

proposed that classifiers are really singular markers. Hence, one would not expect singular markers (classifiers) and plural markers to co-occur.

In this paper, I bring in data on Mandarin *xie*, which I propose to be a plural classifier. The existence of plural classifiers has also been observed in languages such as Bangla (Dayal 2014) and Weining Ahmao (Gerner & Bisang 2010), indicating that classifiers can be inflected for grammatical number. On this basis I argue that classifiers are number markers generated in Num, the cross-linguistic host for number marking. In non-classifier languages, bare nouns are singular, and plural markers function to map singular to plural (or more accurately, general) number. Thus in a language like English, a two-way number distinction is made between singular and plural. In classifier languages, however, bare nouns have general number, and classifiers function to restrict general to singular or plural number. Thus in a language like Mandarin, a three-way number distinction is made: singular, plural (also called exclusive plural), and general number (also called inclusive plural).

This paper is organized as follows. In section 2, I lay out my basic assumptions about bare nouns and grammatical number, as well as the composition of singular classifiers and numerals in the [#-Cl-N] phrase. In section 3, I present data and analysis of plural classifier *xie*. In section 4, I propose an account for Mandarin *-men* as a definite plural marker. In section 5, I show how variation in syntactic structure between Mandarin and English affect scalar implicatures and the semantics/pragmatics of number. Finally in section 6, I discuss some cross-linguistic implications and complications. The data and grammatical judgments in this paper come specifically from speakers of Mandarin Chinese in Taiwan.

2 Theoretical Background and Basic Assumptions

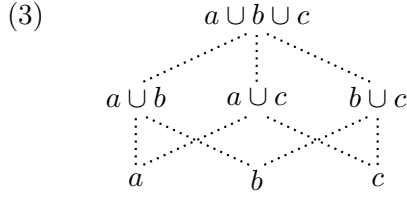
2.1 Nouns and Grammatical Number

According to Chierchia (1998a,b), bare nouns in Mandarin are ‘already pluralized’ in the lexicon, more precisely meaning neutral in terms of the singular/plural distinction. He argues that the Mandarin nominal system does not make singular/plural distinctions through number marking either (citing examples like (1)), and that the number-neutral property of bare nouns explain why. Given that pluralization is a function that maps sets of atoms to sets of pluralities, plural marking cannot take Mandarin nouns as arguments.

While Chierchia’s theory was ultimately unable to account for the presence of plural marking in classifier languages, most subsequent work has maintained his analysis of bare nouns as number-neutral, which he otherwise calls ‘mass’. In this paper I will also adopt Chierchia’s analysis of bare nouns for Mandarin, and I lay out my basic assumptions below. Due to the contentious nature of the mass/count distinction, however, I will address ‘mass’ nouns by saying they have general number (Corbett 2000).

2.1.1 Bare Nouns

I assume that bare nouns are predicates of type $\langle e, t \rangle$, where the domain of entities of type e can be modeled by a complete atomic join semi-lattice (3) (Link 1983). The complete semi-lattice is a set that contains singular entities (or atoms/individuals) and their sums, which are plural entities (or pluralities). Atoms are the minimal elements of the domain, while pluralities are created from

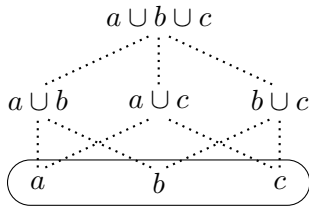


atoms through the join operation \cup .³ The domain is ordered by the part-of or ‘subgroup’ relation \leq , where atoms are subgroups of any plurality they belong to (4a), pluralities are subgroups of any larger plurality created through the join operation \cup (4b), and each entity is a subgroup of itself (4c).⁴ The ‘proper subgroup’ relation $<$ differs in that each entity is not a proper subgroup of itself (5).⁵

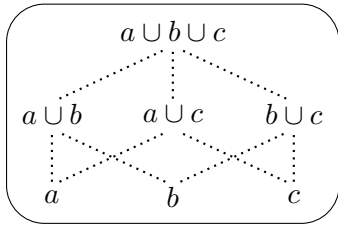
- (4)
- a. $a \leq a \cup b$
 - b. $a \cup b \leq a \cup b \cup c$
 - c. $a \leq a$, $a \cup b \leq a \cup b$
- (5)
- a. $a < a \cup b$
 - b. $a \cup b < a \cup b \cup c$

In a non-classifier language like English, bare nouns are singular and denote only a subset of the complete semi-lattice, the set of atoms (6). In a classifier language like Mandarin, however, bare nouns have general number and denote the complete semi-lattice, the set of atoms and all their pluralities (7).⁶

- (6) English bare noun denotation (singular)



- (7) Mandarin bare noun denotation (general number)



Thus, while bare nouns cross-linguistically operate within the same domain, languages may funda-

³The join operation \cup is defined as follows: for any two elements a, b in the domain, $a \cup b$ is the smallest entity comprising them.

⁴The subgroup relation \leq is defined as follows: for any two elements a, b in the domain, $a \leq b$ iff $a \wedge b = a$.

⁵The subgroup relation $<$ is defined as follows: for any two elements a, b in the domain where $a \neq b$, $a < b$ iff $a \wedge b = a$.

mentally differ in terms of the particular subset of singular/plural entities they denote.

2.1.2 Number Distinctions

In this paper, I will be discussing three types of number distinctions: singular, plural, and general number. Singular number (SG) is defined as the set of atoms (8a), plural number (PL) is defined as the set of all pluralities (8b), and general number (GN) is defined as the complete set of atoms and all their pluralities (8c). The general number set is thus the union of the singular and plural sets, i.e. a general number denotation is the combination of both singular and plural denotations.

- (8) a. singular (SG): $\{a, b, c\}$
 b. plural (PL): $\{a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$
 c. general number (GN): $\{a, b, c, a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$

2.1.3 General Number

A noun with general number is one that is neutral in terms of the singular/plural distinction. For example, the Mandarin noun *shu* ‘book(s)’—despite the disjunctive English translation—really has a single meaning of ‘one or more books’. Take the following sentences, which have bare nouns occurring (without any functional elements such as determiners, classifiers, or number marking) in post-verbal position:⁷

- (9) a. *Wo mai le shu.*
 1.SG buy ASP book
 ‘I bought a/some book(s).’
 b. *Ni kanjian le xuesheng.*
 2.SG see ASP student
 ‘You saw a/some student(s).’

The truth conditions of these sentences are independent of whether they describe singular or plural scenarios; that is, (9a) is true whether one or multiple books were bought, and (9b) is true whether one or multiple students were seen. This general number property can also be shown through discourse anaphora. In Mandarin, bare nouns may be antecedents for either singular or plural pronouns:

- (10) a. *Zuotian wo mai le shu_i. Wo ba ta_i/tamen_i dai hui jia le.*
 yesterday 1.SG buy ASP book 1.SG BA 3.SG/3.PL bring back home ASP
 ‘Yesterday I bought a/some book(s). I brought it/them home.’
 b. *Zuotian wo kanjian le xuesheng_i. Wo qing ta_i/tamen_i chi fan le.*
 yesterday 1.SG see ASP student 1.SG invite 3.SG/3.PL eat rice ASP
 ‘Yesterday I saw a/some student(s). I treated him/her/them to a meal.’

⁶As bare nouns are predicates they do not exactly denote sets but more precisely the characteristic functions thereof. where the characteristic function $f(x)$ of a set A will return true for any element y that is in A . In this paper, however, I will for simplification refer to such denotations as sets.

⁷It is an ongoing debate as to whether Mandarin has DP projections, since it has no (overt) determiners. For the purposes of this paper, if the only phonologically overt element of a nominal expression is a bare noun, I will refer to it as just the bare noun itself.

The singular anaphor *ta* and the plural anaphor *tamen* may both refer to the same bare noun, because that noun does not specify for number. It is similar in concept to the English sentence *Yesterday I saw a student and I treated him/her to a meal*, where the noun *student* may be an antecedent for a masculine or a feminine pronoun, because that noun does not specify for gender.

It is important to emphasize that nouns with general number are not ambiguous but unspecified for number (Rullmann & You 2003). Rather than having two possible readings, one singular and one plural, the sentences in (9) and (10) each have a single reading paraphrased by ‘a/some’ in English. This unambiguous, number-neutral reading can be shown through ellipsis of the bare noun:

- (11) a. *Wo mai le shu_i, Xiaoming ye mai le ___i.*
 1.SG buy ASP book Xiaoming also buy ASP
 ‘I bought a/some book(s), Xiaoming did so too.’
- b. *Ni kanjian le xuesheng_i, Alian ye kanjian le ___i.*
 2.SG see ASP student Alian also see ASP
 ‘You saw a/some student(s), Alian did so too.’

As an elided phrase must have the same reading as its antecedent, in these examples that reading should be unspecified for number, and hence the antecedent and the elided bare noun should be able to independently describe singular or plural scenarios. Indeed, (11a) is true regardless of how many books the speaker or Xiaoming bought; the speaker could’ve bought one while Xiaoming bought multiple, or vice versa. If nouns with general number were ambiguous, the elided bare noun must be restricted in number to whichever one of the two readings its antecedent has. (11a) would only be true if the speaker and Xiaoming both bought one book each or both bought multiple books.

Another way to test for general number is through downward entailing contexts such as polar question and negation (Bale & Khanjian 2008):

- (12) *Ni you kanjian xuesheng ma?*
 2.SG have see student Q
 ‘Did you see a/some student(s)?’
- (13) a. *You, wo kanjian le yi ge xuesheng.*
 have 1.SG see ASP one CL student
 ‘Yes, I saw a student.’
- b. *You, wo kanjian le san ge xuesheng.*
 have 1.SG see ASP three CL student
 ‘Yes, I saw three students.’
- c. *Wo mei you kanjian xuesheng.*
 1.SG no have see student
 ‘I did not see a/some student(s).’
- d. # *Wo mei you kanjian xuesheng, wo zhi kanjian yi ge xuesheng.*
 1.SG no have see student 1.SG only see one CL student
 ‘I did not see a/some student(s), I only saw one student.’

In question (12), the object of question is the bare noun *xuesheng* ‘student(s)’ and the answer is true if any number of students, singular (13a) or plural (13b), were seen. To negate the bare noun means both singular and plural scenarios are untrue, and no students were seen at all (13c). Thus, it is infelicitous to negate the bare noun if the singular scenario is true (13d). Interestingly, the

so-called bare “plurals” in English seem to behave the same way (Carlson 1977, Chierchia 1998b):

(14) *Did you see students?*

(15) a. *Yes, I saw a student.*

b. *Yes, I saw three students.*

c. *No, I did not see students.*

d. *#No, I did not see students. I only saw one student.*

If bare plurals in English were truly plural (as in the denotation in (8b)), negation of *students* would not negate the singular scenario. However, the infelicity of (15d) shows that the simultaneous negation of a “plural” noun and affirmation of a singular one is contradictory. This indicates that English bare plurals actually have general number, with the genuine plural reading obtained only pragmatically (Spector 2007) (see section 5).

2.2 The [#-Cl-N] Phrase

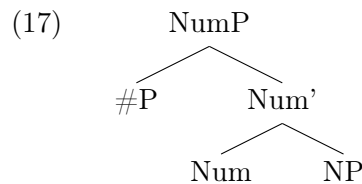
While nouns with general number may stand alone in a nominal expression, they must combine with classifiers in the presence of numerals, forming a [numeral+classifier+noun] ([#-Cl-N]) phrase (16). It is ungrammatical to directly combine numerals with bare nouns.

(16) a. *yi *(zhi) mao*
 one CL cat
 ‘a/one cat’

b. *liang *(zhi) mao*
 two CL cat
 ‘two cats’

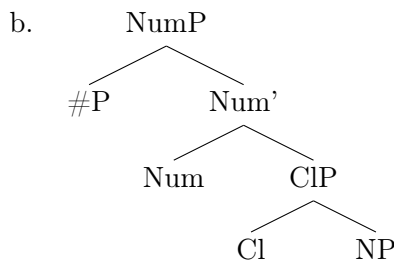
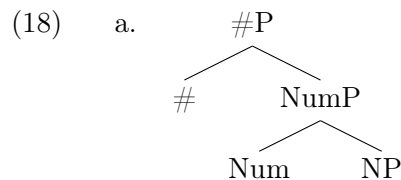
In order to account for such a distribution, I will discuss both a syntactic approach and a semantic approach.

The syntactic approach posits that classifiers are generated on a number (Num) head that selects for a noun complement and a numeral specifier (17) (Nomoto 2013, Zhang 2013). This Num head—sometimes called a classifier (Cl) head—is the cross-linguistic host for number marking (Borer 2005).



Given such a structure, numerals must always occur with classifiers because classifiers are what projects numerals. This is the underlying structure I will adopt for [#-Cl-N] phrases in Mandarin.

Some other structures that are commonly proposed are shown below:



(18a) posits that numerals and classifiers each head their own projection (Borer 2005, Cheng & Sybesma 1999, Jiang 2017). Such a structure can also account for the presence of classifiers with numerals, since the numeral (#) head selects for a classifier complement and not a noun complement. The difference then lies in whether we posit numerals as specifiers or heads; in this paper I will assume them to be specifiers.⁸ (18b) in turn posits that Num and Cl are separate syntactic objects, where the Num head selects a classifier complement and a numeral specifier (Li 1999). Under this analysis, the ClP projection is unique to classifier languages, and classifiers are not considered number marking. However, a unified analysis of classifiers and number marking can be achieved (Nomoto 2013), as I will show in this paper. Thus, I argue in favor of the structure (17) on a theoretical level, as it is able to capture cross-linguistic variation without positing extra projections in certain languages.

The semantic approach, on the other hand, appeals to the process in which numerals, classifiers, and bare nouns compose with each other in [#-Cl-N] phrases. Due to their respective denotations, numerals and nouns are unable to directly compose, and so they require classifiers to transform the noun denotation into one that can compose (Doetjes 1994, Chierchia 1998b).⁹ In sections 2.2.1 to 2.2.2 I will lay out the semantics of (singular) classifiers and numerals, and illustrate semantic composition in a [#-Cl-N] phrase.

Given that classifiers take nouns as arguments, forming [Cl-N] phrases, there are two possible ways to form the [#-Cl-N] phrase. The first option posits that classifiers and numerals are both one place functions; classifiers take nouns and numerals take [Cl-N] phrases. The second option posits that classifiers are two-place functions; they take nouns and then take numerals. While both analyses are compatible with the Mandarin data, in this paper I adopt the first option for simplicity and cross-linguistic consistency. The second option would imply that classifiers always require a numeral to saturate its second argument, yet there are languages such as Cantonese where [Cl-N] phrases occur without numerals (Cheng & Sybesma 1999). In viewing classifiers as Num heads, [Num-N] phrases (i.e. plural nouns) in non-classifier languages such as English may certainly occur without numerals.

One potential problem for the view that numerals are not arguments of classifiers is the fact that Mandarin [Cl-N] phrases rarely occur without numerals, and do so in environments that can be analyzed as an optional omission of the numeral *yi* ‘one’:

- (19) a. *zhe (yi) ben shu*
 this one CL book
 ‘this book’
- b. *you (yi) ben shu*
 have one CL book
 ‘there is a book’
- c. *mai (yi) ben shu*
 buy one CL book
 ‘buy a book’

⁸A numeral in specifier position has the potential to be a phrase, while a numeral head is strictly a terminal node. Ionin & Matushansky (2006) discuss empirical evidence for numerals as phrases, which favor the specifier analysis. Nonetheless, this distinction should not be particularly relevant for the purposes of this paper.

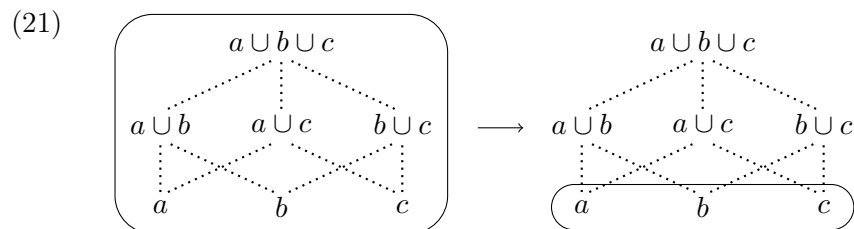
⁹See section 6 for discussion of classifier languages where classifiers and numerals compose before the noun.

However, this reflects a general restriction against phrase-initial classifiers, and not a specific dependency on numerals. That is, classifiers must be licensed by a syntactic object immediately c-commanding it, and while that host is often an (overt) numeral, it may also be a verb, demonstrative, etc. (Cheng & Sybesma 1999). And as [Cl-N] phrases in Mandarin have the same interpretation as [*yi*-Cl-N] phrases (see section 2.2.2), they are semantically interchangeable, which explains why they occur only in environments where *yi* is also possible.

2.2.1 (Singular) Classifiers and Number Marking

Following Nomoto (2013), I will assume that (singular) classifiers are functions of type $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$ that restrict the domain of bare nouns from complete semi-lattices to the set of atoms. They do so by taking in sets and, through an atomizing function, return only the atoms of those sets.^{??}

$$(20) \quad [\text{CL}] = \lambda P \lambda x [\text{ATOM}(P)(x)] = \lambda P \lambda x [P(x) \wedge \neg \exists y \in P [y < x]]$$



Put in terms of grammatical number, classifiers take nouns with general number and singularize them; i.e., classifiers are singular number markers. The [Cl-N] phrase in Mandarin then has the denotation of a singular noun.

At this point, it is interesting to compare how number marking interacts with bare nouns cross-linguistically. In a classifier language like Mandarin, bare nouns have general number, while number marking (in the form of a classifier) creates a singular noun. In a non-classifier language like English, the opposite happens: bare nouns are singular, while number marking (in the form of a “plural” marker) creates a general number noun. Thus it is quite neat that both systems end up making the same number distinctions, albeit in different directions. It is also interesting to notice that none of the constructions discussed so far are genuinely plural; this hints at the central argument of my paper, that classifier languages are able to make the plural number distinction via plural classifiers and other plural markers.

Yet while I do argue that classifiers are number markers, the most apparent function of classifiers—as the word itself suggests—is to reflect a broad conceptual classification of nouns in terms of animacy, shape, size, etc.. For example, the classifier *zhi* is used with most animate non-human nouns, while the classifier *tiao* is used with nouns representing long objects. These classifications are to a certain degree unpredictable, and based off of historical convention. For the purposes of this paper, I will not go into the semantics of the classification function of classifiers, and for now assume that it can be represented as a presupposition on the classifier (Jenks 2011).

2.2.2 Numerals

In an analysis of numeral modification, Bale et al. (2011) proposed that numerals are subsective, restricting the domain of nouns to subsets of specified cardinality. Take the English example *two cats*: the bare noun *cat* is singular (22a), and after number marking the bare “plural” *cat-s* has

general number (22b). The subsective numeral *two* is then able to form a subset from the denotation in (22b), with the cardinality ‘2’ (22c).

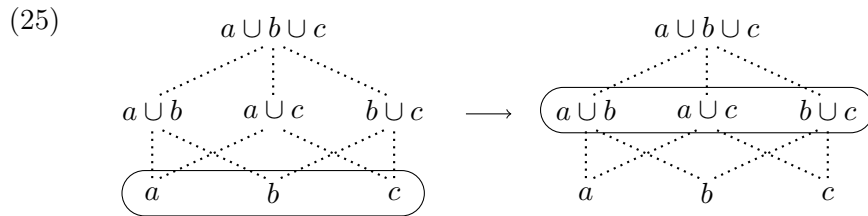
- (22) a. $\llbracket \textit{cat} \rrbracket : \{a, b, c\}$
 b. $\llbracket \textit{cat-s} \rrbracket : \{a, b, c, a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$
 c. $\llbracket \textit{two cat-s} \rrbracket : \{a \cup b, a \cup c, b \cup c\}$

Yet, while this analysis accounts for English numeral modification, it cannot do so for Mandarin. Now take the Mandarin example *liang zhi mao* ‘two cats’: the bare noun *mao* has general number (23a), but after number marking the [Cl-N] phrase *zhi mao* is singular (23b). As a result, Mandarin numerals cannot be subsective, because they must combine with nouns denoting atoms and create a new, disjunctive set of pluralities with cardinality ‘2’ (23c).

- (23) a. $\llbracket \textit{miao} \rrbracket : \{a, b, c, a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$
 b. $\llbracket \textit{zhi miao} \rrbracket : \{a, b, c\}$
 c. $\llbracket \textit{liang zhi miao} \rrbracket : \{a \cup b, a \cup c, b \cup c\}$

This disjunctive quality of Mandarin numerals can instead be captured by the denotation in (24). In this paper, I assume that numerals are functions of type $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$ that map sets of atoms to sets of pluralities with the appropriate cardinality. Below is the denotation of the numeral *san* ‘three’, where * is the distributivity operator and cardinality is counted by atoms:¹⁰

- (24) $\llbracket 2 \rrbracket = \lambda P : \text{ATOMIC}(P) . \lambda x [*P(x) \wedge |x|_P = 2]$
 $= \lambda P : \forall x \in P [\neg \exists y \in P [y < x]] . \lambda x [*P(x) \wedge |x|_P = 2]$



Such a semantics also accounts for why Mandarin does not allow direct combination of numerals and bare nouns. Mandarin bare nouns have general number, but Mandarin numerals are not subsective and cannot combine with nouns of general number. They must instead combine with singular nouns, i.e. the [Cl-N] phrase. The domain condition— $\text{ATOMIC}(P)$ or $\forall x \in P [\neg \exists z \in P [z < x]]$ —checks if the argument is atomic, such that numerals are undefined for any non-atomic sets.

Interestingly, in the case of Mandarin numeral *yi* ‘one’, numeral modification does not change the interpretation of the [Cl-N] phrase. That is, both [Cl-N] and [*yi*-Cl-N] phrases denote the set of atoms. (This identity-like function of *yi* will be relevant later in the discussion of plural classifier *xie*.) This also corroborates the observation that *yi* may be omitted (in certain *c*-command situations) while preserving the singular meaning (19). The optionality of *yi* is commonly attributed to phonological reduction or a null numeral ‘one’ (Cheng & Sybesma 1999), and my analysis perhaps

¹⁰The distributivity operator * is defined as follows: for any predicate P and sum of individuals x , $*P$ holds of x iff P holds of each individual part of x (Link 1987).

provides a semantic explanation for the naturalness of such a reduction. It may also suggest that, instead of the presence of a covert numeral, there is simply an absence of any numeral, and *yi* is optionally projected.

2.3 Summary

So far, I have accounted for the Mandarin [#-Cl-N] phrase by showing that bare nouns denote complete semi-lattices, while (singular) classifiers restrict these complete semi-lattices to atoms and numerals then use these atoms to count. Now, it is reasonable to ask from a theoretical standpoint why this is so. Why do classifiers function to eliminate all pluralities, only for numerals to go back and restore certain pluralities? We can perhaps answer this question by comparing the process of numeral modification in Mandarin and English.

I argue that in both languages, numeral modification always involves an atomizing function; the difference lies only in terms of where the atomizing function is implemented throughout the derivation. And the creation of atomic sets, crucially, is the mechanism by which to identify the units needed to count cardinality.

In Mandarin, the atomizing function is implemented in the classifier, and the numeral can simply count by these atomic units which are already produced. In English, however, the atomizing function is absent from the plural marker, and the numeral itself has built-in atomic measures in order to count by them (Krifka 1995). Below are my proposed denotations for both languages, where the function *ATOM* is part of the classifier denotation in Mandarin but part of the numeral denotation in English.

- (26) Mandarin classifier and numeral denotation
- a. $\llbracket \text{CL} \rrbracket = \lambda P \lambda x [\text{ATOM}(P)(x)]$
 - b. $\llbracket 2 \rrbracket = \lambda P : \text{ATOMIC}(P) . \lambda x [*P(x) \wedge |x|_P = 2]$
- (27) English plural marking and numeral denotation
- a. $\llbracket \text{PL} \rrbracket = \lambda P \lambda x [*P(x)]$
 - b. $\llbracket 2 \rrbracket = \lambda P \lambda x [P(x) \wedge |x|_{\text{ATOM}(P)} = 2]$

Put in other words, one could say that numerals in non-classifier language collapse the function of classifiers and numerals and classifier languages, as they are able to 1) map general number to countable units and 2) count.

It is important to point out that, looking at the assumptions I have laid out so far, they are actually in line with Chierchia's (1998b) theory of classifier languages. Chierchia had proposed that bare nouns have general number^{??}, while the purpose of classifiers is to map nouns to atomic sets for counting. Where my analysis differs from Chierchia, then, is the idea that plural marking is compatible with bare nouns in classifier languages, because of the different plurality distinctions allowed in classifier languages.

3 The Plural Classifier *xie*

In this section, I will introduce data on Mandarin *xie*, and provide a syntactic and semantic account for *xie* as a plural classifier. While there are many types of singular classifiers in Mandarin, there is

only one plural classifier *xie*. I will be glossing all singular classifiers as CL, and the plural classifier *xie* as XIE. I will also be notating [classifier+noun] phrases as [Cl-N] for singular classifiers, [*xie*-N] for plural classifiers, and [Num-N] for all classifiers.

Within past literature, *xie* has not received a lot of attention compared to Mandarin *-men*, which has been studied extensively as a plural marker (see section 5). This is perhaps due to the unclear nature of *xie*, with disagreement between whether it is a classifier, a quantifier, a plural marker on demonstratives, etc. (Iljic 1994, Li 1999, Zhang 2013). Here I argue that *xie* is a plural classifier, making it both a classifier and a plural marker.

A plural classifier’s function is to restrict bare nouns to plural entities, as opposed to singular classifiers that restrict bare nouns to singular entities. These different number distinctions can be shown by varying the antecedent in discourse anaphora:

- (28) *Zuotian wo kanjian le [xuesheng]_i. Wo qing ta_i/tamen_i chi fan le.*
 yesterday 1.SG see ASP student 1.SG invite 3.SG/3.PL eat rice ASP
 ‘Yesterday I saw a/some student(s). I treated him/her/they to a meal.’
- (29) *Zuotian wo kanjian le [yi ge xuesheng]_i. Wo qing ta_i/*tamen_i chi fan le.*
 yesterday 1.SG see ASP one CL student 1.SG invite 3.SG/3.PL eat rice ASP
 ‘Yesterday I saw a student. I treated him/her/*them to a meal.’
- (30) *Zuotian wo kanjian le [yi xie xuesheng]_i. Wo qing *ta_i/tamen_i chi fan le.*
 yesterday 1.SG see ASP one XIE student 1.SG invite 3.SG/3.PL eat rice ASP
 ‘Yesterday I saw some students. I treated *him/*her/they to a meal.’

Recall from earlier that bare nouns may be antecedents for both singular and plural pronouns (10b, reprinted as 28). In the exact same environment, [*yi*-Cl-N] phrases may be antecedents for singular but not plural pronouns (29), while [*yi-xie*-N] phrases may be antecedents for plural but not singular pronouns (30). In this paper *xie* is loosely translated as ‘some’.

Although *-men* has been studied as a plural marker, its exact status has been controversial due to disagreement over the nature of its distribution and what syntactic position it occupies (Li 1999, Jiang 2017). If instead *xie* can be shown to be a plural marker, then the most immediate implication is to provide stronger support for the existence of grammatical number in Mandarin and classifier languages in general. Additionally, it suggests that grammatical number is marked cross-linguistically—in classifier and non-classifier languages—on the same Num head.

The outline of this section is as follows. In section 3.1, I will provide evidence for *xie* as a classifier, appealing to its distributional properties. In section 3.2, I will give the semantic denotation of *xie*. In section 3.3, I will discuss the presence of numeral *yi* ‘one’ with *xie*, analyzing *yi* as an identity function distinct from normal numerals in Mandarin. Then in section 3.4, I will introduce some conflicting data on *xie* indicating that there are two *xie*’s, a plural classifier and a quantifier.

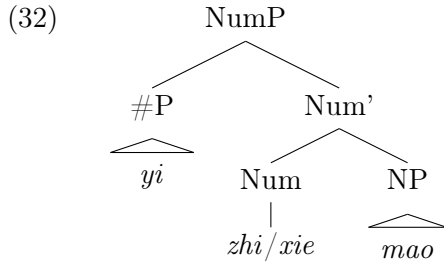
3.1 Data

While *xie* has been addressed variably in the literature as a classifier or a quantifier, it is often only mentioned in passing, with little work detailing its distribution (Iljic 1994, Li 1999, Zhang 2013). The goal of the data presented here is to provide evidence of distributional properties *xie* shares with singular classifiers, as well as evidence against analyzing *xie* as a quantifier (see section 3.4 for conflicting data).

On a very basic level, *xie* occurs in what looks like a [#-Num-N] phrase:

- (31) a. *yi zhi mao*
 one CL cat
 ‘a/one cat’
- b. *yi xie mao*
 one XIE cat
 ‘some cats’

Crucially, the numeral *yi* ‘one’ precedes both the singular classifier and *xie*, followed by the noun. Given that numerals are projected by Num heads, the most straightforward parse of (31a) and (31b) is the structure in (32), where singular classifier *zhi* and plural classifier *xie* are both Num heads.



Furthermore, *xie* exhibits the same licensing condition as singular classifiers. It cannot occur phrase-initially (33), and requires a c-commanding host. In the environment that a host other than a numeral is present, *yi* may be omitted while preserving the meaning of the [#-Num-N] phrase (34).

- (33) a. *zhe (yi) ben shu*
 this one CL book
 ‘this book’
- b. *you (yi) ben shu*
 have one CL cat
 ‘there is a book’
- c. *mai (yi) ben shu*
 buy one CL cat
 ‘buy a book’
- (34) a. *zhe (yi) xie shu*
 this one XIE book
 ‘these books’
- b. *you (yi) xie shu*
 have one XIE book
 ‘there are some books’
- c. *mai (yi) xie shu*
 buy one XIE book
 ‘buy some books’

By positing that singular classifiers and *xie* occupy the same syntactic position, this allows the dependency to be generalized as a property of classifier Num heads.

In Cantonese, [Num-N] phrases acquire definite interpretation in pre-verbal contexts (Cheng & Sybesma 1999). It is perhaps worthy to note that *di*, roughly the Cantonese counterpart of Mandarin *xie*, may occur in such definite constructions along with singular classifiers:

- (35) a. *Gaa ce zozyu go ceothau.* [Cantonese]
 CL car block CL exit
 ‘The car is blocking the exit.’
- b. *Di ce zozyu go ceothau.* [Cantonese]
 DI car block CL exit
 ‘The cars are blocking the exit.’

In an analysis opposing *xie* as a classifier, Iljic (1994) and Zhang (2013) pointed out that *xie* is unable to combine with numerals other than *yi* ‘one’:

- (36) a. *liang zhi mao*
two CL cat
'two cats'
- b. **liang xie mao*
two XIE cat
'two cats', 'two groups of cats'

I will address this issue in section 3.2, where I argue that the ungrammaticality of (36b) is due to a semantic incompatibility between plural classifiers and numerals (other than *yi*), and not due to the syntactic status of *xie*. Essentially, this ungrammaticality can be attributed to the domain condition set by numerals, where they are defined only for atomic sets; plural classifiers, however, denote non-atomic sets. This analysis will require me to propose a separate denotation for the numeral *yi*, which I will argue to be an identity function.

Though this paper has really only addressed classifiers that occur with count nouns, in Mandarin there is a distinction between what Cheng & Sybesma (1999) call 'count classifiers' and 'massifiers'. Count classifiers simply identify the intrinsic unit of a count noun, such as an individual person or cat (37). Massifiers, on the other hand, occur with either count or mass nouns to create an extrinsic unit of measure, such as a group or a bottle (38). Thus, a plausible analysis to consider is that *xie* is a (singular) massifier denoting a collective group.

However, between the distributional differences exhibited by count classifiers and massifiers, *xie* patterns with the former. The sentences below show that the modification marker *de* may intervene between [massifier+N] sequences but not [count-classifier+N] sequences:

- (37) a. *san ge (*de) ren*
three CL DE person
'three people'
- b. *san zhi (*de) mao*
three CL DE cat
'three cats'
- c. *san ben (*de) shu*
three CL DE book
'three books'
- (38) a. *san qun (de) ren*
three CL.group DE people
'three groups of people'
- b. *san bei (de) shui*
three CL.bottle DE water
'three bottles of water'
- c. *san bang (de) pingguo*
three CL.pound DE apple
'three pounds of apples'

These data are interesting in of themselves, as they suggests that the underlying structures for [count-classifier+N] and [massifier+N] constructions are different (Li & Rothstein 2012, Zhang 2013). Furthermore, despite the general number nature of bare nouns in Mandarin, a count/mass distinction is nonetheless present within the language (Cheng & Sybesma 1999, Doetjes 1996, 1997). The particular argument here is that *xie* does not allow modification by *de*, thus patterning with count classifiers:

- (39) *yi xie (*de) mao*
one XIE DE cat
'some cats'

Additionally, while massifiers are allowed to freely combine with numerals (38), *xie* is unable to do so (36). This indicates that massifiers are normal singular classifiers that create atomic sets; *xie*, on the other hand, is a plural count classifier that creates non-atomic sets.

Lastly, given its plural interpretation, there have been analyses of *xie* as a quantifier with the meaning 'some' (Iljic 1994, Zhang 2013). These analyses have proposed that, although Mandarin is an isolating language and morphemes are more often than not monosyllabic, *xie* could belong to a

single morpheme *yixie*, explaining the occurrence of *yi* with the quantifier. Now Mandarin has three types of quantifiers: weak, strong, and adjectival.¹¹ Weak quantifiers, like numerals, are generated in the Num specifier and combine with [Cl-N] phrases, obligatorily occurring with classifiers (40a). However, *yixie* is unable to combine with [Cl-N] phrases (41a).

- (40) a. *ji* *(*zhi*) *mao* b. **yi* *ji* *mao*
 several CL cat one several cat
 ‘several cats’ ‘several cats’
- (41) a. *yi* *xie* (**zhi*) *mao* b. *yi* *xie* *mao*
 one XIE CL cat one XIE cat
 ‘some cats’ ‘some cats’

Strong quantifiers are generated above the Num phrase and combine with [*yi*-Cl-N] phrases, also obligatorily occurring with classifiers (42a). However, *yixie* is unable to combine with [*yi*-Cl-N] phrases (43a).

- (42) a. *mei* *yi* *(*zhi*) *mao* b. **yi* *mei* *mao*
 every one CL cat one every cat
 ‘every cat’ ‘every cat’
- (43) a. *yi* *xie* (**yi*) (**zhi*) *mao* b. *yi* *xie* *mao*
 one XIE one CL cat one XIE cat
 ‘some cats’ ‘some cats’

Adjectival quantifiers optionally occurs with the modification marker *de*, which may intervene between the quantifier and noun (44a-c). Yet, *yixie* cannot be modified by *de* either (39, reprinted as 45a).

- (44) a. *shaoshu* (*de*) *mao* d. **yi* *shaoshu* *mao*
 few DE cat one few cat
 ‘few cats’ ‘few cats’
- b. *xuduo* (*de*) *mao* e. **yi* *xuduo* *mao*
 many DE cat one many cat
 ‘many cats’ ‘many cats’
- c. *suoyou* (*de*) *mao* f. **yi* *suoyou* *mao*
 all DE cat one all cat
 ‘all of the cats’ ‘all of the cats’
- (45) a. *yi* *xie* (**de*) *mao* b. *yi* *xie* *mao*
 one XIE DE cat one XIE cat
 ‘some cats’ ‘some cats’

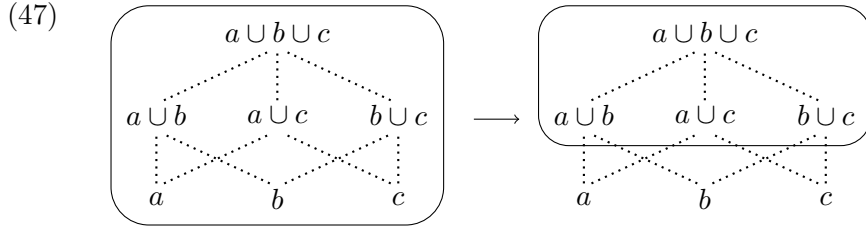
It is also not the case that quantifiers may combine with *yi* (40b, 42b, 44d-f), eliminating the possibility that *xie* is a quantifier and *yi* is a semantically vacuous morpheme that may precede quantifiers. Therefore, I conclude against analyzing (*yi*)*xie* as a quantifier in these contexts (see section 3.4 for certain uses of *xie* as a quantifier, in different contexts), in favor of its analysis as a plural classifier.

¹¹For terminology on weak, strong, etc. different types of quantification see Barwise & Cooper (1981).

3.2 Denotation

Like singular classifiers, plural classifiers are functions of type $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$. While singular classifiers restrict the domain of bare nouns from complete semi-lattices to the set of atoms, plural classifiers restrict the domain of bare nouns from complete semi-lattices to the set of pluralities. They do so by taking in sets and, through a pluralizing function, return only the pluralities of those sets.^{??}

$$(46) \quad \llbracket \text{XIE} \rrbracket = \lambda P \lambda x [\text{PL}(P)(x)] = \lambda P \lambda x [P(x) \wedge \exists y \in P [y < x]]$$



Put in terms of grammatical number, the plural classifier *xie* take nouns with general number and pluralize them; i.e., *xie* is a plural number marker. The [*xie*-N] phrase in Mandarin then has the denotation of a plural noun.

Previously in section 2.2.1, I had discussed how Mandarin and English nominal systems are both capable of making the same number distinctions (singular and general number), albeit in different directions. Here, I propose that Mandarin is also capable of producing a third number distinction, the plural (as defined in 8b), through the plural classifier *xie*. This suggests that while number marking is available cross-linguistically, languages may differ in terms of what particular number distinctions they distinguish.

3.3 The Special Case of Numeral *yi*

Similar to the relationship between [Cl-N] and [*yi*-Cl-N] phrases, both [*xie*-N] and [*yi-xie*-N] phrases have the same interpretation. Thus, semantic composition must happen as follows:

- (48)
- a. $\llbracket \text{mao} \rrbracket : \{a, b, c, a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$
 - b. $\llbracket \text{xie mao} \rrbracket : \{a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$
 - c. $\llbracket \text{yi xie mao} \rrbracket : \{a \cup b, a \cup c, b \cup c, a \cup b \cup c\}$

Interestingly, *yi* is the only numeral that *xie* can compose with. It is ungrammatical to combine *xie* with any other numerals.

- (49)
- | | |
|---|--|
| <p>a. <i>yi xie mao</i>
one XIE cat
'some cats'</p> | <p>b. *<i>liang xie mao</i>
liang XIE cat
'two cats', 'two groups of cats'</p> |
|---|--|

In the assumptions laid out in section 2, I proposed that numerals impose a domain condition for atomic sets. This explained semantically why numerals cannot compose with bare nouns, as bare nouns denote non-atomic sets. Hence, the fact that numerals (other than *yi*) cannot compose with plural classifier *xie*, which also denotes non-atomic sets, seems to corroborate this semantic analysis of numerals. Since singular and plural classifiers occupy the same syntactic position, the Num head, it makes sense that there is a semantic reason why the former freely combines with

numerals while the latter does not. In other words, the ungrammaticality of sentences like (49b) do not undermine the status of *xie* as a classifier.

Yet given this analysis of numerals, the denotation for *yi* would be as follows, complete with the domain condition for atomic sets:

$$(50) \quad \llbracket 1 \rrbracket = \lambda P: \text{ATOMIC}(P) . \lambda x [*P(x) \wedge |x|_P = 1]$$

Why then, does *yi* occur with *xie*, if *xie* denotes pluralities? Moreover, what is happening semantically when *yi* composes with *xie*? Looking back at (48), it certainly does not seem like *yi* is functioning in any way to count cardinality. In fact, *yi* does not even change the interpretation of the [*xie*-N] phrase; both [*xie*-N] and [*yi-xie*-N] phrases denote the set of all pluralities.

Therefore, I argue that instead of having the denotation of a regular numeral, *yi* has the special denotation of a semantically vacuous numeral. That is, *yi* is the identity function:

$$(51) \quad \llbracket yi \rrbracket = \lambda P. P$$

When *yi* combines with a singular classifier, both [Cl-N] and [*yi*-Cl-N] denote the set of atoms. When *yi* combines with *xie*, both [*xie*-N] and [*yi-xie*-N] denote the set of pluralities.

While I acknowledge that an expletive view of *yi* is rather stipulative, there is perhaps a historical basis to such an interpretation. Notice that the regular denotation (50) and expletive denotation (51) of *yi* actually produce the same output for [*yi*-Cl-N] phrases; they take in a set of atoms and return that identical same set of atoms. Perhaps *yi* started out as a regular numeral, but was eventually reanalyzed by speakers as being semantically vacuous, since both analyses are compatible with the empirical data. Simultaneously, with the general prevalence of singular classifiers in Mandarin, perhaps speakers extended the ability to project numerals from singular classifiers to all classifiers, including *xie*. The projection of numerals by *xie*, as well as the expletive nature of numeral *yi*, thus led to the formation of the [*yi-xie*-N] phrase.

Additionally, it is worthy to mention that English *a* often exhibits the same kind of ambiguity between the meaning ‘one’ and being semantically vacuous. For example, when *a* combines with a singular bare noun in predicative sentences such as *John is a student*, it is unclear exactly what the semantic contribution of *a* is in that sentence.

3.4 The Other *xie*

In section 3.1, I provided data that *xie* has the distribution of a classifier, as opposed to a quantifier. Recall that *yi xie* cannot occur with singular classifiers or the modification marker *de*, both of which are distributional properties of Mandarin quantifiers. However, consider the following data:

- (52) a. *zhe yi xie (*zhi) mao*
 this one XIE₁ CL cat
 ‘these cats’
- b. *zhe (*yi) xie zhi mao*
 this one XIE₂ CL cat
 ‘these cats’

Surprisingly, *xie* alone is able to occur with singular classifiers, as long as numeral *yi* (or any other numeral) is not present (52b) (Zhang 2013). In other words, *xie* can occur with either numeral *yi* or

a singular classifier, but not both simultaneously. This poses a challenge for various reasons. First, if *xie* really were a classifier, occupying the Num head, how can it co-occur with another classifier? Second, if *xie* weren't a classifier, what position must it occupy such that it may co-occur with a numeral and a classifier, but not both at the same time?

In order to maintain a unified analysis of *xie*, one would have to address the seeming competition between numeral *yi* and singular classifiers, despite them occupying different syntactic positions and surfacing in different linear order with respect to *xie*. Such an analysis is impossible without making stipulative claims about the underlying structures in (52).

I propose instead a split analysis of *xie*, where there are two *xie*'s that represent homophonous but separate lexical items, one a classifier and the other a quantifier. I will be glossing classifier *xie* as XIE₁ and quantifier *xie* as XIE₂. Under such an analysis, classifier *xie* occurs with numeral *yi* while quantifier *xie* occurs with singular classifiers. Thus, the ungrammaticality in (52a) is the result of competition with *xie*₁ for the classifier position, while the ungrammaticality in (52b) is the result of competition with *xie*₂ for the numeral position. From a semantic and historical standpoint, it seem reasonable enough for speakers to have reanalyzed *xie* from a plural classifier to a quantifier, given the similarities between a plural meaning and a quantifier meaning 'some'.

Thus, quantifier *xie* is a weak quantifier, generated in the numeral specifier. Like regular numerals, they obligatorily combine with [Cl-N] phrases, and cannot combine with bare nouns or [*xie*-N] phrases:

- (53) a. **ji* (xie₁) *mao*
 several XIE₁ cat
 b. **xie*₂ (xie₁) *mao*
 XIE₂ XIE₁ cat

This suggests that numerals and quantifiers share the same domain condition that require atomic sets as arguments, perhaps as a general property of the specifier of Num. This also indicates that *xie* in [*xie*-N] phrases must always be the plural classifier. For instance, the example below is not ambiguous between the two *xie*'s because it features a [*xie*-N] phrase without a singular classifier:

- (54) *zhe xie*₁/**xie*₂ *mao*
 this XIE₁/XIE₂ cat
 'these cats'

It is perhaps worthy to note that *di*, previously mentioned as the Cantonese counterpart of Mandarin *xie*, may occur in constructions like (52a) but not (52b). That is, *di* has the distribution of classifier *xie* but not quantifier *xie*.

- (55) a. *li jat di* (**zek*) *maau* [Cantonese]
 this one DI CL cat
 'these cats'
 b. **li* (*jat*) *di zek maau* [Cantonese]
 this one DI CL cat
 'these cats'

These data corroborate the split analysis of *xie*. While Mandarin *xie* is homophonous between plural classifier and quantifier, one would expect the possibility of a language that does not exhibit

such a homophony. Indeed, Cantonese plural classifier *di* does not double as a quantifier.

3.5 Summary

This section accounted for *xie* as a plural classifier through its syntactic and semantic properties. I argue this to be evidence that plurality, and hence grammatical number, is indeed marked in Mandarin. And while the exact mechanisms differ between classifier and non-classifier languages, there is nonetheless a cross-linguistic projection for number marking, Num. Furthermore, we see a three-way number distinction in Mandarin: general number of bare nouns, singular number created by singular classifiers, and plural number created by *xie*.

4 Plural Number and Scalar Implicatures

So far we've established the presence of number marking in both classifier and non-classifier languages, despite variability in the specific number distinctions produced at each stage of the derivation. This section explores how such variability can impact pragmatic interpretation of plurality across languages, due to the presence or absence of scalar implicatures.

Recall that plurality can be expressed through a strict plural denotation (which contains only pluralities) or a general number denotation (which contains both singularities and pluralities). In English, plural marker *-s* produces an underlying general number denotation, but may acquire in certain contexts a strict plural meaning via calculation of scalar implicatures (Spector 2007).¹² By contrast this paper has argued that in Mandarin, plural classifier *xie* directly produces the strict plural denotation, distinct from the general number denotation of bare nouns. In other words, these two plural meanings are marked separately and produced by different structures in Mandarin, a distinction collapsed in English morphology.

Consider the following data, which compares discourse anaphora in upward entailing contexts for both languages. Note that number marking creates three patterns in Mandarin but only two patterns in English.

- (56) a. *Zuotian wo mai le [yi ben shu]_i. Wo ba ta_i/*tamen_i dai hui jia le.*
 yesterday 1.SG buy ASP one CL book 1.SG BA 3.SG/3.PL bring back home ASP
 'Yesterday I bought a book. I brought it/*them home.'
- b. *Zuotian wo mai le [yi xie shu]_i. Wo ba *ta_i/tamen_i dai hui jia le.*
 yesterday 1.SG buy ASP one XIE book 1.SG BA 3.SG/3.PL bring back home ASP
 'Yesterday I bought some books. I brought *it/them home.'
- c. *Zuotian wo mai le [shu]_i. Wo ba ta_i/tamen_i dai hui jia le.*
 yesterday 1.SG buy ASP book 1.SG BA 3.SG/3.PL bring back home ASP
 'Yesterday I bought a/some book(s). I brought it/them home.'
- (57) a. *Yesterday I bought a [book]_i. I brought it_i/*them_i home.*
- b. *Yesterday I bought [books]_i. I brought *it_i/them_i home.*

¹²This is one of two views. The other is that English *-s* is semantically ambiguous between plural and general number (de Swart & Farkas 2000). As the main argument here is that English makes no structural distinction between plural and general number, taking either view will not matter for the purposes of this section.

In these data, it appears that English bare plurals (57b) pattern with Mandarin *xie* (56b), serving as antecedents only to plural anaphors. This corroborates the common intuition of English speakers that bare plurals are exclusive of singulars. This is also what previously led Chierchia (1998b) and other scholars to believe that bare plurals were strict plurals, as opposed to general number.

However, when placed in downward entailing contexts, we see that English bare plurals pattern with Mandarin bare nouns instead. They now have general number, inclusive of singulars (Spector 2007):

- (58) a. *Ta ruguo mei you [yi xie haizi] ye you yi ge.*
 3.SG if no have one XIE child also have one CL
 ‘If he doesn’t have some children he at least has one.’
- b. **Ta ruguo mei you [haizi] ye you yi ge.*
 3.SG if no have child also have one CL
 ‘If he doesn’t have a/some child(ren) he at least has one.’
- c. **If he doesn’t have [children] he at least has one.*
- (59) a. *Mei ge you [yi xie haizi] de ren qing ju shou.*
 every CL have one XIE child DE person please raise hand
 ‘Everyone who has some children, please raise your hand.’
- b. *Mei ge you [haizi] de ren qing ju shou.*
 every CL have child DE person please raise hand
 ‘Everyone who has a/some child(ren), please raise your hand.’
- c. *Everyone who has [children], please raise your hand.*

In (58), negation of a bare noun (58b) or bare plural (58c) negates the singular scenario of having one child, while negation of plural *xie* (58a) does not. Likewise in (59), use of a bare noun (59b) or bare plural (59c) includes the singular scenario such that one would raise their hand if they only had one child, while use of plural *xie* (59a) does not.

The overall pattern is summarized in the table below. In upward entailing (UE) contexts, English bare plurals have a strict plural reading like Mandarin *xie*. In downward entailing (DE) contexts, they have a general number reading like Mandarin bare nouns.

(60)

	UE	DE
Mandarin <i>xie</i>		PL
Mandarin bare nouns		GN
English bare plurals	PL	GN

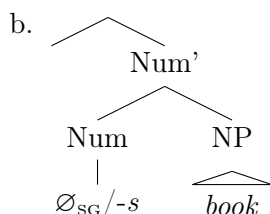
The question now, therefore, is how English bare plurals acquire both readings. What allows for two readings to arise out of one syntactic construction, while they belong to separate constructions in Mandarin? What about upward or downward entailing contexts influence the meaning of English bare plurals? To explain this phenomenon, the remainder of the section is dedicated to the pragmatics of scalar implicatures, and the difference in availability of structural alternatives in Mandarin and English.

Scalar implicatures function to attribute meaning beyond basic semantic denotation; given the use of an informatively weak expression, the implicature is that any informatively stronger expression does not hold, as they would have otherwise been used. This theory of conversational reasoning

dates back to Grice’s (1975) maxims of quantity and quality, where a speaker tries to be maximally informative without giving false information. Generally, informativeness is evaluated based on semantic entailment, where an expression p is more informative than q if p entails q (in other words, if p has a narrower denotation than q). It can be organized into scales, which must somehow be constrained such that informativeness is computed through a finite set of scalar alternatives (Horn 1972, Horn 1989). This in turn dates back to Grice’s maxims of relevance and manner, where informativeness is limited to what is relevant and concise. In this paper, I will adopt a structurally-defined approach to scalar alternatives, where the set of possible alternatives is limited to structures that are equal or lesser in complexity to the original structure (Katzir 2007).

Applied to English number morphology, we see that scalar implicatures arise between singular nouns and bare plurals. As they match in terms of structural complexity—both consist of a Num head and an NP complement (61b)—they are both viable scalar alternatives for each other.

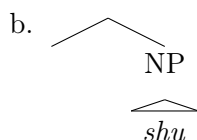
(61) a. $\langle \textit{book}, \textit{books} \rangle$



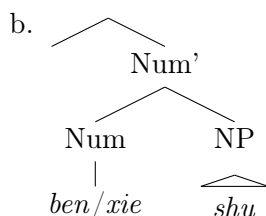
In upward entailing contexts, singular *book* (which acquires an enriched meaning of ‘exactly one book’) is informatively stronger than general number *books* (Spector 2007). Thus, use of the bare plural implies that the singular noun does not hold, which gives rise to the strict plural meaning. In downward entailing contexts, however, informative strength is reversed, and singular *book* is informatively weaker than general number *books*. Thus, use of the bare plural does not give rise to any scalar implicatures, and the general number reading persists.

In contrast, applied to Mandarin number morphology, we see that such scalar implicatures do not arise. First, as bare nouns have the simple structure of an unmodified NP (62b), there are no viable scalar alternatives. Thus, bare nouns have general number reading consistent across upward and downward entailing contexts.

(62) a. $\langle \textit{shu} \rangle$



(63) a. $\langle \textit{ben shu}, \textit{xie shu}, \textit{shu} \rangle$



Second, as for Mandarin *xie*, it belongs to a more complex structure consisting of a Num head and an NP complement (63b). For [*xie*-N] phrases, viable scalar alternatives include the equally complex [Cl-N] phrases as well as the less complex bare nouns. Yet even with these scalar alternatives, scalar implicatures do not end up affecting the plural reading of Mandarin *xie*. The plural *xie shu* is not in competition for informativeness with the singular *ben shu* (which acquires an enriched meaning of ‘exactly one book’), as their meanings are mutually exclusive. In upward entailing contexts, plural

xie shu is more informative than general number *shu*, thus no scalar implicatures arise. In downward entailing contexts, despite plural *xie shu* being less informative than general number *shu*, no scalar implicatures arise either because the implication that *shu* does not hold is compatible with *xie shu*. Thus, Mandarin *xie* has a strict plural reading consistent across upward and downward entailing contexts.

In summary, English bare plurals and Mandarin bare nouns both have general number, but while the former acquires a strict plural reading through scalar implicature, the latter does not due to lack of scalar alternatives at the same level of structure. Instead, Mandarin *xie* produces the strict plural reading through syntactic composition with the bare noun. The distinction between plural and general number is marked grammatically in Mandarin, but only pragmatically in English.

5 The Plural Marker *-men*

If *xie* is a plural classifier (and thus a plural marker), what, then, is *-men*? To situate this question, previous literature has offered varied analyses of *-men* as a collective marker (Iljic 1994), a definite plural marker (Li 1999), an associative plural marker (Jiang 2017), etc.. And while exact details may differ, one commonality across these analyses is the plural function that *-men* contributes. Certainly *-men* has been studied extensively for its syntactic and semantic distribution, but what calls for renewed discussion of it here is figuring out an analysis that can fit into our theory of classifiers as number markers. Where does *-men* belong in the structure? How do we reconcile *-men*, an apparent plural marker of sorts, with plural classifier *xie*? This section has two goals. First, to explore whether *-men* is generated in Num—syntactically what would be required of its distribution, and semantically how it plays into grammatical number distinctions. Second, to propose a preliminary analysis of *-men* that is compatible within our theory, although further work is needed to address some details and open questions.

A basic characteristic that distinguishes *-men* from classifiers is that it is a suffix. It attaches to both common nouns and pronouns:

- | | | | | |
|------|----|--|----|---|
| (64) | a. | <i>xuesheng</i>
student
'student(s)' | b. | <i>xuesheng -men</i>
student MEN
'(the) students' |
| (65) | a. | <i>wo</i>
1.SG
'I/me' | b. | <i>wo-men</i>
1.PL
'we/us' |

When suffixed to common nouns (64), *-men* takes general number and returns a plural; hence *xuesheng-men* describes pluralities in which each individual must be a student. When suffixed to pronouns (65), however, *-men* takes singular and returns an associative plural; *wo-men* describes pluralities consisting of the speaker *wo* and associated individuals. In both cases, *-men* also contributes a definite meaning: it must designate a specific, salient group whose existence can't be posited or negated (Iljic 1994, Li 1999). Interestingly, *-men* does not occur with numerals the way number markers are expected to. In [#-Num-N] phrases, bare nouns combine with classifiers (number markers) then with numerals. However, bare nouns combined with *-men* cannot then combine with numerals, making *[#-N-*men*] phrases ungrammatical:

- (66) a. **yi xuesheng -men*
 one student MEN
 ‘(the) students’
- b. **san xuesheng -men*
 three student MEN
 ‘(the) three students’

Perhaps (66b) is not surprising considering numerals other than *yi* ‘one’ cannot occur with plural classifier *xie* either, but (66a) is surprising if we expect *-men* to behave as a suffixal counterpart to *xie*. It is also not the case that *-men* may occur with classifiers, with or without numerals:

- (67) a. **yi xie xuesheng -men*
 one XIE student MEN
 ‘(the) students’
- b. **zhe xie xuesheng -men*
 this XIE student MEN
 ‘(these) students’
- c. **san ge xuesheng -men*
 three CL student MEN
 ‘(the) three students’
- d. **zhe ge xuesheng -men*
 this CL student MEN
 ‘(these) students’

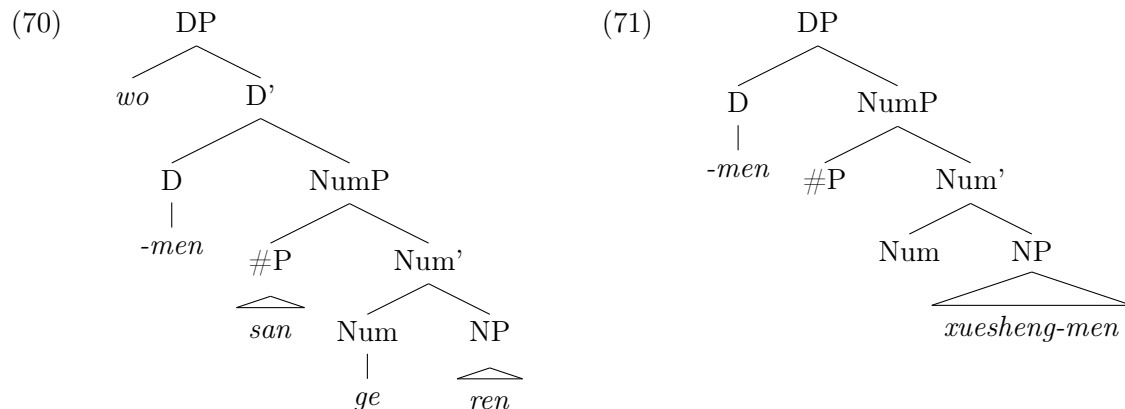
Considering the facts laid out above, *-men* does not appear as a straightforward number marker. From a semantic standpoint, definiteness—a property distinct from the number properties generated in Num—is not typically expounded in plural markers. From a syntactic standpoint, it is hard to explain the coexistence of two plural markers *xie* and *-men*, realized as a classifier versus a suffix, respectively. Additionally, *-men* marks both common nouns and pronouns, despite that common nouns are generated below the Num phrase while pronouns are generated above (Bi & Jenks 2019). Lastly, *-men* does not occur with numerals, not even with *yi* ‘one’. Since *yi* is an identity function, anything in Num should be able to combine with it; thus the ungrammaticality of *yi xuesheng-men* is a syntactic rather than semantic error, indicating that *-men* might not be generated in Num.

Where, if not in Num, is *-men* generated? The following proposal borrows much of the analysis proposed by Li (1999), that *-men* is a definite plural marker realized in D. Some adjustments are made so as to better fit into the theory of classifiers as number markers, but the empirical facts and argumentation still remain relevant. Consider the following data, where common nouns (with or without *-men*) can never precede [#-Num-N] phrases, while pronouns (with or without *-men*) can:

- (68) a. **xuesheng yi ge (ren)*
 student one CL person
 ‘(the) student one person’
- b. **xuesheng -men san ge (ren)*
 student MEN three CL person
 ‘(the) students three people’
- c. **xuesheng -men yi xie (ren)*
 student MEN one XIE person
 ‘(the) students some people’
- (69) a. *wo yi ge (ren)*
 1.SG one CL person
 ‘I/me one person’
- b. *wo -men san ge (ren)*
 1.PL three CL person
 ‘we/us three people’
- c. *wo -men yi xie (ren)*
 1.PL one XIE person
 ‘we/us some people’

These data illustrate the different syntactic distributions of common nouns and pronouns. While common nouns originate as complements to Num and cannot occur above NumP, pronouns can occur above NumP, and crucially *-men* can occur above NumP. Thus, I argue that *-men* is a definite plural feature generated in D. When *-men* attaches to pronouns, the underlying structure

is a D head *-men* with a pronoun specifier and an optional NumP complement (70).¹³ When *-men* attaches to common nouns, the underlying structure is a D head *-men* that lowers onto the noun (71). This lowering is only possible if there are no numerals/classifiers in Num to intervene—hence the ungrammaticality of [#-Num-N-*men*] phrases.



In her work, Li (1999) assumed a separate NumP and ClP, and thus proposed that *-men* was generated in Num (and realized in either D or N) while classifiers were generated in Cl. In this paper, since our goal is to unify NumP and ClP, we can propose that *-men* is generated directly in D (and nonetheless realized in either D or N) while classifiers are generated in Num.

As mentioned earlier, this is only a preliminary analysis of *-men*, and further work is needed to address some details and open questions. Given the regular plural vs. associative plural functions of *-men*, its exact semantic denotation is unclear; perhaps there are really two homophonous *-men*'s. Additionally, some complications arise in *-men*'s distribution with massifiers and weak quantifiers (Jiang 2017). Nonetheless, the data here supports the analysis that *-men* is not generated in Num, but in D.

It is important to note that a challenge in researching *-men* is the variation that exists between regional dialects. While collecting data, I found that native speakers of Mandarin varied in terms of their grammaticality judgments on *-men*. The data presented in this paper come entirely from speakers from Taiwan. However, I found that some speakers from Mainland China judged (67a-c) and (68b-c) to be grammatical. In Li (1999) and Jiang (2017), they report that *-men* can have an associative plural meaning when attached to proper names. However, I found that speakers from both Taiwan and Mainland China judged (72b) to be infelicitous.

- (72) a. *Xiaoming -men*
 Xiaoming MEN
 '(the) Xiaomings'
- b. #*Xiaoming -men*
 Xiaoming MEN
 'Xiaoming and others'

More research has to be done to create a clearer picture of regional variation. In addition, more transparency has to be given in the literature when making claims about *-men* or Mandarin in general, so as to acknowledge these regional variations.

¹³The Mandarin pronominal structure assumed here with pronouns in Spec,DP is based on Bi & Jenks (2019).

6 Conclusion

In this paper, I proposed that number marking is available cross-linguistically, though languages may differ in terms of the particular number distinctions they make. In Mandarin, number marking takes the form of classifiers—singular or plural—which operate on nouns that have general number.

This view of classifiers falls in line with Borer’s (2005) proposal, who argued that number markers and classifiers are generated in the same syntactic position, Num. And as the proposal was motivated by the complementary nature of number markers and classifiers in language (via the Greenberg-Sanches-Slobin generalization), at the time it was fairly arbitrary that number markers and classifiers occupied the same node given that they had different functions; one involved number distinctions while the other involved noun classification. Thus, this new view of classifiers provides a unified analysis of Num as the cross-linguistic locus of grammatical number. Number markers, then, may realize either as suffixes (like English *-s*) or separate words (like Mandarin classifiers).

An implication of this theory is that suffixed and non-suffixed number markers may co-exist in a language, as long as they do not co-occur. Indeed, in Turkish and Western Armenian, singular classifiers and plural suffixes co-exist but do not co-occur (Bale et al. 2011). In fact, number marking in Turkish and Western Armenian behaves essentially like Mandarin: numerals obligatorily combine with singular markers, but cannot combine with plural markers. The only difference lies in whether the plural marker is a suffix or a classifier. Perhaps a challenge to this theory, however, is that classifiers and plural suffixes do co-occur in languages like Korean (Kim & Melchin 2018), Mi’gmaq and Chol (Bale & Coon 2014). Bale & Coon (2014) describe the possibility of two types of classifier languages: one where classifiers provide number distinctions for nouns, and the other where classifiers provide measure functions for numerals. If this is the case, distinct analyses are required for classifiers in Mandarin, Turkish, and Western Armenian versus classifiers in Korean, Mi’gmaq, and Chol.¹⁴

This paper is only the beginning of what needs to be a long-term discussion on the typology of classifiers and number markers. While my analysis was focused on count classifiers, further research on mass classifiers is crucial to understanding the full picture of grammatical number in Mandarin. Furthermore, the term “classifier” has been used in literature as an umbrella term for objects that occur with numerals and nouns, but do not look like canonical number markers. Thus, it is likely that the term “classifier” actually refers to multiple objects with different syntactic and semantic functions. Lastly, it remains open what a typological organization of all noun, number marking, and numeral denotations (and their combinations) that exist across languages, in terms of grammatical number, would look like.

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¹⁴One possible analysis for Korean, Mi’gmaq, and Chol is that numerals and classifiers in together occupy Spec,Num, while plural suffixes occupy the Num head. That is, in these languages classifiers are not number markers.

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