Syntactic Properties of Numeral Classifiers in Mandarin Chinese

Niina Ning Zhang April 10, 2009
National Chung Cheng University *Lngnz@ccu.edu.tw*

Abstract

This study aims to investigate the syntactic representations of numeral classifiers in Mandarin Chinese, which function as noun-sorters, mass-dividers, and counting units semantically. Analyzing certain newly revealed generalizations, we claim that the dependency between a numeral and a Cl is syntactic as well as semantic, that not all Cls are able to divide mass and not all syntactic positions may a Cl function as a counting unit, and that various types of Cls have different syntactic positions and thus the so-called ClP is not justified.

Keywords: classifier, numeral, Chinese, measure word

1. Introduction

Classifiers in Mandarin Chinese have been called numeral classifiers. In this paper, we use the abbreviation Cl to label all types of numeral classifiers in this language. Cls display three major functions. First, they link a numeral to a noun, serving as "quasi-units" (Greenberg 1972) of counting (also see Senft 2000:21, among others). For instance, the Cl *bǎ* in (1a) is parallel to the counting units *kilos* in (1b) and *bottles* in (1c). This is the counting unit function of Cls.

(1) a. 3 bǎ yǔsǎn
3 Cl umbrella
'3 umbrellas'

b. 3 kilos of books

c. 3 bottles of juice

Second, Cls also sort nouns according to their semantics (e.g. Lyons 1977:463). For instance, the Cl *tóu* for *zhū* 'pig' may not occur with *yǔsǎn* 'umbrella', as seen in (2). This is the sortal function of Cls.

(2) a. *3 tóu yǔsǎn
3 Cl umbrella

b. 3 tóu zhū
3 Cl pig

Third, Cls also play the role of mass-dividers, expressing an individual instance of a "substance' conveyed by the noun (Ritchie 1971, also Greenberg 1972:26). The Cl *dī* in (3a) has the same function as the word *drops* in (3b). Both divide the blood mass into countable units.

(3) a. 3 dī xiě
3 Cl blood
'3 drops of blood'

b. 3 drops of blood

The goal of this paper is to find out the syntactic positions of various types of Cls and how the positions are related to these semantic functions. The main thrusts are that the dependency between a numeral and a Cl is both syntactic and semantic in Mandarin Chinese, that Cls exhibit the counting unit function at a higher position, while their sortal function comes from a lower position, that not all Cls are able to divide mass, and that various Cls are base-generated at different positions and thus there should be no ClP.

The paper is organized as follows. In Section 2, I clarify that syntactically it is a Cl that licenses a numeral in Mandarin Chinese. In Section 3, I show how a Cl also semantically licenses a numeral, and how the generic Cl fails to function as either a mass-divider or a sorter. Then in Section 4, I report the distributions of sortal Cls. I present my syntactic derivations of Cl constructions in Section 5. Then I analyze the syntactic properties of measure words in Section 6. In this section, I show how Cls fail to function as counting units in the presence of a measure word. I then discuss more nominal constructions in Section 7. Finally, in Section 8, I summarize my conclusions and present my tentative analysis of the D-linking property of the generic Cl *ge*.

2. The dependency of cardinal numerals on classifiers

Numeral Classifiers "appear contiguous to numerals in numeral noun phrases" (Aikhenvald 2003:98). It has long been realized that there is certain correlation between the occurrence of

a numeral classifier (Cl) and the occurrence of a cardinal numeral. However, the exact nature of this dependency has not been clarified. It has generally been believed that the occurrence of a Cl depends on the occurrence of a cardinal numeral (Cheng & Sybesma 1999:530, 2005:sec. 5.1, among others). However, in this section, I will argue that the direction of the dependency is just the opposite.

2.1 The licensing of cardinal numerals in Chinese

Syntactically, does a numeral license a Cl, or a Cl license a numeral? I have three facts to argue for the latter dependency in Mandarin Chinese.

First, a cardinal numeral may not be adjacent to a phrasal modifier in Mandarin Chinese. Consider the acceptability contrast in (4) and (5).

(4) a. *3 dà de běn shū
3 big DE Cl book

b. 3 dà běn shū
3 big Cl book
'3 big books'

(5) a. *3 dà de xiāng shū
3 big DE box book

b. 3 dà xiāng shū
3 big box book
'3 big boxes of books'

The adjectives in (4a) and (4b) are the same, thus the acceptability contrast is not semantic. (4a) differs from the acceptable (4b) in the occurrence of the functional element *de*. A well-accepted assumption is that when a modifier is followed by *de*, it is a phrasal element (e.g. Tang 1990b:420). It has been recognized in the studies of Cls that Cls are not phrasal (e.g. Tang 1990b). We can see that *da* 'big' as a phrasal element is adjacent to the numeral in (4a). In contrast, since the word *da* is not introduced by *de* in (4b), it is not phrasal, and thus the numeral in the example is adjacent to a complex head element composed of *da* and *ben*. Tang (1990b:418) correctly points out that in data like (4b), "the adjective and the classifier function as a compound rather than a phrase." The same contrast is seen in (5), where the position of a Cl is taken by a measure word, which is also a head element. We can see that a numeral needs to be adjacent to a head element.

Another fact showing the dependency of a cardinal numeral on an adjacent head element in Mandarin Chinese is that a numeral alone may not occur as an argument. In the English example in (6a), the numeral 5 can occur in the object position independently in the answer part of the dialogue, however this is impossible in Chinese, as seen in (6b). Similarly, in the English example in (7a), the numeral 4 can occur in the subject position independently in the answer part of the dialogue, however this is impossible in Chinese, as seen in (7b). Moreover, in the English example in (8a), the numeral *8* and *11* can occur respectively in the object position of the prepositions *from* and *to*, however, the numerals in the parallel positions in Chinese, as seen in (8b), have to be followed by the head element *diǎn* 'o'clock'.

(6) a. Ques.: How many pens did John buy? Ans.: He bought 5.

b. Ques.: Bǎoyù mǎi-le jǐ zhī bǐ? Ans.: Tā mǎi-le 5 *(zhī).
Baoyu buy-PRF how.many Cl pen he buy-PRF 5 Cl
'How many pens did Baoyu buy?' 'He bought 5.'

(7) a. Ques.: How many people are enough for carrying this piano? Ans.: 4 is enough.

b. Ques.: jǐ ge rén cái néng táiqǐ zhè jiǎ gāngqín? Ans.: 4 *(ge) jiù gòu le.
how.many Cl person then can carry this Cl piano 4 Cl just enough prt
'How many people are enough for carrying this piano?' '4 is enough.'

(8) a. I worked from 8 to 11 yesterday.

b. wǒ zuótiān cóng 8 *(diǎn) dào 11 *(diǎn) dōu zài gōngzuò.
I yesterday from 8 o'clock to 11 o'clock all PROG work
'I worked from 8 to 11 yesterday.'

Third, a numeral may not be adjacent to an NP in Mandarin Chinese. This is seen in the unacceptability of data like (9), where the numeral is adjacent to either a simple NP or an NP that contains an AP.

(9) a. *3 [$_{NP}$ shū] b. *3 [$_{NP}$ dà de shū]
3 book 3 big DE book

The above three facts might lead us to think that a cardinal numeral is licensed by an adjacent overt head element in Chinese. However, not all kinds of head elements may license a numeral:

(10) a. *5 de shū b. *5 shì shū
5 DE book 5 be book

The functional element *de* has been recognized as a head element, regardless of whether it heads a ModP, DP, nP, or any other projection (see Li 2007 for a review). The element *shi*, which can be a copular or focus marker, is also a head element. However, neither *de* nor *shi* may license a numeral. Assuming that Cls and measure words have the feature x whereas *de* and *shi* do not have this feature, and leaving x to be specified later (3.3), we come up with the following generalization:

(11) A cardinal numeral is licensed by an adjacent overt head element with feature x in Mandarin Chinese.

In the current syntactic theories, the facts in (4) through (9) have not been well-accounted for.

The unacceptability of data like (4a) has been noted since Tang (1990b:419), but its implication has not been explored. In Cheng & Sybesma (1999:529 fn.16), it is conjectured that "This may be due to some obligatory cliticalization of Cl to Numeral" (also see Yang 2001:72). However, the Cl *běn* in (4b) is not next to a numeral. Moreover, it is well-recognized that a clitic may be hosted by a cluster that is composed of another clitic and its host (e.g. both *'d* and *'ve* are clitics and the latter is hosted by *I'd* in *I'd've brought some for you, if I'd known*.). Thus, if a Cl is an enclitic and *de* is also an enclitic (Huang 1989), why can the Cl not take the cluster *da de* 'big DE' as its host in (4a)? It is clear that the dependency between a numeral and a Cl is beyond cliticalization.

The acceptability contrast in (6) through (8) has not been discussed, as far as I know. Note that numerals are not proclitics, since they can be stressed. Thus the dependency reported in (11) is also beyond cliticalization.

The unacceptability of data like (9) has been accounted for by the assumption that there is no distinction between mass and count nouns in Chinese, and therefore a numeral has to be followed by a Cl, which functions as a mass-divider and counting unit. In (12a), the mass noun *water* may not be merged with the numeral directly, unlike the count noun *books* in (12b). So it has been assumed that all nouns in Chinese are like *water* in English, and the Cl between a numeral and a noun is like the word *cups* in (12c). Under this assumption, one explains the unacceptability of (9) and (12a) in the same way (Krifka 1995, Chierchia 1998).

(12) a. *3 water b. 3 books c. 3 cups of water

However, we have seen in (4) and (5) that the occurrence of a Cl or measure word with a numeral may not ensure the acceptability of the nominal. Thus the above semantic account is not sufficient. Moreover, a Cl is obligatory even for the numeral *líng* 'zero', which does not seem to require the countability of a noun semantically:

(13) Nàlǐ yǒu líng *(běn) shū.
there have zero Cl book
'There are zero books.'

(11) states a special dependency of numerals on classifiers (or measure words, which are also head elements), in contrast to the claim that "overt classifiers simply cannot appear without a numeral" (Cheng & Sybesma 1999:529). The alleged dependency of Cls on numerals is too weak to account for the acceptability contrast shown in (4) and (5). Moreover, a Cl may also be preceded by an indefinite quantifier, which is not a numeral, as in (14a), and it may also occur in its reduplication form (Ōta 1958 [Jiang & Xu 2003: 155], Paris 1981:69, Cheng & Sybesma 1999:536), which is not next to a numeral, either, as in (14b).[1]

(14) a. hěnduō zhāng zhǐ
a.lot Cl paper
'a lot of paper'

b. Zhè dìfāng zuò-zuò gāo-shān dōu hěn dǒu.
this place Cl-Cl high-hill all very steep
'In this place, every high-hill is steep.'

Later in 3.3, we will see that a Cl may also follow a noun, which also shows that a Cl does not have to be next to a numeral.

The dependency of numerals on head elements introduced above is also seen in Cantonese. In this language, no bare numeral is allowed (Au Yeung 2005:55). However, the dependency is not seen in some other classifier languages such as Indonesian. In Indonesian, a numeral may be followed by either a Cl or an NP directly (Sato 2009:15):

(15) a. tiga orang siswa
3 Cl student

b. tiga siswa
3 student
Both: '3 students'

Moreover, the licensing condition on Chinese numerals stated in (11) is not seen in Chinese quantifiers, such as *henduo* 'a lot', *da-liang* 'big amount', and *yīxiē* 'some', which denote an indefinite quantity. Unlike numerals, such elements may be next to an NP, as seen in (16a,b) (cf. (9)), and may occur independently as an argument, as seen in (16c) (cf. (6b)):

(16) a. hěnduō shū
a.lot book
'a lot of books'

b. dà-liàng [$_{NP}$ [cóng zhōngguó jìnkǒu] de niúnǎi]
big.amount from China import DE milk
'a big amount of milk imported from China'

[1] One might ask why the Cl may not license the numeral in (i):
(i) *5 zhāng-zhāng zhǐ dōu hěn dà.
5 Cl-Cl paper all very big
One answer to the question is that a numeral encodes a definite quantity, whereas a reduplicated Cl encodes an indefinite quantity, and thus there is a semantic conflict between the numeral and the Cl. If it is the indefinite determiner *yī* 'a', instead of the numeral *5*, that precedes the Cl in (i), the sentence becomes acceptable:
(ii) yī zhāng-zhāng zhǐ dōu hěn dà.
a Cl-Cl paper all very big
'Every piece of paper is very big.'

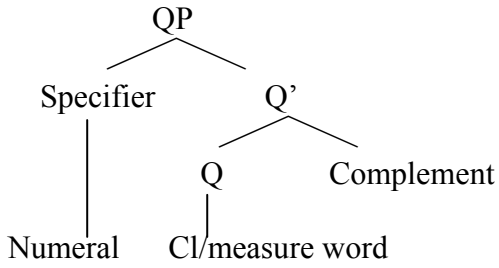
c. Bǎoyù zhǐ mǎi-le 2 zhī bǐ, Dàiyù què mǎi-le hěnduō.
Baoyu only buy-PRF 2 Cl pen Daiyu however buy-PRF a.lot
'Baoyu bought only 2 pens, however, Daiyu bought a lot.'

2.2 My analysis

We have seen that numerals in Chinese require an adjacent overt head element, and this property is not seen in another type of quantity-denoting element, indefinite quantifiers. Therefore, cardinal numerals seem to have a special formal licensing condition in Chinese.

The licensing condition can be formalized as a Spec-head relation in syntactic representations. Between a head and the Spec of the same projection, no phrasal element may intervene. I claim that numerals are nominals (Corver & Zwarts 2006), and are base-generated at Spec of QP (Quantity Phrase, or #P, see Borer 2005:35, 59, Ritter 1991), and a Cl or a measure word surfaces at Q. This is illustrated in (17). Following Ritter (1991) and Borer (2005), I assume that in an argument position, QP is dominated by DP. I will discuss the complement of Q in later sections.

(17)



In the generative grammar, the dependency of a head element on the overt occurrence of its Spec element is called an EPP effect, regardless of whether the head element is overt (Chomsky 2000). For instance, Infl in English requires an overt element at the Spec position. However, it has also been observed that for certain functional projections, the overtness of an element at the Spec position requires the overtness of an element at the head position. This kind of dependency can be attested in the so-called verb second requirement on matrix (or root) declaratives in non-English Germanic languages. In (18a), for instance, *Jan* is at Spec of CP and *sla* 'hit' is at C. If C is not realized by an overt element, as in (18b), the form is not acceptable.

(18) a. Jan sla ik. b. *Jan ik sla. (Dutch)
John hit I John I hit
'John, I hit.'

A similar effect is seen in the fact that fronted non-subject wh-elements must be followed by a head element in English. The fronted *what* at Spec of CP must be followed by *does* in (19a) (cf. (19b)), whereas the auxiliary *does* at C does not require occurrence of an element at Spec of CP, as seen in (19c).

(19) a. What does Bill usually read? b. *What Bill usually reads?
c. Does Bill usually read novels?

Of course, there are intra- and inter-language variations. For instance, there is no verb second requirement on declaratives in English, as seen in the translation of (18a), and fronted subject wh-elements in English does not have to be followed by a head element (e.g. *Who usually reads the book?*).

I claim that QP in Chinese exhibits a similar dependency of the occurrence a numeral at the Spec of Q on the occurrence of an overt element at Q. Intra- and inter-language variations are also expected. Unlike numerals in Chinese, indefinite quantifiers in Chinese and numerals in English and Indonesian do not exhibit this effect.[2]

The dependency of a Spec element on the occurrence of a local head element does not mean that the Spec and the head element form a syntactic constituent. Yang (2001:58) claims that since a numeral and a classifier never separate, they must form a constituent. In Section 5.5 I will present more arguments against the claim.

In this section, I have argued that numerals are dependent on the occurrence of a head element in Mandarin Chinese, Cls are such head elements, and this dependency is recognized as a Spec-head relation in syntactic representations.

3. The distributions of the Cl_{gen}

3.1 The sortal-generic contrast

Cls are generally divided into sortal and generic ones. A sortal Cl (Cl_{sort}) is "the one which individuates whatever it refers to in terms of the kind of entity that it is" (Lyons 1977:463; my emphasis). In contrast, a generic Cl (Cl_{gen}) is not sensitive to the semantics of the noun (Aikhenvald 2003:98, Grinevald 2003:98).

In Chinese, *ge* is a Cl_{gen} (Chao 1968:588, Lyons 1977:461, Li and Thompson 1981:112, a.o.). As stated in Myers (2000:187), "*ge* has no lexical semantics" and "*ge* is used in a variety of situations that have nothing in common except for the inability to form analogies with examples in memory."[3] In (20a), before the flute-denoting noun, either the Cl_{sort} *zhī* or the Cl_{gen} *ge* may occur, but the Cl_{sort} *jià* may not occur. In contrast, in (20b), before the piano-denoting noun, either the Cl_{sort} *jià* or the Cl_{gen} may occur, but the Cl_{sort} *zhī* may not occur.[4]

---

[2] The quantifier *jǐ* 'several, how many' is also licensed by an overt local head element. The contrast in (i) is reported in Yang (2005:62):

(i) jǐ *(běn) shū
several Cl book 'several books'
how.many Cl book 'how many books?'

[3] Many papers have been published on *ge*. See Myers (2000) for a review.

The word *ge* in data like the following is also a classifier, followed by a nominalized element (Ōta 1958:sec 21.4, Chao 1968: 320). The word *ta* here has been analyzed as an indefinite D-element in Lin & Zhang (2006):

(i) Zánmen wán tā ge tòngkuài!
we play it Cl satisfaction
'Let's play as much as we like.'

The word *ge* may also precede a proper noun, the reference of which is unique.

(ii) Nà *(ge) Húfēi zhēn bù xiànghuà. (Cheng & Sybesma 1999:523, also see Ōta 1958:sec 11.1.1)
that CL Hufei truly not decent
'That Hufei is really unreasonable!'

Ge can also occur to the left of an adjective, as in (iii-a); or to the left of negation, as in (iii-b) (Ōta 1958:sec 21.4, Zhu 1982:49):

(iii) a. Akiu pǎo-le *(ge) kuài.
Akiu run-PRF CL fast
'Akiu ran fast.'

b. Akiu xiào *(ge) bù-tíng.
Akiu laugh CL not-stop
'Akiu laughed endlessly.'

No other classifier can occur in such contexts. Lü (1983:131) claims that in certain cases, *ge* is used for prosodic reasons (cf. Zhang 1991:266).

In (iv), as well as in (ii) and (iii), *ge* may not be preceded by a numeral. This is different from a regular Cl. The *ge* in (iv) might function as an indefinite determiner (see Wang 1989:110).

(iv) Wǒ hē ge shuǐ jiù lái.
I drink Cl water then come
'I'll come after I drink some water.'

[4] Historically, the Cl_{gen} *ge* appeared later than Cl_{sorts} (Wang 1989:103).

(20) a. Akiu mǎi-le 2 {zhī/ge/*jià} dízi.
Akiu buy-PRF 2 Cl_{sort}/Cl/Cl_{sort} flute
'Akiu bought 2 flutes.'

b. Akiu mǎi-le 2 { jià /ge/*zhī } gāngqín.
Akiu buy-PRF 2 Cl_{sort}/Cl/Cl_{sort} piano
'Akiu bought 2 pianos.'

The contrast between the two types of Cls are well-observed, cross-linguistically. In classical Chinese, up to the Tang dynasty (ca. 600 AD), the Cl_{gen} was *méi* (枚), in contrast to many other Cl_{sort}s such as *tóu* (頭), which was for nouns such as *guī* 'turtle' (Liu 1965:82, Wang 1989:99). Korean has the Cl_{gen} *gay* and many Cl_{sort}s, and Japanese also has the Cl_{gen} *ko* (e.g. Zubin & Shimojo 1993).

Some languages have Cl_{gen}s only (e.g. Niuean, Massam 2008, and certain Oceanic languages, Mathew Dryer, p.c.). In these languages, every nominal is in construal with a classifier, and the form of classifiers always remains the same.

3.2 The count noun constraint on generic Cls

3.2.1 A new observation

Although the generic Cl is not sensitive to the semantic properties of the referent encoded by the noun, it is sensitive to the contrast between mass and count nouns. We observe the generalization that the Cl_{gen} may not occur with a mass noun. The count noun *zhuōzi* 'table' may occur with either the Cl_{sort} *zhāng* or the Cl_{gen} *ge*, as seen in (21a). However, mass nouns may occur with a Cl_{sort}, but not with *ge*, as shown in (21b,c,d) and (21e), respectively.

(21) a. 3 {zhāng/ge} zhuōzi
3 Cl_{sort}/Cl_{gen} table
'3 tables'

b. 3 zhāng zhǐ
3 Cl_{sort} paper
'3 pieces of paper'

c. 3 gǔ zhēngqì
3 Cl_{sort} steam
'3 puffs of steam'

d. 3 dī yóu
3 Cl_{sort} oil
'3 drops of oil'

e. *3 ge {zhǐ/zhēngqì/yóu/xiě/ròu/bù/qián/yǎnlèi}
3 Cl paper/steam/oil/blood/meat/cloth/money/tear

The constraint on *ge* has been informally reflected in Wang's (1989:104) report that "*ge* is never used as a classifier for tea and wine". We notice that the Cl_{gen} *méi* (枚) in classical Chinese may not occur with a mass noun, either (see data in Liu 1965). Similarly, the Cl_{gen} *gay* in Korean may not occur with mass nouns (Byeong-Uk Yi, p.c.), and the Cl_{gen} *ko* in Japanese has the same constraint (Byeong-Uk Yi's p.c. with Takashi Iida).[5]

Furthermore, we find that event-denoting nominals also show the same contrast, i.e., the Cl *ge* may occur with count eventualities but not mass eventualities.

Achievement & Accomplishment are count eventualities. They allow *ge*:

(22) a. 1 {cì/ge} jīngxǐ
1 Cl/Cl surprise

1 {cì/ge} pēntì
1 Cl/Cl sneeze

b. 1 {cì/ge} huìyì
1 Cl/Cl meeting

1 {cì/lún/ge} bǐsài
1 Cl/Cl competition

[5] Aikhenvald (2003:249) states that "some classifiers are restricted to countable nouns only." However, she does not give examples.

Activities & States are mass eventualities. They do not allow *ge*:

(23) a. 1 {cì/*ge} pǎobù — 1 {cì/zhèn /*ge} dà xiào
1 Cl/Cl jogging — 1 Cl/Cl/Cl big laugh
b. 1 {chǎng/*ge} liàn'ài — 1 {zhèn/*ge} fènnù
1 Cl/Cl love — 1 Cl/Cl anger

Two points need to be clarified. First, I have shown that the Cl_{gen} in Chinese and its counterparts in Korean and Japanese, which are cognate forms of the Chinese one (they share the same Chinese written form 個), have this restriction, however, I have not investigated whether Cl_{gen}s in other languages have this restriction (I thank xxx for urging me to make this clarification). Second, if *ge* does not function as a Cl, no such a constraint is observed. See the examples in footnote 3.

3.2 2 Proform and coercive effects

I have reported a new observation on the Cl_{gen}. I now falsify a belief of the relation between Cl_{sort}s and the Cl_{gen}. It has been assumed that Cl_{sort}s typically mark the first mention of a new item; they occur with indefinite nouns rather than definite ones and the Cl_{gen} may take a Cl_{sort} as an antecedent (Erbaugh 1986:408, Aikhenvald 2003:324, 328). The example in (24a) is used to show this belief. However, there is no problem if we exchange the positions of the two Cls in this example, as seen in (24b). Our (24c) is another example in which it is the Cl_{gen} that occurs first, and a Cl_{sort} occurs later in describing the same entity.

(24) a. Cóng nèibiān guòlái yí ge xiǎoháizi, uh…qí, qí, qí-zhe yí liàng jiǎotāchē
from there come one Cl child uh ride ride ride-PRG one Cl bike
uh shì yí ge hěn kě'ài de xiǎo de jiǎotāchē.
uh be one Cl very cute DE little DE bike
b. …, qí-zhe yí ge jiǎotāchē, shì yí liang hěn kě'ài de xiǎo de jiǎotāchē.
ride-PRG one Cl bike be one Cl very cute DE little DE bike
Both: 'From there comes a child, riding a bike, (it) is a very cute little bike.'
c. Yuǎnyuǎn de lái-le yí ge rén, yuánlái shì yí wèi lǎo jiàoshòu.
far DE come-PRF one Cl person in.fact be one Cl old professor
'A person came from far away. It turned out to be an old professor.'

In all of the examples in (24), the post-Cl noun is a count noun, and *ge* is simply a Cl underspecified with the semantics of the noun, rather than a proform. If the noun is a mass noun, *ge* may not occur, regardless of its position relative to the Cl_{sort}, i.e. *zhāng* in (25).

(25) a. *Cóng nèibiān guòlái yí ge xiǎoháizi, ná-zhe yí zhāng zhǐ
from there come one Cl child hold-PRG one Cl paper
shì yí ge hěn dà de zhǐ.
be one Cl very big DE paper
b. *…, ná-zhe yí ge zhǐ, shì yí zhāng hěn dà de zhǐ.
hold-PRG one Cl paper be one Cl very big DE paper
Intended: 'From there comes a child, holding a piece of paper, a very big one.'

We now turn to the issue of coercive effect. English mass nouns are interpreted as count nouns in certain syntactic contexts (e.g. the presence of a plural marker; see Borer 2005:sec 4.2). There are two kinds of such coercions, Portion Coercions and Sorter Coercions.

Portion Coercions typically occur in restaurant talk. For instance, the word *whisky* in English is interpreted as a mass noun by default, as shown in (26a). However, *whisky* in *three whiskies* in (26b) is "regarded as an individuated, re-identifiable and enumerable unit" (Lyons 1977:463). The elements that make this coercion possible (e.g. the plural marker in (26b)) are called packagers in Pelletier (2009).

(26) a. Jim drinks whisky. b. Three whiskies, please. (e.g. in a restaurant)

Similarly, in the possible interpretation of (27a), *píjiǔ* 'beer' may also be regarded as an individuated, re-identifiable and enumerable unit, and *ge* seems to be a packager. Similar claim can be made for (27b).

(27) a. 3 ge píjiǔ (e.g. in a restaurant)
3 Cl beer
'3 beer units defined in the discourse'
b. Měi rén xuǎn-le 3 ge shíjiān. (e.g. in making a schedule)
each person choose-PRF 3 Cl time
'Each person chose 3 time-slots.'

Note that if the unit of beer in a restaurant is a glass, (27a) means 3 glasses; and if the unit of beer in another restaurant is a bottle, (27a) means 3 bottles. This variation is not seen in the divider function of Cl_{sort}s, as in (21b,c,d). Thus, it is plausible to assume that *ge* in (27) is a proform for a measure unit specified in the discourse. A measure unit always portions out mass (see 6.3). Thus in (27), it is the measure unit in the discourse, rather than *ge*, that is the real packager of the mass.

Like *ge* in Mandarin Chinese, the Cl_{gen}s in Korean and Japanese may also have a parallel proform function (Byeong-Uk Yi, p.c. and Byeong-Uk Yi's p.c. with Takashi Iida). For instance, the Japanese example in (28) means "three sugar cubes or three bags of sugar or some other three arrangements of sugar depending on the context' and *ko* "is applicable to a noun only when the noun denotes some countable objects which are individuated by some principle." (Takashi Iida's email to Byeong-Uk Yi in January 2009).

(28) satou san ko
sugar 3 Cl_{gen}

Portion Coercions introduce count readings with respect to individuals, whereas Sorter Coercions introduce count readings with respect to kinds (Bunt 1985, Pelletier & Schubert 1989). The word *wine* in English is interpreted as a mass noun by default, as seen in (29a). A Sorter Coercion is seen in (29b), where *wines* means different kinds of wine (see also Lyons 1977:463).

(29) a. Jim drinks wine. b. The best wines are from Spain.

In Dagaare, the plural marker *–ree* plays a Sorter role exclusively, in contrast to the regular plural marker *–ri* (Grimm 2009). In Chinese, the kind Cls *lèi* and *zhǒng* have this Sorter function (See 7.3 for the syntax of kind Cls). In both languages, there is no coercion in the lexicalized sorters.

In Chinese, *3 ge wēishìjì* '3 Cl whisky' is different from *three whiskies* in English. Unlike the latter, the former never means three kinds of whiskies. The reason is simple: while *ge* may be a proform of a measure unit specified in the discourse, it may not be a proform of a kind Cl.

Our example (25a) also shows that *ge* may not be a proform of a Cl_{sort}, either.

We conclude that if there is no measure unit in the discourse, *ge* may not occur with a mass noun.

3.2.3 Two unreliable tests

We have shown that the contrast between mass and count nouns in Chinese are exhibited in their interactions with the two types of Cls. Cheng & Sybesma (1998, 1999) are right in stating that in Mandarin Chinese "the count/mass distinction is clearly reflected in the classifier system" (1999:515, also 1998:403). However, their two tests to support their statement are not reliable, as pointed out by Tang (2005:432, 440, also see Borer 2005:99).

Test A. It has been claim that *de* may occur between a measure word and a mass noun, but not between a Cl and a count noun (Chao 1968:555, Paris 1981:32, Zhu 1982:51, Cheng & Sybesma 1998:388, 1999:515). A typical pair of examples is (30):

(30) a.	3 wǎn de tāng		b.	*3 kē de táo-shù
	3 bowl DE soup			3 Cl DE peach-tree
	'3 bowls of soup'			'3 peach trees'

Descriptively, as noted in Tang (2005, also Hsieh 2008:32), *de* may indeed occur between a Cl and a count noun, as seen in (31). Therefore, the asserted test is problematic.

(31) a.	100 kē de táo-shù	b.	245 běn de shū	c.	54 zhāng de chuáng	
	100 Cl DE peach-tree		245 Cl DE book		54 Cl	DE bed

The contrast between the unacceptable (30b) and the acceptable (31) is that the numeral in the former is much lower (say, less than 20) than the ones in the latter. We have observed that if the numeral is a high one, *de* may precede a count noun naturally.

Why does the degree of a numeral make such a difference? Different properties between constructions containing low and high numerals are also observed in other languages (see Croft 1994:163, Aikhenvald 2003:100, Sato 2009:7) (In Tang 2005:444, the contrast between low and high numerals is viewed as the contrast in "information weight", although the meaning of this notion in this context is not clear to me).

In Cantonese, the counterpart of Mandarin *de* (i.e., ge^3) may always follow a Cl, regardless of whether the noun is a mass or count one (Au Yeung 2005:55). Similarly, in Japanese, the counterpart of Mandarin *de* (i.e., *no*) may always occur with a Cl, regardless of whether the noun is a mass or count one (Watanabe 2006).

Moreover, in contrast to Cls, measure words in Mandarin Chinese may always be followed by *de*, as seen in (32a), which has a mass noun, and (32b), which has a count noun. We also know that a measure word has to be followed by *of* in English, but not by any functional word in other Germanic languages, as shown in (33) and (34) (Alexidou et al. 2007:401, among others).

(32) a.	3 wǎn de tāng	(= (30a))	b.	3 xiāng de shū
	3 bowl de soup			3 box de book
	'3 bowls of soup'			'3 boxes of books'
(33) a.	3 cups of milk		b.	3 boxes of books
(34) a.	1 Glas (*von) Wasser		b.	1 Tüte (*von) Äpfel (German)
	1 glass of water			1 bag of apples

All of these variations in the occurrence of a linking word in a numeral expression have nothing to do with the contrast between mass and count nouns.

Both Tang (1993:744, 2005:434) and Cheng & Sybesma (1998) present quite a lot of facts to show that the construction with *de* and the construction without *de* are semantically and syntactically different. For instance, if *de* occurs, no demonstrative is allowed (Cheng & Sybesma 1999:393):

(35) a. na 3 wǎn tāng
that 3 bowl soup
'those 3 bowls of soup'

b. *na 3 wǎn de tāng
that 3 bowl DE soup

(36) a. nà 30 běn shu
that 30 Cl book
'those 3 books'

b. *nà 30 běn de shū
that 30 Cl DE book

Also, if *de* occurs, the whole nominal may not be preceded by a relative clause (Cheng & Sybesma 1999:394, Tang 2005:448) or adjective (the underlined part in (37)):

(37) a. Lùlù mǎi de 3 xiāng (*de) shū
Lulu buy DE 3 box DE book
'the 3 boxes of books that Lulu bought'

b. hěn zhòng de 3 xiāng (*de) shū
very heavy DE 3 box DE book
'the 3 heavy boxes of books'

Based on the systematic differences between the construction with *de* and the construction without *de* both Tang and Cheng & Sybesma conclude that the two constructions "are not derivationally related" (Cheng & Sybesma 1998:401, also Tang 1990b, 1993, 2005:435, Borer 2005:99). In this paper, we discuss the construction without *de* only.

Test B. It has also been claimed that a pre-Cl adjective may occur with a mass noun, as in (38a), but not with a count noun (Cheng & Sybesma 1998:390, 1999:516, but see Cheng & Sybesma 1998:390 fn. 4 for their acknowledgement of counter-examples).[6] In fact, a pre-Cl adjective may occur with a count noun, as seen in (38b,c) (also in (4b)) (Zhu 1982:52, Yang 2005:33).

(38) a. 3 dà zhāng zhǐ
3 big Cl paper
'3 big pieces of paper'

b. 3 dà zhī gǒuxióng
3 big Cl bear
'3 big bears'

c. 1 cháng tiáo xiàngliàn
1 long Cl necklace
'1 long necklace'

3.3 A new generalization and the defectiveness of the Cl_{gen}

In 3.1 I showed that the Cl_{gen} may not occur with a mass noun directly. However, it may occur with a mass noun if the latter is followed by a Cl_{sort}, as in (39c). (39c) is a double Cl construction, containing both the Cl_{gen} and the Cl_{sort} *dī*.

(39) a. *3 ge shuǐ
3 Cl water

b. 3 dī shuǐ
3 Cl water

c. 3 ge shuǐ-dī
3 Cl water-Cl
'3 water-droplets'

[6] Cheng & Sybesma (1998: 390) claim that only the numeral *yī* 'one' may be followed by an adjective. This is not accurate, as seen in our examples.

Double Cl constructions similar to (39c) are also found in Korean (data from Byeong-Uk Yi 2008:19, 21, and p.c.):

(40) a.	mul-pangwul se gay		b.	mul se pangwul	
	water-Cl_{sort} 3 Cl_{gen}			water 3 Cl_{sort}	both: '3 water-droplets'
(41) a.	soykoki-cokak twu gay		b.	soykoki twu cokak	
	beef-Cl_{sort} 2 Cl_{gen}			beef 2 Cl_{sort}	both: '2 beef pieces'

We thus refine our generalization stated at the beginning of 3.2.1 into the following:

(42) The Cl_{gen} needs the support of a Cl_{sort} to occur with a mass noun.

In order to account for the generalization in (42), we need to consider Doetjes's (1996) claim that numerals require the presence of a syntactic marker of countability. We showed in Section 2 that the co-occurrence of a numeral and a Cl is not sufficient to ensure the acceptability of a numeral expression. We now need to emphasize that the occurrence of a Cl, as a marker of countability, is still necessary for licensing a numeral. As pointed out by Borer (2005:115), cardinals in general do not have a dividing function, but they require a dividing structure. However, I do not adopt Doetjes (1996) and Borer's (2005) theory that all Cls are such dividing markers in Chinese, since the theory cannot explain why (39a) is not acceptable, but (39b) and (39c) are acceptable. Instead, I claim that only Cl_{sort}s are such markers, whereas *ge* is not.

Specifically, I claim that Cl_{sort}s have a DIV (division) feature, whereas the Cl_{gen} does not. This feature is developed from Borer (2005:59), for representing countability. In other words, a Cl_{sort} is a portmanteau morph that encodes both a sortal feature and a DIV feature.[7]

The claim that Cl_{sort}s have DIV features also reflects the following insights in the studies of Cls. For instance, Greenberg (1972:26) states that a Cl is an individualizer which performs the same function as a singulative affix in languages with the collective/singulative opposition. Similarly, Lyons (1977:463) states that a Cl_{sort} is "the one which individuates whatever it refers to in terms of the kind of entity that it is." (my emphasis) Doetjes (1996) also claims that Cls and number marking share the role of indicating the presence of countable units. Moreover, Borer (2005:94,101,120) states that both Cls and plural inflection have a function of dividing or portioning out mass denotation. Similar statements are found in Paris (1981:69), Iljic (1994:104), Croft (1994:147, 162), Chierchia (1998), and Cheng & Sybesma (1999:538). In these works, the mass-divider function of Cls has not been restricted to Cl_{sort}s. In this paper, we refine their description and reach the conclusion that only Cl_{sort}s are mass-dividers, whereas the Cl_{gen} *ge* is not.

The claim that Cl_{sort}s have DIV features is also supported by the following fact. In some Chinese dialects, numerals do not need a local overt head element, and thus they may be followed by an NP directly (Erbaugh 2002, Di 2008). However, Di (2008:sec.3.2) reports that such an omission of a Cl is impossible for mass nouns. We can see that it is the DIV feature of a Cl_{sort} that semantically licenses a numeral in the classifier language.

My conclusion of this section is that Cl_{sort}s have a DIV feature whereas the Cl_{gen} does not.

[7] Technically, one can adopt Borer's (2005:35) treatment of a functional head as a variable-operator dependency between an open value of a category and an operator that assigns range to the open value. Specifically here, one can claim that it is a Cl_{sort} that assigns range to $<e>_{DIV}$.

If one expects all Cls to have a DIV feature, the Cl_{gen} *ge* must be a defective one, semantically. Thus, unlike many Cl_{sort}s, *ge* not only "has no lexical semantics" (Myers 2000:187), but also seems to have no semantic functions.

At this point, we can specify the x feature mentioned in (11) as a DIV feature. Obviously, *de* and *shi* do not have a DIV feature and thus they are not able to license the numeral in (10). But this claim seems to be too strong to rule in examples such as (43), in which *ge* seems to license the numeral alone.

(43) 3 ge zhuōzi
3 Cl table
'3 tables'

Among various possibilities to account for such examples, one is that count nouns themselves have DIV features and thus *ge* here simply satisfies the requirement of a local head element for a numeral in Chinese (Section 2). Another possibility is that no noun has a DIV feature, and that *ge* is never a real licensor of a numeral and the required DIV feature comes from another source in examples like (43). We will come back to this issue after we have presented more facts of Cls.

4. The distributions of Cl_{sort}s

4.1 Against a lexical approach to the double Cl construction

In last section, we have introduced a double Cl construction, such as (44c) (= (39c)):

(44) a.	*3 ge shuǐ	b.	3 di shuǐ	c.	3 ge shuǐ-dī	
	3 Cl water		3 Cl water		3 Cl water-Cl	'3 water-droplets'

One might deny the Cl status of the post-N shape-denoting element in the double Cl construction, such as *dī* in (44c), assuming that the cluster composed of the N and the element (i.e. *shuǐ-dī*) is simply a compound, denoting a modifier-modifiee relation. The internal structure of a compound is invisible to syntax. However, I have the following arguments against this lexical approach to the double Cl construction.

First, if the post-N element in examples like (44c) is part of a lexical item, according to the Lexical Integrity principle, it should not play any role in supporting *ge*, when the noun is a mass noun. Lexical Integrity can be viewed as a barrier for syntactic dependencies between lexical-internal elements and elements in higher domains. In (45a), we see that the independent negation word *méi* licenses the existential polarity reading of the WH-element *shénme* 'what' in the first reading (Li 1992), whereas in (45b), the negative element *fǒu*, which is part of the compound *fǒu-jué* 'reject', may not license such a reading of the WH-element.[8]

[8] Note that in (i-a), the existential polarity reading of the wh-word is licensed by the epistemic verb *hǎoxiàng* 'seem', rather than the negative bound form *fǒu-*. The fact that the epistemic verb alone may license an existential polarity reading of a wh-word is seen in (i-b) (see Yu 2006:40 for a review of the relevant literature).

(i) a. Bǎoyù hǎoxiàng fǒu-jué-le shénme
Baoyu seem reject-PRF what
'Baoyu seemed to have rejected something.'

b. Bǎoyù hǎoxiàng chī-le shénme.
Baoyu seem eat-PRF what
'Baoyu seemed to have eaten something.'

(45) a. Bǎoyù méi chī shénme
Baoyu not eat what
'Baoyu did not eat anything.'
'What did Baoyu not eat?'

b. Bǎoyù fǒu-jué-le shénme
Baoyu reject-PRF what
Not: 'Baoyu rejected something.'
OK: 'What did Baoyu reject?'

The acceptability contrast between (44a) and (44c) indicates that the post-N *di* in (44c) is as visible as the pre-N *di* in (44b), in licensing *ge*, and therefore its syntactic role falsifies the lexical approach.

Second, unlike a substantial lexical element, the post-N element in examples like (44c) may not form a question. The right-part of a modifier-modifiee compound is a substantial lexical element, and its modifier can be questioned. For instance, *jú-huā* 'chrysanthemum' can be an answer to *shénme huā* 'what flower' in (46a), however, *shuǐ-dī* 'water-Cl' may not be an answer to *shénme dī* 'what Cl' in (46b).

(46) a. Ques: Nàlǐ yǒu 3 duǒ shénme huā?
there have 3 Cl what flower
'What kind of 3 flowers are there?'
Ans.: Nàlǐ yǒu 3 duǒ jú-huā.
there have 3 Cl chrysanthemum
'There are 3 chrysanthemums.'

b. Ques: *Nàlǐ yǒu 3 ge shénme dī?
there have 3 Cl what Cl
Ans.: Nàlǐ yǒu 3 ge shuǐ-dī.
there have 3 Cl water-Cl
'There are 3 water-drops.'

I conclude that although all Cls may occur between a numeral and a noun, some Cls may also follow a noun, forming an N-Cl cluster. In Section 5 we will see that the relationship between a Cl_{sort} and its associate noun is either predication or selection, rather than modification, unlike the relation between *ju* and *hua* in (46b).

4.2 Against the collective or plural approach to N-Cl clusters

In Li & Thompson (1981:82), it is claimed that N-Cl clusters always have a collective or plural reading. The collective reading claim is falsified by the fact that when such a cluster is preceded by a numeral such as *3*, the reading is not 3 groups (cf. *3 committees*); instead, the reading is simply three individuals. (44c) does not mean '3 groups of water-drops'.

Moreover, the plural reading claim is falsified by the fact that such a cluster is compatible with the numeral *1*, and the reading of the constructed nominal is not plural at all. One may say *1 ge shuǐ-dī* '1 water-Cl' to mean one single water-drop.

4.3 Double Cl constructions and their alternative constructions

We have introduced a double Cl construction, in which the Cl_{gen} precedes an N-Cl_{sort} cluster. In fact, the noun in the cluster can be either a mass noun, as in (47a), or a count noun, as in (47b):

(47) a. 3 ge shuǐ-dī
3 Cl water-Cl
'3 water drops'

b. 3 ge huā-duǒ
3 Cl flower-Cl'
'3 flowers'

A basic formal property of Cls is that they are able to occur between a numeral (#) and a noun. I label this basic word order Construction C. I label the Double Cl Construction Construction B, and a bare N-Cl cluster Construction A.

(48) Construction A. N Cl
Construction B. # ge N Cl (Double Cl Construction)

Construction C. # Cl N (basic word order)

Not all Cl_{sort}s may appear in Construction A and Construction B. I list the four possible distributional types of Cl_{sort}s in (49), and examples in (50) through (52).

(49)

Constructions ⇩ / Distributional types of Cl_{sort}s ⇨	I. Free	II. No-*ge*	III. pre-N only	IV.
A. N Cl	+	+	-	-
B. # ge N Cl	+	-	-	+
C. # Cl N	+	+	+	+
example	*lì*	*pī*	*zhī*	

I. The Free Type: such Cls may occur in all of the three constructions, e.g. *lì*:

(50) A. mǐ-lì
rice-Cl
B. 3 ge mǐ-lì
3 Cl rice-Cl
C. 3 lì mǐ
3 Cl rice

The Cls in the following instances of Construction A also belong to this type: *bù-kuài* 'cloth-Cl', *bù-tiáo* 'cloth-Cl', *miàn-tuán* 'flour-dough', *shuǐ-dī* 'water-Cl', *xiàn-tiáo* 'line-Cl', *huā-duǒ* 'flower-Cl'.

II. The no-*ge* Type: Such Cls may not occur in Construction B, e.g. *pī*:

(51) A. mǎ-pī
horse-Cl
B. *3 ge mǎ-pī
3 Cl horse-Cl
C. 3 pī mǎ
3 Cl horse

The Cls in the following instances of Construction A also belong to this type: *zhǐ-zhāng* 'paper-Cl', *chē-liàng* 'car-Cl', *chuán-zhī* 'boat-Cl', *shū-běn* 'book-Cl'.

III. The pre-N only type: Such Cls may not occur in Construction A and Construction B e.g. *dǔ*:

(52) A. *qiáng-dǔ
wall-Cl
B. *3 ge qiáng-dǔ
3 Cl wall-Cl
C. 3 dǔ qiáng
3 Cl wall

The Cls in the following instances of Construction C also belong to this type: *3 wěi yú* '3 Cl fish', *3 zhǎn dēng* '3 Cl lamp', *3 bǎ shànzi* '3 Cl fan', *3 zhī jī* '3 Cl chicken', and *3 gǔ zhēngqì* '3 Cl steam'. Cls with a modifier also belong to this group, e.g. *dà-zhāng* 'big Cl', *xiǎo-kuài* 'small Cl'.

IV. The unattested type of Cls: such Cls should be able to occur in both Construction B and Construction C, but not Construction A.

Later, after I discuss the derivations of the three constructions, I will show that the absence of this type of Cls is predicted in my theory.

It is not important which Cl_{sort} belongs to which type. The Cl_{sort} *tiáo* acts like Type I when it occurs with nouns such as *bù* 'cloth', but acts like Type III when it occurs with nouns such as *tuǐ* 'leg', *shé* 'snake', *shéngzi* 'rope'. What matters is that all Cl_{sort}s are in the range of the types.

5. The syntactic positions of numeral classifiers

5.1 Specifying and selecting Cl_{sort}s

I divide Cl_{sort}s into two functional types: specifying and selecting ones. Specifying Cls specify certain semantic property of the referent of the noun, including shape (Allen 1977) and body part (Tversky and Hemenway 1983, 1984). For instance, *tóu* is for garlic bulbs but *bàn* is for garlic cloves, as in (53). For rolls of paper, the Cl *juǎn* is used, and for pieces of paper and beds, the Cl *zhāng* is used, as in (54).

(53) a. 3 tóu suàn
3 Cl garlic
'3 garlic bulbs'

b. 3 bàn suàn
3 Cl garlic
'3 garlic cloves'

(54) a. 3 juǎn zhǐ
3 Cl paper
'3 rolls of paper'

b. 3 zhāng zhǐ
3 Cl paper
'3 pieces of paper'

c. 3 zhāng chuáng
3 Cl bed
'3 beds'

For pigs, one can use the Cl *tóu*, which shares its form with the body part noun *tóu* 'head', and for fish, one can use the Cl *wěi*, which shares its form with the noun *wěi* 'tail'.

Since an entity may have different semantic properties, which may all be specified by Cl_{sort}s, the same noun may occur with different specifying Cl_{sort}s, as seen in (53). Also, a specific characteristic may be that of an individual, as in (54c), or may individuate a mass in that way, as seen in (54a) and (54b) (see Tai 1994 and Zhang 2007 for more discussions of this type of Cls).

In contrast, selecting Cls do not specify any semantic property of the associated noun. Instead, they select certain type of nouns arbitrarily. For instance, for count nouns: *zhǎn* is for lamps, *sōu* for boats, *zhēn* for photos, *zōng* for trade transactions and legal cases, *fù* for paintings, *xí* for sets of clothes, *dòng* for houses, and to a certain degree *pī* for horses (see Tai 1994:490); and for mass nouns: *pào* is for urine and *pī* is for cloth.

The same noun may not occur with different selecting Cl_{sort}s.

(55) a. *3 sōu fēijī
3 Cl^{boat} plane

b. *3 zhǎn làzhú
3 Cl^{lamp} candle

c. *3 pī zhǐ
3 Cl^{cloth} paper

Gender markers show a similar contrast. Specifying gender markers are for nouns that do not have intrinsic gender specification (e.g. Harris 1991).

(56) le client — la cliente
ART.DEF.MASC. client — ART.DEF.FEM client

This kind of gender markers specify certain semantic property of the referent. Accordingly, the same noun root may occur with different specifying gender markers (See Alexiadou et al. 2007:242 and Aikhenvald 2003:27-28, fn. 9 for more examples).

Selecting gender markers are for nouns that have intrinsic gender specification:

(57) a. une petite ile
INDEF.FEM small island

b. *un petit ile
INDEF.MASC small island

This kind of gender markers select certain type of nouns arbitrarily rather than specifying the semantic properties of the nouns. The same noun may not occur with different selecting gender markers.

Selecting Cls are a closed set, whereas specifying ones are an open set. People have tried to classify Cl_{sort}s into various types, but they seem to be recognizing more and more types. Aikhenvald's (2003:98) claim that "Numeral classifiers can be an open lexical class" applies to the specifying type only. This is expected, since specifying Cls may come from almost any nouns. For instance, the Cl *xiàn* in (58a) comes from the noun *xiàn* 'line', and the Cl *wán* in (58b) comes from the noun *wán* 'small ball'

(58) a. 1 xiàn xīwàng
1 Cl hope

b. 1 wán lěng-yuè (He 2000:119)
1 Cl cold-moon

The open-set nature of specifying Cls means that they are productive, since the number of different forms that the category may take is not limited by virtue of linguistic rules or principles (Emonds 1987:615). Theoretically, the open set property of specifying Cls is parallel to the open set property of V1 of Serial Verb Constructions, which has been recognized as an auxiliary-like functional element in Aboh (2009). In this sense, Cl constructions can be seen as a kind of Serial Noun Constructions. Indeed, Chao (1968:584) mentions that he used to call Cls "auxiliary noun".

The contrasts between the two types of Cl_{sort}s are summarized in (59).

(59)

	Specifying Cls	Selecting Cls
Characteristics-denoting	+	-
Open-class	+	-

Note that the contrast between openness and closeness is not gradable, therefore, there is no semi-open class. However, within a certain class, it is possible that some members can occur with more types of nouns than other members of the class. For instance, the Cl *zhǎn* is for lamps only, whereas *pī* not only is used for horses and cloth but can also be extended to a large image of a dog, and even to a rising sun, in poems (xxx, p.c.).

5.2 Merging Cl_{sort}s with NPs

Specifying Cl_{sort}s are intrinsic characteristics-denoting elements. Such elements are relational terms, which must be licensed by a nominal (see de Bruin & Scha 1988, Déchaine 1993:§2.4.3.7, among others). A relational term is a predicate and its licensor is its subject (Szabolcsi 1983, Kayne 1994, Hornstein et al. 1994, Castillo 2001, Uriagereka 2008). Thus, a specifying Cl is a predicate of the noun. Accordingly, I claim that such a Cl and the noun are merged initially, expressing a predication relation. In this merger, the predicate is the head. If we assume that a Cl_{sort} is the realization of the functional head Sort, the predication-denoting projection should be a SortP. Since the Cl is a nominal functional element, this SortP can be understood as a nominalized Small Clause (Stowell 1983) or RP (den Dikken 2006).

This SortP can be directly realized by an N-Cl_{sort} cluster, as seen in (60).

(60) a. huā-duǒ
flower-Cl

b. suàn-tóu
garlic-Cl

c. qì-tuán
air-Cl

d. shí-kuài
stone-Cl

Unlike a specifying Cl, a selecting Cl does not encode any characteristics of the referent of a noun. Therefore, it is not a predicate of the associated noun. Instead, I claim, it simply

takes the noun as its complement, projecting a SortP.

Such a SortP may also be directly realized by a N-Cl_{sort} cluster, as those in (61).

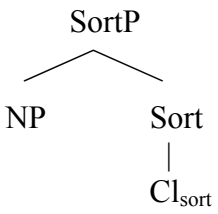
(61) a. bù-pī
cloth-Cl

b. chuán-zhī
boat-Cl

We thus have another type of SortP, which is also headed by a Cl_{sort}.

We now conclude that for both types of Cl_{sort}s, they are directly merged with nouns in their base-positions, and SortP is the structure of Construction A, introduced in 4.3.

(62)



(Construction A)

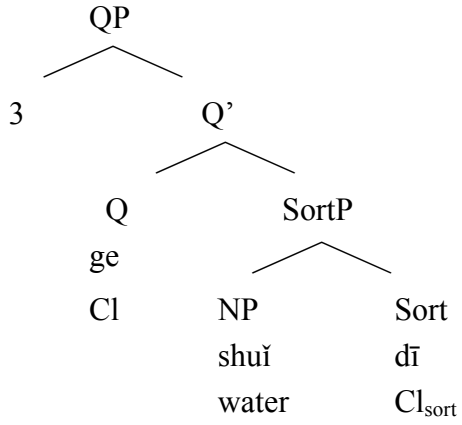
5.3 SortP as the complement of Q

In Construction B, a N-Cl cluster is preceded by *ge*, which is in turn preceded by a numeral, a double Cl construction, as in (63):

(63) 3 ge shuǐ-dī
3 Cl water-Cl
'3 water drops'

In 2.2, I claimed that a numeral is licensed by a head element and they establish a Spec-Head relation in QP. I now further claim that Q takes SortP as its complement and it can be realized by *ge*. Accordingly, the structure of the construction in (63) is (64):

(64)



(Construction B)

In this analysis, Q, as a functional head, does not have an s-selection restriction, and it is therefore able to take the predication-denoting SortP as its complement.

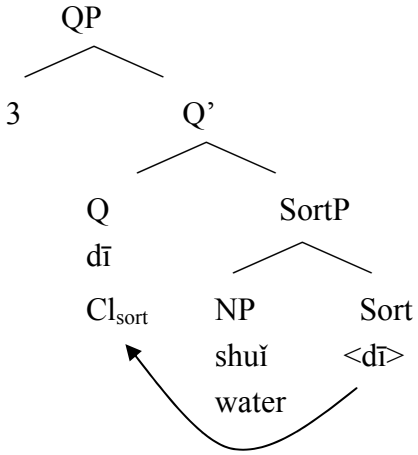
From another perspective, if QP is for counting, which needs a DIV feature, and if the Cl_{sort} is the element that has a DIV feature, Cl_{sort} must be integrated in the structure before the projection of QP. Thus the structure hierarchy in (64) is justified (Borer 2005:90, 93, 96 fn.8).

5.4 The raising of a Cl_{sort}

If the Cl_{gen} *ge* does not occur, its position is filled by a Cl_{sort}. We assume that the Cl_{sort} is raised from Sort to Q. The structure of (65a) is (65b). This is the structure of Construction C, introduced in 4.3.

(65) a. 3 dī shuǐ
3 Cl water
'3 water drops'

b. (Construction C)



The motivation of the movement correlates with the generalization that a numeral is licensed by a local overt head element in Chinese (Section 2).

In this analysis, Cl_{sort}s are consistently base-generated at Sort, and they may move to Q.[9]

5.5 The constituency of the string #-Cl-NP

Our claim that a Cl_{sort} of either type is merged with a noun in its base-position, as shown in (66a), rejects the constituency analysis in which a Cl and a numeral form a constituent, excluding a noun, as shown in (66b) (Tang 1990a, Croft 1994:151, Yang 2001, Hsieh 2008, among others).

(66) a. $[_{QP}$ # $[_{Q'}$ Cl $[_{SortP}$ NP <Cl>]] b. *[[# Cl] NP]

The plausibility of (66a) and the implausibility of (66b) can be supported by the following three facts.

First, the two types of relationship between an NP and a Cl, i.e., the predication relation and selection relation discussed in 5.1, indicate that the two elements are directly merged together, and this is represented in the SortP of (66a), but not in (66b).

Second, if the combination of a numeral and a Cl formed a constituent, the combination should be able to move. However, it cannot, as seen in (67) (cf. Hsieh 2008:112). This is unexpected from the analysis in (66b).

---

[9] A QP may also be relational. In (i-a), *tuǐ* licenses the relational term *tiáo*. In (i-b), *Bǎoyù*, as a possessor, licenses the relational term *2 tiáo tui* (I thank xxx for raising this issue to me).

(i) a. 2 tiáo [tuǐ <tiáo>]
2 Cl leg Cl
'2 legs'

b. Bǎoyù de [2 tiáo [tuǐ <tiáo>]]
Baoyu DE 2 Cl leg Cl
'Baoyu's 2 legs'

(67) *5 duǒ Akiu mǎi-le __ huā.
5 Cl Akiu buy-PRF flower

Note that both analyses may account for the immobility of the string Cl-N, as seen in (68). In the analysis in (66a), the string may not move because it is an intermediate projection, Q'; and in the analysis in (66b), the string may not move because it is not a constituent.

(68) *duǒ huā, Akiu mǎi-le 5 __.
Cl flower Akiu buy-PRF 5

Importantly, however, if a Cl_{sort} remains at its base-position, Sort, the projected SortP, which is composed of a noun and a Cl_{sort}, may move, as expected from (66a). Although the advocates of (66b) have not discussed such a N-Cl cluster (for which they were never intended, to be fair), the existence of such a constituent is not compatible with (66b).

(69) Huā-duǒ Akiu hěn xǐhuān __.
flower-Cl Akiu very like
'Flowers, Akiu likes very much.'

Third, a head element may license phrasal ellipsis in Chinese. In (70a), the null object is licensed by the overt verb *mai-le* 'buy-PRF'. Similarly, in (70b), the VP ellipsis is licensed by the overt modal *hui* 'will'. In (70c), the VP ellipsis cannot be licensed by the adverb *ye* 'also', which does not take the VP as its complement. In (70d), the VP ellipsis also cannot be licensed by the adverbial NP *jin-nian* 'this year'.

(70) a. Bǎoyù mǎi-le xīguā, Dàiyù yě mǎi-le ~~xīgu~~ā.
Baoyu buy-PRF watermelon Daiyu also buy-PRF watermelon
'Baoyu bought a watermelon, so did Daiyu.'
b. Bǎoyù huì mǎi bǎoxiǎn, Dàiyù yě huì ~~mǎi bǎoxiǎn~~.
Baoyu will buy insurance Daiyu also will buy insurance
'Baoyu will buy insurance, and Daiyu will also buy insurance.'
c. *Bǎoyù huì mǎi bǎoxiǎn, Dàiyù yě ~~huì~~ ~~mǎi bǎoxiǎn~~.
Baoyu will buy insurance Daiyu also will buy insurance
d. *Bǎoyù qù-nián mǎi-le bǎoxiǎn, Dàiyù jīn-nián ~~ye mǎi-le bǎoxiǎn~~.
Baoyu last-year buy-PRF insurance Daiyu this-year also buy-PRF insurance

The generalization drawn from the above data is that if XP is the complement of Y, the presence of Y licenses the silence of XP, whereas if XP is not the complement of Y, the presence of Y does not license the silence of XP.

From data like (71) we can see that numerals may not, whereas Cls may license phrasal ellipsis. The contrast indicates that numerals are not head elements (see Corver & Zwart 2006 and Danon 2009 for the non-head status of numerals in other languages), whereas Cls are head elements, supporting our Spec-head analysis of #-Cl strings.

(71) a. *Akiu mǎi-le 5 __.
Akiu buy-PRF 5

b. Bǎoyù mǎi-le 7 duǒ-huā, Dàiyù mǎi-le 5 duǒ ~~huā~~.
Baoyu buy-PRF 7 Cl flower Daiyu buy-PRF 5 Cl flower
'Baoyu bought 7 flowers and Daiyu bought 5.'

One might defend (66b) by the fact that the string #-Cl may occur as an answer to a question, as in (72):

(72) Ques.: Bǎoyù mǎi-le jǐ zhī bǐ? Ans.: 5 zhī.
Baoyu buy-PRF how.many Cl pen 5 Cl
'How many pens did Baoyu buy?'

However, an answer does not have to be a syntactic constituent. For example, in the dialogue *Have you read the book? I have.* The answer *I have* is not a syntactic constituent.

5.6 Cl Copying Constructions and the syntax of the extra *ge*

Unlike Cl_{sort}s, the Cl_{gen} *ge* has only one surface position: to the immediate right of a numeral. It never follows a noun and thus there is no N-Cl_{gen} cluster, as shown by (73a). Accordingly, in a double Cl construction, the positions of the two Cls are fixed: the Cl_{gen} must precede the noun and the Cl_{sort} must follow the noun.

(73) a. *píngguǒ-ge
apple-Cl

b. 3 ge shuǐ-dī
3 Cl water-Cl
'3 water-droplets'

c. *3 dī shuǐ-ge
3 Cl water-Cl

In Section 5.3, I claimed that the syntactic position of *ge* is at Q. I now further claim that this is both its surface and its base-position.

If *ge* is exclusively located at Q, it does not have the feature of Sort. This syntactic analysis is compatible with the fact that *ge* is not sensitive to the semantic classification of nouns and thus has no sortal features.

Ge may be replaced with a copy of the post-N Cl_{sort}, if there is one, and the replacement does not cause a change of meaning. The Construction B in (74a), and the Cl copy construction in (74b) are exchangeable in communication:

(74) a. 3 ge fáng-jiān
3 Cl room-Cl

⇔

b. 3 jiān fáng-jiān
3 Cl room-Cl
Both: '3 rooms'

Other Cl copying constructions such as *3 kuài shí-kuài* '3 Cl stone-Cl', *3 tiáo xiàn-tiáo* '3 Cl line-Cl', *3 duǒ huā-duǒ* '3 Cl flower-Cl', *3 piàn bōlí-piàn* '3 Cl glass-Cl', and *3 dī dà shuǐ-dī* '3 Cl big water-Cl', may also alternate with a form of Construction B.

Theoretically, in a copying X construction, if one copy of X c-commends the other copy of X, it is possible that the two copies form a movement chain, in the absence of any semantic trigger for the copying (see Quer & Vicente 2009). Then the two copies are just phonological realizations of the two occurrences of a single element that undergoes the movement. Since the upper copy can be replaced by *ge*, and *ge* is at Q, which c-commands Sort, i.e., the position of the lower copy of the Cl_{sort}, it is possible that the upper copy and the lower copy form a movement chain. Thus the derivation of a Cl copying construction is similar to that of Construction C (see (65b)).

In 5.3, I claimed that *ge* appears at Q. Since Construction B may alternate with a

construction in which the Cl_{sort} undergoes movement, *ge* in Construction B acts like a generalized PF realization of the upper link of the movement chain. In other words, it is possible that a Cl copying construction and its corresponding Construction B are syntactically derived in the same way, and they are different only in the PF form of the upper link of the movement of the Cl_{sort}. Theoretically, two different audible forms do not have to be syntactically different. This is parallel to the fact that two silent forms (e.g. trace and PRO) do not have to be syntactically the same. It is thus possible that *ge* in Construction B and the upper copy of a Cl_{sort} are syntactically the same.

This hypothesis is supported by the fact that the correlation between the two types of double Cl constructions is systematic. If a N-Cl cluster may not be preceded by *ge*, as the one that contains a Type II Cl_{sort} (4.3), no Cl copying is possible:

(75) a. *3 ge mǎ-pī ⇔ b. *3 pī mǎ-pī
3 Cl horse-Cl 3 Cl paper-Cl

Considering the existence of Cl copying constructions and their alternation with Construction B, I claim that in the presence of *ge*, a Cl_{sort} always undergoes movement from Sort to Q. *Ge* in such constructions is thus a PF variant of the upper copy of the Cl_{sort}. Then, syntactically, Construction B, the Cl copying construction, and Construction C are derived in the same way. The first two constructions are different from the last construction in their overt phonological realization of the lower link of the Cl_{sort} movement, and the first construction is different from the latter two constructions in that the phonological realization of the upper link of the movement is *ge*.

5.7 Representing the positions of various distributional types of Cl_{sort}s

We now consider the syntactic natures of the four distributional types of Cl_{sort}s listed in 4.3.

(76)

Constructions ⇩	Distributional types of Cl_{sort} ⇨	I. Free	II. No-ge	III. pre-N only	IV.
A.	$[_{SortP}$ N Cl]	+	+	-	-
B.	$[_{QP}$ # ge $[_{SortP}$ N Cl]	+	-	-	+
C.	$[_{QP}$ # Cl $[_{SortP}$ N <Cl>]	+	+	+	+
example		*lì*	*pī*	*zhī*	

Cls of Type I may either remain at Sort or move overtly to Q, and the upper link of the movement may also be realized by *ge*.

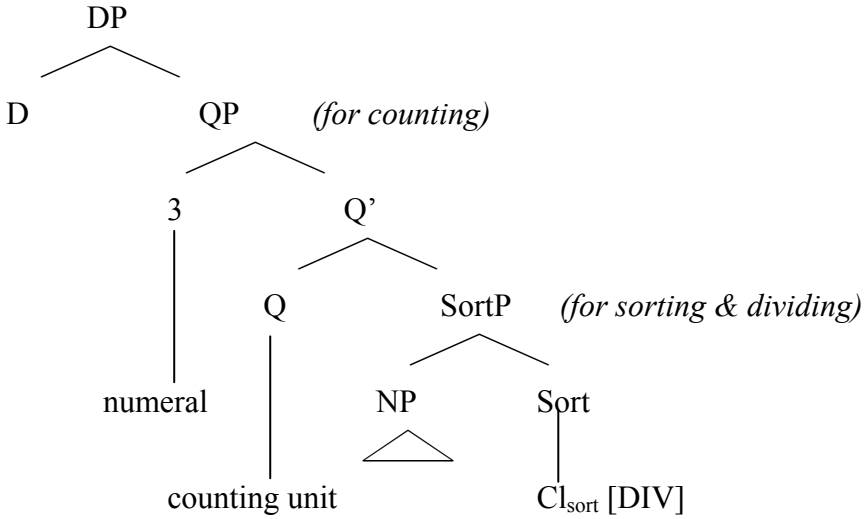
Cls of Type II may either remain at Sort or move to Q overtly, but the upper link of the movement may not be realized by *ge*.

Cls of Type III may not remain at Sort. They always move to Q, and do not allow the upper link of the movement to be realized by *ge*.

Type IV is syntactically impossible, because in our proposed structures, Construction A and Construction B are derivationally related: Construction B is derived from the same structure of Construction A, by more syntactic operations. Thus, if a Cl may not occur in Construction A, it may not occur in Construction B, either.

Summarizing, I have argued in this section that a Cl_{sort} is always merged with an NP, projecting SortP, and QP is projected above SortP, below DP. Semantically, SortP is for sorting and dividing, since a Cl_{sort} has both sortal and DIV features. The Spec of Q is realized by a numeral, and the projection of QP is for counting. I also argued that a Cl_{sort} may move from Sort to Q, and thus it may have two surface positions: either at its base-position, Sort, as the sister of NP, or at Q, after it moves there. My proposed structure is in (77):

(77)



The configuration of this structure is similar to the nominal structure proposed in Borer (2005, 2009). One difference between this structure and her structure is the label of the projection between NP and QP: it is SortP in (77), whereas it is CL^{max} in (Borer 2005) and Div^{max} in Borer (2009). Borer (2005:96 fn.8) states that "no theoretical implications are intended" for the label CL rather than DIV. In this section, I have shown that a Cl_{sort} may occur at a high or low position, and the Cl*gen* always occurs at a high position, therefore, the so-called ClP (Tang 1990b, Cheng & Sybesma 1999) does not exist.

6. The syntactic position of measure words

Measure words include standard measure unit words such as *kilo* and container measure unit words such as *box*. Yip (2008) lists three differences of the former from other related elements including container measure unit words in Mandarin Chinese. However, all three are challenged by systematic counter examples. First, he claims that standard measure unit words may not occur in the absence of an overt numeral. However, the word *jīn* 'catty' in (78a) and the word *mǔ* 'acre' in (78b) are not preceded by an overt numeral. Second, Yip claims that standard measure unit words may not follow a demonstrative immediately, however, *jīn* 'catty' follows the demonstrative *nà* 'that' in (79a). Third, Yip claims that standard measure unit words may not reduplicate, however, (79b) shows that this is not true.

(78) a. wǒ xiǎng mǎi jīn yángròu chī
I want buy catty mutton eat
'I want to buy a catty of mutton to eat.'

b. rúguǒ wǒ yǒu mǔ dì dehuà
if I have acre land if
'If I have an acre of land'

(79) a. nà jīn pingguǒ
that catty apple
'that catty of apple'

b. cùn-cùn guāngyīn
inch-inch light
'each inch of light (of time)'

Since I have not seen any syntactic differences between standard measure unit words and container measure unit words, I give them a unified analysis. Both types of measure words are seen in pseudo-partitive constructions in other languages, with or without a linking element such as *of* in English (see (32) – (34)).

Chao (1968) and Li and Thompson (1981) do not differentiate measure words from Cls. Chao (1968:584–620) refers to Cls as individual measures, and subsumes them under the general term 'measure words'. Li and Thompson (1981:106) claim that 'any measure word can be a classifier'. However, Ōta (1958 [Jiang & Xu 2003: 146]) and Zhu (1982:49, Ma

1990:29, among others) clearly distinguish Cls from measure units.

In this section, I discuss the syntactic differences between container measure words and container nouns, and the similarities and differences between measure words and the two types of Cls, i.e., Cl_{gen}s and Cl_{sort}s.

6.1 A comparison of measure words and container NPs

As we know, most of Cls are developed from nouns or verbs, and many still share forms with nouns and verbs. Similarly, container measure words share forms with container nouns. The measure word *wǎn* 'bowl' in (80a) and the container noun *wǎn* 'bowl' in (80b) have the same form.

(80) a. 3 wǎn tāng
3 bowl soup
'3 bowls of soup'

b. 3 ge wǎn
3 Cl bowl
'3 bowls'

However, container measure words, such as *wǎn* 'bowl' in (80a), are different from container NPs, such as *wǎn* 'bowl' in (80b), in syntactic properties. First, unlike container NPs, measure words may not be modified by a phrasal modifier (Tang 1990b:419). Recall that *de* typically introduces a phrasal modifier. (81) shows that the measure word *wǎn* in (81a) may not be preceded by *de*, whereas the noun *wǎn* in (81b) may be preceded by *de*.

(81) a. 3 dà (*de) wǎn tang
3 big de bowl soup
'3 bowls of soup'

b. 3 ge dà de wǎn
3 Cl big de bowl
'3 big bowls'

In my analysis, measure words are syntactic licensors of cardinal numerals, the former and the latter are in a head-Spec relation and thus no phrasal element may intervene them (Section 2).

Second, a container noun, as a lexical element, may be coordinated with another container noun, and their combination can appear in a single numeral expression, as shown in (82a); however, no two measure words may be combined to appear in a single numeral expression, as shown in (82b). Semantically, the counting of a single numeral expression makes sense for one counting unit only, rather than two counting units.

(82) a. Nàlǐ yǒu jǐ ge [wǎn gēn pánzi].
there have several Cl bowl and plate
'There are several bowls and plates.'

b. *Nàlǐ yǒu jǐ [wǎn gēn pánzi] tāng.
there have several bowl and plate soup

Third, container nouns are referential, whereas measure words as functional elements are not referential. One can ask a WH question about the properties of the referent of the former, as in (83b), whereas such a question is impossible for the latter, as seen in (84b).

(83) a. Speaker A: Wǒ mǎi-le 5 ge wǎn.
I buy-PRF 5 Cl bowl
'I bought 5 bowls.'

b. Speaker B: Dōu shì shénmeyàng de wǎn?
all be how DE bowl
'How do they look like?

(84) a. Speaker A: Wo he-le 5 wan tang. b. Speaker B: *Dou shi shenmeyang de wan?
I drink-PRF 5 bowl soup all be how DE bowl
'I ate 5 bowls of soup.'

These three arguments falsify the claim that container measure words are moved to their surface position from an NP, the same position for a container noun, proposed in Cheng & Sybesma (1998:406). For more arguments against this derivational relation, see Tang (2005).

We conclude that like Cls, measure words are functional elements, whereas container nouns are lexical elements. It is common that a certain functional item and a lexical item have the same morphological form, and the sharing of the form gives the illusion that they are syntactically identical (see Aboh 2009:30 for more clarifications of the issue). I have shown in this section that container measure words are not derivationally related to container nouns.

6.2 A comparison of measure words and the Cl_{gen}

Measure words occur at the same structural position as the Cl_{gen} *ge*. This can be shown by two facts. First, measure words never co-occur with *ge*.

(85) a. *3 ge xiāng píngguǒ b. *3 ge gōngjīn píngguǒ
3 Cl box apple 3 Cl kg apple

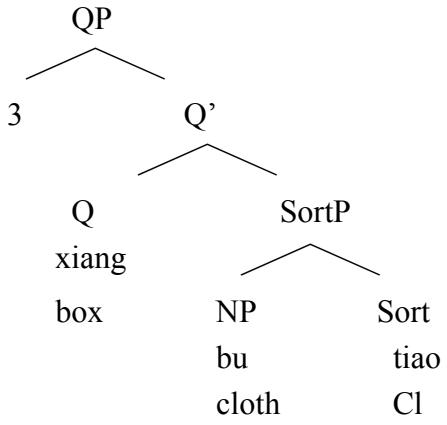
Moreover, like *ge*, measure words may also precede a N-Cl cluster (SortP in our analysis), as seen in (86).

(86) a. 3 xiāng bù-tiáo b. 3 gōngjīn bù-tiáo c. 3 chǐ bù-tiáo
3 box cloth-Cl 3 kg cloth-Cl 3 foot cloth-Cl
'3 boxes of cloth-strips' '3 kgs of cloth-strips' '3 feet of cloth-strip'

In order to account for examples like (85), Cheng & Sybesma (1998:407) claim that a measure word always moves from N to the functional head Cl, and if the latter is taken by a Cl, the former may not move. Alternatively, I claim that the Cl_{gen} and a measure word are base-generated at the same syntactic position, and that is why they may not co-occur. I have shown the syntactic differences between measure words and container nouns, and thus it is impossible for the former to be derivationally related to the latter.

In this analysis, both the Cl_{gen} and a measure word appear at Q. The structure of (85a) is (87), which is similar to the structure of Construction B in (64).

(87)



However, unlike *ge*, a measure word may not be replaced by a copy of a post-N Cl_{sort}. (88a) and (88b) have different readings.

(88) a. 3 gōngjīn shí-kuài ≠ b. 3 kuài shi-kuài
3 kg stone-Cl 3 Cl stone-Cl
'3 kgs of stones' '3 chunks of stone'

This restriction shows that measure words are not place-holders. Their readings are in contrast to those of Cl_{sort}s. Syntactically, they do not form a chain with the post-N Cl, if there is one. If measure words are base-generated at Q, in their presence, no Cl_{sort} may move to Q.

6.3 A comparison of measure words and Cl_{sort}s

6.3.1 The same compatibility with mass nouns

As pointed out by Schwarzschild (2006:69), measure words may occur with either count or mass nouns.

(89) a. 3 {gōngjīn/xiāng} zhǐ
3 kilo / box paper
'3 kilos of paper'

b. 3 {gōngjīn/xiāng} píngguǒ
3 kilo / box apple
'3 kilos of apples'

In this sense measure words are like Cl_{sort}s. In my analysis, their compatibility with mass nouns means that they have an intrinsic DIV feature (see 3.3). In Borer's (2005) terms, the compatibility means that measure words as well as Cl_{sort}s are operators that assign range to the open value of $<e>_{DIV}$.

6.3.2 Different base-positions

Syntactically, the distributions of measure words and Cl_{sort}s are different. Unlike Cl_{sort}s, measure words never follow a noun.

(90) a. bù-tiáo b. *bù-chǐ
cloth-Cl cloth-foot

This restriction on measure words means that like *ge*, measure words not only surface at Q (6.2), but also are base-generated at Q. Moreover, since a measure word and a Cl_{sort} are base-generated at different positions, they may co-occur, as seen in the examples in (86).

6.3.3 Different semantic functions and the corresponding syntactic positions

Cl_{sort}s and measure words have different semantic functions. First, measure words neither have a subject-predicate relation nor have a selection relation with the noun in the nominal. Tai & Wang (1990:38) state that "A classifier categorizes a class of nouns by picking out some salient perceptual properties, either physically or functionally based, which are permanently associated with entities named by the class of nouns; a measure word does not categorize but denotes the quantity of the entity named by a noun." Measure words are blind to the semantics of the noun. Semantically, any noun can occur with any measure word, subject to pragmatic conditions. Syntactically, in our proposed (87), the measure word is never merged with the noun, and thus the lack of interactions between the two is captured.

Second, measure words intrinsically establish counting units, containing information

about how the referent is measured (Zhu 1982:49, Tai & Wang 1990, Croft 1994:162, Cheng & Sybesma 1998:388, 2005, Aikhenvald 2003:115; 2006:466). In contrast, Cl_{sort}s are not intrinsic counting units. According to Lyons (1977:464), Cls such as *kuai* (塊) 'chunk' can be both sortal and mensural (i.e., function as a counting unit). These two functions of Cl_{sort}s are represented as their two syntactic positions in my analysis: if a Cl_{sort} moves to Q, as in Construction C (also Construction B and the Cl copying Construction, see 5.6), it has the function of a counting unit, but if it does not move to Q, as in the case it occurs with a measure word, e.g. (86) and (88a), it does not have the function of a counting unit. In this latter case, it is the measure word that is the counting unit. In (88a), for instance, the Cl_{sort} *kuài* is not a counting unit, although as a DIV holder, it still individuates the mass, or portions out the stuff (see Borer 2005:90,120). We thus reach the generalization in (91):

(91) In the presence of a measure word, no Cl is a counting unit.

Consequently, we see that different surface positions of Cl_{sort}s correspond to different semantic functions. In other words, the interpretations of a numeral expression are decided by the syntactic context (see Borer 2005:16 for a general theory along this line). In Mandarin Chinese, if and only if an element has a Spec-Head relation with a numeral in QP, the element may be interpreted as a counting unit.

Technically, following Borer (2005:ch. 2), we assume that QP is the locus of counting. Q is headed by an open value, call it $<e>_q$. A measure word is an f-morph, which assigns range to $<e>_q$ directly. However, $<e>_q$ may also be assigned range by a head feature, necessitating the head movement of a Cl_{sort} from Sort to Q. The distinct structures are the result of these distinct modes of range assignment.

In this analysis, the same Cl_{sort} may have different semantic functions depending on its syntactic positions. Parallel situation can be seen in the specific and non-specific indefinite readings of numerals in English. According to Borer (2005:145), when a numeral remains in #P (= QP in this paper), it does not have a specific reading; but when it moves to DP, it has a specific reading.

Summarizing, I have shown that a measure word and the Cl_{gen} *ge* always occur at Q, whereas a Cl_{sort} may either remains at Sort, surfacing to the right of a noun, or moves to Q, surfacing to the left of a noun. This conclusion is different from that of Cheng & Sybesma (1998:406). The table in (107) highlights the contrast in the types of elements that move and the types of elements that remain in situ, in the two analyses.

(92)	This analysis	Cheng & Sybesma (1998:406)
measure word	Stay at Q	Move from N to the head of ClP
the Cl_{gen}		Stay at the head of ClP
Cl_{sort}s	may move from Sort to Q	

If measure words have intrinsic DIV features and are base-generated at Q, while Cl_{sort}s also have DIV features but are base-generated at Sort, there is no unique syntactic position for DIV features. What is important is that a numeral, which is at Spec of QP, c-commands a DIV feature-holder.

7. Other structures of nominals

7.1 Configurational Cls and SortP recursion

Specifying Cl_{sort}s include not only individual-level Cls such as *tiáo* and *tóu* but also Cls such as *duī* 'pile', *dié* 'pile, stack', *zǔ* 'group', *qún* 'crowd', *tào* 'set'. The non-individual Cls are called collective Cls in Ōta (1958:sec.14.1) and Zhu (1982:49), set-level Cls in (Yang

2001:102), and configurational Cls in Grinevald (2003:97). Configurational Cls are also relational terms. They may occur in all of the three constructions, patterning with Type I Cl_{sort}s:

(93) A. tǔ-duī
earth-Cl^{pile}
B. 3 ge tǔ-duī
3 Cl earth-Cl^{pile}
C. 3 duī tǔ
3 Cl^{pile} earth All: '3 piles of earth'

A. yáng-qún
sheep-Cl^{crowd}
B. 3 ge yáng-qún
3 Cl sheep-Cl^{crowd}
C. 3 qún yáng
3 Cl^{crowd} sheep All: '3 crowds of sheep'

Moreover, like other Cl_{sort}s, they may also occur in a Cl copying construction:

(94) 3 qún yang-qún
3 Cl^{crowd} sheep-Cl^{crowd}
'3 crowds of sheep'

However, unlike other specifying Cl_{sort}s, a configurational Cl may co-occur with another Cl_{sort}, as seen in (95) (I thank xxx for bringing my attention to such examples). Moreover, a configurational Cl may also occur with both *ge* and another Cl_{sort}, creating a triple Cl construction, as seen in (96b) (Googled):

(95) a. 3 duī mǐ-lì
3 Cl^{pile} rice-Cl
'3 piles of rice'
b. 3 duī miàn-tuán
3 Cl^{pile} flour-Cl
'3 piles of dough chunks'
c. 3 duī pingguǒ-piàn
3 Cl^{pile} apple-Cl
'3 piles of apple slices'

(96) a. 3 duī suì bù-tiáo
3 Cl^{pile} broken cloth-Cl
'3 piles of broken cloth-strips'
⇔
b. 3 ge suì bù-tiáo-duī
3 Cl broken cloth-Cl-Cl^{pile}

We can see that in the examples in (93), the configurational Cl *duī* 'pile' denotes certain characteristics of the referent of the noun. It describes *tǔ* 'earth' in (93A). In contrast, in the examples in (95), the configurational Cl denotes certain characteristics of the referent of the cluster composed of the noun and the Cl_{sort}. For instance, *duī* 'pile' describes *miàn-tuán* 'flour-dough' in (95b). In *miàn-tuán,* the Cl_{sort} has already specified the shape of the flour-dough. Thus there are two-levels of predication. Accordingly, I propose the following major derivation steps for (95b).

(97) Step 1: build [$_{SortP2}$ [$_{SortP1}$ miàn-tuán] duī]
Step 2: move *duī* to Q and then merge 3: [$_{QP}$ 3 duī [$_{SortP2}$ [$_{SortP1}$ miàn-tuán] <duī>]]

The output of Step 1 is the structure of Construction A, the word order of which is the same as that of the string after *ge* in (96b). The output of Step 2 is the structure of Construction C.

Since the hierarchy of the predication is fixed, i.e., the shape-specification is embedded in the configuration-specification, the word order is also fixed. Therefore, it is impossible to generate the following unacceptable forms:

(98) a. *3 lì mǐ-duī
3 Cl rice-Cl^{pile}
b. *3 tuán miàn-duī
3 Cl flour-Cl^{pile}

7.2 Nominals without SortP or QP

We have proposed the following basic structure for a numeral-containing nominal in Chinese,

in which the recursive SortP (marked by SortP*) is for sorting and dividing, and QP is for counting.

(99) [$_{DP}$ [$_{QP}$ [$_{SortP*}$ NP Sort]]]

In addition to this full-fledged structure, nominals may also exist in other simpler structures. In the absence of a Cl_{sort}, (100a) encodes counting but not sorting, and the intrinsic DIV feature of the measure word *xiāng* 'box' makes the counting possible. In the absence of a numeral, (100b) encodes sorting and dividing, but not counting. Without a counting structure (i.e. QP), data like (100b) are parallel to bare plurals in English, in the sense of Borer (2005:96). Finally, in the absence of a Cl and a numeral, (100c) encodes neither counting nor sorting. Without a dividing structure (i.e. SortP), data like (100c) are interpreted as mass nominals in Borer (2005:96, 2009:1) and Cowper & Hall (2009:3).

(100) a. [$_{DP}$ [$_{QP}$ [$_{NP}$ NP]]] e.g. Lùlù kànjiàn-le [3 xiāng bù].
Lulu see-PRF 3 box cloth
'Lulu saw 3 boxes of cloth.'

b. [$_{DP}$ [$_{SortP}$ [$_{NP}$ NP]]] e.g. Lùlù kànjiàn-le [bù-tiáo].
Lulu see-PRF cloth-strip
'Lulu saw the cloth-strips'

c. [$_{DP}$ [$_{NP}$ NP]] e.g. Lùlù kànjiàn-le {bù/shuǐ/rén}
Lulu see-PRF cloth/water/person
'Lulu saw the cloth/water/person(s).'

We conclude that not all DPs have QP and SortP (see Borer 2005:96, 2009 for a similar conclusion).

7.3 Kind Cls and DP embedding

In addition to Cl_{sort}s and Cl_{gen}s, one more type of Cls is kind-Cls (Cl_{kind}s), such as *zhǒng* 'kind' (Huang & Ahrens 2003). Cl_{kind}s share several properties with measure words. First, like measure words and the Cl_{gen}, Cl_{kind}s are not sensitive to the semantics of the noun (e.g., it occurs with the umbrella-denoting noun in (101a), and the soup-denoting noun in (101b)), and may be followed by a N-Cl cluster, such as *mù-kuài* 'wood-Cl' in (102a). Second, like measure words and unlike the Cl_{gen}, Cl_{kind}s may occur with both mass and count nouns ((101a) and (101b)). Third, like measure words and unlike the Cl_{gen}, Cl_{kind}s may not be alternated with a Cl copying construction ((102a) and (102b) have different interpretations). Fourth, like measure words and unlike Cl_{sort}s, a Cl_{kind} may not be replaced by the Cl_{gen}, as seen in the different readings of (102a) and (102c).

(101) a. 3 zhǒng yǔsǎn
3 kind umbrella
'3 kinds of umbrellas'

b. 3 zhǒng tāng
3 kind soup
'3 kinds of soup'

(102) a. 5 zhǒng mù-kuài ≠ b. 5 kuài mù-kuài c. 5 ge mù-kuài
5 kind wood-Cl 5 Cl wood-Cl 5 Cl wood-Cl
'5 kinds of wood chunks' '5 wood chunks' '5 wood chunks'

All of these facts show that Cl_{kind}s act like measure words syntactically, and thus they should be base-generated at Q, acting as intrinsic counting units.

Constructions containing a Cl_{kind} and another Cl or measure word, as seen in (103), have been studied by Liao (2008):

(103) a. Bǎoyù mǎi-le [6 bǎ nà 3 zhǒng yǔsǎn].
Baoyu buy-PRF 6 Cl that 3 kind umbrella
'Baoyu bought 6 umbrellas of those three kinds.'
b. Lǐsì gòng hē-le 3 wǎn zhè 2 zhǒng tāng.
Lisi totally drink-PRF 3 bowl this two kind soup
'Lisi totally drank three bowls of soup of the two different kinds.'
c. Bǎoyù mǎi-le [60 kg nà 3 zhǒng mù-kuài].
Baoyu buy-PRF 60 kg that 3 kind wood-Cl
'Baoyu bought 60 kgs of wood chunks of those three kinds.'

Liao (2008) presents a semantic study to explain why in such constructions, the Cl_{kind} must be at a lower position than the other Cl (or measure word) and why the Cl_{kind} must take a demonstrative.

To represent Liao's two observations syntactically, I propose DP embedding structures for such constructions. Specifically, I propose that in (103a), the Cl_{sort} *bǎ* is a realization of Sort, and this Sort is merged with a DP to its left, and the DP has its own internal QP. *Ba* as a Cl_{sort} of Type III has to move to Q (see 4.3 and 5.4). The structure of the bracketed part of (2a) is (2b):

(104) a. Bǎoyù mǎi-le [6 bǎ nà 3 zhǒng yǔsǎn].
Baoyu buy-PRF 6 Cl that 3 kind umbrella
b. $[_{DP2}\ [_{QP2}$ 6 bǎ $[_{SortP}$ **[**$_{DP1}$ nà $[_{QP1}$ 3 zhǒng $[_{NP}$ yǔsǎn]]**]** <bǎ>]]]

In (103b), where the first counting unit *wǎn* 'bow' is a measure word, I propose that the measure word is the realization of Q, and this Q is merged with a DP to its right, and the DP has its own internal QP. The structure of the bracketed part of (105a) is (105b):

(105) a. Lǐsì gòng hē-le [3 wǎn zhè 2 zhǒng tāng].
Lisi totally drink-PRF 3 bowl this two kind soup
b. $[_{DP2}\ [_{QP2}$ 3 wǎn **[**$_{DP1}$ zhè $[_{QP1}$ 2 zhǒng $[_{NP}$ tāng]]**]**]].

As for (103c), where the first counting unit is the measure word *kg*, I propose that *kg* is the realization of Q, and this Q is merged with a DP to its right, and the DP has its own internal QP and SortP. The structure of the bracketed part of (106a) is (106b):

(106) a. Bǎoyù mǎi-le [60 kg nà 3 zhǒng mù-kuài].
Baoyu buy-PRF 60 kg that 3 kind wood-Cl
b. $[_{DP2}\ [_{QP2}$ 60 kg **[**$_{DP1}$ nà $[_{QP1}$ 3 zhǒng $[_{SortP}$ $[_{NP}$ mù] kuài]]**]**]].

8. Conclusions and discussion

8.1 Conclusions

Major contributions of this study are the following.

First, we have clarified that a cardinal numeral is syntactically licensed by an adjacent head element in Mandarin Chinese, and is semantically licensed by an element that has a DIV feature, cross-linguistically.

Second, not all types of Cls exhibit all of the three semantic functions, i.e., the functions of a noun-sorter, mass-divider, and counting unit. (107) is a summary.

(107)

	noun-sorter	mass-divider	counting unit
Cl_{sort}	+	+	+ (raised)/ - (in situ)
Cl_{gen}	-	-	+
Cl_{kind}	-	+	+
Measure word	-	+	+

Third, measure words and Cl_{kind}s are base-generated at Q, Cl_{sort}s are base-generated in the complement of Q, and the Cl_{gen}, when it occurs with a Cl_{sort}, is a place-holder of Q (We will discuss the construction in which the Cl_{gen} is the only Cl in 8.2). Therefore, it is not true that all types of Cls occur in the same syntactic position (e.g. heading the so-called ClP, as proposed in Tang 1990b, Borer 2005, among others).

Fourth, Cl_{sort}s may move, and thus they have two surface positions. This movement derives the basic word order #-Cl-N, the order #-*ge*-N-Cl, and the Cl copying construction, and the landing site of the movement is the syntactic position for a Cl_{sort} to exhibit its counting unit function.

8.2 Discussion

In the literature of Cls, it has been claimed that there is no distinction between mass and count nouns in Chinese, or, all nouns in Chinese are mass nouns by default (e.g. Graham 1989, Krifka 1995, Chierchia 1998). Borer (2005, 2009) and Pelletier (2009) claim that universally, the mass-count contrast is at a level of functional projection (e.g. DP), rather than the level of nouns themselves.

How is the contrast between mass and count nominals represented in Chinese?

It is clear that Chinese does not have the English type of plural markers. Moreover, there is no Chinese counterpart of the contrast between count determiners or quantifiers such as *many, these* and mass ones such as *much*. The word *hěnduō* 'a lot' and the demonstratives *zhèxiē* 'this amount' and *nàxiē* 'that amount' occur with both count and mass nouns:[10]

(108) a. zhèxiē shuǐ
this.amount water
'this-amount of water'

b. hěnduō shuǐ
a.lot water
'a lot of water'

(109) a. zhèxiē pútáo
this.amount grape
'this-amount of grapes'

b. hěnduō pútáo
a.lot grape
'a lot of grapes'

(110) a. zhèxiē xīguā
this.amount watermelon
'this-amount of watermelons'
'this amount of watermelon stuff'

b. hěnduō xīguā
a.lot watermelon
'many watermelons'
'much of watermelon stuff'

These elements introduce a plural reading for nouns that denote small entities such as grapes, as seen in (109), but they also introduce a mass reading for nouns that denote big entities such as watermelon, a grinder coercive reading (Pelletier 1975), as seen in the second reading of (110a) and (110b). If part of a watermelon is cut into pieces or mashed, or if there

[10] Similarly, in Japanese, another Cl language, *takusan* means both 'many' and 'much' (Iida 1998:4).

is a combination of several watermelons and some pieces of watermelon, (110a) and (110b) are still acceptable.

In 2.1 we showed that syntactically, unlike numerals, indefinite quantifiers do not require an adjacent head element. The examples in (108) through (110) indicate that semantically, unlike numerals, they do not require the presence of a DIV feature-holder, either, since there is neither a Cl nor a measure word.[11]

The vagueness of the distinction between mass and count reading of the nominals in (110a) and (110b), and their difference from (109a) and (109b), i.e., the difference in the size of the encoded entities, indicate that the distinction here is not syntactic. Instead, it is discourse-linked. The nominals in (108) through (110) are DPs. We can see that even at the level of DP, the mass-count contrast can be underspecified in Chinese.

Moreover, like English nouns, Chinese nouns also exhibit flexibility between mass and count readings. For instance, the word *chicken* has a count reading in (111a), but a mass reading in (111b) (Grinder Coercion, Pelletier 1975). Similarly, the word *píngguǒ* 'apple' has both a count and a mass reading in (112).

(111) a. There {is a chicken/are chickens} in the yard.
b. There is chicken in the soup.

(112) Lùlù chī-le 3 wǎn píngguǒ
Lulu eat-PRF 3 bowl apple
'Lulu ate 3 bowls of apples' (count)
'Lulu ate 3 bowls of apple stuff (slices, chunks, mash)' (mass)

How, then, can we make a distinction between count and mass readings in Chinese syntactically? There might be two ways to do so.

First, like in English (Bunt 1985:199), mass nouns in Chinese may not be directly modified by a size adjective, because of the unbounded nature of the encoded referent.[12]

(113) There is some {*small/*large} water on the floor.

(114) a. *3 wǎn dà shuǐ
3 bowl big water
b. *3 gǔ dà zhēngqì
3 Cl big steam

(115) a. 3 běn dà shū
3 Cl big book
b. 3 zhāng dà dìtú
3 Cl big map

Second, like diminutive affixes in Germanic languages (Wiltschko 2005), the diminutive suffix *–zi* in Mandarin Chinese never occurs in mass nouns (Cheng 2009).

(116) a. *shuǐ-zi
water-DIM
b. bēi-zi
cup-DIM

However, one might think these two criteria are semantic rather than syntactic. For the size adjective criterion, the unacceptability of (114) can be parallel to that of **tender water*, which is not a syntactic issue. As for the diminutive criterion, the unacceptability of (116a) can be parallel to that of **wēndù-zi* 'temperature-DIM', which is not a syntactic issue, either. If we have no way to see the size of an entity, how can we use a size adjective or diminutive

[11] Examples like (108) make us reject the plural Cl analysis of *xiē* proposed by Cheng & Sybesma (1999:536, 2005:sec. 3.1.3). See Borer (2005:96 fn.9) for more arguments against the Cl status of *xiē*.

[12] Although mass nouns may not be modified directly by a size adjective, the Cl to their left may be modified by a size adjective, as seen in (38a).

formative at all? So one can still claim that there is no syntactic difference between count and mass nouns in Chinese.

Now it is time to consider the implication of the sensitivity of *ge* to the mass-count contrast, introduced in 3.2. We have shown that Cl_{sort}s have a DIV feature, which individuates mass, whereas *ge* does not have this feature (3.3). Let us think about two hypotheses and see the implication of the distributions of *ge* to the issue.

Hypothesis A: Chinese nouns do have an intrinsic distinction between mass and count nouns. Accordingly, count nouns have an intrinsic DIV feature, whereas mass nouns do not have a DIV feature. In (117a), it is the DIV feature of the count noun *píngguǒ* 'apple' that licenses the numeral. In (117b), it is the DIV feature of the Cl_{sort} *dī* that licenses the numeral. In (117c), neither the Cl_{gen} nor the mass noun *yóu* 'oil' has a DIV feature, therefore the numeral is not licensed there.

(117)	a.	3 ge píngguǒ	b.	3 ge yóu-dī	c.	*3 ge yóu
		3 Cl apple		3 Cl oil-Cl		3 Cl oil

Now consider (118). If *pútáo* 'grape' is a count noun in both (118a) and (118b), it has a DIV feature. The numeral in each of the examples can be licensed by the DIV feature directly. What is the function of the DIV feature of the Cl_{sort} *lì* then? One answer could be that the feature is redundant. But the Cl_{sort} has other functions in the examples, which are not redundant. In both examples, the Cl_{sort} describes the shape of grapes. In addition, in (118a), the $Cl_{sort,}$ as a head element, moves from Sort to Q, to license the numeral syntactically.

(118)	a.	3 li pútáo	b.	3 ge pútáo-lì
		3 Cl grape		3 Cl grape-Cl

However, if nouns such as *xīguā* 'watermelon' and *píngguǒ* 'apple' intrinsically have a DIV feature and are thus count nouns, why may they have a mass reading in (110) and (112) at all?

Hypothesis B: all nouns in Mandarin Chinese have a mass reading by default (Graham 1989, Krifka 1995, Chierchia 1998, Borer 2005, 2009). Under this hypothesis, it is possible that when *ge* is the only Cl in the construction, there is another way to obtain a DIV feature.

First consider the possibility that there might be an implicit Cl_{sort}, and it is this Cl_{sort} that individuates the noun. Since all nouns in Chinese are mass nouns, when they occur with a numeral, it is either the explicit or implicit Cl_{sort} that individuates them. Then the question is if (117a) has an implicit Cl_{sort}, parallel to the post-N Cl_{sort} *dī* in (117b), so that *píngguǒ* may occur with the numeral, why may (117c) not have an implicit Cl_{sort}, if both *píngguǒ* 'apple' and *yóu* 'oil' are mass nouns?

Alternatively, it is possible that the implicit DIV-carrying element for a *ge* construction such as (117a) is not syntactic. Recall that *ge* may form a chain with another Cl, as in (117b) (5.6), and may also be a proform of a discourse-defined measure word (3.2.2). In both cases, *ge* is linked to something else that has a DIV feature. In the absence of any DIV-carrying element, as in (117a), it is possible for *ge* to be linked to a DIV feature explicit in the discourse. An apple has its intrinsic natural shape. It is this natural shape that separates one apple from another, and thus a DIV feature is available pragmatically. In contrast, oil has no natural shape for any intrinsic division, and thus there is no DIV feature available pragmatically. If a DIV feature is available pragmatically, *ge* may be discourse-linked to the feature. Just like a pro may be linked to a discourse-defined antecedent in East Asian languages, *ge* may be linked to a discourse-defined DIV feature, and thus is able to license the numeral in examples like (117a). Just like a discourse-licensed pro may not occur out of blue,

ge may not occur in examples like (117c), in which no pragmatic DIV feature is available (see Borer 2005:37-38 for a theory of range assignment to an open value via a discourse-operator) (I thank xxx for urging me to try this approach).

In the presence of a DIV-carrying element syntactically, such as the measure word *wǎn* 'bowl' in (119a) (= (112)) and the Cl_{sort} *piàn-piàn* in (119b), no pragmatic DIV feature is active. In (119a), it is the measure word that divides the entity expressed by *píngguǒ* 'apple': what is encoded is simply three bowls of apple(s), and the noun *píngguǒ* is not specified with either an individual or a stuff reading. In (119b), it is the Cl_{sort} *piàn-piàn* that divides the entity expressed by *xīguā* 'watermelon' into slices, and thus the natural division between one watermelon from another watermelon is ignored.

(119) a.	3 wǎn píngguǒ	b.	piàn-piàn xīguā
	3 bowl apple		Cl-Cl watermelon
	'3 bowls of apple(s)'		'each slice of watermelon'

Moreover, in the absence of a DIV feature, as in examples such as (109) and (110), we also find that the nominal is not specified with either an individual or a stuff reading.

Our discourse-linking analysis of *ge* also applies to expressions of eventualities, discussion in 3.2.1.

As for the syntactic position of the discourse-linked *ge*, I claim that it is always Q. Unlike Cl_{sort}s, *ge* neither has a predication relation with nor selects a noun. Therefore, it is not merged with a noun. As a head element at Q, *ge* licenses a numeral syntactically.

References

Aboh, Enoch Gladé. 2009. Clause Structure and Verb Series. *Linguistic Inquiry* 40: 1-33.

Aikhenvald, A. 2003. Classifiers: a typology of noun categorization devices. Oxford University Press.

Aikhenvald, A. 2006. Classifiers and noun classes: semantics. *Encyclopaedia of Language and Linguistics*, 2nd ed. K. Brown (ed.) Elsevier: Oxford, 463-470.

Alexiadou, et al. 2007. *Noun Phrase in the Generative Perspective*. Mouton de Gruyter, Berlin.

Allan, Keith. 1977. Classifiers. *Language* 53: 285-311.

Au Yeung, Wai Hoo. 2005. An interface program for parameterization of classifiers in Chinese. Doctoral dissertation, The Hong Kong University of Science and Technology.

Borer, Hagit. 2005. *In Name Only*. Oxford University Press.

Borer, Hagit. 2009. Syntax for Kinds? Paper presented at Mass/Count Workshop, University of Toronto, Feb. 7-8, 2009.

Bruin, Jos de, & Remko Scha. 1988. The interpretation of relational nouns. *Proceedings of the 26th Annual Meeting of the Association for Computational Linguistics*, 25-32. Buffalo: State University of New York.

Bunt, H.C. 1985. Mass Terms and Model-Theoretic Semantics. Cambridge: Cambridge University Press.

Castillo, Juan Carlos. 2001. *Thematic Relations between Nouns*. College Park: University of Maryland dissertation.

Chao, Y.R. 1968. *A grammar of spoken Chinese*. University of California Press, Berkeley.

Cheng, L.-S. & R. Sybesma. 1998. Yi-wan tang, yi-ge tang: classifiers and massifiers. *Tsing-Hua Journal of Chinese Studies* 28 (3): 385-412.

Cheng, L. & R. Sybesma. 1999. Bare and not so bare nouns and the structure of NP. *Linguistic Inquiry* 30 (4): 509-542.

Cheng, L. & R. Sybesma. 2005. Classifiers in four varieties of Chinese. In G. Cinque & R. Kayne (eds) *Handbook of Comparative Syntax*, 259-292. Oxford University Press.

Chierchia, G. 1998. Plurality of mass nouns and the notion of semantic parameter, in S. Rothstein (ed.) *Events and Grammar*, Dordrecht: Kluwer, 53-103.

Chomsky, Noam 2000. Minimalist inquiries: The framework, in Roger Martin, David Michaels, and Juan Uriagereka (eds.), *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*, Cambridge, MA: MIT Press, 89-155.

Corver, N. & J. Zwarts. 2006. Prepositional Numerals. *Lingua* 116(6): 811-835.

Cowper, Elizabeth & Daniel Currie Hall. 2009. Aspects of individuation. Paper presented at Mass/Count Workshop, University of Toronto, Feb. 7-8, 2009.

Croft, William. 1994. Semantic universals in classifier systems. *Word* 45: 145-171.

Danon, Gabi. 2009. Grammatical number in numeral-noun constructions. 19th Colloquium on Generative Grammar, Vitoria-Gasteiz, Spain, April 1-3, 2009.

Déchaine, Rose-Marie A. 1993. *Predicates Across Categories: Towards a Categoryneutral Syntax*. Amherst: University of Massachusetts.

Di, Xuan. 2008. Demonstratives, Numerals and Colour Terms in (Beijing) Mandarin. Selected Papers from the 2006 Cyprus Syntax Fest. *LingBuzz*/000609.

Dikken, Marcel den. 2006. *Relators and Linkers: The Syntax of Predication, Predicate Inversion and Copulas*. Cambridge: MIT Press.

Dixon, Robert M. W. 1986. Noun classes and noun classification in typological perspective. In Colett Craig (ed.), *Noun classes and categorization*. Amsterdam: John Benjamins. 105-12.

Doetjes, J. 1996. Mass and count: syntax or semantics? *Proceedings of Meaning on the HIL.* 34-52.

Emonds, Joseph. 1987. The invisible category principle. *Linguistic Inquiry* 18: 613-632.

Erbaugh, Mary S. 1986. Taking Stock: The Development of Chinese Noun Classifiers Historically and in Young Children, in Craig (ed.) *Noun Classes and Categorization: Proceedings of a Symposium on Categorization and Noun Classification. Eugene, Oregon, October 1983*. Amsterdam: John Benjamins, 399-436.

Erbaugh, Mary S. 2002. Classifiers are for specification: Complementary functions for sortal and general classifiers in Cantonese and Mandarin. *Cahiers de Linguistique - Asie Orientale* 31 (1): 33-69.

Graham, A. C. 1989. Disputers of the Tao. Open Court, La Salle, Ill.

Greenberg, Joseph. 1972. Numeral classifiers and substantival number: Problems in the genesis of a linguistic type. *Working Papers on Language Universals* 9: 2-39.

Grimm, Scott. 2009. Number Marking and Individuation: a View from Dagaare. Paper presented at Mass/Count Workshop, University of Toronto, Feb. 7-8, 2009.

Grinevald, C. 2003. Classifier systems in the context of typology of nominal classification. K. Emmorey (ed.) Perspectives on classifier constructions in sign languages. LEA., London. 91-109.

Harris, J. 1991. The exponence of gender in Spanish. *Linguistic Inquiry* 22: 27-62.

He, Jie. 2000. *Xiàndài hànyǔ liàngcí yánjiù* [A study of classifiers in modern Chinese]. Minzu

Press, Beijing.

Hornstein, N., S. Rosen and J. Uriagereka. 1994. Integrals. *University of Maryland Working Papers in Linguistics* 2:70-90.

Hsieh, M.L. 2008. *The internal structure of noun phrases in Chinese*. Crane Publishing Co., LTD.

Huang, Chu-Ren. 1989. *Mandarin Chinese NP de -A Comparative Study of Current Grammatical Theories*. Nankang, Taipei (PhD thesis, Cornell University 1987).

Huang, Chu-Ren & Kathleen Ahrens. 2003. Individuals, kinds and events. *Language Sciences* 25 (4): 353-373.

Iida, Takashi. 1998. Professor Quine on Japanese Classifiers. *The Annals of the Japan Association for Philosophy of Science*. Vol. 9, No. 3: 111-118.

Iljic. Robert. 1994. Quantification in Mandarin Chinese: Two markers of plurality. *Linguistics* 32: 91-116.

Kayne, Richard S. 1994. *The Antisymmetry of Syntax*. Cambridge: MIT Press.

Krifka, M. 1995. Common nouns: a contrastive analysis of Chinese and English, in G.N. Carlson & F. J. Pelletier (eds.), *The Generic Book*, Chicago University Press 1995, 398-411.

Li, C.N. and S.A. Thompson. 1981. *Mandarin Chinese. A functional reference grammar*. University of California Press, Berkeley.

Li, Yen-Hui Audrey. 1992. Indefinite wh in Chinese. *Journal of East Asian Linguistics* 1: 125-156.

Li, Yen-Hui Audrey. 2007. Rclativization and Conjunction. Ms. USC.

Liao, Wei-wen Roger. 2008. Multiple Classifiers Construction and Nominal Expressions in Chinese. To appear in NELS 39.

Lin, Jo-wang & Niina Zhang. 2006. The Syntax of the Non-Referential TA 'it' in Mandarin Chinese. *Language and Linguistics* 7 (4): 991-1016.

Liu, S.-R. 1965. Wei-Jin-Nanbei-chao liangci yanjiu [A study of the classifiers in the dynasties of Wei-Jin-Nanbei]. Zhonghua Shuju.

Lü, Shuxiang. 1983. *Lü Shuxiang Lunwenji* [Lü Shuxiang's Works], Shangwu Press.

Lyons, J. 1977. *Semantics*. Vol. 2. Cambridge: Cambridge University Press.

Massam, D. 2008. Quantity in Niuean: a mixed classifier/number language. Paper presented at the conference of the Past Meets the Present: A Dialogue Between Historical Linguistics and Theoretical Linguistics, Taipei, July 14-16, 2008.

Ma, Qingzhu. 1990. Shuci, Liangci de Yuyi Chengfen he Shuliang Jiegou de Yufa Gongneng [The semantic elements of numerals and classifiers and grammatical functions of numeral-classifier constructions], *Zhongguo Yuwen* 1990 (3), 161-173.

Myers, J. 2000. Rules vs. analogy in Mandarin classifier selection. *Language and Linguistics, 1* (2), 187-209.

Ōta, Tatsuo. 1958. *Chūgokugo rekishi bunpo* [A historical grammar of modern Chinese], [Chinese translation by S. Jiang and C. Xu, *zhōngguóyǔ lìshǐ wénfǎ*, 2003. Beijing University Press: Beijing].

Paris, Marie-Claude. 1981. *Problèmes de syntaxe et de sémantique en linguistique Chinoise*. Collège de France, Paris.

Pelletier, Jeff. 2009. Some Old Things and New Stuff about Mass and Count Terms. Paper presented at Mass/Count Workshop, University of Toronto, Feb. 7-8, 2009.

Quer, J. & L. Vicente. Semantically triggered verb doubling in Spanish unconditionals. 19th Colloquium on Generative Grammar, Vitoria-Gasteiz, Spain, April 1-3, 2009.

Ritchie, W. C. 1971. On the analys1s of surface nouns. *Papers in Linguistics* 4 1-16.

Ritter, E. 1991. Two functional categories in Noun Phrases: evidence from Modern Hebrew. *Perspectives on Phrase Structure*. (ed.) Susan Rothstein (Syntax and Semantics 25). New York: Academic Press. 37-62.

Ritter, E. 1993. Where's Gender? *Linguistic Inquiry* 24: 795-803.

Sato, Yosake. 2009. Radical underspecification, general number, and nominal denotation in Indonesian: an exo-skeletal approach. Ms. University of British Columbia.

Schwarzschild, Roger. 2006. The role of dimensions in the syntax of noun phrases. *Syntax* 9: 67-110.

Senft, Gunter. 2000. *Systems of nominal classification*. Cambridge University Press.

Stowell, T. 1983. Subjects across categories, *The Linguistic Review* 2:285-312.

Szabolcsi, Anna. 1983. The possessor that ran away from home. *The Linguistic Review* 3: 89-102.

Tai, James H-Y. 1994. Chinese Classifier Systems and Human Categorization. *In Honor of Professor William S-Y. Wang: Interdisciplinary Studies on Language and Language Change*, Matthew Chen and Ovid Tseng, eds. Pyramid Publishing Company, 479-494.

Tai, J. and L.Q. Wang. 1990. A semantic study of the classifier *tiao*. *Journal of the Chinese Language Teachers Association* 25/1:35-56.

Tang, Chih-chen Jane. 1990a. A note on the DP analysis of the Chinese noun phrase. *Linguistics* 28: 337-354.

Tang, Chih-chen Jane. 1990b. Chinese phrase structure and extended X'-theory. PhD thesis, Cornell University.

Tang, Chih-chen Jane. 1993. Chinese *de* and English ·s. *Bulletin of the Institute History and Philology*. Academia Sinica 63 (4):733-757.

Tang, Chih-chen Jane. 2005. Nouns or classifiers: a non-movement analysis of classifiers in Chinese. *Language and Linguistics* 6: 431-472.

Tversky, Barbarai & Kathleen Hemenway. 1983. Categories of Environmental Scenes. *Cognitive Psychology* I5: 121-149.

Tversky, Barbarai & Kathleen Hemenway. 1984. Objects, Parts, and Categories. *Journal of Experimental Psychology* 113: 169-193.

Uriagereka, Juan. 2008. *Syntactic Anchors*. Cambridge & New York: Cambridge University Press.

Wang, S.X. 1989. Liangci ge zai Tangdai qianhou de fazhan [the development of the classifier *ge* around the Tang Dynasty]. *Yuyan Jiaoxue yu Yanjiu*. Vol. 2: 98-119.

Watanabe, Akira. 2006. Functional projections of nominals in Japanese: syntax of classifiers. *Natural Languages and Linguistic Theory* 24: 241-306.

Wiltschko, Martina. 2005. Why should diminutives count? *Organizing Grammar*, H. Broekhuis, N. Corver, R. Huybregts, and U. Kleinhenz (eds.), Mouton de Gruyter, Berlin & New York, 669-678.

Yang, Henrietta Shu-Fen. 2005. Plurality and modification in Mandarin Nominal Phrases. Doctoral dissertation, The University of Texas at Austin.

Yang, Rong. 2001. Common nouns, classifiers and quantification in Chinese. Doctoral

dissertation, Rutgers, The State University of New Jersey.

Yi, Byeong-Uk. 2008. The meaning and functions of Korean nouns and classifiers. Paper presented at CIL 18, Seoul, July 21-26, 2008.

Yip, Chak-Lam Colum. 2008. Complicating the Oversimplification: Chinese Numeral Classifiers and True Measures. *Proceedings of the 20th North American Conference on Chinese Linguistics* (NACCL-20). 2008. Volume 1. Marjorie K.M. Chan and Hana Kang (eds.). Columbus, Ohio: The Ohio State University. 285-295.

Yu, Xin-xian Rex. 2006. Evaluative adverbs in Mandarin Chinese. MA thesis, National Chung Cheng University.

Zhang, Hong. 2007. Numeral classifiers in Mandarin Chinese. *Journal of East Asian Linguistics* 16: 43-59.

Zhang, W. 1991. Shi Lun Xiandai Hanyu Fuhe-Liangci [On Compound Classifiers of Modern Chinese], *Zhongguo Yuwen*, 1991(4), 262-268.

Zhu, Dexi. 1982. *Yufa Jiangyi* [Lectures on grammar], Beijing, Shangwu Press.

Zubin, David A. & Mitsuaki Shimojo. 1993. How "general" are general classifiers? with special reference to *ko* and *tsu* in Japanese. Proceedings of the Berkeley Linguistics Society 19.490-502.