshen  
   three student

(48) a. *san gakusee-tachi/-ra  
   three student-Pl/-Pl

b. *san gakusee  
   three student

The ungrammaticality of the b-examples is clear. If these [+human] nouns are kind-denoting expressions, they cannot be used with numerals, just like the ungrammaticality of *three furniture. On the other hand, if they are countable nouns, the extension of which is a set of atoms, then they have to be pluralized by a plural marker when used with numerals. So, the account is straightforward. The apparent problem is the ungrammaticality of (47a) and (48a), since it seems possible to interpret them as ‘the three students’. But it also follows from our story. It is reasonable to assume that they are structured as in (49), where the common noun and the plural marker make a small constituent and the numeral attaches the complex.6

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6 See also Cheng and Sybesma 1999 for a different approach.
In order for them to be interpretable, they should be translated into $\sigma x[\text{PL}('\text{STUDENT}') (x) \land |x| = 3]$. And to obtain such a logical representation, the definite operator has to combine with a pluralized common noun, like \textit{the three students} in English, as shown in (50).

But we cannot derive such a representation from the structure in (49). We have argued above that a common noun followed by a plural marker is interpreted as definite NP, like \textit{the students}. This means that the $\sigma$-operator is introduced in the logical representation before the numeral. If numeral expressions in Chinese and Japanese denote a function from properties to properties, like 4 of (50), which itself is a very natural assumption, then it follows that \textit{xueshen-men} ‘the students’ can’t combine with \textit{san} ‘three’. Simply put, the ungrammaticality of (47a) and (48a) is the same as that of *\textit{three the students} in English.

There are two notes that should be given before closing this section. One is that our approach predicts that [+human] nouns can be used with the numeral ‘one’ without classifier just like English \textit{one student}. This prediction is borne out at least in Japanese as given in (51), although such use is very restricted.

(51) John-wa ichi gakusee toshite hantaishi-ta.
-Top one student as make.objection-Past
‘John made an objection as a student.’

In this case, \textit{gakusee} ‘student’ is interpreted as a singular count noun, so that it can be used with the numeral \textit{ichi} ‘one’. On the other hand, Chinese [+human] common nouns resist \textit{yi} ‘one’ without classifiers, which is problematic for our analysis.

Another note is that there is a case where a CN-\textit{tachi} seems to be interpreted as indefinite, as in (52) (see Nakanishi and Tomioka 2001).

(52) Kooen-de kodomo-\textit{tachi}/-\textit{ra}-ga ason-dei-ta.
This sentence is felicitous under the situation where there is a child who were not playing in the park. That is, (52) seems not to satisfy the maximality requirement on the definite marker. The English definite article *the* also has the similar use, as in (53).

(53) Look. The desk is dirty.

This can be felicitously uttered when there are more than one desks. Chierchia 1995 accounts for such cases, which he calls the indexical use of definites, by domain selection. He argued that (53) has an implicit restriction as shown in (54).

(54) a. The desk over there is dirty.
   b. dirty'(σx[R(o, x) ∧ desk'(x)])

I propose that (52) also has an implicit restriction, and what the sentence says is that all the children in the most salient domain were playing in the park. The truth conditions of (53) is given in (55).

(55) be-playing'(σx[R(o, x) ∧ PL(child')(x)])

A sentence like (52), thus, is not problematic for our claim that a common noun followed by a plural morpheme is interpreted as definite.

4 A Theoretical Implication

The observation we have made so far is summarized as in (56).

(56) In Chinese and Japanese, bare/common nouns which have the [+human] feature are ambiguous between count nouns and mass/kind nouns. Semantically this means that they are ambiguous between type e and type <e, t>.

This result is very important with respect to the Nominal Mapping Parameter. (56) suggests that even in [+arg, -pred] languages there are common nouns of type <e, t> in the lexicon. The immediate question is, then: Are Chinese and Japanese [+arg, +pred] languages like English? And a more general question is: Is the Nominal Mapping Parameter correct? A possible answer might be that there is no such parameter, and the mass/count distinction should be specified lexical item by lexical item. However, this cannot capture the fact that in French, every common noun is used only as predicates, and likewise that in Chinese and Japanese, every common noun can be used in argument position and there is no common noun which can be used only as predicate. So, I would like to suggest that the Japanese lexicon consists of two strata in the subset relation, as illustrated in (57).

(57) The strata of Chinese/Japanese nouns in the lexion

```
[+arg, -pred]
  [+ human]

[+arg, +pred]
  [+ human]
```
All Chinese/Japanese nouns, both [+human] and [-human] nouns, have the parameter setting of [+arg, -pred], mapped onto type $e$, but [+human] nouns can have the value of [-arg, +pred], so their category-type mapping is determined item by item like English. They are mapped onto type $<e, t>$ when used with plural morphemes. This means that the [+arg, -pred] are default values in Chinese and Japanese, but the [-pred] value of the [+human] nouns can be changed to [+pred] when the semantics of -men or -ra is learned through positive evidence.

This situation is reminiscent of Itô, Mester and Padgett’s 1995 analysis of voicing of consonants after nasal in Japanese. In the framework of Optimality Theory, they claim that the constraint ranking for native Japanese vocabulary differs from the one for non-native Japanese vocabulary. This means that one language, say Japanese, can have two constraint rankings. What we are looking at is very similar to this case in that a language has two types of vocabulary and one has the opposite value of parameter setting against the other.

5 Conclusion

In this paper, I investigated the semantics of Japanese plural morphemes -tachi and -ra and claimed that Japanese NPs with a plural morpheme function as definite markers based on the following facts: (i) they cannot be used as predicates, (ii) they take scope over intensional verbs, (iii) over pronouns show the anti-E-type property while those with -ra are interpreted as E-type, which suggests that the plural morpheme functions as Cooperian definite description, and (iv) overt pronouns with -ra obey the uniqueness/ maximality requirement.

The Japanese plural morphemes are used with [+human] nouns, which means that those nouns are of type $<e, t>$ in spite of the fact that Japanese bare nouns can be used in argument position, being of type $e$. This fact appears to be counter-evidence against the Nominal Mapping Parameter proposed by Chierchia 1998a, b, which says that Japanese is a [+arg, -pred] language in which every common noun is mapped onto type $e$ and there is no plural markers. I argued that the Nominal Mapping Parameter is correct, and claim that the Japanese lexicon has two strata where one properly includes the other. The superset has the [+arg, -pred] value and the subset the [+arg, +pred] value. The [+human] nouns are members of the subset, that is, they have the [+arg, +pred], so their category-type mapping is determined item by item.

Appendix: An OT Reformulation of the Nominal Mapping Parameter

The Nominal Mapping Parameter can be restated in OT as follows. Suppose any lexical item can be either [arg] or [pred]. Relevant constraints are given in (A1)

(A1) *arg: argumental use is not allowed.
*pred: predicative use is not allowed.
Faithfulness: Don’t change a feature of input.

In French, *arg outranks Faith and *pred, so even if an input noun has [arg], it cannot be used as argument, but had better be used as predicative, violating Faith and *pred, as shown in (A2).

(A2) French

<table>
<thead>
<tr>
<th>input: [arg]</th>
<th>*arg</th>
<th>Faith</th>
<th>*pred</th>
</tr>
</thead>
<tbody>
<tr>
<td>[arg]</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>[pred]</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>input: [pred]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[arg]</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>[pred]</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

In Chinese and Japanese, the default ranking of constraints is *pred >> {*arg, Faith}, so bare nouns in these languages can be used in argument position.
The English ranking is Faith >> \{*arg, *pred\}, by which the feature specified in an input is respected. The [+human] nouns in Chinese/Japanese are also subject to this ranking. So, if the input is *gakusee* ‘student’ with the [arg] feature, the optimal output is its argumental use, and if the same lexical item happens to be assigned the [pred] feature, it is used as predicative.

<table>
<thead>
<tr>
<th>Input</th>
<th>Faith</th>
<th>*arg</th>
<th>*pred</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>arg</em></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td><em>pred</em></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Input: [arg]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>pred</em></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Input: [pred]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bibliography**


