

# ***Numeral Classifier Structures***

Niina Ning Zhang

National Chung Cheng University

<http://www.ccunix.ccu.edu.tw/~lngnz/> June 29, 2011

This monograph, *Numeral Classifier Structures*, addresses the fundamental syntactic and syntax-semantics interface issues of numeral classifier constructions within the framework of generative grammar, based on a thorough study of a typical classifier language, Mandarin Chinese. It aims to clarify three major issues: the relationship between classifiers and the count-mass contrast, the constituency and thus the syntactic structures of classifier constructions, and the syntactic representations of the container and containee readings of a container measure construction. First, the book shows that the contrast between count and mass is not binary. Instead, there are two independently attested features: numerability, the ability of a noun to combine with a numeral directly, distinguishes count from non-count nouns, and dimensionality, the ability of a noun to be modified by a size or shape modifier, distinguishes mass from non-mass nouns. Assuming numerals and size and shape modifiers are universally available, we are able to identify count and mass nominals in any language. Although all nouns in Chinese are non-count nouns, there is still a mass/non-mass contrast, with mass nouns selected by individuating classifiers and non-mass nouns selected by individual classifiers. Second, while individual and individuating classifier constructions are right-branching, partitive and collective classifier constructions are left-branching. Third, semantic features and syntactic features do not have to be projected from the same element, thus giving rise to syntax-semantic mismatches.

Key words: classifier, countability, count, mass, plural, number, measure, Chinese

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Acknowledgment (to be added later. YOUR comments are now welcome. [Lngnz@ccu.edu.tw](mailto:Lngnz@ccu.edu.tw))

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## Chapter 1 Introduction

The word *zhi* in the Chinese example in (1a) is called numeral classifier (I will simply call it CL henceforth). A CL occurs with a numeral and an NP, such as *san* ‘three’ and *bi* ‘pen’ in (1a), respectively. In (1b), *di* is also a CL.

- (1) a. Yaoyao kanjian-le san zhi bi.  
Yaoyao see-PRF three CL pen  
‘Yaoyao saw three pens.’  
b. Yaoyao kanjian-le san di you.  
Yaoyao see-PRF three CL oil  
‘Yaoyao saw three drops of oil’.

Some languages have CLs and some do not. Some languages have the counterpart of the CL in (1b), but not that in (1a). From the English translations of the two examples in (1) we can see that English has the word *drop* to correlate with the CL *di* in (1b), but does not have a counterpart to the CL *ben* in (1a). CLs like *ben* are called individual CLs in Chao (1968), and CLs like *di* are called individuating CLs in this book (they are grouped into partitive CLs in Chao 1968). Languages that have both types of CLs, such as Chinese, are called CL language.

The CLs in (1) can be compared with other types of unit words. According to Croft (1994: 151-152), standard measures such as *liter* in (2a), container measures such as *bottle* in (2b), kind CLs such as *kind* in (2c), partitive CLs such as *section* in (2d), and collective CLs such as *group* in (2e) are universally available.

- (2) a. Kim bought three liters of milk. (standard measure)  
b. Kim bought three bottles of milk. (container measures)  
c. three kinds of chocolate (kind CL)  
d. three sections of orange (partitive CL)  
e. three groups of students (collective CL)

All types of CLs and measure words are used in counting, telling us what counts as one in the context, i.e., the unit of counting. I thus treat all types of CLs and measure words as unit words. I also call a complex nominal that is composed of a numeral, a unit word, and an NP, such as *san zhi bi* in (1) and *three liters of milk* in (2a), counting construction.

We are curious about the syntactic properties of CLs: where are they integrated into the structure of a counting construction and how do they interact with the formal properties of other elements of the construction? As a case study, this book investigates the syntactic properties of various kinds of CLs and their relationship with other unit words in a particular language, Mandarin Chinese.

The book aims to clarify three major empirical issues:

The countability issue, i.e., the relationship between CLs and the count-mass contrast;

The structure issue, i.e., the constituency and thus the syntactic structures of CL constructions;

A particular syntax-semantics mapping issue, i.e., the syntactic representations of the two readings of a container measure construction: a container reading and a containee reading.

The countability issue is investigated from the following four aspects (A-D). A, B, and D are covered by Chapter 2 and C is covered by 4.6.

A. The relation between count and mass, from a syntagmatic perspective.

It has been widely assumed that the contrast between count and mass is a dichotomous contrast. This belief, however, fails to get support from linguistic facts. As realized in Rothstein (2010) and Chierchia (2010), it is difficult to make a clear distinction from semantic, morphological, and syntactic perspectives. For instance, if one claims that Chinese nouns such as *bi* ‘pen’ are count and nouns such as *you* ‘oil’ are mass, why do the former, as well as the latter, need a unit word, such as the CL *zhi*, for counting? So *bi* seems to behave like the English mass noun *oil*, since both need a unit word for counting: *zhi* in Chinese and *drop* in English. If all nouns in Chinese are mass nouns, then why can nouns like *bi* be modified by a shape modifier such as *chang* ‘long’, patterning with the count noun *pen* (*long pen*), but not the mass noun *oil* (*\*long oil*) in English? A reasonable doubt is: is the contrast of count and mass really binary? Is it possible that there are actually two features, which give more possible types of nominals? This is the new approach pursued in this book. Also, instead of the traditional paradigmatic perspective, this book tries to find the properties of countability from a syntagmatic perspective: whether a noun can combine with a numeral directly, and whether it can be modified by a size or shape-denoting modifier. These are two possible features responsible for the count-mass contrast. Obviously, the noun *bi*, which occurs with the CL *zhi* in (1a), can be modified by a dimension adjective, whereas *you*, which occurs with the CL *di* (1b), may not be modified by a dimension adjective.

B. The distinctive functions of CLs of CL languages.

With the assumption that all nouns in numeral CL languages are mass nouns, it has been believed that the function of individual CLs, such as *zhi* in (1), is to individuate or divide mass into units, just like the word *drop* does in *three drops of water*. This book falsifies this belief. The challenge to the belief is expected if not all nouns in CL languages are mass nouns. Then the question becomes why CLs exist in CL languages. This book explores the possibility that the syntactic position for an individual CL is available for all languages. This is the same surface position for other kinds of unit words, such as *litre* in (2a) and *bottle* in (2b). CL languages are then different from other languages in the consistent overtness of the form in the syntactic position for the unit word in a counting construction.

C. The cross-linguistic patterns of the null versions of individual and individuating CLs.

As we mentioned above, unit words such as standard measures, container measures, kind CLs, partitive CLs, and collective CLs are universally available. But individual CLs (e.g., *zhi* in (1a)) and individuating CLs (*di* in (1b)) are not found in every language. Is there any pattern for the forms in the syntactic position reserved for individual or individuating CLs? This issue has to be addressed from a cross-linguistic perspective. With the two features mentioned in part A above, we can precisely describe the patterns of null CLs. We find that some languages have the covert forms of individual CLs only, and some languages may also have the covert forms of individuating CLs. The two kinds of CLs show different co-occurrence restrictions with nouns.

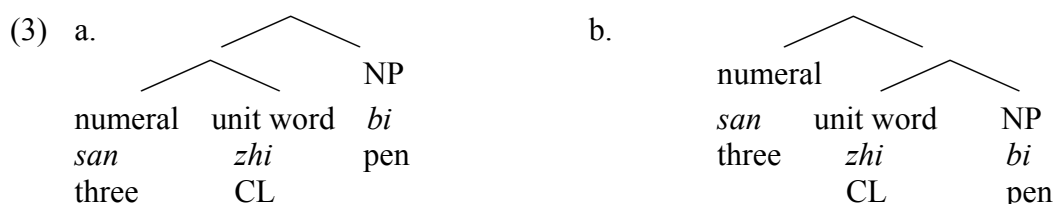
D. The relation between the count-mass contrast and morphological number.

If the ability to combine with a numeral is the most reliable property of a count noun (Chierchia 1998: 353; 2010: 104), and if one assumes that the occurrence of a plural marker means count, why do we still have nouns that have plural markers but reject numerals, such as *clothes*, *oats*, *grits*, and *masses* (McClawley 1979 [1975]: 172; Huddleston & Pullum 2002: 342)? If the rejection of a plural marker means mass, are the words *furniture* and *school* in *at school* as massive as *oil*? Questions like these have been raised in the studies of countability. This book shows why numerability is different from number, while also addressing their interactions in various languages. The book also explores how plurality is expressed by CLs in Mandarin Chinese.

The structure issue is investigated from the following two aspects (E and F). They are covered by Chapter 3, Chapter 4, and Chapter 6.

E. The constituency of counting constructions.

A counting construction has only three basic overt elements in Chinese: a numeral, a unit word, and an NP. If all structures are binary, which two of them form a constituent? In the literature, Greenberg (1990 [1975]: 227), Li & Thompson (1981: 105), Paris (1981: 105-117), Tang (1990a), Croft (1994: 151), Lin (1997: 419), and Hsieh (2008) all have proposed a unified left-branching structure, in which the numeral and the unit word form a constituent, excluding the noun, as in (3a). In contrast, Tang (1990b: 413, 2005) and Cheng & Sybesma (1998, 1999), Y.H. A. Li (1999), among others, have proposed a unified right-branching structure, in which a unit word and the noun form a constituent first, excluding the numeral, as in (3b).



Not many arguments can be found to support either claim, although this is a basic issue of the syntax of counting constructions. In this book, all arguments that I can find are reviewed. Not convinced by any of them, I deal with the issue from four new perspectives: the scope of a left-peripheral modifier; the dependency between the modifier of a unit word and that of a noun; the complement and predicate status of the combination of a numeral and a unit word; and the semantic selection of a unit word on a noun. It turns out that constructions of different types of unit words may have different structures.

F. The different syntactic properties of CLs in different syntactic contexts.

Not only the structural configurations of counting constructions are different with different types of CLs, but also the same form of a CL may head different functional projections in different contexts. In this book, three contexts where a CL may occur are studied: when a CL occurs as a free form between a numeral and a noun, such as *zhi* in (1a), *di* in (1b), or *ge* in (4b), when a CL is reduplicated, such as *duo-duo* in (4a), and when a CL occurs in a compound, such as *duo* in (4b).

- (4) a. Tian-shang piao-zhe duo-duo bai yun.  
sky-on fly-PRG CL-RED white cloud  
'Many pieces of cloud are flying in the sky.'
- b. Yaoyao na-le yi ge hua-duo.  
Yaoyao take-PRF one CL flower-CL  
'Yaoyao took a flower.'

Few studies have been done for the CLs in the latter two contexts, but one can see the various roles of CLs may play and how their decomposed features take part in the syntactic computation.

The syntax-semantics mapping issue, i.e., the syntactic representations of the two readings of a container measure construction, is investigated from the following aspect (G). It is covered by Chapter 5.

G. The projection of semantic features.

In addition to clarifying that certain apparent similar constructions may have different

syntactic structures, this book also shows that certain constructions that have been claimed to have different structures in the literature actually have the same structure. The semantic selection of the verbs in (5) indicates that the counting construction *three bottles of wine* has a containee reading in (5a), but a container reading in (5b).

- (5) a. Kim drank three bottles of wine.  
b. Kim broke three bottles of wine.

The contrast between examples like (5a) and examples like (5b) has been studied by Akmajian & Lehrer (1976), Selkirk (1977: 310ff), Corver (1998), and Rothstein (2009), among others. All claim that the counting constructions in the two types of examples have different syntactic structures. In this book, I falsify this claim and argue for an identical structure for the two constructions. If so, the next question is how to capture the reading contrast between (5a) and (5b). In this book, the possible projection routes of semantic features are studied. The investigation opens a new window for us to see how syntactic and semantic features are computed independently.

The theoretical framework of this book is generative grammar. But no high-tech formal operation is used.

This book discusses numeral CL only, not other types of CLs such as possessive CLs (Aikenvald 2003). It is not an exhaustive descriptive work on quantifiers, either. Chinese quantifiers such as *xie* is not discussed in this book (see Kuo 2011 for a recent discussion). Also, the book does not cover all constructions involving numeral CLs. For instance, verbal CLs such as *ci* in (6) are beyond the scope of this book.

- (6) Yaoyao qu-le Bali san ci.  
Yaoyao go-PRF Paris three CL  
'Yaoyao has been to Paris three times.'

But all of the empirical issues investigated in this book may deepen our understanding of the syntax of nominals and the interfaces between syntax and semantics. CL structures are bound to give us a special dimension of knowledge, about human language, and thus about ourselves.

## Chapter 2      Classifiers and Countability

### **2.1. Introduction**

Why do classifiers (CLs) exist in CL languages such as Mandarin Chinese? It has been widely assumed that the obligatory occurrence of a CL with a numeral and a noun in CL languages is related to the contrast between count and mass nominals. The goal of this chapter is to show that this traditional assumption is not fine-grained enough to cover the systematic contrasts of nominals in either Mandarin Chinese or other languages. Instead, I argue that two syntagmatic properties of nominals are syntactically significant: the ability of a noun to combine with a numeral directly, and the ability of a noun to be modified by a size or shape modifier. The two newly recognized properties or features can be attested in the co-occurrence restrictions of quantifiers, adverbs, prepositions, and CLs, in pronominalization, and in certain context-triggered shifts. It is the interactions between these two features, rather than the alleged binary contrast between count and mass, that explain various syntactic contrasts of countability, cross-linguistically. I argue that although the positive value of the first feature alone is enough to define the count status of a nominal, it is the combination of the negative values of both features that defines the mass status of a nominal. This chapter shows that the popular assertion that all nouns in Chinese are mass nouns is not accurate. Instead, all nouns in Chinese are non-count nouns, but they are further divided into mass and non-mass ones.

The chapter also falsifies the generally believed entailment relation between plurality and countability. Furthermore, it also clarifies the distinctive functions of CLs of CL languages.

The two features argued for in this chapter: numerability and dimensionality, also set the scene for the analysis of other syntactic issues of counting constructions in this book. They are encoded in functional categories, to be shown in later chapters.

In addition to this introduction section and the last summary section, this chapter is composed of six substantial parts. Section 2.2 proposes my new theory of the count-mass contrast, based on the two features. Section 2.3 and Section 2.4 are investigations of the features in Chinese nouns and unit words, respectively. Section 2.5 presents how quantifiers in Chinese are sensitive to numerability. Section 2.6 compares this new analysis of the count-mass contrast with other approaches in the literature. Section 2.7 further argues that the count and non-count contrast is syntactic, and shows the problems of certain current syntactic analyses of CLs.

### **2.2. Decomposing countability**

#### **2.2.1 Identifying two new features syntagmatically**

Since De Saussure (1916), two kinds of relationship between linguistic elements are recognized: paradigmatic and syntagmatic ones. A paradigmatic relationship is established by a substitution test. For instance, the three words *of*, *by* and *for* establish a paradigmatic relation in the string *government {of/by/for} the people*, since each of them can substitute another. They may occur in the same syntactic position. A syntagmatic relationship is defined by the compatibility of co-occurring elements in the same construction, e.g., the relationship between *the* and *people* in the string *the people*. Paradigmatic and syntagmatic relationships have been metaphorically viewed as vertical and horizontal ones, respectively.

Many formal features such as tense and aspect of verbal expressions, gender and person of nominal expressions are defined paradigmatically. Selection features are typically syntagmatic features. For instance, the transitive verb *drink* c-selects a nominal, because it needs to occur with a nominal; and it s-selects a liquid-denoting nominal, because it needs to combine with this type of nominal.



(7) a. the quite nice book                      b. the (\*quite) next book

(8) a. Kim shouted deliberately.                      b. Kim arrived (\*deliberately).

Some nominals may combine with a cardinal numeral directly, and some may not. In (9a), for instance, the noun *apple* combines with the numeral *one* directly. In (10a), however, the noun *oil* may not combine with the numeral.

- (9) a. one apple                      b. five apples                      c. zero apples  
      d. 0.5 apples                    e. 1.0 apples                    f. five nouns
- (10) a. (\*one) oil                      b. (\*one) furniture

(11) a. The boys are at least thirty.                      b. \*The gold is at least thirty.  
c. The gold is at least thirty pounds.

The contrast is also seen between Argument Structure Nominals and their correlated simple nominals. According to Grimshaw (1990) and Alexidiado (2011: 34), in both English and Greek, Argument Structure Nominals, such as *jumping of the cow* in (12a), may not occur with a numeral, whereas their correlated simple nominals may, as shown by *jump* in (12b)

9

(12) a. \*One jumping of the cow was interruptee by the fireworks.  
b. One jump was disqualified.  
c. one jump, two jumps

The numerals in the nominals in (9), which are all [+numerable], are different. In this analysis, numerability cares about the ability to occur with a numeral only, and no special status is given to the contrast between singularity and plurality, or among integer, zero, and other numerals.

(13) a. drie suiker-en      b. \*drie suiker-werk-en      c. suiker-werk [Dutch]  
three sugar-PL      three sugar-COL-PL      sugar-COL  
'three sugars'           'confectionery'

(14) a. a big apple      b. large furniture      c. square watermelon  
d. \*large oil      e. \*large music      f. \*big noun      g. \*square wine

(15) a. The violets are small.    b. The furniture is small.    c. \*The snow is small.

I use the feature dimensionality to represent the contrast between nominals that may be modified by a dimension modifier and nominals that may not do so. Thus, [+dimension] means ALLOWING A DIMENSION MODIFIER, and [-dimension] means DISALLOWING

A DIMENSION MODIFIER. The nominals in (14a), (14b), (14c), (15a), and (15b) are [+dimension] and other nominals in (14) and (15) are [-dimension].

When a nominal has [+dimension], we know that its denotation must have “a certain shape or precise limits” (Jespersen 1924: 198). The shape or limits are definable or measurable in certain dimensions (e.g., length, size, volume and shape), and therefore, atomicity is exhibited. In contrast, a nominal with [-dimension] denotes either material, which in itself independent of shape or size, such as *silver*, *water*, *butter*, *gas*, *air*, or immaterial notions, such as *leisure*, *music*, *traffic*, *success*, *tact*, *commonsense* (Jespersen 1924: 198). In my understanding, the former group of nouns can occur with a standard or container measure, as seen in (16a) and (17a), whereas the latter group cannot, as seen in the rest examples in (16) and (17).<sup>2</sup>

- |         |                  |    |                    |    |                  |
|---------|------------------|----|--------------------|----|------------------|
| (16) a. | a kilo of butter | b. | *a kilo of leisure | c. | *a kilo of nouns |
| (17) a. | a bowl of butter | b. | *a bowl of leisure | c. | *a bowl of nouns |

Note that immaterial nouns such as *noun* can be [+numerable], as seen in (9f), although they are [-dimension], as seen in (14f).

Similar to numerability, dimensionality is also attested in the fact that certain elements intrinsically bring about a relevant effect. For instance, *shui* ‘water’ alone may not be modified by *xiao* ‘small’, as seen in (18a); but if it is followed by a CL such as *di*, the whole compound *shui-di* can be modified by *xiao*, as seen in (18a’). Similarly, *ni* ‘mud’ alone may not be modified by *xiao*, as seen in (18b); but if it is followed by a CL such as *kuai*, the whole compound *ni-kuai* can be modified by *xiao*, as seen in (18b’) (more about this issue will be discussed in 6.3.1).

- |         |                           |     |  |
|---------|---------------------------|-----|--|
| (18) a. | *xiao shui<br>small water | a’. | xiao shui-di<br>small water-CL<br>‘small drop(s) of water’ |
| b.      | *xiao ni<br>small mud     | b’. | xiao ni-kuai<br>small mud-CL<br>‘small chunk(s) of mud’    |
| c.      | *da yun<br>big cloud      | c’. | da yun-duo<br>big cloud-CL<br>‘big piece(s) of cloud’      |

It is important to be pointed out that words such as *big* and *small* and their Chinese counterparts have an intensifying usage. As stated in Morzyski (2009: 176), “an adjective that normally expresses size characterizes the degree to which the gradable predicate holds”, as shown in the examples in (19).

- |         |   |    |   |
|---------|---|----|---|
| (19) a. | big idiot   | b. | big smoker  |
| c.      | da hao xingshi<br>big good situation<br>‘very good situation’ | d. | xiao xian shenshou<br>small show skill<br>‘show the skill a little bit’ |

The intensifying readings are not size readings, and thus the adjectives in such a use are not dimension adjectives. Similar intensifying reading is also found in other adjectives such

<sup>2</sup> In idiomatic expressions, *ton* can occur with any noun. Thus *tons of leisure* is acceptable. But *ton* may not be replaced by other standard measures such as *pound* and *kilo* in such expressions. I thank Audrey Li for pushing me to clarify this.

as *good*, as in (20) (Levinson 2010: 150).<sup>3</sup>

(20) He braided her hair good and tight.

### 2.2.2 Defining count and mass by the two features

Traditionally, the notion of count is in direct contrast to the notion of mass. Different from this binary analysis, I use the two values of the two features, numerability and dimensionality, to describe the count-mass contrast.

The feature numerability alone may distinguish a count noun from a non-count noun. If a nominal may combine with a numeral directly in the context, it has [+numerable] and thus is a count one in that context. Otherwise, it is a non-count one. According to Chierchia (1998: 353; 2010: 104), being able to combine with a numeral is the signature property of a count nominal.

But numerability alone is not enough to identify whether a noun is a mass noun. A non-count noun is not necessarily a mass noun. On the one hand, well-recognized mass nouns, such as the word *oil* may be neither combined with a numeral directly (see (10a)), nor modified by a dimension adjective (see (14d)). On the other hand, words such as *furniture* may be modified by a dimension modifier (see (14b)), although they cannot combine with a numeral directly (see (10b)). Such nouns are non-count and non-mass. I claim that although the feature [+numerable] alone is enough to define the count status of a nominal, it is the combination of both [-numerable] and [-dimension] that defines the mass status of a nominal.

To make the discussion complete, it is necessary to be pointed out that [+dimension] is not part of the defining property of a count element. Words such as *noun* may combine with a numeral, as seen in (9f), and thus are count nouns, but they may not be modified by a dimension adjective, as seen in (14f). The four possible combinations of the two values of the features are summarized in (21):

(21)

	[numerable]	[dimension]	example	
a.	+	+	<i>apple</i> in (9a), (14a)	count
b.	+	-	<i>noun</i> in (9f), (14f)	count
c.	-	+	<i>furniture</i> in (10b), (14b)	non-count, non-mass
d.	-	-	<i>oil</i> in (10a), (14d)	mass

Among the four possibilities: (21a) and (21b) are both count, (21d) is mass, and (21c) is non-count and non-mass. Although count is not mass and mass is not count, what is new in this analysis is the independent status of (21c). The existence of this group of nouns indicates that non-count nominals do not have to be mass nouns. Also, from a different perspective, having the feature [+dimension] means that the noun is not a mass noun, but it does not mean that the noun must be a count noun (contra Wiltschko 2005, among others). *Duckling* and the German word *Eichhörnchen* ‘squirrel’ can occur as non-count nouns, in addition to count nouns (see de Belder, to appear, fn. 12), although they can be modified by dimension modifiers (e.g., *small duckling*). Moreover, the independent status of (21b) indicates that not

<sup>3</sup> A related issue to be clarified is that the retroflexion suffix *-r* in Mandarin Chinese encodes endearment, as well as diminutiveness. In the former reading, no size meaning is expressed, as seen in (i).

(i) a. da-men-r                      b. qi-shui-r  
       big-door-RETRO            air-water-RETRO  
       ‘big door’                    ‘soda water’

In Cinque (2011: 6), the functional projection to host an endearment element is ranked lower than the one for a diminutive element.

all count nouns denote entities that have physical dimensions, since not all count nouns may be modified by a dimension modifier.

The maximal contrast between the *apple*-type of nouns and *oil*-type of nouns maintains the basic contrast between nouns that denote atomicity and nouns that do not, a contrast that has been supported by acquisition studies such as Spelke (1985).

This classification also correlates with the refiner classification attested in the experimental study of Barner & Snedeker (2005), as shown in (22), so long as we change their label “mass nouns” into “non-count nouns”, and link their “number-based judgment” to [+dimension], and their “quantity-based judgment” to [-dimension]. In our analysis, the last type, i.e., the *toothpaste*-type, is the real mass type.

(22) Barner & Snedeker (2005)

Count nouns	Mass nouns	
<i>shoes</i>	object-mass noun <i>silverware</i>	substance-mass noun <i>toothpaste</i>
Number-based judgment		Quantity-based judgment

In my approach, like the feature of gradability for APs and the feature agentivity for VPs, the features related to the count-mass contrast for NPs can also be defined syntagmatically.

I claim that the two features, numerability and dimensionality, are universal in defining count and mass nouns, assuming numerals and dimension modifiers are available in all languages. Also, they are the only criteria to be considered in analyzing the count-mass contrast. The relationship between plural markers and the count-mass contrast will be discussed in 2.2.6 and 2.6.3.

### **2.2.3 Attesting the two features in co-occurrence restrictions**

The linguistic reality of numerability and dimensionality is independently attested in co-occurrence restrictions of articles, quantifiers, adverbs, prepositions, and CLs.

It is well-known that indefinite articles and some quantifiers occur with count nouns in English. For instance, *every* and *many* occur with nouns that have [+numerable], and *much* occurs with nouns that have [-numerable].

(23) a. {every} apple      b. {many/\*much} apples

(24) a. \*{every} oil      b. {\*many/much} oil      c. {\*many/much} furniture

In Japanese, the quantifiers *tasuu* ‘many’ and *shoosuu* ‘a few’ may occur with words such as *isha* ‘doctor’ or *hon* ‘book’, but not words like *inku* ‘ink’ or *gyunyu* ‘milk’. This contrast is shown in (25a) and (25b). The word *isha* or *hon*, but not *inku* or *gyunyu*, can be modified by a dimension adjective. Therefore, the quantifiers occur with [+dimension] nominals. However, the opposite pattern is seen in the quantifiers *taryoo* ‘much’ and *shooryoo* ‘a little’. They may occur with words such as *inku* or *gyunyu*, but not words like *isha* or *hon*, as shown in (26a) and (26b), and therefore, they occur with [-dimension] nominals (Kobuchi-Philip 2011: Sec. 3.3; similar examples have also been provided to me by Yukari Kurita, p.c., Sept. 23, 2010).

(25) a. {tasuu/shoosuu}-no isha      b. \*{tasuu/shoosuu}-no inku  
          many/a few    -GEN doctor      many/a few    -GEN ink

(26) a. \*{taryoo/shooryoo}-no isha      b. {taryoo/shooryoo}-no inku  
          much/a little    -GEN doctor      much/a little    -GEN ink

In 2.5, we will see that certain quantifiers in Chinese have the similar co-occurrence restrictions with respect to numerability.

Adverbs such as *each* may not be in construal with nouns that have [-numerable]. as shown in the contrast in (27).

- (27) a. The balls each fell down off the table.  
 b. \*The oil each fell down off the table.

Prepositions can also select numerability. For instance, Dutch preposition *per* ‘by’ takes count nouns only, whereas *vol* ‘full of’ takes non-count nouns only (de Swart et al. 2010: 6-7).

- (28) a. *per* {bus/trein/bootje/\*zand/\*steenkool} [Dutch]  
           by bus/train/boat.DIM/sand/coal  
 b. *vol* {modder/zand/\*auto/\*koe}  
       full.of mud/sand/car/cow

In Chinese, some CLs are sensitive to the dimension feature of the noun. Some CLs take nouns with [-dimension] only. For instance, no liquid-denoting noun may be modified by a dimension adjective, as seen in (29a). Such a noun is [-dimension]. It can occur with the CL *di*, as seen in (29b).

- (29) a. \**chang* {you/shui/xue/niao/yanlei/mo-shui}  
           long oil/water/blood/urine/tear/ink-water  
 b. *san di* {you/shui/xue/niao/yanlei/mo-shui/\*putao}  
       three CL oil/water/blood/urine/tear/ink-water/grape  
       ‘three drops of {oil/water/blood/urine/tear/ink/\*grape}’

In contrast, *putao* ‘grape’ can be modified by a dimension adjective, as seen in (30a) below. Such a noun is [+dimension]. It may not occur with *di*, as seen in (29b) above. Other CLs that reject nominals with [+dimension] include *ji* (for liquid medicine), *pao* (for urine), *tan* (for any liquid). I call such CLs (part of Chao’s 1968 partitive CLs) individuating CLs, which select [-dimension].

- (30) a. *da putao*  
           big grape  
           ‘big grape’  
 b. *san ke* {putao/\*you/\*zhi/\*zheng-qi/\*xue/\*rou/\*bu/\*qian/\*yanlei}  
       three CL grape/oil/paper/steam-air/blood/meat/cloth/money/tear

Words like *putao* can be selected by another kind of CLs, called individual CLs in Chao (1968). The CL *ke* in (30b) is such a CL. It selects nouns with [+dimension]. Other CLs such as *ben* (本), *tou*, and *zhi* (隻) are also individual CLs. Moreover, collective CLs, such as *zu* ‘group’, *qun* ‘crowd’, *da* ‘dozen’, *shuang* ‘pair’, *dui* ‘pair’, and partitive CLs, such as *ye* ‘page’, *duan* ‘paragraph’, and *zhang* ‘chapter’ (they are also Chao’s 1968 partitive CLs), also occur with nouns with [+dimension].

#### **2.2.4 Attesting the two features in pronominalization**

The English proform *one* can only take a count noun as its antecedent (Schütze 2001; Barbiers 2005). The same constraint is also seen in the Afrikaans proform *een* ‘one’ (Corver

& van Koppen 2011: Sec. 3.2). This constraint indicates that such pronominalization is sensitive to the feature numerability.

- (31) a. Would you like a red bike or a white one?  
 b. \*Would you like red wine or white one?

In Mandarin Chinese, the pro-form *liaoliaowuji* ‘few’ can only take a noun that is able to be modified by a dimension adjective as its antecedent. In (32a), the antecedent of *liaoliaowuji* is *mao-bi* ‘brush-pen’, which can be modified by a dimension adjective such as *chang* ‘long’. In contrast, in (32b), the antecedent of *liaoliaowuji* is *mo-shui*, ‘ink-water’, which, as shown in (29a) above, cannot be modified by any dimension adjective. The word *liaoliaowuji*, like a regular pronoun, may not be followed by a noun, as shown in (32c). The contrast in (33) exhibits the same pronominalization constraint.

- (32) a. Wo yiqian mai-guo henduo mao-pi, xianzai shengxia liaoliaowuji.  
 I before buy-PRF many brush-pen now remain few  
 ‘I bought many brush-pens before, but few of them remain now.’  
 b. Wo yiqian mai-guo henduo mo-shui, \*xianzai sheng-xia liaoliaowuji.  
 I before buy-PRF many ink-water now remain few  
 ‘I bought much ink before, \*but few of them remain now.’  
 c. \*liaoliaowuji mao-bi  
 few brush-pen  
 (33) a. Women guji daliang keren hui lai canjai wanhui,  
 we estimate a.lot guest will come participate party  
 keshi zhi lai-le liaoliaowuji.  
 but only come-PRF few  
 ‘We estimated that a lot of guests would come to the party, but only a few came.’  
 b. Women guji daliang zheng-qi hui cong zhe ge kung mao-chulai,  
 we estimate a.lot steam-air will from this CL hole rise-out come  
 \*keshi zhi mao-chulai-le liaoliaowuji.  
 but only rise-out-PRF few  
 Intended: ‘We estimated that a lot of steam would come out of this hole, but only little came out.’

This contrast between (32a) and (32b) and that between (33a) and (33b) indicate that pronominalization of *liaoliaowuji* is sensitive to the feature dimensionality.

### **2.2.5 Attesting the two features in shifts**

In this subsection, I argue that the two features are also attested in the input and output of three shifts: Universal Grinder, Universal Packager, and Universal Sorter.

#### **Universal Grinder**

Imagine we have a big grinder. We can put anything in and what we get is a massive object, which is shapeless. This is the so-called effect of Universal Grinder (Pelletier 1979 [1975]: 6). Compared with the word *apple* in (34a), the word *apple* in (34b) denotes a massive object.

- (34) a. There is an apple on the table.      b. There is apple in the salad.

Universal Grinder has been viewed as an effect of changing a “count” noun into a “mass” noun. I claim that it is an effect of blocking the projection of the feature [+dimension],

in a specific context. In other words, the output of the shift must be [-dimension]. For instance, the word *apple* in (34b) may not be modified by the dimension adjective *small*, as shown in (35) (Bunt 1985: 207).

(35) There is (\*small) apple in the salad.

The effect of the Universal Grinder is also seen in Chinese:

- (36) a. Wo yu bu chi-le.  
           I fish not eat-PRF  
           A: 'I will not eat the whole fish anymore.'  
           B: 'I will not eat the fish meat anymore.'
- b. Wo da de yu bu chi-le.  
       I big DE fish not eat-PRF  
       A: 'I will not eat the whole big fish anymore.'  
       \*B: 'I will not eat the (big) fish meat anymore.'

The word *yu* 'fish' in (36a) is ambiguous. Reading A is attested when the speaker is with a plate of whole fish, and Reading B is attested when the speaker is with a plate of processed fish meat (e.g., fish slices or chunks). The meat reading is an effect of Universal Grinder. However, in (36b), the adjective *da* 'big' occurs, and then *yu* must have the whole fish reading. The meat reading disappears. Note that only dimension modifiers can bring about the blocking effect. In (37), the modifier is not a dimensional one and thus the ambiguity remains (in this case, the Universal Grinder effect is observed even in a complex nominal. Cf. Acquaviva 2010: 9).

- (37) Zuotian mai de yu wo bu chi-le.  
       yesterday buy DE fish I not eat-PRF  
       A: 'I will not eat the whole fish that {was/were} bought yesterday.'  
       B: 'I will not eat the fish meat that was bought yesterday.'

We can see that the presence of the dimension adjective correlates with the atomicity reading. The fact that the output of the Universal Grinder may not allow a dimension adjective means that the output of the shift is not only [-numerable], but also [-dimension].

If the shift is understood as a simple change of the value of a binary count-mass contrast, one cannot explain the acceptability contrast in (35) and the reading contrast in (36). The two features proposed in this book can give a more precise description of the output of the shift: it must be [-dimension], as well as [-numerable].

Examples of the effect of the Universal Grinder are easy to find in Chinese (contra Cheng et al. 2008; See de Belder, to appear: Sec. 6, or 2011: 91, for a discussion of the markedness of *There is dog all over the wall*).<sup>4</sup> (38) gives us another pair of such examples parallel to those in (36).

<sup>4</sup> While de Belder (to appear: Sec. 6; 2011: 91) treats certain unacceptable cases of Universal Grinder as marked cases, and gives a pragmatic account, Cheng et al. (2008) treat acceptable cases as exceptions to their claim that Chinese has no Universal Grinder effect. The markedness theory has an explicit account for the unacceptability, whereas the exception theory does not give a convincing account for the counter-examples to the rigid claim.



- (38) a. Wo jidan chi-wan-le.  
           I egg eat-finish-PRF  
           A: ‘I have finished eating of the whole eggs.’  
           B: ‘I have finished eating of the scrambled egg.’  
       b. Wo da de jidan chi-wan-le.  
           I big DE egg not eat-finish-PRF  
           A: ‘I have finished eating of the big whole eggs.’  
           \*B: ‘I have finished eating of the (big) scrambled egg.’

Now let us turn to the input of the shift. In Chinese, no noun may combine with a numeral directly and thus all nouns are [-numerable] (2.3.1), but the Universal Grinder effect is still available. As for English, the word *furniture* is [-numerable] (see (10b)). After an earthquake, for example, when pieces of furniture pieces such as legs of chairs and tops of tables are all over a place, one can say (39), and thus the Universal Grinder effect is also available.

(39) There is furniture all over the place.

Considering both the Chinese example in (36a), (37), (38a), and the English example in (39), we can see that the input of the shift is not restricted to [+numerable]. So the shift is not a shift from a count noun to something else, since the input can be a non-count noun.

Is the input of the shift restricted to [+dimension]? In (40) (Acquaviva 2010: 9), as a proper noun, *Griechenland* may not be modified by a dimension adjective. The mass noun use of the word suggests that the input of the shift can be [-dimension].

- (40) Wieviel Griechenland können wir uns leisten? [German]  
       how.much Greece can we us make  
       ‘How much Greece can we afford?’

The above discussion shows that the input of Universal Grinder is free:

(41) Universal Grinder: [ $\alpha$  numerable,  $\beta$  dimension]  $\rightarrow$  [-numerable, -dimension]

The two features are thus attested in a more precise description of the shift.

### **Universal Packager**

In a perspective different from the Universal Grinder, all kinds of the material type of massive objects can be put in containers or be apportioned in a certain way, and after doing so, the massive objects become discrete portions and thus can be counted. For instance, the word *water* and *beer* in (42) each occur with a numeral and are thus [+numerable], i.e., countable.

(42) Give me two waters and one beer.

This is the so-called effect of Universal Packager (Bach 1986: 10; Jackendoff 1991; 1997: 53). It has been viewed as an effect of changing a “mass” noun into a “count” noun. In fact, it is a contextually induced numerability effect. The denoted entity must be quantized in a certain way in the context. The discourse context specifies the exact unit of counting. The feature [+numerable] emerges in the context where the noun occurs with a numeral.

The effect of Universal Packager is seen in nouns with [-dimension] only, but not [+dimension] words such as *furniture* and *cutlery*. For instance, \**three cutleries* does not

mean three packages of cutleries (Borer 2005: 103, fn. 14; Acquaviva 2010: 3).<sup>5</sup>

If the shift is understood as a simple change of the binary division between count and mass nouns, one cannot explain why certain “mass” nouns reject the shift consistently. The two features proposed in this book can give a more precise description of the input of the shift. The packager effect applies to [-numerable, -dimension] nouns only, but not [-numerable, +dimension] nouns.

(43) Universal Packager: [-dimension, -numerable] → [+numerable]

No noun in Chinese can be preceded by a numeral directly, even for non-mass nouns. So the shift does not apply to Chinese. However, the shift seems to be attested in an indirect way in Chinese, but it is subject to the same input condition. In (44a) (Yu Hong, p.c., Dec. 3, 2010; Jane Tang, p.c., Jan. 17, 2011) and (44b) (Doetjes (1997: 33), the mass nouns *guozhi* ‘juice’ and *pjiu* ‘beer’ are interpreted as packages of juice and beer. But importantly, first, the package interpretations emerge only when a mass noun follows a unit word, such as the collective CL *da* ‘dozen’ in (44a) and the individual CL *ge* in (44b). This is different from examples such as (42). Second, the package interpretation is not observed if the noun following a CL has [+dimension]. In (44c), *pingguo* ‘apple’, which can be modified by a dimension adjective such as *xiao* ‘small’ and thus has [+dimension], does not have a packager reading.

- |   |  |
|---|--|
| (44) a.    yi    da    {guozhi/pjiu}<br>one dozen juice/beer<br>‘a dozen packages of {juice/beer}’<br>c.    yi    da    pingguo<br>one dozen apple<br>‘a dozen (*packages of) apples’ | b.    Gei wo liang ge pjiu.<br>give I    two CL beer<br>‘Give me two units of beer.’ |
|---|--|

### **Universal Sorter**

Counting kinds is to count abstract units. Examples like (45) (Chierchai 2010: 106) are discussed in Lyons (1977: 463), Allan (1977: 294), and Bunt (1985: 11). The word *wines* in (45) follows a numeral and thus behaves like a count noun. Allen calls nouns in such a use pseudo-uncountable nouns, and Bunt calls this phenomenon the effect of Universal Sorter.

(45) I like only three wines: chardonnay, pinot, and chianti.

Like in the case of the Universal Packager, the denoted entity is also quantized in Universal Sorter. But the quantization is accomplished in an abstract sense. In both cases, a noun combines with a numeral, and it thus exhibits [+numerable] feature. Therefore, like the words *water* and *beer* in (42), the word *wine* in (45) also behaves like a count noun.

As pointed out by Cowper & Hall (2009: 1), the Universal Sorter effect is not seen in words such as *furniture*. We have seen above that the Universal Packager effect is also absent in *furniture*-type of words. In my feature analysis, we can precisely make a description that like the shift of Universal Packager, the shift of Universal Sorter applies to [-numerable, -dimension] nouns only, but not [-numerable, +dimension] nouns. So we get the same rule as the one for the Universal Packager:

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<sup>5</sup> The Universal Packager effect is seen in the presence of a numeral. Therefore, when Acquaviva (2010: 3) cites Barner & Snedeker (2005: 57) for the acceptability of ‘*fine furnitures*’, one may treat this example still as a non-count noun. In other words, there is still no effect of Universal Packager.

(46) Universal Sorter: [-dimension, -numerable] → [+numerable]

Like Universal Packager, Universal Sorter does not apply to Chinese.

In all of the three shifts, Universal Grinder, Packager, and Sorter, the two features, dimensionality and numerability, are attested in either their input or output.

### **2.2.6 Numerability and number**

I have decomposed countability into two features, [numerable] and [dimension], and have argued that [+numerable] alone can distinguish count nouns from non-count nouns. Numerability is different from the notion of number, since it is based on the contrast whether an element can occur with a numeral, but does not have to be sensible to the contrast between singular and plural markers. However, number concerns the contrast between singular and plural in morphology, but is not sensitive to the possible occurrence of a numeral. When we consider the two values of numerability and the two values of plurality, we see four possible patterns. All of them are attested.

First, a nominal can be both [+numerable] and [+plural], as seen in (47) (see Krifka 1998b: Ch. 7, fn. 1; Borer 2009: Sec. 1.1 for such examples).

(47) a. 1.0 apples      b. two apples      c. zero apples

Second, a nominal can be [+numerable] but [-plural], as seen in (48).

(48) one apple

This pattern is also seen in the fact that some nouns may occur with a numeral, and thus have [+numerable], but they reject a plural marker when they do so (the following German examples are from Krifka 2007: 26). In (49a), *Pfunde* ‘pound.PL’ is in a plural form, in the absence of a numeral. In (49b), however, the numeral *drei* ‘three’ occurs, and then only the singular form *Pfund* rather than the plural form may show up.

(49) a. Peter hat viele Pfunde verloren.      b. drei {Pfund/\*Pfunde} Papier  
Peter has many pound.PL lost      three pound/pound.PL paper  
‘Peter lost many pounds.’      ‘three pounds of paper’

Third, a nominal can be [-numerable] but [+plural]. McClawley (1979 [1975]: 172) shows that the word *clothes* is plural, since it takes plural agreement in (50a), but it may not combine with a numeral, as seen in (50b). He also notes that words such as *guts* and *intestines* behave the same. We can add *oats*, *grits*, and *masses* to this group. Jespersen (1961 [1909]) gives dozens of such words in English (also see Acquaviva 2010: 2).

(50) a. My clothes {are/\*is} in this locker.      b. \*I’ve just bought five clothes.

Similarly, although mass nouns such as *water* have been found in a plural form in a non-shift context, as in (51a) (adapted from Krifka 2008: Sec. 7.1), they may not occur with a numeral. Nouns in such contexts are [-numerable] but [+plural]. This is the so-called “mass plural”, “abundant plural”, or substance-denoting plural-only nouns (Huddleston & Pullum 2002: 342). Similar examples are reported in unrelated languages. The modern Greek example in (51b) is from Alexiadou (2011: 36) (for more examples and an extensive discussion, see Tsoulas 2006), and the Niuean example in (51c) is from Massam (2009: 682 fn. 20; C = common). Ghaniabadi (2009) reports that plural markers in Persian may also

occur with mass nouns. Wiltschko (2009: 6) also reports that mass nouns in Blackfoot and Halkomelem may have plural markers to express this “abundant” meaning.

- (51) a. the (\*three) waters of the Nile  
 b. {hithikan nera /hithike nero} sto patoma. [Modern Greek]  
 dripped water.PL/dripped water on the floor  
 ‘A lot of water dripped on the floor.’  
 c. e tau vai [Niuean]  
 ABS.C PL water

Fourth, a nominal can be both [-numerable] and [-plural]. One example is *furniture*. Also, the nominals after the prepositions in (52) occur with neither a plural marker nor a numeral. The English examples are from Kiss (2010) and de Swart et al. (2010), the Catalan and Spanish examples are from Espinal (2010: 985).

- (52) a. at school b. in prison  
 c. Van anar a escola. [Catalan]  
 PAST go to school  
 ‘They went to school.’ (It could be one, or more than one)  
 d. Estuvieron en prisión. [Spanish]  
 were in prison  
 ‘They spent time in prison.’ (It may have been more than one prison)

Not only prepositions, but also transitive verbs can take such bare complements, in a language that has plural morphology, as seen in (53) (Espinal 2010: 985):

- (53) a. Has portat samarreta. [Catalan]  
 have worn T-shirt  
 ‘You have worn a T-shirt.’ (It could be one, or more than one)  
 b. Comprará cochel. [Spanish]  
 buy-FUT car  
 ‘(S)he will buy a car.’ (It could be one, or more than one)

Examples like those in (52) and (53) have been labelled as number neutrality in languages that usually express number (Espinal 2010: 985).

Moreover, some nouns are found in singular, since they are preceded by the indefinite singular article *a*, but they never occur with a numeral, including *one*. The word *shortage* in (54a) and the nominal *good knowledge of Greek* in (54b) may not be preceded by the numeral *one*. In my analysis, the nominals here are not count ones.

- (54) a. {a/\*one} shortage of engineers  
 b. Jill has {a/\*one} good knowledge of Greek.

Cross-linguistically, both values of number may occur with both values of numerability. Therefore, number and numerability are different.

We can add two more examples to show how numerability is different from plurality, a notion of number. Examples like those in (55) are mentioned in Krifka (1998b: Ch. 7, fn. 1):

- (55) a. 1.0 apples (= (9e)) b. \*1.0 apple  
 c. \*one apples d. one apple

The acceptability of (55a) and (55d) indicates that the word *apple* is [+numerable], but different numerals (*1.0* vs. *one*) have different co-occurrence restrictions on the morphological number of the noun.

The acceptability contrasts in (55) also show that the contrast between [+plural] and [-plural] of number does not correlate with a contrast in counting, semantically. Another example is mentioned in Krifka (1989a, 2008: Sec. 5.1):

- (56) A. Do you have children?                      B. Yes, one.                      C. \*No, (just) one.  
 (57) A. Do you have two or more children?      B. \*Yes, one.                      C. No, (just) one.

In (56), no numeral occurs in A's question. Therefore, counting is not an issue. A only asks for the existence of children. B's affirmative answer, followed by the quantity information "one" is appropriate. But C's negative answer followed by the quantity "one" is self-contradictory. In (57), a numeral occurs in A's question, and thus counting is an issue here. Therefore, B's affirmative answer followed by the information of the numeral that is not compatible with the numerals given by A is not acceptable; but C's negative answer followed by the numeral that is not compatible with the numerals given by A is an appropriate one. We can see that it is the occurrence of a numeral rather than a bare plural that encodes counting.

All of the facts discussed in this section indicate that numerability and number are two different grammatical notions, although they may interact in a certain language-specific way. This is similar to the situation that modality and tense may interact closely, but they are recognized as two different notions. The possible interactions also do not mean that one is a sub-type of the other. Unfortunately, it is still widely believed that plurality is an issue of the count-mass contrast, assuming only count nouns may be plural.

Syntactic features are distributed in different types of elements cross-linguistically and within the same language. In the following three sections, we discuss the two features with respect to different types of elements in Chinese, a CL language, compared with non-CL languages, such as English.

## **2.3. The two features in nouns**

### **2.3.1 Numerability of nouns**

Occasionally, we see people claim that numeral CL languages do have count nouns, or people feel reluctant to admit that there is no count noun in such languages. However, we still need to consider "If we assume that classifier languages have count nouns (similar to English *silverware*, cf. constructions like *three pieces of silverware*), then it is unclear what necessitates the use of classifiers." (Krifka 2008: 5)

If we put unit words such as *dui* 'pile' aside, it is undeniable that no noun in Chinese is able to combine with a numeral directly, as shown in (58). Therefore, all nouns in the language have the feature [-numerable]. This means that no noun in the language is a count noun.

- (58) a.    \*san    xianglian                      b.    \*san    you  
              three necklace                      three oil

The occurrence of a unit word such as a CL is obligatory between a numeral and a noun in Chinese. It has been noted that a CL can be optional after the numeral *yī* 'one' in colloquial Beijing dialect of Mandarin Chinese, in examples such as (59a), (59b) (H. Huang 1981), and (59c) (Lü et al. 1999 [1980]: 599).

- (59) a. *chi yi mantou*  
eat one steamed.bread  
'eat one steamed-bread'
- b. *bei yi shu-bao shangxue qu*  
carry one book-bag go-school go  
'carry one book-bag and go to school'
- c. *zhe yi {qingkuang/shigu/banfa}*  
this one situation/accident/method  
'this situation/accident/method'
- d. *\*yi {you/zhi/zheng-qi/xie/rou/bu/qian/yanlei}*  
one oil/paper/steam-air/blood/meat/cloth/money/tear

However, Du (1993) and Jing (1995) find that the omission of a CL in such data must satisfy two conditions. First, the noun must be a "count noun". More precisely speaking, the noun must be the one that may occur with the CL *ge*. The examples in (59d) are not acceptable, since the nouns may not occur with *ge*, as seen in (60b) (see 2.4.1 for more discussion of *ge*).

- (60) a. *yi ge {mantou/shu-bao/qingkuang/shigu/banfa}*  
one CL steamed.bread/book-bag/situation/accident/method
- b. *\*yi ge {you/zhi/zheng-qi/xie/rou/bu/qian/yanlei}*  
one CL oil/paper/steam-air/blood/meat/cloth/money/tear

Second, the tone of the numeral *yi* 'one' consistently undergoes the tone sandhi as though it is followed by a fourth tone syllable (Jin 1979), i.e., the tone is changed from the first tone to the second tone. Importantly, the CL *ge* has the fourth tone. In all of the examples like (59a, b, c), the CL *ge* may show up. The syllable *man*, which follows *yi* in (59a), has the second tone, and the syllable *shu*, which follows *yi* in (59b), has the first tone. Neither is able to trigger the tone sandhi of *yi*. Jing (1995: 14) thus correctly claims that in data like (59), an implicit version the CL *ge* actually occurs between *yi* and the noun, and that is why *yi* undergoes the tone sandhi. The tone sandhi fact clearly shows that the CL *ge* occurs in the syntax and even the phonological structure of the apparent CL-less examples like (59a,b,c). Thus, there is always a unit word between a numeral and a noun in Mandarin Chinese. Since it is the unit word that directly combines with a numeral, it is the unit word, rather than the associated noun, that exhibits [+numerable].

In contrast to Chinese, in some languages such as Hopi (Whorf 1956 [1941]: 141; Greenberg 1990a [1972]: 176), Halkomelem Salish (Wilhelm 2008: 64), and Yudja (an indigenous language spoken in Brazil; see Lima 2010), all nouns can combine with a numeral unconditionally. (61) is an example (Lima 2010: 7).

- (61) *txabĩa apeta* [Yudja]  
three blood  
'three units of blood'  
(the unit is identified in the context: drops, puddles, or containers)

In Yudja, there are neither CLs nor plural markers. When a numeral and a noun are combined, the exact unit of counting depends on the discourse context (Lima 2010: 13). Lima reports the naturalness of data like (61) in the absence of either Universal Sorter or Universal Packager effects. We can see that all nouns in such languages may have the feature [+numerable].

Between the above two patterns, in languages such as English, some nouns may combine with numerals directly (e.g., *apple*) and some may not (e.g., *oil*), as seen before.

The variation among Chinese, Yudja, and English clearly shows that numerability is a

notion of grammar (see 4.6 for my syntactic analysis of the variation).

In some languages, there is an optionality with respect to the occurrence of a CL for a non-mass NP. In Jingpo (Dai 1991) and Indonesian (Sato 2009: 15), a numeral may be followed by either a CL or a non-mass NP directly.

- (62) a.   tiga   orang siswa                      b.   tiga   siswa                      [Indonesian]  
           three CL    student                      three student  
           Both: ‘three students’

The optionality is also seen in certain semantic types of nominals in other CL languages (see Tang 2004 for a discussion). Tang calls languages that require a CL or measure word to occur with a numeral “rich” CL languages, whereas CL languages that do not have this requirement “poor” CL languages.

In fact, the apparent cross-linguistic variation can also be found within the same language. In Mandarin Chinese, in a normal phrasal nominal, a unit word is obligatory between a numeral and a noun, but in an idiomatic expression or compound, the language patterns with Yudja: no unit word appears in this position. In the examples in (63a, b), a kind CL is implied, and in (63c, d, e, f), an individual CL is implied. Note that there is no fourth-tone-triggered tone sandhi of *yi* in (63d), so such examples are different from those in (59).

- (63) a.   wu-xiang-fen                                      b.   wu-du-ju-quan  
           five-spice-powder                               five-poison-all-complete  
           ‘five-spice-power’                               ‘all five kinds of sins’  
       c.   san-jiao-guanxi                               d.   yi   xin   bu   neng   er   yong  
           three-angle-relation                           one hear not able two use  
           ‘triangle relation’                               ‘don’t be absent-minded’  
       e.   San   ren   xing   bi   you   wo   shi.       f.   san   fang   liang   ting  
           three person walk must have my teacher   three room two sitting.room  
           ‘One can always find a teacher around.’   ‘3 bedrooms & 2 sitting room’

The frequent occurrence of such expressions does not mean they are productive. One cannot replace a component of such an expression with another element freely. For instance, compared with (63a), neither of the two examples in (64) is acceptable. So we need to distinguish the productivity of types of construal from frequency rate of tokens.

- (64) a.   \*liu-xiang-fen                               b.   \*wu-chou-fen  
           six-spice-powder                               five-stink-powder

Moreover, if the numeral denotes a very high number, a CL is optional for a non-mass noun, as seen in (65) (Xing 1997: 191). Aikhenvald (2003: 100) reports that several languages have the same pattern. She observes that for numeral CLs, “[I]n many languages, they are obligatory with smaller numbers, and optional with larger ones.”

- (65) a.   Liu-yi   (ge) funü   cheng   ban-bian tian.  
           Six-billion CL woman support half-part heaven  
           ‘Six billion women can take half of the responsibilities of the world.’  
       b.   Bai-wan                      (ge) nong-nu   zhan-qilai le.  
           hundred-ten.thousand CL farm-slave stand-up PRT  
           ‘A million slaves have stood up.’

It is possible that when no CL shows up in data like (65), the second numeral morpheme, i.e., *yi* ‘billion’ in (65a) or *wan* ‘ten.thousand’ in (65b), functions as a collective CL, like *shuang* ‘pair’ or *da* ‘dozen’.

The complexity does not affect the establishment of the two values of numerability. We will give our syntactic representations of the variations in 4.6.

### 2.3.2 Dimensionality of nouns

Although all nouns in Chinese are non-count nouns, they are not the same, with respect to dimensionality. In 2.2.3, we see that nouns with [+dimension] are selected by individual CLs, and nouns with [-dimension] are selected by individuating CLs. As shown in (66), nouns such as *he* ‘river’ can be modified by a dimension adjective such as *changchang* ‘long’. In contrast, material nouns such as *you* ‘oil’ in (67a) and immaterial nouns such as *minzhu* ‘democracy’ in (68a), reject such adjectives (putting aside the intensifying reading of such adjectives; see the discussion of (19)).

- |         |   |    |  |    |  |
|---------|---|----|--|----|--|
| (66) a. | <i>changchang</i> de <i>he</i><br>long DE river<br>‘long river’ | b. | <i>da</i> <i>qi-qiu</i><br>big air-ball<br>‘big balloon’ | c. | <i>fang</i> <i>xigua</i><br>square watermelon<br>‘square watermelon’ |
| (67) a. | * <i>changchang</i> (de) <i>you</i><br>long DE oil              | b. | * <i>da</i> (de) <i>zheng-qi</i><br>big DE steam-air     | c. | * <i>fang</i> de <i>mianfen</i><br>square DE flour                   |
| (68) a. | * <i>changchang</i> (de) <i>minzhu</i><br>long DE democracy     | b. | * <i>bo</i> (de) <i>zibenzhuyi</i><br>thin DE capitalism |    |  |

The constraint is shown not only in modification, but also in predication. The string *hen chang* ‘very long’ may not be the predicate of the mass noun *you* ‘oil’ in (69a), but it can be the predicate of the non-mass noun *he* ‘river’ in (70a). The string *hen da* ‘very big’ may not be the predicate of the mass noun *zheng-qi* ‘steam-air’ in (69b), but it can be the predicate of the non-mass noun *qi-qiu* ‘balloon’ in (70b).<sup>6</sup>

- |         |  |    |  |
|---------|--|----|--|
| (69) a. | * <i>You</i> <i>hen chang</i> .<br>oil very long                             | b. | * <i>Zheng-qi</i> <i>hen da</i> .<br>steam-air very big                          |
| (70) a. | <i>He</i> <i>hen chang</i> .<br>river very long<br>‘The river is very long.’ | b. | <i>Qi-qiu</i> <i>hen da</i> .<br>air-ball very big<br>‘The balloon is very big.’ |

This contrast shows that the feature dimensionality can divide Chinese non-count nouns into the mass-type, which has [-dimension], and the non-mass-type, which has [+dimension].

Greenberg (1972: 26) claims that nouns in CL languages have the characteristics of a mass noun. The idea is also seen in Hansen (1972), Graham (1989), Krifka (1995), Doetjes (1996, 1997), Chierchia (1998), among many others. According to our new analysis of the count-mass contrast, however, not all nouns in Chinese are mass nouns.

<sup>6</sup> Audrey Li mentions to me an asymmetry in the word *tiankong* ‘sky’. It may not be directly modified by *da* ‘big’, but can take *hen da* ‘very big’ as its predicate.

(i) a.	* <i>da</i> <i>tiankong</i> big sky	b.	<i>Tiankong</i> <i>hen da</i> . sky very big ‘The sky is very big.’
--------	--	----	---

Note that sky is unique and *da* ‘big’ here is not in contrast to *xiao* ‘small’. I leave this intrigue asymmetry for future research.



## 2.4. The two features in unit words

### 2.4.1 Classification of unit words

All unit words tell us what counts as one in counting. Unit words include CLs and measure words. The latter group is composed of standard measures such as *kilo* and container measures such as *cup* in *three cups of tea*. Unlike Croft (1994: 162-163), who considers individual CLs as real CLs and excludes other types of CLs in his study, Chao (1968) covers all types of unit words. Since this study targets counting constructions, I also consider all types of unit words.<sup>7</sup>

Kind CLs have no occurrence restrictions. They occur with all types of nouns. Standard and container measures occur with either [+dimension] nouns or material type of [-dimension] nouns, but reject nouns denoting immaterial notions (see (16) and (17)). So these three types of unit words are not sensitive to the contrast between [+dimension] and [-dimension]. In the following data, the nouns in the a-examples are [+dimension] and those in the b-examples are [-dimension].

- |         |   |    |  |                                 |
|---------|---|----|--|---------------------------------|
| (71) a. | shi <u>zhong</u> luobo<br>ten CL carrot<br>'ten types of carrot'      | b. | shi <u>zhong</u> mianfen<br>ten CL flour<br>'ten types of flour'     | [Kind CL]                       |
| (72) a. | shi <u>gongjin</u> luobo<br>ten kilo carrot<br>'ten kilos of carrots' | b. | shi <u>gongjin</u> mianfen<br>ten kilo flour<br>'ten kilos of flour' | [Standard measure] <sup>8</sup> |
| (73) a. | shi <u>xiang</u> luobo<br>ten box carrot<br>'ten boxes of carrots'    | b. | shi <u>xiang</u> mianfen<br>ten box flour<br>'ten boxes of flour'    | [Container measure]             |

When these three types of unit words occur with nouns of [+dimension], they do not represent the natural units of the elements encoded by the nouns.

Unit words that select [-dimension] nouns are individuating CLs (2.2.3), as shown in (74). Such CLs occur with mass nouns (e.g., Croft 1994: 162). Semantically, individuating CLs are associated with the idea that "the noun refers to some kind of mass and the classifier gives a unit of this mass" (Denny 1986: 298, cited in Aikhenvald 2003: 318).<sup>9</sup>

- |         |  |    |  |    |   |
|---------|--|----|--|----|---|
| (74) a. | shi dui tu<br>ten CL earth<br>'ten piles of earth' | b. | wu gu zheng-qi<br>five CL steam-air<br>'five puffs of steam' | c. | wu zhang zhi<br>five CL paper<br>'five pieces of paper' |
| d.      | wu di you<br>five CL oil<br>'five drops of oil'    | e. | wu tan you<br>five CL oil<br>'five puddles of oil'           | f. | wu pao niao<br>five CL urine<br>'five units of urine'   |

<sup>7</sup> I put aside Chao's (1968: 698) quasi-measures, which include some nouns with deleted unit words. I also ignore other types of "measures" in Chao (1968), which are not unit words of nominals.

<sup>8</sup> Other than the well-recognized standard measures such as *gongjin* 'kilo', the words *nian* 'year', *yue* 'month', and *ri* 'day' may be ambiguous between unit words and regular nouns (J. Tang 2005: 457). When such nouns are preceded by a CL, they are nouns, but when they are preceded by a numeral, as pointed out by Cinque (2011: 3), they occur in the position of a CL, and what is missing is a noun. Also see S. Tang (2010) for a recent research on this issue.

<sup>9</sup> Individuating CLs divide massive objects into units, but not necessarily minimal units (contra Wilhelm 2008: 49). Both *di* in (i) and *tan* in (ii) are individuating CLs. The unit encoded by the latter is bigger than that by the former. Moreover, a chunk of mud or meat can be big or small, and there does not seem to have a minimal one.

(i)	san di shui three CL water 'three drops of water'	(ii)	san tan shui three CL water 'three puddles of water'
-----	---	------	--

- g. liu ji yao-shui  
six CL medicine-liquid  
'six units of medicine liquid'

Unit words that occur with [+dimension] nouns are divided into three types. A. What counts as one is bigger than the natural unit of the element denoted by the non-mass noun. In this case, a collective CL is used, as in (75a). Collective CLs (called group measures in Chao 1968: 595) include the so-called arrangement CLs, such as *pai* 'row' and *luo* 'stack', and number set CLs, such as *shuang* 'pair', *dui* 'pair', and *da* 'dozen'. B. What counts as one is smaller than the natural unit. In this case, a partitive CL is used, as in (75b). C. What counts as one matches the natural unit. In this case, an individual CL is used, as in (75c).<sup>10</sup>

- (75) a. shi dui luobo [Collective CL]  
ten CL carrot  
'ten piles of carrots'  
b. shi pian luobo [Partitive CL]  
ten CL carrot  
'ten slices of carrot'  
c. shi gen luobo [Individual CL]  
ten CL carrot  
'ten carrots'

Generally speaking, the same form of a unit word can belong to different types, depending on the type of the associated noun, and the semantic function of the unit. In (74a), the CL *dui* occurs with the mass noun *tu* 'earth', and it is thus an individuating CL. However, in (75a), *dui* occurs with the non-mass noun *luobo* 'carrot', and it is thus a collective CL. Similarly, when the CL *pian* occurs with *luobo* 'carrot' in (75b), it denotes a part of a carrot and thus it is a partitive CL, but when it occurs with *shuye* 'leaf' in (76a) below, it represents the natural unit of a leaf, and therefore it is an individual CL. Moreover, if the CL *pian* occurs with the mass noun *moutou* 'wood', as in (76b), it apportions the mass of wood, therefore it is an individuating CL. Furthermore, if it occurs with non-mass nouns such as *qiche* 'car', as in (76c), it is a collective CL. The two examples of the CL *duo* in (77) also show the ambiguity of a CL.

- |  |  |   |
|--|--|---|
| (76) a. san pian shuye<br>three CL leaf<br>'three leaves'<br>[Individual CL] | b. san pian mutou<br>three CL wood<br>'three pieces of wood'<br>[Individuating CL] | c. yi pian qiche<br>one CL car<br>'one area of cars'<br>[Collective CL] |
| (77)a. san duo hua<br>three CL flower<br>'three flowers'<br>[Individual CL]  | b. san duo yun<br>three CL cloud<br>'three pieces of cloud'<br>[individuating CL]  |   |

<sup>10</sup> Partitive CL is one of the various types of unit words for pseudo-partitive constructions. Pseudo-partitive constructions denote the quantity of entities (e.g., *three kilos of tea*), whereas partitive constructions (e.g., Fodor & Sag 1982, Jackendoff 1977) denote a part-whole relation within a definite domain (e.g., *three kilos of the tea*). The counting constructions discussed here, including those contain a partitive CL, are all pseudo-partitive constructions. The fractional CL *cheng* in Chinese is used in partitive constructions only. I do not discuss this CL in this book.

- (i) Ba cheng xuesheng yijing kao-le Tuofu.  
eight CL student already test-PRF TOEFL  
'80% of the students have taken the TOEFL test.'

In English, the CL *piece* is also ambiguous. It is an individuating CL in (78a), but a partitive CL in (78b) (see Lehrer 1986: 115):

- (78) a. a piece of paper                      b. a piece of celery

The CL *ge* in Mandarin Chinese functions like a chameleon. This CL can be used as an individual CL, when it occurs with nouns with [+dimension], as seen in (79a); a kind CL, as in (79b) (also in (103c) later), or an individuating CL, as in (79c) (adapted from Lü et al. 1999 [1980]: 599), when it occurs with a noun denoting an immaterial notion. But it never occurs with a material-denoting mass noun, as seen in (79d). None of the nouns in (79c) and (79d) have [+dimension], but the former cannot occur with a standard or container measure, whereas the latter can. The acceptability of the former group, where *ge* occurs with a mass noun, indicates Chao's (1968: 508-509) generalization that "Mass nouns do not take the individual classifier *g*" (sic) is not accurate.<sup>11</sup>

- (79) a. san ge xianglian  
three CL necklace  
'three necklaces'  
b. Shijie-shang you liang ge butong de minzhu.  
world-on have two CL different DE democracy  
'There are two kinds of democracy in the world.'  
c. zhe yi ge {qingkuang/shigu/banfa}  
this one CL situation/accident/method  
'this situation/accident/method'  
d. \*san ge {you/zhi/zheng-qi/xie/rou/bu/qian/yanlei}  
three CL oil/paper/steam-air/blood/meat/cloth/money/tear

Unit words are for counting. In counting, there is no restriction to numerals. In my study, I do not consider words that may not be preceded by any numeral other than *yi* 'one', such as those in (80) (Chao 1968: 603, Li & Thompson 1981: 111). In such constructions, the word *yi* is probably not a numeral, since it can be replaced by the adjective *man* 'full' (Y. M. Li 2000:

<sup>11</sup> Many papers have been published on *ge*. See Myers (2000) for a review. The word *ge* in data like the following is also a CL, followed by a nominalized element (Ōta 2003 [1958]: 363, Chao 1968: 320). The word *ta* here has been analyzed as an indefinite D-element in Lin & Zhang (2006):

- (i) Zanmen wan ta (yi) ge tongkuai!  
we play it one CL satisfaction  
'Let's play as much as we like.'

*Ge* may also occur in other contexts in which no numeral may occur. *Ge* in such uses is thus not a unit word. For instance, it can occur to the left of an adjective, as in (ii-a); or to the left of negation, as in (ii-b) (Ōta 1958: sec 21.4, Zhu 1982: 49):

- (ii) a. Akiu pao-le \*(ge) kuai.                      b. Akiu xiao \*(ge) bu-ting.  
Akiu run-PRF GE fast                      Akiu laugh GE not-stop  
'Akiu ran fast.'                      'Akiu laughed endlessly.'

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

In (iii), *ge* also rejects a numeral. In (iv), *ge* precedes a pronoun (Cheng & Sybesma 1999: 538) or proper name (Ōta 2003 [1958]: 75; Cheng & Sybesma 1999: 523).

- (iii) Wo he (\*yi) ge shui jiu lai.                      (iv) Na \*(ge) Hufei zhen bu xianghua.  
I drink one GE water then come                      that CL Hufei truly not decent  
'I'll come after I drink some water.'                      'That Hufei is really unreasonable.'

However, examples like (iv) may show that the uses of pronouns and proper names have the syntax of common nouns (Ōta 2003 [1958]: 75; X. F. Zhang 2008: 413; De Clercq 2008). In S. Wang (1989: 110), the *ge* in (iv) is claimed to function as an indefinite determiner.

(80) a. {yi/\*san} shen nitu  
one/three body mud  
'a body covered all over in mud'

b. {yi/\*san} lian you  
one/three face oil  
'a face covered all over in oil'

The conditions of silent *yi* are studied by D. Yang (1996). Silent *yi* can follow *mei* ‘each’ and the demonstrative *zhe* ‘this’ or *na* ‘that’. When *yi* is covert, its occurrence in syntax can be attested by the singular reading of the whole nominal (see more discussion of this issue in 3.4.1 and 4.2.2).

- English unit words are also countable. As stated in Grimshaw (2007: 204 fn. 6), unit words in English can never be mass. For instance, Chierchia (2010: 103) claims that in (82), the unit word *quantities* is countable, and thus the whole NP *quantities of water* is countable, although *water* is not countable. In my analysis, unit words may combine with a numeral directly and thus they are [+numerable], i.e., they are countable.

- Since no noun in Chinese has the feature [+numerable] and all unit words have the feature, the latter are the unique numerability bearer in the language. We can see that numerability does not have to be anchored to lexical or root elements (for a non-lexical approach to the count-mass contrast, see Allen 1980, Borer 2005, Pelletier 2009; for a lexical approach to the contrast, see Doetjes, to appear).

The analytical realization of numerability is parallel to the situation that tense information can be realized by either verbs or auxiliaries in English. Formal features in general can be distributed in various types of elements.

Two types of unit words may not be modified by a dimension modifier: standard measures (Liu 1980: 10; cf. Lu 1987: fn. 3) and kind CLs:

- 28

- (84) a. san zhong qianbi      b. \*san {chang/da} zhong qianbi      [Kind CL]  
 three kind pencil      three long/big kind pencil  
 ‘three kinds of pencil’

Note that the adjectives *da* ‘big’ and *xiao* ‘small’ may mean ‘significant’ and ‘insignificant’, respectively (see the discussion of (19) above). Such readings are not dimension readings, and thus the two adjective in these readings may modify abstract nouns (cf. English *big idea*, *big chance*) and abstract units in (85a,b) and standard measures in (85c,d):

- (85) a. si da bi jiaoyi      b. si xiao tiao jianyi  
 four big CL transaction      four small CL suggestion  
 ‘four significant transactions’      ‘four minor suggestions’  
 c. zuowei dui wo de jiangli, ni gei wo mai yi da jin putao!  
 as to I DE award yu for me buy one big jin grape  
 ‘As an award, you should buys two big jins of grapes for me!’  
 d. ta zuzu fei-le liang da bang.  
 he as-much-as fat-PRF two big pound  
 ‘He has gained weight as much as two big pounds.’

All other types of unit words may be modified by a dimension adjective in Chinese (Lu 1987, Luo 1988, among others), and thus have the feature [+dimension] (Note that Cheng & Sybesma’s 1998: 390 claim that individual CLs may not be modified and only the numeral *yi* ‘one’ may be followed by an adjective; but our data in (85) show that the two restrictions assumed in their theory cannot be maintained).

- (86) a. san tiao xianglian      b. san chang tiao xianglian      [Individual CL]  
 three CL necklace      three long CL necklace  
 ‘three necklaces’      ‘three long necklaces’  
 (87) a. san di you      b. san da di you      [Individuating CL]  
 three CL oil      three big CL oil  
 ‘three drops of oil’      ‘three big drops of oil’  
 (88) a. san pian xigua      b. san da pian xigua      [Partitive CL]  
 three CL watermelon      three big CL watermelon  
 ‘three slices of watermelon’      ‘three big slices of watermelon’  
 (89) a. san qun yang      b. san da qun yang      [Collective CL]  
 three CL sheep      three big CL sheep  
 ‘three flocks of sheep’      ‘three big flocks of sheep’  
 (90) a. san xiang xianglian      b. san da xiang xianglian      [Container measure]  
 three box necklace      three big box necklace  
 ‘three boxes of necklaces’      ‘three big boxes of necklaces’  
 c. san ping you      d. san da ping you  
 three bottle oil      three big bottle oil  
 ‘three bottles of oil’      ‘three big bottles of oil’

Individual CLs in other languages such as Thai (Hundius & Kölver 1983: 169-171), Kiriwina (Croft 1994: 150), and Hungarian (Csirmaz & Dékány 2010: e.g., (36)) may also be modified by dimension adjectives. But since kind CLs may not do so, the feature is not a defining property of CLs. Cross-linguistically, CLs in Korean may not be modified (Byeong Yi, p.c., Sept. 16, 2010).

I leave to Chapter 4 the discussion of the morphological constraints on such modification in Chinese and possible derivation of the constructions.

## 2.5. Numerability and quantifiers in Chinese

It is well-known that quantifiers have co-occurrence restrictions with respect to countability in English, as seen in section 2.2.3. Some quantifiers also show the similar occurrence restrictions in Chinese.

Recall that it is unit words, rather than nouns, that can be count elements in Chinese. So if a quantifier has to occur with a count element in Chinese, it must combine with a unit word.

According to Cardinaletti & Giusti (2006), quantifying elements can be modifiers or non-modifiers, cross-linguistically, and they are syntactically different (also see de Belder 2011: 105). In Chinese, modifiers can be followed by the functional word *de*. Quantifying elements such as *daliang* ‘a lot’, *suoyou* ‘all’, *quanbu* ‘all’, *daduoshu* ‘most’, *dabufen* ‘most’ can be followed by *de*, and thus they should be quantifying modifiers. They modify NPs directly, and thus may not be followed by a CL, as seen in (91) (see Tang 2007: 984; Hsieh 2008: 61; X. P. Li 2011: 6):<sup>12</sup>

- |         |  |    |  |
|---------|--|----|--|
| (91) a. | suoyou (de) (*duo) hua<br>all DE CL flower<br>‘all of the flowers’ | b. | daliang (de) (*ping) shui<br>a.lot DE bottle water<br>‘a lot of water’ |
|---------|--|----|--|

Putting such modifiers aside, I consider quantifiers that may not be followed by *de*.

### 2.5.1 Quantifiers that occur with [+numerable]

Cardinal numerals, ordinal numerals, and quantifiers such as *ji* ‘how many’ (Chao 1968: 580; it is called “unknown figure” in Iljic 1994: 107), *ji* ‘a few, several, several’, *haoji* ‘several’, *ruogan* ‘several’, *ge* ‘each’ (各), *zheng* ‘whole’, and *man* ‘all’ must be followed by a unit word (i.e., a CL or measure word) in counting, as seen in (92). Such quantifiers occur with elements that have [+numerable].<sup>13</sup>

- |         |  |    |  |
|---------|--|----|--|
| (92) a. | san *(duo) hua<br>three CL flower<br>‘three flowers’   | b. | di san *(duo) hua<br>ORD three CL flower<br>‘the third flower’ |
| c.      | Ni you ji *(duo) hua?<br>you have how.many CL flower<br>‘How many flowers do you have?’  | d. | haoji *(duo) hua<br>several CL flower<br>‘several flowers’     |
| e.      | man *(ben) rijì dou xie-zhe liang ge zi: jian fei<br>whole CL diary all write-PRG two CL word lose fat<br>‘The whole diary is full of two words: lose weight.’ |    |  |

But these quantifiers have no restriction on dimensionality feature of the element following them. In (93a), the quantifier *ji* ‘how many’ precedes the CL *di*, which is modified by the dimension adjective *da* ‘big’. In (93b), *ji* precedes the standard measure *sheng* ‘liter’, which rejects a dimension adjective. *Ji* may occur with either of them, indicating that it is not sensitive to the dimension feature of the unit words.

<sup>12</sup> Note that the position of *de* is to the left of the unit word in (91) and (96) in 2.5.3. Thus the issue is different from the one in 2.7.4, where whether *de* may follow a unit word is discussed.

<sup>13</sup> In expressions such as *zheng-nian* ‘whole year’, *zheng-yue* ‘whole month’, the second morphemes can be CLs, which take a deleted *shijian* ‘time’ or a null noun meaning time (see footnote 8).

- (93) a. Ji            da    di you?  
          how.many big CL oil  
          ‘How many big drops of oil?’
- b. Ji            (\*da) sheng you?  
          how.many big liter oil  
          ‘How many (\*big) liters of oil?’

### **2.5.2 Quantifiers that occur with [-numerable]**

Quantifiers such as *(yi)-dianr* ‘some, a little’ and *henshao* ‘little’ may not be followed by any unit word, as shown in (94).

- (94) a. Nali you *(yi)-dian* (\*ping/\*di) niunai.  
          there have some bottle/CL milk  
          ‘There is a little milk.’
- b. Duo xue *yi-dian* (\*ge) Ma-Lie!  
          more study some CL Marx-Lenin  
          ‘Study more of Marxism and Leninism!’
- c. Nali you *yi-dian* (\*ke) xigua.  
          there have some CL watermelon  
          A: ‘There is some watermelon.’ (Reading of the Universal Grinder)  
          B: There are a few watermelons.’ (e.g., in the context of talking about the quantity of the storage in a certain place)
- d. Henshao (\*ge) xuesheng neng zai 20 fenzhong-nei gei-chu huida.  
          few CL student can at 20 minute-in give-out answer  
          ‘Very few students can give an answer in 20 minutes.’

Iljic (1994: 107) claims that such quantifiers are for mass or abstract nouns only. Precisely speaking, it is a unit word, rather than a non-mass noun, that may not be quantified by such quantifiers. In Reading B of (94c), *xigua* ‘watermelon’ is not a mass noun, but it is quantified by *yi-dian* ‘a little’.

The rejection of unit words, which are the only count elements in the language, indicates the rejection of [+numerable]. Therefore, quantifiers such as *(yi) dianr* ‘some, a little’ and *hen shao* ‘very little’ can be regarded as quantifiers that occur with [-numerable] expressions, similar to *much* and *little* in English.

Note that words such as *renhe* ‘any’ and *mei* ‘each’ are D-elements, base-generated higher than a numeral, since they may precede a numeral (e.g., {*renhe/mei*} *san ba san* ‘{any/every} three umbrella(s); also see (153b)).

### **2.5.3 The ambiguous cases**

In addition to the two types of quantifiers introduced above, quantifiers such as *henduo*, *haoduo*, or *haoxie*, which all mean ‘many, much’, may occur with any type of nouns or unit words (Tang 2007: 984, Hsieh 2008: 61) (the same is true of *takusan* ‘many, much’ in Japanese, another CL language; see Iida 1998: 4; Kobuchi-Philip 2011: Sec. 3.3).

- (95) a. henduo (ben) shu  
          many CL book  
          ‘many books’
- b. henduo (di) shui  
          many CL water  
          ‘a lot of {water/drops of water}’

However, when *henduo* occurs with a unit word, e.g., a CL, it may not be followed by *de*, as in (96a), patterning with a quantifier that occurs with [+numerable], such as a numeral, as seen in (96b); whereas when it occurs without a CL, it may be followed by *de*, as in (97a),

patterning with a quantifying modifier such as *suoyou*, as seen in (97b) (see (91a)) (Hsieh 2008: 61).

- |  |   |
|--|---|
| <p>(96) a.   henduo (*de) ben shu<br/>                   many    DE   CL book<br/>                   ‘many books’</p> <p>(97) a.   henduo (de) shu<br/>                   many   DE   book<br/>                   ‘many books’</p> | <p>b.    san (*de) ben shu<br/>               three DE CL book<br/>               ‘three books’</p> <p>b.    suoyou (de) shu<br/>               all       DE book<br/>               ‘all items of the books’</p> |
|--|---|

Such quantifiers are thus ambiguous in their status.

The fact that certain quantifiers are sensitive to numerability further indicates that nominal constructions in Chinese exhibit the contrast between count and non-count elements.

## **2.6. Reflections on alternative theories of the count-mass contrast**

### **2.6.1 What’s new**

The study of the contrast between count and mass nouns dates back to Aristotle. Developing the insights of many previous studies, I have made the following three main claims with respect to the contrast.

First, a count noun is defined exclusively by [+numerable], i.e., the possibility to combine with a numeral directly. It has been generally recognized that such a combination possibility is the “signature” grammatical property of count nouns (e.g., Chierchia 2010: 104). I have now further argued that this is the only defining grammatical property of a count noun, cross-linguistically. This syntagmatic definition means that the count/non-count distinction is clearly linguistic, rather than extra-linguistic. It is thus not surprising that countability is expressed in various ways, cross-linguistically and within the same language. In Chinese, generally speaking, no noun may combine with a numeral directly, and therefore, no noun is a count noun. Numerability is instead represented exclusively by unit words, including CLs and measure words. In languages such as Yudja (Lima 2010) and Halkomelem Salish (Wilhelm 2008: 64), no CL exists, and every noun can combine with a numeral directly. Thus every noun can be a count noun. Between these two patterns, in languages such as English and Dëne (Wilhelm 2008), in an unmarked situation (i.e., without a shift), some words are [+numerable], and others are [-numerable] (see 4.6).

Second, the notion of mass is not the direct negation of count. Instead, it is the combination of the two syntagmatic properties: [-numerable] and [-dimension]. Words such as *oil* in English and their counterparts in Chinese are mass nouns. This refined analysis makes it possible to precisely identify elements that may not combine with a numeral directly but may allow a dimension adjective, e.g., *furniture* in English and *pingguo* ‘apple’ in Chinese. Such words do not denote massive objects. As put it in Chierchia (2010: 144), “we know right off the bat that *furniture* cannot be treated on a par with *water*.” Such words have been identified as “count mass nouns” (Doetjes 1996: 44, 2010: 44), “object mass nouns” (Barner & Snedeker 2005), and “fake mass nouns” (Chierchia 2010: 110). The similarity between such words and the Chinese counterparts of English count nouns has been mentioned in Doetjes (1996: 35), Portner (2005: 98), Krifka (2008: Sec. 6.5), Cowper & Hall (2009: 1), and Chierchia (2010: 111, fn. 12), among others. In Doetjes (1996: 34), “count mass nouns” are for the words which are semantically count but behave like a mass noun syntactically. If one assumes that there is a binary contrast and then gives a name to the elements that do not fit in the contrast, I do not think the scientific mission has been completed.

Although it has been widely believed that all nouns are mass nouns in Chinese, the



difference between English typical mass nouns and Chinese non-mass nouns, with respect to dimensionality, has been noted in Gil (2008: 8). He finds that unlike the former, the latter can be modified by “size and shape adjectives”. Explicitly, he states:

... whereas in English, constructions such as *big water* are bizarre, in Mandarin, constructions such as *da pingguo* ‘big apple’ are syntactically well-formed, and understood in the same way as their English counterparts.

In my analysis, both *furniture* and *pingguo* are [-numerable] and [+dimension]. Therefore, *da pingguo* ‘big apple’ is as natural as *big furniture*.

The close interaction between the notions numerability and dimensionality has long been realized in the literature, but the nature of the relation between them has not been clarified. Jespersen (1924: 198) makes the following statement:

There are a great many words which do not call up the idea of some definite thing with a certain shape or precise limits. I call these “mass-words”; they may be either material, in which case they denote some substance in itself independent of form, such as *silver*; *quicksilver*; *water*; *butter*; *gas*, *air*, etc., or else immaterial, such as *leisure*, *music*, *traffic*, *success*, *tact*, *commonsense*

Quine (1960: 104) also notes that the unacceptability of \**spherical water* and \**spherical wine*. On the other hand, it is obvious that count nouns such as *suggestion* also reject *spherical*. Bunt (1985: 199) also points out that mass nouns such as *water* may not be modified by adjectives such as *large*. Krifka (2008: Sec. 1) states that mass nouns such as *water*; *milk*, and *gold* denote liquids and substances that lack of defined boundary. However, McCawley (1975: 170) finds that *furniture* and *footwear*, which have also been treated as “mass” nouns, admit size modification “much more readily than hard-core mass nouns such as *rice*”, and Bunt also notices the acceptability of examples such as ‘*There is small furniture in the doll’s house*’ (1985, 200 & 207ff).

The most recent and thorough discussion of the relation between the count-mass contrast and size adjectives is de Belder (to appear; 2011). Her discussion does not cover other dimension modifiers such as *thick*, *thin*, *round*, though. Crucially, she claims that “if something acquires the [Size] feature, it automatically becomes countable.” (to appear: Sec. 2.2.5) So for her analysis, size features entail the count status. This is different from my analysis, which gives an equal status to numerability and dimensionality: neither entails the other, and thus there are four possibilities. One empirical consequence of her analysis is that she fails to capture the fact that non-count nouns such as *furniture* may have size feature. This kind of nouns are predicted to be “illicit” in her theory (de Belder to appear: Sec. 2.1; 2011: 83 (34)), contrary to the fact.

The idea that count and mass is not a dichotomous contrast and thus we need more features to represent them is also seen in Muromatsu (2003) and Acquaviva (2010). However, in the absence of syntactic criteria to analyze the empirical issues, the idea in the works is not well-developed. But it does pave the way for the research in this book.

The proposed two features, numerability and dimensionality, are different, but are both related to the countability of nominals. This is parallel to our understanding that tense and aspect features are different, but are both related to the temporal properties of linguistic elements.

Third, numerability, which is one of the two features for the mass-count contrast, is different from morphological number, as shown in 2.2.6. I will say more about this issue in 2.6.3.

In 2.6.2, 2.6.3, and 2.6.5, I will discuss some alternatives to identify the count-mass contrast: the semantic approach, the morphological approach, and the multiple-criteria approach.

## **2.6.2 The semantic approach to the count-mass contrast**

A pure semantic approach would assume that only count nouns denote elements that show natural atomicity. Whorf (1956 [1941]: 140) states that “Individual nouns denote bodies with definite outlines: ‘a tree, a stick, a man, a hill.’ Mass nouns denote homogeneous continuance without implied boundaries”. Quine (1960), McCawley (1979 [1975]), Wierzbicka (1985), among others (see Joosten 2003 for a survey) all try a semantic approach to the count-mass contrast. For a brief review of the semantic studies of the issue, from the perspectives of cumulativity, divisiveness, to the homogeneousness of the referent, see Doetjes (to appear, Section 2.1). Recently, the atomicity approach is defended in Wilhelm (2008), or the semantic criteria are taken for granted in works such as de Belder (2011: 73). However, Rothstein’s (2010: 14) following statement clearly tells us why this approach fails:

“inherent, or natural, atomicity is neither a necessary nor a sufficient criterion for count noun predicates, and homogeneity v. non-homogeneity cannot be at the root of the mass/count distinction. *Furniture* is mass but naturally atomic and non-homogeneous since it denotes sets of individual units and *fence* is count but homogeneous and not naturally atomic. This means that a theory of count nouns cannot rely on presuppositions of atomicity.” [sic.]

In addition to *fence*, nouns such as *segment* and *line* are also count but denote homogeneous entities, like mass nouns (Aquaviva 2010: 4).

As pointed by Rothstein (2010: 19), “the mass/count distinction can only be explained in terms of how the expressions refer, and not in terms of the things they refer to. This means it is a grammatical and not an ontological distinction.” Doetjes (2010: 10) also points out that “meaning does not determine whether a noun is mass or count in an unambiguous way” (similar idea is seen in Chierchia 2010: 103). As frequently noted in the literature, the same type of notions can be expressed by both count and non-count words in the same language, and by count words in one language but non-count ones in another language. Some well-known examples can be found in McCawley (1975: 165). The following examples in (98a, a’, b, b’) are cited from Kiss (2010) and the rest in (98) are from Chierchia (2010: 101, 110).

	Count		Non-Count	
(98) a.	vegetable	a’.	fruit	
b.	Obst	b’.	Gemüse	[German]
	fruit		vegetable	
c.	mobile/mobili	c’.	mobilia	[Italian]
	furniture.SG/furniture.PL		furniture	
d.	virtue	d’.	beauty	
e.	belief	e’.	knowledge	
f.	jump	f’.	jumping	

Theoretically, our approach defines grammatical notions in a system syntagmatically. Therefore, we do not use semantic features such as [+/-shape] (Rijkhoff 2002: 51) or [+/-concrete] (Muromatsu 2003), or [+/-size] (de Belder, to appear), or [+/-individuated] (Bobyleva 2011: 58) to define dimensionality or numerability. Linguistic categories are

defined by the relations of elements in the language system, rather than by the properties of the denoted referents. The latter approach fails to account for cross-linguistic variations.<sup>14</sup>

One might still argue that it is quantization rather than atomicity that decides the count status. This is right. However, only when we know the possibility for a nominal to combine with a numeral directly can we see the quantization. Thus it is the syntagmatic property of the nominal, rather than the referent of a lexical item itself, that correlates with quantization, and thus the count status.

In Wilhelm's (2008: 64) semantic approach, examples like *furniture* are treated as semantics-syntax mismatches. Since all non-mass nouns in Chinese behave like *furniture*, as recognized by many scholars, one would claim that Chinese is a typical screwed-up language. If a theory labels a whole system as a mismatch one, the theory does not look plausible. Chierchia (2010: 103) has this to say, "the existence of the mass/count distinction in grammar is neither a logical nor, perhaps, a communicative necessity." "Language, viewed as specifically human aggregate of cognitive capacities, must have developed an autonomous apparatus responsible for the mass/count system." In this book, we have identified two linguistic features of the apparatus, and therefore, hopefully, the system of the count-mass contrast is less vague now.

### **2.6.3 The morphological approach to the count-mass contrast**

A pure morphological approach to the count-mass contrast would assume that count nouns are identified by their number markers, while mass nouns are signaled by the rejection of a number marker. Such an approach has been found in Link (1983: 306), Doetjet (1996, 1997), among others. However, we have extensively discussed the differences between the count status and number in 2.2.6.

There are at least four problems in a number marking approach to the count-mass contrast.

First, the expectation of a "count" noun fails when we consider the so-called mass plural, seen in 2.2.6. More examples of mass plural are listed in (99) (Acquaviva 2010: 3, 8), where the occurrence of the plural marker leads to a mass reading, instead of the expected count reading.

	Count	Mass	
(99) a.	brain	brains	
b.	fund	funds	
c.	ksilo	ksila	[Modern Greek]
	wood.SG	wood.PL	
	'piece of wood'	'wood'	

Second, the expectation of a "mass" noun fails, when we consider the bare nouns in certain PPs and VPs, introduced in 2.2.6. For instance, the noun *prison* in the PP *in prison* neither has a plural form nor is preceded by any article. The absence of a number marker does not lead to a mass reading. The nouns in such constructions seem to have a singular form, but denote either one or more than one atom. They thus look like non-counting singulars.

Third, there also exist non-counting plurals. We have seen examples (55) and (56) before. Plurality that is not for counting is also seen in Acquaviva's (2010: 2) following examples (I thank Jonathan Evans for giving me more such examples to see the contrast):

<sup>14</sup> We have also seen the claim that "other things being equal, stuff consisting of bigger, more conspicuous individual entities are more likely to be viewed as 'multiplicities' and designated by plural nouns than stuff consisting of smaller, less conspicuous entities" (Wierzbicka 1985: 313; also see Krifka 2008: 1). But mass nouns such as *tiankong* 'sky', *yun* 'cloud', and *bu* 'cloth' may indeed denote big stuff.

- (100)a. I saw you in my dreams ≠ several different dreams  
 b. a house in the woods ≠ in several different woods  
 c. I have plans for tonight ≠ I have a few plans for tonight

If a count noun is supposed to occur in the context of counting, the notion of non-counting plural is not compatible with this understanding.

Fourth, mutual exclusiveness between a numeral and a plural marker is observed in certain constructions (see the German examples in (49) before). For some languages, this is a consistent pattern, a well-known fact stated in textbooks such as Booij (2007: 127). In the Hungarian examples in (101), the plural marker *-k* may not occur with the numeral (Csirmaz & Dekany 2010: (88)). The same constraint is also found in Bangla (Dayal 2011: 4). If the possibility to occur with a numeral is the signature property of a count noun (Chierchia 1998: 353), the conflict indicates that plural markers cannot be a reliable signal for count nouns.

- |         |   |    |  |             |
|---------|---|----|--|-------------|
| (101)a. | három takaró-(*k)<br>three blanket-PL<br>'three blankets' | b. | három kutya-(*k)<br>five dog-PL<br>'five dogs' | [Hungarian] |
|---------|---|----|--|-------------|

Realizing the complexity of plural markers, different terms have been used in the literature, to cover the patterns unpredicted by the morphological approach. Doetjet (2010: 45) calls the plurals in *oats* and *grits*, which may not occur with a numeral, defective plural, and finds that they often correspond to mass nouns in other languages. Some researchers treat such plurals as idiosyncratic ones and keep number marking as an effective way to distinguish count from mass nouns (e.g., de Belder 2011: 72; 205). Some other researchers (e.g., Harbour 2008) distinguish morphological number from semantic number. Krifka (2008) distinguishes semantic plurals and agreement plurals. For a recent review of the problems of morphological approach to the count-mass contrast, see Schaden (2010). As stated in Wilhelm (2008: 47, also see 57), "number marking is not a necessary property of count nouns".

Also, the number marker approach can lead us to the conclusion that languages such as Chinese, Yudja (Lima 2010), Halkomelem Salish (Wilhelm 2008: 64), and Dëne (Wilhelm 2008) have no way to express the count-mass contrast, since in such languages there is no (obligatory) number markers.

According to Distributed Morphology, morphological operations take place after syntax and before PF, and thus morphological markers are not a reliable argument for syntactic analysis (also see Bobaljik 2008; Zhang 2009a: 21). Morphological operations may change the features on terminal nodes. If plural marking in a specific language is a morphological operation, it is subject to language-specific constraints and does not directly reflect syntactic structure information. The rejection of a plural marker in examples like (101) may be the result of impoverishment (see Sauerland 1995 for a parallel deletion of gender markers in Norwegian weak adjectives).

#### **2.6.4 Plurality and CLs**

I have argued that CLs are numerability bearers. A further question is the relationship between individual CLs and plural markers. The so-called Sanches-Greenberg Generalization states that "Numeral classifier languages generally do not have compulsory expression of nominal plurality, but at most facultative expression." (Greenberg 1974: 25; also see Sanches 1973) Indeed, in CL languages such as Japanese, Thai, and Korean, CLs occur with plural markers optionally (Mizuguchi 2004: 18, 145, among others). However, observations that do not match Sanches and Greenberg's generalization have been reported. In Gerner & Bisang

(2008), one can see the co-occurrence of systematic number marking and numeral CLs. Allen (1977: 294), Aikenvald (2003: 100-101) also reports the cases in which CL languages have number markings.

The Sanches-Greenberg Generalization has been extended into a complementary distribution relation between CLs and plural markers in T'sou (1976), Doetjes (1996, 1997), and Chierchia (1998). It has been assumed that a language has either CLs or plural markers, and if a language has both systems, a CL does not occur with a plural marker in the same construction (e.g., Borer 2005: 95). The assumed complementary distribution has been rationalized by the hypothesis that all nouns in CL languages are mass nouns, mass nouns are inherently plural, and therefore, nouns in such languages have no plural markers (e.g., Chierchia 1998). I have argued against the first step of this rationalization. As for the second step of this rationalization, the mass-is-plural hypothesis (also see McCawley 1998 [1988]: 568), has been shown to be problematic in Schaden (2010), and the references therein.

In the perspective of this alleged complementary distribution, Borer (2005), among others, represents CLs and plural markers in the same syntactic position. But in addition to the languages that allow the co-occurrence of CLs and number markers, languages such as Yudja (Lima 2010) and Dëne (Wilhelm 2008) have neither CLs nor number markers.

Although, as pointed out in Doetjes (to appear: 2), the Sanches-Greenberg generalization does not go the other way, i.e., it does not make any claim about non-CL languages, one still finds the co-occurrence of CLs and plural marking in non-CL languages. Krifka (2008: 7) presents the following German examples to show this. Persian (Gebhardt 2009) and Hungarian (Csirmaz & Dékány 2010: 13) also allow a numeral and a CL to occur in the same nominal.

- (102)a.   zwanzig Stück Semmel-n  
          twenty CL   bread.roll-PL  
          'twenty bread-rolls'  
      b.   fünf Mann Mensch-en  
          five CL     person-PL  
          'five people' (title of a play by Jandl and Mayröcker)

My proposal that number and numerability are different notions and CLs are numerability bearers in counting constructions can capture the co-occurrence of plural markers and CLs.

A related issue is that if numerability is different from number, how does Mandarin Chinese express plurality? In this CL language, no noun may occur with a numeral directly, which means no noun is countable. But some nouns may be in a reduplicate form to express plurality, as seen in (103). This is the so-called 'distributive plural' (Sanches 1973: 13).

- (103)a.   Jia-jia     menko dou gua-zhe   denglong.  
          home-RED door   all   hang-PRG lantern  
          'The doors of all of the houses have lanterns.'  
      b.   Zi-zi           dou liulu-chu   tade chouhen.  
          character-RED all   reveal-out his   hatred  
          'All characters show his hatred.'  
      c.   Cun-cun     dou faxian-le zhe ge bingdu.  
          village-RED all   find-PRF this CL virus  
          'This kind of virus has been found in all of the villages.'

Chinese also has a productive way to express distributive plurality: the reduplication of

unit words, including CLs. All types of mono-syllabic unit words can be reduplicated to express distributive plurality (Liu 1980: 10; Yang 2005: 63; Hsieh 2008: 3).

- (104)a. Zhang-zhang zhi dou que yi ge jiao. [individuating CL]  
 CL-RED paper all lack one CL corner  
 ‘One corner is missing from each piece of the paper.’
- b. Ge-ge xuesheng dou you ziji de wangye. [individual CL]  
 CL-RED student all have self DE webpage  
 ‘All students have their own webpages.’
- c. Shuang-shuang qingren bu-ru hui-chang. [collective CL]  
 CL-RED lover step-in meeting-place  
 ‘All pairs of lovers stepped into the meeting place.’
- d. Pian-pian xigua dou hen tian. [partitive CL]  
 CL-RED watermelon all very sweet  
 ‘Every slice of watermelon is sweet.’
- e. Cun-cun jifu dou ke dedao bao hu. [standard measure]  
 inch-RED skin all can get protection  
 ‘Every inch of the skin can get protected.’
- f. Pan-pan cai dou hen te bie. [container measure]  
 plate-RED dish all very special  
 ‘Every dish is special.’
- g. Zhong-zhong jixiang biao ming Zhong-yi bu ke kao. [kind CL]  
 CL-RED sign indicate Chinese-medication not reliable  
 ‘Various signs indicate that Chinese medication is not reliable.’

In addition to the preverbal position, reduplicated CLs can also occur at the post-verbal position, as seen in (105b):

- (105)a. Tian-shang piao-zhe liang duo bai yun.  
 sky-on fly-PRG two CL white cloud  
 ‘Two pieces of cloud are flying in the sky.’
- b. Tian-shang piao-zhe duo-duo bai yun.  
 sky-on fly-PRG CL-CL white cloud  
 ‘Many pieces of cloud are flying in the sky.’

In Indonesian, another CL language, both mass nouns and non-mass nouns can be reduplicated (Dalrymple 2008: 3). Reduplicated mass nouns, as in (106a) and (106b), encode multiple units of massive objects (similar to the mass plural in (99)), and reduplicated non-mass nouns, as in (106c), encode plurality.

- (106)a. Mereka telah kemasukan air laut terlalu banyak dan air-air itu sudah  
 they have ingested water sea excessive many and water-RED that already  
 berhasil dikeluarkan.  
 successfully Pass.exit.Kan  
 ‘They have ingested too much sea water, and those [amounts of] water have successfully been taken away.’
- b. minyak-minyak itu muncrat dari manhole kapal dan membeku setelah  
 oil-RED that stream from manhole ship and solidify then  
 membentuk seperti sabu dan mengotori pantai sekitar.  
 form like bubble and make.dirty beach around

‘The [streams of]oil streamed from the manhole of the ship and solidified, and then formed bubbles and polluted the beach.’

- c. (\*orang) siswa-siswa  
CL student-RED  
‘students’

However, like in Hungarian (see (101)) and Bangla (Dayal 2011), in both Indonesian and Mandarin Chinese, plurality is not compatible with numerals. In (107a) (Sato 2009: 10) and (107b), the reduplicated form may not occur with the numeral. Parallel to this, the plural-denoting suffix *-men*, which obligatorily occurs with plural pronouns and optionally with plural human-denoting nouns (Iljik 1994, Y.H. A. Li 1999) is also incompatible with numerals, a well-known fact, as shown in (100c). Therefore, non-counting plural, like those in (100) and (56), is also observed in CL languages.<sup>15</sup>

- (107)a. tiga siswa-(\*siswa) (cf. (106c)) [Indonesian]  
three student-RED  
‘three students’  
b. san zhang-(\*zhang) zhi (cf. (104a)) [Mandarin Chinese]  
three CL-RED paper  
‘three pieces of paper’  
c. san ge laoshi-(\*men)  
three CL teacher-PL  
‘three teachers’

### **2.6.5 The multi-criteria approach**

The multi-criteria approach (Allen 1980) put various considerations together, including the possibility to occur with a numeral, semantic and morphological factors, and rank the degree of countability for each noun. This approach is adopted in Joosten (2003) and Kuo & Wu (2010). However, I have shown that semantic and morphological approaches to the count-mass contrast are both problematic. Then, logically, if the individual factors are problematic, putting them together does not help.

Moreover, since some linguistic phenomena are not observed in certain languages, in order to measure the countability of words in different languages, different criteria are used in this approach. For instance, in Kuo & Wu (2010), in order to judge the countability of a noun, articles and plural markers are used for English, but individual CLs are used for Chinese. This consistency is not desirable, methodologically speaking.<sup>16</sup>

## **2.7. Reflections on theories of the relation between CLs and countability**

### **2.7.1 The syntactic foundations of the presence of CLs**

The novel analysis of the count-mass contrast proposed in this book opens a new window to see the syntactic foundations of the existence of individual CLs in CL languages.

Counting is possible in the presence of a unit. The unit tells us what counts as one in the

<sup>15</sup> The only possible numeral-like element that may precede a reduplicated CL is *yī* ‘one’. However, since such words denote plural, the meaning of *yī* is opaque. It is very possible that *yī* in this case is not a numeral. Instead, it may be a distributive D-element (See Lan 2010).

(i) Yī liang-liang qiche kai-jin-le da yuan.  
one CL-CL car drive-enter-PRF big yard  
‘The cars entered the big yard one after another.’

<sup>16</sup> Other problems of Kuo & Wu (2010) include the claim that container measures are more countable than standard measures, and the absence of individuating CLs in their analysis of Chinese CLs. Neither is justified.

Individual CLs are syntactically different from nouns. Thus the fact that numerability is realized on CLs rather than nouns is a syntactic issue. The syntactic nature of the existence of individual CLs can be seen in another fact: the occurrence of such CLs is sensitive to syntactic categories in English. Counting in verbal phrases in English requires the occurrence of CLs (Krifka 2007: 39), but not in nominals, as seen in (108). There is no CL in the nominal counting construction *three trips to Paris* in (108a), but the CL *times* is obligatory in the verbal counting construction in (108b). Like nominals in Chinese, verbal phrases in English are not numerability bearers, and thus need CLs in counting. If we consider the representation of numerability in verbal phrases, English should be treated as a CL language.

- This numerability-bearer analysis of CLs calls for a review of our current understanding of CLs in CL languages.

All seven types of unit words listed in 2.4.1 “are closely related in grammar and function” (Croft 1994: 152). Like measure words, CLs are also counting units or “unit counters” (Allen 1977: 293). There is no syntactic reason to restrict our research to just any one type of them. In Croft (1994: 151, 163), many types of unit words (e.g., standard measure, collective and partitive CLs) are excluded in his study, because, “if measure terms are included, then all languages are numeral classifier languages, and a critical distinction between the languages in question and the remaining languages is lost.” (p. 151) In this book, it is exactly for the purpose to find out what is special in CL languages that we need to consider all types of unit words.

Let us examine how the dividing assumption misrepresents the basic function of CLs. We have introduced five types of CLs in 2.4.1:

- 40



- e.    san    ben shu                      [individual CL]  
three CL   book  
‘three books’

From the translations of (109a), (109b), (109c) and (109d), we can see that English also has kind CL such as *kind*, individuating CL such as *di* ‘drop’, collective CLs such as *group* and partitive CLs such as *slice*.

Among the five types of CLs, the individuating CL in (109b) indeed divides a massive object into units (also see the examples in (74)). CLs like this are called “Partitive Measures” in Chao (1968), and “Classifiers for massive objects” in Gerner & Bisang (2010: 606). Such CLs are also found in non-CL languages such as English, as seen in the word *drop* in the translation of (109c). Obviously, individuating CLs cannot distinguish CL languages from other languages.

What English does not have is individual CLs. There is no English counterpart for *ben* in (109e). It is this type of CLs that distinguishes CL languages from non-CL languages such as English. In non-CL languages, individual CLs are not overtly represented by linguistic expressions. In such languages, it has been assumed (Quine 1969: 36) that the semantics of an individual CL is integrated either in the numeral (see Wilhelm 2008: 55) or the noun (see Chierchia 1998) (see 4.6.2 for more discussion of these two approaches).

Crucially, individual CLs do not divide or individuate anything. They do not occur with mass nouns. As pointed out by Bale & Barner (2009: 7), “default classifiers [such as the individual CL *ge* in Mandarin Chinese] often combine with nouns that already are interpreted as containing individuals.” Such CLs neither individuate anything nor create new units for the individuals any more, unlike collective or partitive CLs. Therefore, the popular belief that it is the individuating (discreet set-creating) function of CLs that is special in CL languages needs reconsideration. A more precise generalization is that in addition to the various ways of specifying a unit for counting, CLs in CL languages may also represent the natural unit of entities that show atomicity, whereas the CLs of other languages do not have this semantic function. In other words, the CLs in CL languages are special in their ability to represent the natural units of the entities denoted by non-mass nouns.

Based on the above discussion, I claim that if unit words project an independent functional projection, it should not be called DivP (Borer 2009). Instead, a label such as UnitP is more appropriate.

If the general function of CLs is not dividing, we need to reconsider Borer's (2005) syntactic analysis of the count-mass contrast. In her analysis, the absence of dividing structure (DivP) derives "mass" reading, and the presence of dividing structure derives "count" reading. The two features proposed in this book calls for a richer structure to represent the count-mass contrast. This will be the topic of Chapter 4.

In Liao & Wang (2011), only two types of CLs are considered: individual and kind CLs. They (p. 148) thus claim that “the function of a classifier is to distinguish the ambiguous NP denotations by selecting a corresponding counting level (a KCL [= kind CL –NZ] selects a level which consists of kind terms, and an ICL [= individual CL –NZ] a level that consists of atomic individuals).” Considering the existence of collective, partitive, and individuating CLs, in addition to individual and kind CLs, we think Liao & Wang’s claim fails to capture the general function of CLs. The general function of CLs, like that of measure words, is simply to tell us what counts as one in counting, beyond distinguishing the denotations of NPs.

### **2.7.3 The sortal and mensural CLs and CLs that do not classify**

Some scholars divide CLs into sortal CLs and mensural CLs. Tang (2005: 453) uses s(ortal)-feature and m(ensural)-feature to label the contrast. However, neither the definitions of

the notions nor the classification are consistent in the literature.

According to Lyons (1977: 463), “A sortal classifier . . . individuates whatever it refers to in terms of the kind of entity it is”, whereas “A mensural classifier . . . individuates in terms of quantity.” Lyons (1977: 464) also mentions that CLs such as *kuai* ‘chunk’ can be both sortal and mensural. In this definition, both types of CLs individuate, and they are different only in the way of individuating. I have just claimed that not all CLs have the function of individuating, since not all nouns in Chinese are mass nouns. If Lyons’s basic idea is that there are two ways to encode units by CLs: one is related to the property of the associated noun and the other is not, the division seems to be plausible. I elaborate this shortly.

In Aikhenvald (2006: 466), however, “sortal classifiers, which just characterize a referent, and mensural classifiers, which contain information about how the referent is measured.” This definition is vague in describing the alleged contrast. Does the assumed distinction mean that sortal CLs do not contain information about how the referent is measured? In fact, all of the CLs in the following examples both contain the information about how the referent is measured and, to a certain degree, characterize the referent.

- |  |   |
|--|---|
| <p>(110)a. yi dui {yan/tang}<br/>one CL salt/sugar<br/>‘one pile of {salt/sugar}’</p> <p>b. liang zhang zhi<br/>two CL paper<br/>‘two sheets of paper’</p> <p>c. liang zhi hua<br/>two CL flower<br/>‘two flowers on their stalks’</p> | <p>a’. yi kuai {yan/tang}<br/>one CL salt/sugar<br/>‘one chunk of {salt/sugar (candy)}’</p> <p>b’. liang juan zhi<br/>two CL paper<br/>‘two rolls of paper’</p> <p>c’. liang duo hua<br/>two CL flower<br/>‘two flowers (not focusing on the stalks)’</p> |
|--|---|

For Grinstead (2002: 261), only individual CLs are sortal ones and all other types of unit words are mensural. In Gerner & Bisang (2010), sortal CLs include individual and individuating CLs, whereas mensural CLs include standard measures, container measures, collective CLs, and partitive CLs. As usual, the two basic types are defined by listing the subtypes, which themselves are described by examples, without any formal criterion. If the alleged division between sortal and mensural CLs is not formally defined, it is not surprising that the groupings are different for different scholars.

It has also been assumed that the so-called sortal CLs typically mark the first mention of a new item; they occur with indefinite nouns rather than definite ones and the so-called generic CL *ge* may take a sortal CL as an antecedent (Erbaugh 1986: 408, Aikhenvald 2003: 324, 328). The example in (111a) 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 (111b). Our (111c) is another example in which it is the CL *ge* that occurs first, and another CL occurs later in describing the same entity.

- (111)a. Cong neibian guolai yi ge xiaohaizi, uh...qi, qí, qí-zhe yi liang jiaotache  
from there come one CL child uh ride ride ride-PRG one CL bike  
uh shi yi ge hen ke’ai de xiao de jiaotache.  
uh be one CL very cute DE little DE bike
- b. ..., qi-zhe yi ge jiaotache, shì yi liang hen ke’ai de xiao de jiaotache.  
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. Yuanyuan de lai-le      yí ge ren,      yuanlai shi yí wei lao jiaoshou.  
 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.’

If unit words, including individual (*ge* or other CLs) and individuating CLs, are used for counting, their primary function is uniformly to tell us what counts as one in the context. Thus, all of them “contain information about how the referent is measured”.

Admitting that this is the primary function of CLs, we do not deny that some CLs may have semantic contents (Allen 1977: 285; Tai & Wang 1990), as seen in (110), and that different individual CLs for the same noun may be contrastive in their information structures (Her 2011), as seen in (112) below:

- (112)a. liang mian qiang      a'. liang du qiang  
 two CL wall      two CL wall  
 ‘two walls (2-dimension perspective)’      ‘two walls (3-dimension perspective)’  
 b. san tiao yu      b'. san wei yu  
 three CL fish      three CL fish  
 ‘three fish (focusing on their body shape)’      ‘three fish (focusing on their tails)’

However, CLs in Chinese do not classify the semantic types of the associated nouns in all constructions. Considering the lack of semantic transparency of the classification by CLs, following H. Zhang (2007), we do not think synchronically, the general function of CLs in the language is sorting the semantic types of nouns. For instance, the two uses of the individual CL *zhang* in (113a) and (113b) do not exhibit semantic similarity. As pointed out by Greenberg (1990a [1972]: 175), a study of the semantic classification of a CL on the associate noun is more valuable in the study of the grammaticalization of the CL.

- (113)a. san zhang zui      b. san zhang chuang  
 three CL mouth      three CL bed  
 ‘three mouths’      ‘three beds’

Moreover, obviously, collective, partitive, and kind CLs do not classify the semantic types of the associated nouns. The primary function of CLs tells us why they exist and the possible contrasts in semantics and information structure among CLs answer the question why there are so many of them in Chinese.

If the basic function of CLs in a counting construction is not sorting, we expect to see the existence of languages in which individual CLs do not classify nominals, either. Indeed, Niuean (Massam 2009) and many Oceanic languages (Mathew Dryer, p.c. July 2008) are such languages. In these languages, every non-mass noun is in construal with a CL when it combines with a numeral or quantifier, and the form of the CL remains the same. In the following Niuean examples (Massam 2009: 679), the CL *e* occurs with various types of nouns. This CL has no sorting function at all.

- (114)a. (e) ua e kuli      b. tokolima e tagata loloa  
 ABS.C two CL dog      PERS-five CL person tall  
 ‘two dogs’      ‘five tall people’  
 c. (e) loga e fua loku      d. tokologa e Niue  
 ABS.C many CL fruit papaya      PERS-many CL Niue  
 ‘many papayas’      ‘many Niueans’

Thus, numeral CLs do not have to classify nominals. On the other hand, the CLs found in Bantu languages (e.g., Aikhenvald 2003) or the CLs that are incorporated into verbal expressions in sign languages (e.g., Sandler & Lillo-Martin 2006) do classify nominals (or arguments), but they do not have to occur with a numeral or quantifier, and are thus not unit words.

#### **2.7.4 The unreliability of the *de* and pre-CL adjective arguments**

In this section, I argue against the assumed correlation between the count-mass contrast and two phenomena in Mandarin Chinese: the occurrence of an adjective to the left of a unit word and the occurrence of the functional word *de* to the right of a unit word (Cheng & Sybesma 1998, 1999).

I have argued that in Chinese, neither nouns nor CLs make a distinction between count and non-count ones themselves, since all nouns are non-count elements (2.3.1) and all CLs are count elements (2.4.2). But the selection of CLs may distinguish mass nouns from non-mass nouns. Individual, collective, and partitive CLs occur with non-mass nouns and individuating CLs occur with mass nouns (other unit words, i.e., kind CLs, standard and container measures, occur with both mass and non-mass nouns).

Cheng & Sybesma (1998, 1999) try to make a distinction between count CLs and mass CLs (called massifiers). The names are used to show that in Chinese, the contrast between count and mass nouns can be distinguished at the level of CLs, if not at the level of nouns.

The terms count CLs and mass CLs correlate respectively with the terms sortal CLs and mensural CLs (see 2.7.3). In Cheng (2009: 3), it seems that the count CLs are equivalent to individual CLs and all other kinds of unit words are mass CLs. Developing the ideas in certain previous literatures, Cheng & Sybesma (1988, 1999) formalize the following two criteria.

Criterion A. A pre-CL adjective may occur with a mass noun, as seen in (115a), but not with a “count” noun, as seen in (115b) (Cheng & Sybesma 1998: 390, 1999: 516; also Wang 1994: 30). The term count noun in their analysis is called non-mass and non-count noun in this paper.

- |         |   |    |  |    |   |
|---------|---|----|--|----|---|
| (115)a. | yi   da zhang zhi<br>one big CL   paper<br>‘one big piece of paper’ | b. | *yi   da wei laoshi<br>one big CL teacher                      |    |   |
| c.      | yi   da tiao hao-han<br>one big CL good-guy<br>‘one big good guy’   | d. | san   da zhi laohu<br>three big CL tiger<br>‘three big tigers’ | e. | san chang tiao xianglian<br>three long CL   necklace<br>‘three long necklace’ |

It is true that (115b) is not acceptable. But isolated cases like this do not affect the observation that other examples of the same type are acceptable, as shown in (115c, d, e) (see Cheng & Sybesma 1998: 390 fn. 4 for their acknowledgement of counter-examples). Tang (2005), Hsieh (2008), Liu (2010), and X. P. Li (2011: 34), among others, all present a lot of counter-examples to this claim on pre-CL adjectives. More examples can be found in Zhu (1982: 52), Lu (1987), Luo (1988), and Yang (2005: 33) (Examples of various types of CLs with adjectives can be seen in 2.4.3 above). Therefore, the adjective criterion is empirically problematic.

Criterion B. *De* may occur between a measure word and a mass noun, but not between a CL and a “count” noun (Chao 1968: 555, 588; Paris 1981: 32; Zhu 1982: 51; Cheng & Sybesma 1998: 388, 1999: 515). A typical pair of examples is (116):

- (116)a. san wan de tang  
three bowl DE soup  
'three bowls of soup'
- b. \*san ge de laoshi  
three CL DE teacher  
'three teachers'

Again, the unacceptability of (116b) is one of few isolated cases. In fact, all types of CLs can be followed by *de* in an appropriate context. The choice of the context has nothing to do with the count-mass contrast. Instead, it has to do with the syntactic position of *de*. In Chapter 3, I will spell out my analysis. Shortly speaking, there are two sources of *de*: one introduces a constituent directly and the other surfaces in a comparative ellipsis construction. Constructions of individual, individuating, and kind CL host the latter *de* only, whereas those of the rest types of unit words (partitive and collective CLs, standard and container measures) host *de* of either source. Note that the division here does not match with Cheng & Sybesma's distinction between count and mass CLs. If one just considers the phonological form of *de* without considering its structural position, then, *de* may occur with all types of CLs or unit words, as shown in (117a). In (117b) and (117c), *de* follows the individual CLs *li* and *tiao*, respectively.

- (117)a. Shufen chi-le yi-bai {ge/gongjin/bao/pian/dui/zhong} de pingguo.  
Shufen eat-PRF one-hundred CL/kilo/bag/slice/pile/kind DE apple  
'Shufen ate 100 apples or 100 {kilos/bags/slices/piles/kinds} of apples.'
- b. Shufen chi-le san-fen-zhi-yi li de ganmao-yao. (X. P. Li 2011: 40)  
Shufen eat-PRF one-third CL DE cold-pill  
'Shufen took one third of a cold pill.'
- c. Yi liang tiao de maojin ni zong mai-de-qi ba!  
one two CL DE towel you after.all buy-can PRT  
'You should be able to afford to buy one or two towels!'

Therefore, Cheng & Sybesma's (1998, 1999) claim that one type of CLs (the "count" type) may not be modified by an adjective, and may not be followed by *de*, whereas the other type (the "mass" type) can, is descriptively inadequate.

As mentioned above, several works, including Tang (2005: 432, 440-446), Hsieh (2008: 34), X. P. Li (2011), Liu (2010), etc. have already presented a lot of counter-examples to falsify the alleged distinction. Wu & Bodomo (2009: 489) point out that the alleged two types of CLs can occur with the same NP (See also Borer 2005: 98), as shown in (118). *Ben* in (118a) and *li* in (118b) are the count CLs, and *xiang* in (118a') and *wan* in (118b') are mass CLs, in Cheng & Sybesma's system.

- (118) a. san ben shu                      a'. san xiang shu  
three CL book                      three box book  
‘three books’                      ‘three boxes of books’  
      b. san li mi                      b'. san wan mi  
three CL rice                      three bowl rice  
‘three grains of rice’              ‘three bowls of rice’

Her & Hsieh's (2010: 541) following examples show that the two constraints on the so-called count CLs (i.e., individual CLs) can even be violated at the same time. The CLs *ke* in (119a) and *tiao* in (119b) are typical individual CLs, but they are both preceded by a modifier and followed by *de*.

- (119) a. yi da ke de gaolicai                      b. yi da tiao de yu  
           one big CL DE cabbage                      one big CL DE fish  
           ‘one big cabbage’                              ‘one big fish’

In conclusion, the alleged two criteria cannot make any distinction in CLs in Chinese, regardless of whether the assumed distinction correlates with the count-mass contrast.

## **2.8. Chapter summary**

In this chapter, I have argued for a more refined syntactic analysis of the count-mass contrast. I list my main conclusions as follows:

A. The count-mass contrast of linguistic elements is decomposed into two features: [numerable] and [dimension]. [+numerable] means a noun can combine with a numeral directly, and thus it is a count noun. [-numerable] nouns are non-count nouns. Nouns in Chinese are non-count nouns in general. [+dimension] means a noun can combine with a shape or size modifier, and thus it is a non-mass noun. A mass noun is defined by both [-numerable] and [-dimension]. Not all nouns in Chinese are mass nouns.

B. Some CLs select mass nouns and some select non-mass nouns. The latter type of CLs, i.e., individual CLs, distinguishes CL languages from other languages. Like other types of unit words, all CLs specify units and tell us what counts as one in counting. The semantic function of individual CLs is to represent the natural units of the elements denoted by non-mass nouns. Such a CL has no dividing function at all.

C. The feature [+numerable] may be distributed in different types of elements cross-linguistically and within the same language. In Mandarin Chinese, nouns do not have this feature, whereas unit words do. In languages such as English, the feature is found in both count nouns and unit words such as measure words.

D. Like in English, quantifiers in Chinese also show co-occurrence restrictions with respect to numerability. Since only unit words are [+numerable] in the language, if a quantifier selects [+numerable], it must occur with a unit word.

E. Numerability is different from the notion number, although they interact in various ways cross-linguistically.

## Chapter 3 The Syntactic Constituency of Counting Constructions

### 3.1. Introduction

This chapter studies one of the most fundamental issues in the study of the syntactic structures of counting constructions in Mandarin Chinese: their constituency. Such constructions contain three basic elements, i.e., a numeral, such as *san* ‘three’ in (120), a noun, such as *putao* ‘grape’ in (120), and a unit word between them, such as the CL *ke* in (120a), the standard measure *gongjin* ‘kilo’ in (120b), and the container measure *wan* ‘bowl’ in (120c).

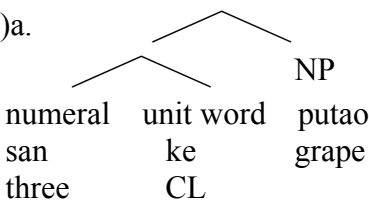
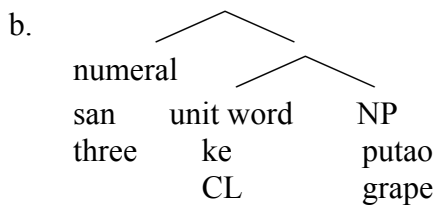
- (120)a.    *san ke putao*                      b.    *san gongjin putao*                      c.    *san wan putao*  
           three CL grape                      three kilo grape                      three bowl grape  
           ‘three grapes’                      ‘three kilos of grapes’                      ‘three bowls of grapes’

The occurrence of a unit word is licensed by the occurrence of the other two elements. One basic question is, among the three elements, whether any two of them form a constituent. In other words, is the structure of a counting construction left-branching or right-branching?

Greenberg (1990b [1975]: 227) makes the following statement, without specifying the “many indications”:

“There are many indications that in the tripartite construction consisting of quantifier (Q) [= numeral], classifier (Cl), and head noun (N), Q is in direct construction with Cl and this complex construction, which will be called the classifier phrase, is in turn in construction with N.”

Similarly, Li & Thompson (1981: 105), Paris (1981: 105-117), Tang (1990a), Croft (1994: 151), Lin (1997: 419), R. Yang (2001), and Hsieh (2008) have all proposed a unified left-branching structure, in which the numeral and the unit word form a constituent, excluding the noun, as in (121a). In contrast, Tang (1990b: 413, 2005), Cheng & Sybesma (1998, 1999), and Y.H. A. Li (1999), among others, have proposed a unified right-branching structure, in which a unit word and the noun form a constituent first, excluding the numeral, as in (121b).

- (121)a. 
- b. 

In contrast to both schools, X. P. Li (2011: 118) proposes that both left- and right-branching structures are possible, and that the former is mapped to a quantity or measure reading, and the latter is mapped to an individual or counting reading. For instance, *liang ping jiu* ‘two bottle wine’ has a pure quantity reading in (122a), but an individual reading in (122b). It is claimed that (122a) has a structure like (121a), and that (122b) has a structure like (121b).

- (122)a.    *tade wei neng zhuangxia liang ping jiu.*  
           his stomach can contain two bottle wine  
           ‘His stomach can contain two bottles of wine.’

- b. Ta ling-le liang ping jiu, zuo-shou yi ping, you-shou yi ping.  
 he lift-PRF two bottle wine left-hand one bottle right-hand one bottle  
 ‘He carried two bottles of wine, one in the left hand and the other in the right hand.’

Although not many arguments have been proposed for any of the above three approaches, I will examine all of those that I have found.

In 2.4.1, I have introduced seven types of unit words: standard measure, container measure, individual CL, individuating CL, collective CL, partitive CL, and kind CL. I will make a proposal that the various types of unit words exhibit three patterns of constituency. First, constructions of container measures, standard measures, partitive CLs, and collective CLs have a left-branching structure, as in (121a). Second, constructions of individual and individuating CLs have a right-branching structure, as in (121b). Third, in constructions of kind CLs, there is no evidence to show that any two of the three elements form a constituent.

The proposal is based on arguments from four aspects: the scope of a left-peripheral modifier; the dependency between the modifier of a unit word and that of a noun; the complement and predicate status of the combination of a numeral and a unit word; and the semantic selection relation between a unit word and a noun.

The constituency issue is the first step in analyzing the syntactic structures of counting constructions. The categorial labels of the constituents identified in this chapter will be specified in the next chapter.

In addition to this introduction section and the final summary section (Section 3.6), the organization of the chapter is the following. Section 3.2 presents the four arguments for a non-unified analysis of the constituency of counting constructions, and makes the proposal that there are three possible structures. Section 3.3 discusses three invalid arguments in the constituency study. Section 3.4 discusses the semantic mappings of the syntactic structures. Finally, Section 3.5 discusses the occurrence of the functional word *de* following a unit word, with respect to the proposed constituency.

### **3.2. Four arguments for the non-unified analysis**

Unit words do not behave the same syntactically. In this section, I present certain differences, and link the differences to the different structures of the counting constructions where they occur.

#### **3.2.1 The scope of a left-peripheral modifier**

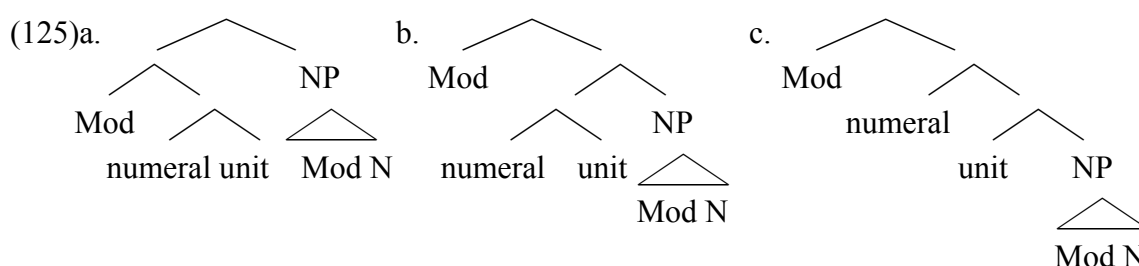
Two incompatible modifiers may co-occur if they scope over different constituents. In each of the examples in (123) and (124), two incompatible modifiers co-occur:

- (123)a. dada de yi wan xiao yingtao  
 big DE one bowl small cherry  
 ‘a big bowl of small cherries’  
 b. fangfangzhengzheng de yi bao sanjiao binggan  
 square DE one package triangle cookie  
 ‘a square package of triangle cookies’  
 c. yuanyuan de yi guan fang-tang  
 round DE one can square-sugar  
 ‘a round can of sugar cubes’  
 d. hen da de yi zhuo xiao keren  
 very big DE one table small guest  
 ‘a very big table with small guests sitting at it’



- (124)a. dada de yi dui xiao yingtao  
big DE one pile small cherry  
'a big pile of small cherries'
- b. hen chang de yi pai chao-duan de xiao qiche  
very long DE one row super-short DE small car  
'a very long row of super-short small cars'

The acceptability of this type of data indicates that the scope of the left-peripheral modifier excludes the NP, which has its own modifier. This fact shows that the two modification domains belong to two different constituents, and that the first constituent is composed of a numeral and a unit word, as well as the modifier. Putting the categorial labels of the constituent nodes aside, among the three structures in (125) (Mod = modifier), only (125a) can capture the fact that the left modifier does not scope over the NP. Thus, data like (123) and (124) should have a left-branching structure.



In (123), the unit words are all container measures, including the so-called temporary CL *zhuo* 'table' in (123d), which can be understood as a contextually-defined container measure. In (124), the unit words are collective CLs.<sup>17</sup> Other types of unit words may not have modifiers that are not compatible with the modifiers of the associated nouns, as seen in (126), for whatever reason. The unit word is the individual CL *li* in (126a), the individuating CL *di* in (126b), the partitive CL *pian* in (126c), the standard measure *gongjin* 'kilo' in (126d), and the kind CL *zhong* 'kind' in (126e).

- |   |                    |
|---|--------------------|
| (126)a. *[dada de] yi li xiao yingtao       | [Individual CL]    |
| big DE one CL small cherry                  |                    |
| b. *hen da de yi di xiao shui               | [Individuating CL] |
| very big DE one CL small water              |                    |
| c. *hen da de yi pian xiao {xiangjiao/juzi} | [Partitive CL]     |
| very big DE one CL small banana/orange      |                    |
| d. *hen zhong de yi gongjin qing muliao     | [Standard measure] |
| very heavy DE one kilo light wood           |                    |
| e. *hen da de yi zhong xiao yu              | [Kind CL]          |
| very big DE one kind small fish             |                    |

Therefore, the left-peripheral modifier test cannot be used to tell the structure of the constructions that have these types of unit words.

<sup>17</sup> Although constructions of collective CLs allow incompatible modifiers, as shown in (124), the example in (i), which looks like a collective CL construction, does not. In such a CL copying construction, the first CL can be replaced by the individual CL *ge*, and thus it is not a real collective CL (see 6.5).

- (i) a. san qun yang-qun                      b. \*dada de san qun xiao yang-qun  
three CL sheep-CL                      big DE three CL small sheep-CL  
'three groups of sheep'

It is necessary to be clarified that the occurrence of the left-peripheral modifier cannot be the result of movement from a position between the numeral and the unit word. This is because the modifier must be followed by *de*, which means that it must be phrasal (e.g., C. Huang 1989, Tang 1990b: 420), however, no unit word may be modified by a phrase in Mandarin Chinese (Tang 1990b: 418; see my 4.4.2). If a phrase moves from a non-phrase position, the movement will violate the constraint of the Structure-Preserving Hypothesis (Emonds 1970; Chomsky 1995: 318).

- (127) \* yi [dada de] wan xiao yingtao  
 one big DE bowl small cherry

My conclusion to this subsection is that container measure and collective CL constructions have a left-branching structure, in which the numeral and the unit word form a constituent, excluding the noun.

### **3.2.2 Syntactic dependency of modifiers**

A dimension modifier of a noun can occur as a modifier of an individual CL (Zhu 1982: 52; see my 2.4.3). (128a) and (128a') are different only in the position of the dimension adjective *chang* 'long': it precedes the CL *tiao* in (128a), but follows the same CL in (128a'). The two counting constructions mean the same, regardless of the position of the adjective. Other examples in (128) show the same pattern.

- |  |   |   |
|--|---|---|
| (128)a. yi chang tiao xianglian<br>one long CL necklace<br>Both: 'one long necklace'           | = | a'. yi tiao chang xianglian<br>one CL long necklace           |
| b. yi bo pian shuye<br>one thin CL leaf<br>Both: 'one thin leaf'                               | = | b'. yi pian bo shuye<br>one CL thin leaf                      |
| c. yi hou ben jiaoke-shu<br>one thick CL text-book<br>Both: 'one thick text-book'              | = | c'. yi ben hou jiaoke-shu<br>one CL thick text-book           |
| d. yi yuan ding maozi<br>one round CL hat<br>Both: 'one round hat'                             | = | d'. yi ding yuan maozi<br>one CL round hat                    |
| e. yi xiao fang zhang zhuanpian<br>one small square CL photo<br>Both: 'one small square photo' | = | e'. yi zhang xiao fang zhuanpian<br>one CL small square photo |

However, such an alternation is not seen in the construction of a modifier of a container measure or collective CL, as shown in (129).

- |  |   |  |
|--|---|--|
| (129)a. yi xiao he kouzi<br>one small box button<br>'one small box of buttons' | ≠ | b'. yi he xiao kouzi [Container meas.]<br>one box small button<br>'one box of small buttons' |
| b. yi da dui maozi<br>one big CL hat<br>'one big pile of hats'                 | ≠ | b'. yi dui da maozi [Collective CL]<br>one CL big hat<br>'one pile of big hats'              |

The possible displacement of the modifier in (128) indicates that the unit word c-commands the noun, so that the modifier of the former can be semantically related to the

modifier of the latter. The c-command relation can be represented by a right-branching structure such as (121b). In (129), however, the readings of the left examples are different from those of the right ones. If the structure of all of the examples in (129) is left-branching, as in (121a), the unit word does not c-command the noun. This proposal captures the fact that the modifier of the former does not hold a dependency relation with the modifier of the latter.

For other types of unit words, the test does not apply, since no acceptable minimal pair can be found. For instance, a mass noun may not be modified by any dimension adjective (see 2.2.2), and thus the individuating CL construction in (130b) is not acceptable for an independent reason. As for kind CLs, when adjectives such as *da* ‘big’ and *xiao* ‘small’ precede them, the size reading disappears, and thus the acceptability of both (131a) and (131b) has a different nature from that of the examples in (129).

- |         |  |   |    |  |
|---------|--|---|----|--|
| (130)a. | yi da di shui<br>one big CL water<br>‘a big drop of water’       | ≠ | b. | *yi di da shui [Individuating CL]<br>one CL big water                    |
| (131)a. | yi da lei shuiguo<br>one big CL fruit<br>‘a major type of fruit’ | ≠ | b. | yi lei da shuiguo [Kind CL]<br>one CL big fruit<br>‘a type of big fruit’ |

My conclusion to this subsection is that individual CL constructions have a right-branching structure and container measure or collective CL constructions have a left-branching structure.

### **3.2.3 The complement and predicate status**

The combination of a numeral and a standard measure, or a container measure, or a partitive CL, can be the complement or predicate of a dimension-denoting element. In (132a), in the attributive expression introduced by *de* to the left of the noun *gunzi* ‘stick’, *chang* ‘long, length’ takes *san cun* ‘three inch’ as its complement. Similarly, in (132b), *zhong* ‘heavy, weight’ takes *san liang* ‘three liang’ as its complement (1 *liang* = 50 grams). Other examples in (133) and (134) also show this complement function of the combination of a numeral and a unit word.

- |         |  |
|---------|--|
| (132)a. | [[san cun] chang] de gunzi<br>three inch long DE stick<br>‘a stick that is three inches long’                |
| b.      | [[san liang] zhong] de danjieshi<br>three liang heavy DE gallstone<br>‘a gallstone that is two liangs heavy’ |
| (133)a. | [[san ping] rongliang] de jiujiang<br>three bottle capacity DE alcohol<br>‘three bottles of alcohol’         |
| b.      | [[san bei] rongliang] de mianfen<br>three cup capacity DE flour<br>‘three cups of flour’                     |
| (134)a. | [[san duan] chang] de kewen<br>three paragraph long DE text<br>‘three paragraphs of text’                    |
| b.      | [[san ceng] gao] de loufang<br>three floor high DE building<br>‘a building that has three floors’            |

- c. [[wushi ye]    hou] de biji-ben  
     fifty    page thick DE note-book  
     ‘a notebook that has fifty pages’

In contrast, the combination of a numeral and an individual CL may not have this function, as seen in (135). In (135a), for example, the dimension word *chang* ‘long’ takes the whole string *san gen kuaizi* ‘three CL chopstick’ as its complement. In the absence of the word *kuaizi* ‘chopstick’, the string *san gen* ‘three CL’ alone may not function as a complement (note: in the intended readings of all of the examples in this subsection, the dimension word does not modify the noun to its right).

- (135)a. [san gen \*(kuaizi)    chang] de gunzi  
         three CL    chopstick long    DE stick  
         ‘a stick that is as long as three chopsticks’  
   b. [yi li \*(putao) da] de danjieshi  
         one CL grape    big DE gallstone  
         ‘a gallstone that is as big as a grape’

The contrast is seen not only in attributive expressions, but also in the so-called double subject constructions such as (136), and comparative constructions such as (137). In both Zhang (2009b) and Corver (2009), a measure phrase, such as *two feet* in *two feet long* is analyzed as a nominal predicate. In (136a), *liang mi* ‘two meter’ is the predicate of *chang* ‘length’. If we replace the standard measure *mi* ‘meter’ with the individual CL *zhang*, the sentence becomes unacceptable, as seen in (136b). The comparative constructions in (137) show a similar contrast.

- (136)a. Na zhang zhuozi [chang liang mi].  
         that CL    table    long    two meter  
         ‘That table is two meters long.’  
   b. \*Na ge zhuozi [chang liang zhang].  
         that CL table    long    two    CL  
   (137)a. Baoyu bi    Daiyu [gao san cun]  
         Baoyu than Daiyu tall three inch  
         ‘Baoyu is three inches taller than Daiyu.’  
   b. \*Baoyu bi    Daiyu [gao san gen].  
         Baoyu than Daiyu tall three CL

Since only a constituent can be a complement and predicate, the acceptable examples in (132) through (134), (136a), and (137a) are a clear indication that the combination of the numeral and the unit word is a syntactic constituent. The impossibility for the combination of the numeral and the individual CL to function as a complement in (135), (136b), and (137b) fails to support the constituency of the combination.

Other types of CLs behave like individual CLs in this aspect. The examples in (138) all show that the combination of a numeral and a CL may not be the complement of the dimension word *da* ‘big’.

- |         |  |   |  |
|---------|--|---|--|
|         | [individuating CL]                               | [collective CL]   | [kind CL]  |
| (138)a. | *[san di da]    de shui<br>three CL big DE water | b. *[san dui    da] de juzi<br>three pile big DE orange | c. *[san zhong da] de juzi<br>three kind big DE orange |

Data like the following might blur the distinction I just showed, since both the partitive CL *jie* in (139a) and the individual CL *du* in (139b) seem to combine with the numeral *liang* ‘two’ to function as a complement in a resultative construction.

- (139)a. Baoyu ba yi gen cong qie-cheng liang jie.  
 Baoyu BA one CL onion cut-as two CL  
 ‘Baoyu cut an onion into two sections.’  
 b. Baoyu ba yi du qiang gaizao-cheng liang du.  
 Baoyu BA one CL wall change-as two CL  
 ‘Baoyu changed one wall into two walls.’

However, in (139b), the noun *qiang* ‘wall’ still can show up to the right of the final *du*, as seen in (140b), whereas the noun *cong* may not show up to the right of the final *jie*, as seen in (140a). The contrast indicates that (139b) actually is the result of deletion of the final noun. Thus, as claimed above, the contrast between partitive and individual CL constructions remains. In (139a), *liang jie* is a constituent, whereas in (139b), *liang du* is not.

- (140)a. Baoyu ba yi gen cong qie-cheng liang jie (\*cong).  
 Baoyu BA one CL onion cut-as two CL onion  
 ‘Baoyu cut an onion into two sections.’  
 b. Baoyu ba yi du qiang gaizao-cheng liang du (qiang).  
 Baoyu BA one CL wall change-as two CL wall  
 ‘Baoyu changed one wall into two walls.’

My conclusion to this subsection is that standard measure, container measure, and partitive CL constructions have a left-branching structure, in which the numeral and the unit word form a constituent, excluding the noun.

### 3.2.4 Semantic selection

It is well-known that there may be a semantic selection relation between a CL and the associated noun. We have addressed the syntagmatic nature of selection in 2.2.1. Selection means that syntagmatically “certain forms arbitrarily behave alike in one way and certain others behave alike in another” (Chao 1968: 6). According to Bloomfield (1933: 165), “The features of selection are often highly arbitrary and whimsical.” A recent discussion of the selection of CLs is seen in Wu & Bodomo (2009: 488). In (141a), for instance, the individual CL *pi* may occur with *ma* ‘horse’, but not with *zhu* ‘pig’.

- (141)a. san pi {ma/\*zhu}    b. san zhan {deng/\*lazhu}    c. san sou {chuan/\*feiji}  
 three CL horse/pig    three CL lamp/candle    three CL ship/plane  
 ‘three horses’    ‘three lamps’    ‘three ships’

Even the more general individual CLs such as *ge* and *jian* (件) have selectional restrictions. *Ge* may not occur with nouns such as *shu* ‘book’ (see Loke 1994), and *jian* may not occur with nouns such as *shu* ‘book’, *deng* ‘lamp’, *qianbi* ‘pencil’, or *hua* ‘flower’.

Semantic selection is also found in individuating CLs, which occur with mass nouns. In (142a), for instance, the individuating CL *ji* (劑) may occur with *yao-shui* ‘medicine-liquid’, but not with *ji-tang* ‘chicken-soup’.

- (142)a. yi ji {yao-shui/\*ji-tang}  
one CL medicine-liquid/chicken-soup  
'one dose of liquid medicine'
- b. yi pao {niao/\*ji-tang}  
one CL urine/chicken-soup  
'the amount of pee for one peeing event'
- c. yi pi {bu/\*zhi}  
one CL cloth/paper  
'one unit of cloth'
- (143)a. yi {pian/\*zhang} yun  
one CL/CL cloud  
'one piece of cloud'
- b. yi {gu/\*tiao} zheng-qi  
one CL/CL steam-air  
'one puff of steam'

The acceptability contrasts in (142) or (143) clearly shows that like other nouns, mass nouns may also occur with particular CLs (contra Chao 1968: 508 "Mass nouns do not have specific classifiers"; also p. 503; Krifka 2008: Sec. 2).

Unlike individual and individuating CLs, other types of unit words do not show selectional restrictions on nouns. In (144a), the container measure *chexiang* 'cattle-car (of a train)' is blind to the semantic distinction between *ma* 'horse' and *zhu* 'pig'. The lack of selectional restriction is also seen in the examples of the standard measure in (145), the collective CLs in (146), the partitive CL in (147), and the kind CL in (148) (Note: it is the semantic conflict rather than the arbitrary selectional restrictions that accounts for the constraint that standard and container measures do not occur with immaterial notions, as shown in 2.2.1).

- (144)a. san chexiang {ma/zhu} [container measure]  
three cattle.car horse/pig  
'three cattle-cars of horses/pigs'
- b. yi wan {yao-shui/ji-tang}  
one bowl medicine-liquid/chicken-soup  
'one bowl of medicine-liquid/chicken-soup'
- (145) yi sheng {yao-shui/ji-tang} [standard measure]  
one liter medicine-liquid/chicken-soup  
'one liter of medicine-liquid/chicken-soup'
- (146)a. yi dui {shu/shoujuan} [collective CL]  
one pile book/handkerchief  
'one pile of books/handkerchiefs'
- b. yi pian {qiche/mayi}  
one CL car/ant  
'one big area of cars/ants'
- (147) yi pian {xigua/huluobo/juzi} [partitive CL]  
one CL watermelon/carrot/orange  
'a slice of watermelon/carrot/orange'
- (148) san zhong {yao-shui/shu} [kind CL]  
three kind medicine-liquid/book  
'three kinds of medicine-liquid/books'

Long & Ma (2008) claim that standard measures never occur with animate nouns. But this constraint simply reflects our conventional world knowledge, since we usually do not measure animate entities with standard measures. Thus it is a pragmatic constraint, rather than co-occurrence restriction. If a proper context is found, the constraint disappears. Imagine if the total weight of certain students is 550 kgs, the following sentence is then natural:

- (149) Zhuangzai-zhe 550 gongjin xuesheng de na ge qiqiu manman de sheng-qilai le.  
 load-PRG 550 kg student DE that CL balloon slow DE rise-up PRT  
 ‘The balloon that has 550 kg students with it is rising up slowly.’

Therefore, a semantic selection is found between an individual or individuating CL and its associated noun, but not between a unit word of other types and its associated noun.

Selection relation must be represented in a local syntactic relation, i.e., the two elements that hold the relation must form a constituent, excluding other elements. The right-branching structure can capture the semantic relation, since the unit word and the noun form a constituent. The left-branching structure, however, does not capture the relation, since the unit word and the noun do not form a constituent.

In Hsieh (2008: 47 fn. 15), a unified left-branching structure is proposed. In order to explain the semantic selection between an individual CL and a noun, a feature-percolating theory is mentioned. However, since the CL in the assumed left-branching structure does not c-command the noun, the assumed percolation is hard to be maintained.

Based on the semantic selection of a unit word on its associated noun, I conclude that individual and individuating CL constructions have a right-branching structure, in which the unit word and the noun form a constituent, excluding the numeral. However, no parallel selection is found for other types of unit words, and thus there is no evidence to support this constituency for them.

### 3.2.5 Three possible structures

The content of the discussion in this section is summarized in the two tables in (150).

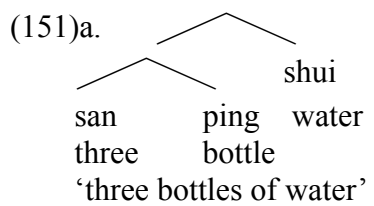
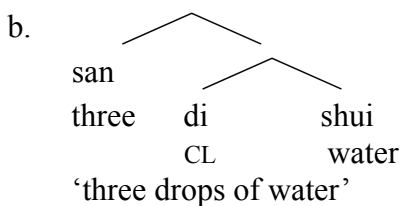
(150) a.

Argument A: The combination of a numeral and a unit word as the scope of a modifier => Left-branching
Argument B: Syntactic dependency of modifiers => Right-branching
Argument C: The complement/predicate status of the combination of a numeral and a unit word => Left-branching
Argument D: Semantic selection of a unit word on a noun => Right-branching

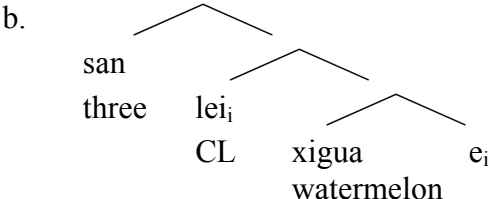
b.

	Left-branching	Right-branching
container measure	Argument A, B, C	
standard measure	Argument C	
collective CL	Argument A, B	
partitive CL	Argument C	
individual CL		Argument B, D
individuating CL		Argument D
kind CL		

From the four constituency tests, we can conclude that the constructions of the first four types of unit words (container measures, standard measures, collective CLs, and partitive CLs) have a left-branching structure, in which the numeral and the unit word form a constituent, excluding the noun, as shown in (151a), and that the constructions of individual and individuating CLs have a right-branching structure, in which the CL and the noun form a constituent, excluding the numeral, as shown in (151b).

- (151)a. 
- b. 

The remaining type is that of kind CLs. The constructions of such CLs do not show evidence of the grouping of any two of the three elements (the numeral, kind CL, and noun) into a constituent. I speculate that (152b) is the structure of (152a). In this structure, no two overt elements form a constituent, and the noun *xigua* ‘watermelon’ is merged with an empty element which is co-indexed with the kind CL *lei*.

- (152) a. san lei xigua  
three CL watermelon  
‘three kinds of watermelon’
- b. 

We can compare the example in (152a) with the following googled examples, in which a kind CL is followed by a combination of a noun and another kind CL (in the form of *lei* or *zhong*):

- (153)a. Taiwan te-you [100 zhong niao-lei] jian-jie  
Taiwan special-have 100 kind bird-kind concise-introduction  
‘a concise introduction to 100 kinds of birds that exist only in Taiwan’
- b. renhe liang zhong zhiwu-lei  
any two kind plant-kind  
‘any two kinds of plants’
- c. Bei Taiwan de ren ke fen-wei liang lei ren-zhong.  
north Taiwan DE person can divide-into two kind person-kind  
‘The people in the north of Taiwan can be divided into two types.’

In each example of (153), there is an overt kind CL to the right of the noun. Such data show that the silent *e* in (152b) can have an overt counterpart in other examples. In other words, it seems that a kind CL is always followed by a N-CL compound, where the compound-internal CL can be silent (see Chapter 6 for more discussion of the construction, including similar constructions in which the CL is not a kind CL, e.g., *san duo hua-duo* ‘three CL flower-CL ‘three flowers’).

The position of *e* in (152b) can also be taken by another overt CL, such as *duo* in (154). In this case, the two overt CLs do not have a co-indexed relation. See Chapter 6 for a discussion of data like (154).

- (154) san lei hua-duo  
three CL flower-CL  
‘three kinds of flowers’



What is important to my discussion here is that in (152a), the overt kind CL *lei* does not form a constituent with the noun *xigua* ‘watermelon’. In the absence of evidence for an alternative analysis, to capture the properties of kind CLs, (152b) can be a plausible hypothesis.<sup>18</sup>

### **3.3. Three invalid arguments**

In this section, I falsify three arguments that have been used in the literature to support the syntactic constituency analyses of counting constructions. The arguments relate to the co-occurrence of a numeral and a unit word, the position of certain partitive markers, and the immobility of the movement of a numeral-CL string.

#### **3.3.1 The co-occurrence of a numeral and a unit word**

In CL languages such as Chinese, a numeral and a CL are adjacent. Greenberg (1972) thus claim that the two elements should form a constituent. Similarly, Croft (1994: 151) claims that since a CL and a numeral co-occur, they must form a constituent. Thus a unified left-branching structure for all types of CL constructions is proposed from this co-occurrence perspective. The claim is adopted in Wilhelm (2008: 60).

This is not an effective argument, however. In English, an auxiliary (e.g., *have* or *be*) needs to occur with a subject or expletive, but the two elements never form a constituent. Also, as pointed out by Krifka (2008: Sec. 6.3), while the co-occurrence of two elements might lead to a certain morphological combination, this does not mean in itself that the two elements form a constituent in the syntactic structure. The combination of a numeral and a CL, such as *liar* (= *liang* ‘two’ + *ge* CL) and *sa* (= *san* ‘three’ + *ge* CL), can be similar to the fusion of a preposition and its following article in French *aux* (= *à les* ‘to the’) and German *beim* (= *bei dem* ‘at the’).

A numeral and a CL may also form a phonological phrase. However, as is well-known, phonological phrases are not necessarily isomorphic to syntactic constituents. For instance, the syntactic constituency of (155a) is not reflected in the phonological grouping in (155b) (Jackendoff 1997: 26).

- (155)    a.    [DP a [NP [AP big] house]]            b.    [<sub>ψ</sub> [<sub>ω</sub> a big] [<sub>ω</sub> house]]

#### **3.3.2 The position of two partitive markers**

##### **3.3.2.1 The position of *duo* ‘more’**

Lü et al. (1999 [1980]: 184) claim that *duo* ‘more’ may follow a measure word, but not a CL in general (with exceptions; see 3.3.2.3 below). Wang (1994: 35) uses the occurrence of the post-unit word *duo* to distinguish CLs from measure words. In Hsieh (2008: 46), it is assumed that if *duo* follows a unit word, the unit word and its preceding numeral should form a constituent. If so, the structure should be left-branching. X. P. Li (2011: 114) uses the same argument to claim that such *duo* constructions have a left-branching structure.

However, the position of *duo* is not a reliable argument in judging the constituency of the containing structure, for the following reason.

*Duo* is an additive partitive quantifier, scoping over the single unit-morpheme to its immediate left. The unit morpheme can be a numeral unit, such as *shi* ‘ten’, *bai* ‘hundred’,

<sup>18</sup> Liao and Wang (2011: 150) claim that in a partitive construction, an individual CL or a measure word precedes a kind CL, as in (ia). Their discussion does not cover partitive CLs. In data like (ib), a partitive CL precedes an individual CL. Note that *zhei* in (ib) is a contracted form of *zhe* ‘this’ and *yi* ‘one’.

(i)    a.    san    zhi    zhe (yi)    zhong    gou                      b.    san    pian    zhei            ge    xigua  
          three CL    this one kind    dog                                      three CL    this.one CL    watermelon  
          ‘three of this kind of dog’    ‘three slices of this watermelon’

*qian* ‘thousand’, etc., or a measure word, or a CL. In (156), for instance, the unit morpheme to the immediate left of *duo* is *shi* ‘ten’, which is the second morpheme of the word *wu-shi* ‘five-ten => 50’. The quantity expressed by this example is 50 plus a part of *shi* ‘ten’. It can be any number between 50 and 60.

- (156)    *wu-shi duo feng xin*  
           five-ten more CL letter  
           ‘fifty and more letters’ ( $50 < x < 60$ )

Importantly, *duo* does not scope over the two-morpheme string *wu-shi* ‘fifty’ in (156), since the reading of the phrase may not cover figures such as 70, which is 50 plus 20 (20 is a part of 50). The following minimal pair is telling (from Lü et al. 1999 [1980]: 184; 1 *mu* = 6.666 m<sup>2</sup>). Both (157a) and (157b) can be roughly translated as ‘10 *mu* and more (of) land’. But precisely speaking, they cover different ranges.

- (157) a.    *shi duo mu di*  
               ten more mu land  
               ‘10 *mu* and more (of) land’ ( $10 < x < 20$ )  
       b.    *shi mu duo di*  
               ten mu more land  
               ‘10 *mu* and more (of) land’ ( $10 < x < 11$ )

In (157a), *duo* ‘more’ is adjacent to *shi* ‘ten’ to its left. In this case, it means part of ten. The quantity expressed by the whole phrase is 10 plus a part of 10, i.e., any figure between 10 and 20 (e.g., 12 *mu*). In (157b), *duo* is adjacent to the standard measure *mu* to its left. In this case, it means part of one *mu*. The quantity expressed by the whole phrase is 10 plus a part of one *mu*, i.e., any figure between 10 and 11 *mu* (e.g., 10.6 *mu*).

Similarly, the reading of (158a) is 30 plus a part of 10. The quantity expressed by the whole nominal is thus any number between 30 and 40, e.g., 33 *mu*. In contrast, the reading of (158b) is 30 plus a part of one *mu*. The quantity expressed by the whole nominal is any number between 30 and 31 *mu*, e.g., 30.4 *mu*.

- (158) a.    *san-shi duo mu di*  
               three-ten more mu land  
               ‘30 *mu* and more (of) land’ ( $30 < x < 40$ )  
       b.    *san-shi mu duo di*  
               three-ten mu more land  
               ‘30 *mu* and more (of) land’ ( $30 < x < 31$ )

Therefore, if *duo* follows a unit word, as in (157b) and (158b), it scopes over the unit only, excluding the numeral. Recall that in Chapter 2 we claim that the unit word tells us what counts as one in counting. If *duo* follows a unit word, its partitive meaning scopes over the one unit encoded by the unit word. Thus, nothing indicates the numeral and the unit word form a syntactic constituent.

### **3.3.2.2 The position of *ban* ‘half’**

Lü et al. (1999 [1980]: 60) claim that *ban* ‘half’ may follow a measure word, but not a CL in general (with exceptions; see 3.3.2.3 below). In Hsieh (2008: 46), it is assumed that if *ban* follows a unit word, the unit word and its preceding numeral should form a constituent. The argument is again not valid.

Like *duo* ‘more’, *ban* ‘half’ is also a partitive quantifier, scoping over one single adjacent morpheme. When *ban* follows a unit word, it scopes over the unit word only, excluding the numeral. For instance, in the three examples in (159), *ban* follows *mi* ‘meter’. The reading of (159a) is 5 plus a half of a meter, i.e., 5.5m. The reading of (159b) is 13 plus a half of a meter, i.e., 13.5m. This example never means the half of 13 (i.e., 6.5). Similarly, the reading of (159c) is 300 plus a half of a meter, i.e., 300.5m.<sup>19</sup>

- (159) a. wu mi ban      b. shi-san mi ban      c. san-bai mi ban  
           five meter half      ten-three meter half      three-hundred meter half  
           ‘5.5 meters’      ‘13.5 meters’      ‘300.5 meters’

Since *ban* never scopes over the combination of a numeral and a unit word, its position does not show whether the combination is a constituent or not.

### 3.3.2.3 The condition for the occurrence of post-unit *duo* and *ban*

When Lü et al. (1999 [1980]) claim that *duo* ‘more’ and *ban* ‘half’ may not follow a CL, they also report some exceptions. We have shown that when these two partitive markers follow a unit word, they scope over the unit word only, introducing an additional fractional quantity. My own observation is that if the internal argument is an incremental theme (Krifka 1989a, Dowty 1991) to the specific verb, the argument may contain a fractional numeral, or the partitive marker *duo* ‘more’ or *ban* ‘half’. In other words, if a context allows the occurrence of a fractional numeral, it also allows the occurrence of *duo* or *ban* after a unit word, including a CL. In (160a), the verb *yong* ‘use’ takes the object that has the fractional numeral 3/4. In (160b) and (160c), we see that in the same context, the object can contain the partitive marker *duo* and *ban*, respectively. In (161a), however, the verb *zhaixia* ‘pick’ may not take the object that has the fractional numeral 3/4. Then in (161b) and (161c), we see that in the same context, the object may not contain the partitive marker *duo* and *ban*, respectively. The examples in (162) and (163) show the same type of contrast.

- (160)a. Zuo zhe ge dangao wo yong-le 3/4 ge pingguo.  
           make this CL cake I use-PRF 3/4 CL apple  
           ‘I used three quaters of an apple to make this cake.’  
       b. Zuo zhe ge dangao wo yong-le yi ge duo pingguo.  
           make this CL cake I use-PRF one CL more apple  
           ‘I used one apple and (some) more to make this cake.’  
       c. Zuo zhe ge dangao wo yong-le yi ge ban pingguo.  
           make this CL cake I use-PRF one CL half apple  
           ‘I used one and a half apples to make this cake.’  
       (161)a. \*Ta cong shu-shang zhaixia-le 3/4 ge pingguo.  
               he from tree-on pick-PRF 3/4 CL apple  
           b. \*Ta cong shu-shang zhaixia-le yi ge duo pingguo.  
               he from tree-on pick-PRF one CL more apple  
           c. \*Ta cong shu-shang zhaixia-le yi ge ban pingguo.  
               he from tree-on pick-PRF one CL half apple

<sup>19</sup> The partitive markers *ban* ‘half’, *ji* ‘a few, several,’ and *duo* ‘more’ have different distributions. Although *duo* can either precede or follow a unit word, as seen in (157) and (158), *ban* may not precede a unit word, and *ji* may not follow a unit word:

- (i) a. shi mi ban      b. \*shi ban mi      (ii) a. \*shi mi ji      b. shi ji mi  
       ten meter half      ten half meter      ten meter several      ten several meter  
       ‘10.5 meters’                     ‘10 and more meters’

- (162)a. Na zhi yang yao-sui-le            3/4 zhi qianbi.  
           that CL goat chew-broken-PRF 3/4 CL pencil  
           ‘That goat chewed three quarters of a pencil into pieces.’  
       b. Na zhi yang yao-sui-le            san zhi duo qianbi.  
           that CL goat chew-broken-PRF three CL more pencil  
           ‘That goat chewed three and more pencils into pieces.’  
       c. Na zhi yang yao-sui-le            san zhi ban qianbi.  
           that CL goat chew-broken-PRF three CL half pencil  
           ‘That goat chewed three and a half pencils into pieces.’  
 (163)a. \*Wo mai-le 3/4 zhi qianbi.  
           I buy-PRF 3/4 CL pencil  
       b. \*Wo mai-le san zhi duo qianbi.  
           I buy-PRF three CL more pencil  
       c. \*Wo mai-le san zhi ban qianbi.  
           I buy-PRF three CL half pencil

The same numeral-initial nominal may occur in one context, but not another. The acceptability contrast exhibited in the above data is not a contrast in nominal-internal constituency. Just as existential verbs may not take a definite argument, so certain verbs may be sensitive to other formal properties of nominal arguments. Thus, it is possible that verbs such as those in (161) and (163) disallow their internal argument to start with a fractional number. Instead, only integers are allowed.

### **3.3.3 The movement argument**

In Mandarin Chinese, the combination of a numeral and a unit word may not be fronted:

- (164)a. Shufen mai-le san ben shu.      b. \*San ben, Shufen mai-le shu.  
           Shufen buy-PRF three CL book            three CL Shufen buy-PRF book  
           ‘Shufen bought three books.’  
 (165)a. Shufen mai-le san jin niurou.      b. \*San jin, Shufen mai-le niurou.  
           Shufen buy-PRF three jin beef            three jin Shufen buy-PRF beef  
           ‘Shufen bought three jin of beef.’

This is different from the following Japanese examples, where the combination of the numeral *san* ‘three’ and the CL *satu* may be separated from the associated noun *hon* ‘book’ in (166b):

- (166)a. Taroo-wa san-satu no hon-o katta.      b. San-satu, Taroo-wa hon-o katta.  
           Taroo-TOP three-CL NO book-ACC bought      three-CL Taroo-TOP book-ACC bought  
           Both: ‘Taroo bought three books.’

Saito et al. (2008: 260) use the contrast between (164) and (166) to show that the CL construction is right-branching in Chinese and thus the combination of the numeral and the CL may not move, whereas the CL construction is left-branching in Japanese and thus the combination of the numeral and the CL can move (see Watanabe 2010 for more discussion of the syntax of Japanese CL constructions). In this chapter, I have also argued that individual CL constructions in Chinese have a right-branching structure, and thus the unacceptability of (164b) is expected. Our conclusion is compatible with Saito et al.’s. However, if the constructions of some other types of unit words, such as the standard measure in (165a), have a left-branching structure, as we proposed, how is it that the combination of the numeral and

the unit word may still not move, as seen in (165b)?

The unacceptability of (165b) does not falsify my analysis, however. The reason is that the parallel left quantity-denoting constituent of a nominal may not move in Chinese, either, as seen in (167b). The constituency status of the string *hen duo* ‘very many’ is not controversial. The fact that the string may not move does not affect its constituent status.

- (167)a. Shufen mai-le *hen duo* (de) shu.      b. \**Hen duo* (de), Shufen mai-le shu.  
 Shufen buy-PRF very many DE book      very many DE Shufen buy-PRF book  
 ‘Shufen bought many books.’

Although it is not clear to me why the language has this constraint, at least data like (167) indicate that such a movement argument, if it is proposed, is not a valid argument against the analysis proposed here. There might be an independent explanation for the general ban on the left dislocation of quantifiers in Chinese.

### **3.4. Remarks on the semantic mappings of the syntactic structures**

Non-unified structures of classifier constructions have also been seen in the literature. However, different structures are claimed to correlate with particular readings. In this section, I argue against such a mapping.

X. P. Li (2011: 117) claims that for a numeral-initial nominal in Mandarin Chinese, a quantity (= his measure) reading is mapped to the left-branching structure, whereas an individual (= his counting) reading is mapped to the right-branching structure. Four main arguments have been presented to support such quantity-individual mapping (p. 113-116; 119-120): (A) the silence of a numeral; (B) the position of *duo*; (C) the position of *de*; and (D) the deletion of the noun after a reduplicated container measure word. In addition to these four arguments, he also mentions another argument: reduplicated unit words, which encode a distributive reading, may not take a nominal in a quantity reading as its antecedent (p. 115-116; 120). Similar observation has been reported in Y.H. Audrey Li (1998: 698) and Rothstein (2009). But it is hard to see how this fact is related to the internal constituency of a unit word construction. I thus ignore this final argument. Argument B has been shown to be invalid in 3.3.2.1 above. The problems of Argument C will be discussed in 3.3.5. In this section, I falsify Arguments A and D.

#### **3.4.1 Against the silent numeral argument**

X. P. Li claims that only the right-branching structure allows the numeral to be silent. This silent numeral argument for the quantity-individual mapping of constituency is based on the examples like (168). The numeral *yi* ‘one’ to the left of a unit word may be silent (D. Yang 1996; Cheng & Sybesma 1999: 530, among others). D. Yang (1996; also see R. Yang 2001: 86) specifies that the silence may occur when *yi* immediately follows a verb, a demonstrative, or a universal quantifier. The three examples in (168) all allow a silent *yi*.

- (168)a. Siyu mai-le (yi) ben shu.      b. zhe (yi) ben shu      c. mei (yi) ben shu  
 Siyu buy-PRF one CL book      this one CL book      every one CL book  
 ‘Siyu bought a book.’      ‘this book’      ‘every book’

It has been shown in D. Yang (1996; also see Hsieh 2008: 125) that on a quantity reading, the unit word must co-occur with an overt numeral, whereas on an individual reading, the numeral *yi* ‘one’ can be silent. I use (169) to show the contrast:

- (169)a. Shufen mai-le \_ gang xiancai.  
 Shufen buy-PRF jar pickle  
 ‘Shufen bought a jar of pickles.’  
 b. Shufen bu-duo-bu-shao zhenghao mai-le \*(yi) gang xiancai.  
 Shufen not-more-not-less exactly buy-PRF one jar pickle  
 ‘Shufen bought exactly one jar of pickles, no more and no less.’

In (169a), the numeral to the left of the container measure *gang* is silent. Such a construction has an exclusive indefinite individual reading, rather than quantity reading. A quantity reading can be seen in (169b), where the expressions *bu-duo-bu-shao* ‘not-more-not-less’ and *zhenghao* ‘exactly’ signal a quantity reading. In this context, it is impossible to delete the numeral *yi* ‘one’.

X. P. Li (2011: 117) claims that in the quantity reading, but not in the individual reading, a numeral and a unit word should form a constituent, a left-branching structure, and the constituent is a complex modifier of the noun. In the left-branching structure, since the numeral is contained in a complex modifier, it cannot be deleted. Thus, the same numeral-initial expression may have two different structures. The object in (169a) has a right-branching structure, whereas the object in (169b) has a left-branching structure. No evidence is given for the impossibility to delete an element in a complex modifier.

More plausibly, I think, the numeral may not be deleted for a quantity reading simply because the numeral is the focus of such a reading. This restriction follows the general principle of PF deletion: it never applies to the focused element.

We further observe that all types of unit words can occur with a silent *yi* ‘one’, as shown in (170), including a standard measure, seen in (170d). There is no focus on the implicit *yi* in any of the examples in (170), and thus only the individual reading is available.

- |         |  |                     |
|---------|--|---------------------|
| (170)a. | Wo xiang mai ben shu.<br>I want buy CL book<br>‘I want to buy a book.’   | [Individual CL]     |
| b.      | Wo gang chi-le pian niu-rou.<br>I just eat-PRF slice cow-meat<br>‘I just ate a slice of beef.’                                       | [Individuating CL]  |
| c.      | Wo xiang mai ping jiu.<br>I want buy bottle wine<br>‘I want to buy a bottle of wine.’  | [Container measure] |
| d.      | Wo gang mai-le jin yangrou.<br>I just buy-PRF jin mutton<br>‘I just bought a jin of mutton.’ (1 <i>jin</i> = 500 grams)              | [Standard measure]  |
| e.      | Wo gang chi-le pian xigua.<br>I just eat-PRF slice water-melon<br>‘I just ate a slice of water-melon.’                               | [Partitive CL]      |
| f.      | Wo gang yujian-le qun qiangdao.<br>I just meet-PRF group robber<br>‘I just met a group of robbers.’                                  | [Collective CL]     |
| g.      | Tamen zhaodao-le zhong hen tebie de zhiwu.<br>they find-PRF kind very special DE plant<br>‘They found a kind of very special plant.’ | [Kind CL]           |

In 3.2, I have argued that individual and individuating CL constructions have a right-branching structure, and that container measure, standard measure, partitive CL and

collective CL constructions have a left-branching structure. The fact that all types of counting constructions allow the silent *yi* and thus may have either an individual or quantity reading indicates that the syntactic distinction does not have to correlate with the semantic distinction of the two readings.

The absence of *yi* ‘one’ can be the result of deletion, a phonological operation, since the reading of all of the above examples must be singular (see 2.4.2). *Yi* is semantically and syntactically present. Therefore, the silence of *yi* does not tell us the constituency of the relevant structure.

It needs to be pointed out that, as in the case of constructions with an overt *yi*, constructions with a covert *yi* can also be specific. Data like the following show that Cheng & Sybesma’s (1999: 526) claim that silent *yi* constructions must be non-specific is not accurate. The post-BA position is a typical position for definite or specific indefinite nominals. Since a counting expression with a silent *yi* may occur in this position, as seen in (171a), it can be specific. Similarly, the subject of a secondary predicate in an existential coda construction (C.-T. J. Huang 1987) must be specific indefinite. Since a counting expression with a silent *yi* may also occur in this position, as seen in (171b), it can be specific.

- (171) a. Shouwei ba ge cong nanfang lai de xiaotou fang-pao-le.  
guard BA CL from south come DE thief release-away-PRF  
‘The guard got released a thief who had come from the south.’  
b. Shufen mai-le zhang zhuozi san tiao tui.  
Shufen buy-PRF CL table three CL leg  
‘Shufen bought a table which has three legs.’

### 3.4.2 Against the noun deletion argument

X. P. Li (p. 120) notes that when a container measure is reduplicated, the noun to its right may not be deleted when the whole nominal has an anaphoric relation to an antecedent that is a string of Num-Unit-N, as shown in (172):

- (172) zhe ge tong zhuang-le san ping jiu, ping-ping \*(jiu) dou hen gui.  
this CL bucket hold-PRF three bottle wine bottle-bottle wine all very expensive  
‘This bucket holds three bottles of wine, each of which is expensive.’

This sentence has a quantity reading (= his measure reading). According to Li, the structure should have a left-branching structure. In this structure, the Numeral-Unit complex *san ping* ‘three bottle’ is a modifier of the noun. If so, the impossible deletion can be accounted for, assuming the modified noun may not be deleted. However, first of all, if the first clause of (172) has a quantity reading, it should not function as an antecedent of another form, especially a form that encodes a distributive reading (his p. 111; 116). Second, the assumption that a modified noun may not be deleted is problematic. The following sentence also has a clear quantity reading, but the noun to the right of the unit word is deleted:

- (173) Baoyu yao mai san bang yingtao, Daiyu yao mai wu bang.  
Baoyu want buy three pound cherry Daiyu want buy five pound  
‘Baoyu wants to buy three pounds of cherries, and Daiyu wants to buy five pounds.’

We conclude that the above arguments for the quantity-individual mapping of constituency are not convincing.

### 3.4.3 Notes on the syntax of quantity-individual readings

The syntactic contrast between a quantity reading and individual reading of a nominal has been systematically studied since Y.H. A. Li (1998). Y.H. A. Li presents certain tests to separate the two readings in Mandarin Chinese. For instance, the quantity reading of *san ge ren* ‘three CL person’ in (174a) may not enter into a co-referential relation with a following pronoun, but the individual reading of the same nominal in (174b) may do so (Y.H. A. Li 1998: 698).

- (174) a. *San ge ren<sub>i</sub> tai-bu-dong zhe jia gangqin. \*Tamen<sub>i</sub> de liliang tai xiao.*  
three CL people lift-not-move this CL piano their DE strength too small  
‘Three people cannot lift up this piano. Their strength is too weak.’  
b. *Ta mingtian hui kandao san ge ren<sub>i</sub>, hai hui gen tamen<sub>i</sub> zuo pengyou.*  
he tomorrow will see three CL people and will with them make friends  
‘He will meet three people tomorrow and will make friends with them.’

Rothstein (2009) also presents a few contrastive properties of the two readings. They are compatible with Y.H. A. Li’s observations. She (p. 110) also mentions that in English, “On the measure reading, the suffix *-ful(s)* can often be added to the classifier, but this is inappropriate for the individuating reading.” The examples in (175) are given to show the contrast:

- (175) a. Add two cup(ful)s of wine to the soup. [quantity]  
b. Bring two cup(#ful)s of wine for our guests. [individual]  
c. We needed three bucket(ful)s of cement to build that wall. [quantity]  
d. Three bucket(#ful)s of mud were standing in a row against the wall. [individual]

According to Akmajian & Lehrer (1976: 412), “The suffix *-ful* added to nouns is a partially productive way of converting nouns to quantifiers.” If a speaker chooses the quantifier version of an expression (i.e., the *-ful* form), instead of the plain noun version, the intended meaning must be a quantity (or measure) one, instead of an individual one.

Rothstein further reports certain morphological contrasts of the two readings in Hebrew. However, no constituency contrast is presented.

In Y.H. A. Li (1998), a pure quantity reading of a counting construction is represented by a functional projection NumP (note that there is no QuantP in her system; see next chapter for the distinction between NumP and QuantP in my analysis), and an individual reading is represented by DP. The latter has one more layer of functional projection than the former. Liao (2010) argues that the contrast should be represented at a higher level, such as in the projection of modals. In neither Y.H. A. Li’s work nor Liao’s work, where the distinction between quantity and individual readings is also discussed, have we seen any claim to support a contrast in the nominal-internal constituency.

The different types of constituency argued in my 3.2 do not correlate with the quantity-individual contrast. Each of the structures may have both readings. In (176), the individual CL *duo* and the noun *hua* ‘flower’ form a constituent, excluding the numeral *san* ‘three’ (i.e., right-branching structure). Now we see that (176a) has an individual reading and (176b) has a quantity reading. In (177), the container measure *ping* ‘bottle’ and the numeral *san* ‘three’ form a constituent, excluding the noun *jiu* ‘wine’ (i.e., left-branching structure). (177a) has an individual reading and (177b) has a quantity reading. In (178), the kind CL *zhong* ‘kind’ does not form a constituent with either the numeral *san* ‘three’ or the noun *yu* ‘fish’. (178a) has an individual reading and (178b) has a quantity reading.



- (176) a. Wo ba san duo hua dou fang zai zhuzi-shang le. [individual]  
 I BA three CL flower all put at table-on PRT  
 ‘I put all of the three flowers on the table.’  
 b. Zheli zhi neng fang san duo hua. [quantity]  
 here only can put three CL flower  
 ‘Only three flowers can be put here.’
- (177) a. Wo ba san ping jiu dou fang zai zhuzi-shang le. [individual]  
 I BA three bottle wine all put at table-on PRT  
 ‘I put all of the three bottles of wine on the table.’  
 b. Zhe zhi bing-tong zhi neng fang san ping jiu. [quantity]  
 this CL ice-bucket only can put three bottle wine  
 ‘This ice-bucket can hold only three bottles of wine.’
- (178) a. You san zhong yu you de hen kuai. [individual]  
 have three kind fish swim DE very fast  
 ‘There are three kinds of fish which swim very fast.’  
 b. Ni zhiduo zhi neng tiao san zhong yu. [quantity]  
 you most only can choose three kind fish  
 ‘You can choose only three kinds of fish at most.’

In X. P. Li (2011), individual CL constructions have a default individual reading (p. 121), as in my (176a), and such a reading has a right-branching structure. For the possible quantity reading of such constructions, as in my (176b), he resorts to the operation of semantic shift (p. 137). Since quantity reading has a left-branching structure in his analysis, the assumed semantic shift must correlate with a change in the syntactic structure. However, no syntactic evidence has been shown to support a left-branching structure for individual CL constructions.

Moreover, consider the two examples of modification constructions in (123) and (124). Zhang (2006) shows that if a construction has a pre-numeral modifier, it has a specific and thus individual reading, but the modification evidence shows that in such examples, the construction clearly has a left-branching structure. This is unexpected if individual readings correlate with a right-branching structure.

Furthermore, English numeral-initial NPs such as *three small children* have no CL, but they also have the two readings (Y.H. A. Li 1998: 695). The numeral-initial nominals in (179a) and (179b) both have a quantity reading, whereas the one in (180) has an individual reading. There is no evidence for a difference in the c-commanding relation of *three* and *small children* between (179a) and (180).

- (179) a. That bed sleeps three small children.  
 b. That hotel suite accommodated 100 guests.  
 (180) Three small children have arrived. They are all in the kitchen.

I thus claim that the contrast between a left- and right-branching structure of unit constructions does not correlate with the contrast between quantity and individual readings.

X. P. Li (2011) also correlates the container reading with an individual reading, which is assumed to have a right-branching structure, and correlates the containee reading with a quantity reading, which is assumed to have a left-branching structure. I will falsify this correlation in 5.2.4.

In addition to the two syntax-semantics mappings that I have argued against above, some other mappings are also seen in the literature. For instance, Tang (1990a: 353) mentions that in English, mass noun constructions have a left-branching structure and count noun

constructions have a right-branching structure. The same correlation is also stated in Watanabe (2006: 261, 270) for Japanese. It is beyond the scope of this book to discuss these languages. In my own analysis of Mandarin Chinese, the contrast between a left-branching structure and right-branching structure is obviously not that between count and mass nouns, since there is no count nouns in Chinese (Chapter 2). Also, my conclusion that individuating and individual CL constructions have an identical constituency shows that there is no difference in the structure of mass nouns and non-mass nouns in Chinese.

Putting kind CL constructions aside, the division between the left- and right-branching structures argued for in this chapter also has no correlation with the division between the alleged sortal and mensural CL constructions (see 2.7.3). According to Grinevald (2002: 261), individual CLs are sortal ones and individuating CLs are mensural ones. In my analysis, both kinds of CLs have a right-branching structure. My division also does not match Ōta's (2003 [1958]: 147) division between measuring (*ji-liang* 計量) and counting (*ji-shu* 計數) constructions: the former is for standard measure and container measure and the latter is for the rest, including individual and collective CL constructions in his analysis. In my analysis, collective CL constructions have the same structure as that of standard and container measures. Since the sortal-mensural division and the measuring-counting division are not supported by any syntactic evidence, it is not surprising that they do not correlate with the syntactic analysis presented here.

### 3.5. The constituency issue and the occurrence of *de* following a unit word

#### 3.5.1 Background

In Mandarin Chinese, the functional element *de* may introduce a modifier such as an adjective or relative clause to the left of another element. We have seen such examples before (e.g., (123) and (124)). *De* may also surface between a unit word and a noun. If the unit word is an individual or individuating CL, there are certain constraints, which will be explained as we progress. However, in general, all types of unit words may be followed by *de*, as observed in Tang (2005: 444), Hsieh (2008: 42), X. P. Li (2011), and Her & Hsieh (2010: 540), and shown in (181a). In both (181b) (X. P. Li 2011: 40) and (181c) (mentioned by James Huang in his talk at National Tsing Hua University, Hsinchu, on July 9, 2010), *de* follows an individual CL.<sup>20</sup>

- (181)a. Shufen chi-le yi-bai {ge/gongjin/bao/pian/dui/zhong} de pingguo.  
 Shufen eat-PRF one-hundred CL/kilo/bag/slice/pile/kind DE apple  
 'Shufen ate 100 apples or 100 {kilos/bags/slices/piles/kinds} of apples.'

<sup>20</sup> I do not consider numeral expressions that express an inherent or individual-level property of the entity denoted by the noun, as shown in the underlined part in (i) (Tang 2005: 434).

- (i) a. Ta mai-le liang tao [wu ben de shu].      b. Ta mai-le liang mi [yi gongfen de shengzi].  
 he buy-PRF two CL five CL DE book      he buy-PRF two meter one cm DE rope  
 'He bought 2 sets of 5 volume books.'      'He bought two meters of the rope that is 1 cm thick.'  
 c. yi ge shi bang de xigua  
 one CL ten pound DE watermelon  
 'one watermelon that has ten pounds'

Such attributive constructions have different syntactic and semantic properties from the pseudo-partitive constructions discussed here. Like in other constructions that contain a complex attributive, the functional word *de* must occur to the right of the attributive, i.e., the second unit word in (i) (contra Her & Hsieh 2010: 536). The higher unit word can be either a CL, as in (ia) and (ic), or a measure word, as in (ib) (contra Her & Hsieh 2010: 536). See Schwartzchild (2006), Hsieh (2008), Liao & Wang (2011: Sec. 5), and X. P. Li (2011) for discussions of such constructions.

- b. Shufen chi-le san-fen-zhi-yi li de ganmao-yao.  
 Shufen eat-PRF one-third CL DE cold-pill  
 ‘Shufen took one third of a cold pill.’
- c. Yi liang tiao de maojin ni zong mai-de-qi ba!  
 one two CL DE towel you after.all buy-can PRT  
 ‘You should be able to afford to buy one or two towels!’

Hsieh (2008: 45) claims that “The use of *de* calls for the organization of all the relevant information in an N-C sequence as a constituent” (her N = numeral; C = CL). The same idea is found in X. P. Li (2011: 119, his Argument C, as I mentioned at the beginning of 3.4 above). They thus both argue for a unified left-branching structure from this *de*-perspective.

However, we have shown that an individual CL construction may not have two incompatible modifiers (see 3.2.1). If *de* occurs, the constraint remains. The consistency does not support a left-branching structure for the counting construction.

- (182) \*Shufen chi-le hen da de yi-bai ge (de) xiao pingguo.  
 Shufen eat-PRF very big DE 100 CL DE small apple

Moreover, if an individual or an individuating CL s-selects a noun, it does so regardless of the presence of *de*. In (183), the noun *pingguo* ‘apple’ may occur with the CL *ge*, but not the CL *zhan*. The latter is for lamps. The selection restriction is not affected by the occurrence of *de*. I have argued that the selection supports a right-branching structure, rather than a left-branching one. This consistency does not support a left-branching structure for the counting construction.

- (183) Shufen chi-le yi-bai {ge/\*zhan} (de) pingguo.  
 Shufen eat-PRF 100 CL/CL DE apple  
 ‘Shufen ate 100 apples.’

We thus need a more plausible analysis of the *de* versions of various counting constructions.

### **3.5.2 The quantity-reading condition**

Morphologically, the functional element *de* is an enclitic consistently (Huang 1989). I claim that *de* may occur in examples like (183) when the quantity is emphasized. In a context where the quantity is not emphasized, *de* may not follow an individual CL, individuating CL, or kind CL, but may follow a unit word of other types, i.e., a partitive CL, collective CL, container measure, or standard measure.

- (184)a. \*Zhuzi-shang you san ge de pingguo. [individual CL]  
 table-on have three CL DE apple
- b. \*Zhuzi-shang you san di de you. [individuating CL]  
 table-on have three CL DE oil
- c. \*Zhuzi-shang you san kuan de fuzhuang. [kind CL]  
 table-on have three kind DE clothes
- (185)a. Zhuzi-shang you san pian de xiangjiao. [partitive CL]  
 table-on have three CL DE banana  
 ‘There are three slices of banana on the table.’

- b. Zhuozi-shang you san dui de yingtao. [collective CL]  
table-on have three pile DE cherry  
'There are three piles of cherries on the table.'
- c. Zhuozi-shang you san bao de pingguo. [container measure]  
table-on have three bag DE apple  
'There are three bags of apples on the table;'
- d. Zhuozi-shang you san bang de yingtao. [standard measure]  
table-on have three pound DE cherry  
'There are three pounds of cherries on the table.'

The division coincides with the one between the right-branching type and the left-branching type of counting constructions. Specifically, the individual CL *ge* in (184a), and the individuating CL *di* in (184b) have a right-branching structure, and the kind CL *kuan* in (184c) has an extended right-branching structure (see 3.2.5). They all disallow *de* in the same context, where no clue shows that the quantity is emphasized. In contrast, the partitive CL *pian* in (185a), the collective CL *dui* 'pile' in (185b), the container measure *bao* 'bag' in (185c), and the standard measure *bang* 'pound' in (185d), all have a left-branching structure. They all allow *de* in the same context.

If the same right-branching type of counting constructions occurs in a context where quantity is emphasized, their acceptability improves significantly. In (186), the quantity reading is attested in the presence of the adverb *yigong* 'total', and in (187), the quantity reading is attested in the predicate *zugou* 'enough'.

- (186)a. Zhuozi-shang yigong you 300 ge de pingguo.  
table-on total have 300 CL DE apple  
'There are 300 apples in total on the table.'
- b. Zhuozi-shang yigong you 300 di de you.  
table-on total have 300 CL DE oil  
'There are 300 drops of oil in total on the table.'
- c. Zhuozi-shang yigong you 300 kuan de fuzhuang.  
table-on total have 300 kind DE clothes  
'There are 300 kinds of clothes in total on the table.'
- (187)a. Yi liang ge de pingguo jiu zugou le.  
one two CL DE apple just enough PRT  
'Just one or two apples are enough.'
- b. Yi liang di de you jiu zugou le.  
one two CL DE oil just enough PRT  
'Just one or two drops of oil are enough.'
- c. Yi liang kuan de fuzhuang jiu zugou le.  
one two kind DE clothes just enough PRT  
'Just one or two kinds of clothes are enough.'

The fact that the occurrence of *de* in the right-branching counting construction is sensitive to a quantity reading is further seen in the following examples. In the presence of a demonstrative, where an individual rather than a quantity-reading is more prominent, the contrast emerges (Cheng & Sybesma 1998: 393 claim that no demonstrative may occur with a post-unit *de*. However, I find (188) natural. All of the nominals in (188) can be found via an internet search):

- (188)a. Ni ba na san xiang de shu qingli-diao! [container measure]  
 you BA that three box DE book clear-away  
 ‘Clear away those three boxes of books!’
- b. Ni ba na yi dui de lüyou-shu qingli-diao! [collective CL]  
 you BA that one pile DE travel-book clear-away  
 ‘Clear away that pile of travel books!’
- c. Ni ba na san jin de fanqie qingli-diao! [standard measure]  
 you BA that three kilo DE tomato clear-away  
 ‘Clear away those three kilos of tomatoes!’
- d. Ni ba na liang bufen de kewen bei yixia! [partitive CL]  
 you BA that two part DE text recite once  
 ‘Recite those two parts of the text!’
- (189)a. \*Ni ba na san ge de pingguo qingli-diao! [individual CL]  
 you BA that three CL DE apple clear-away
- b. \*Ni ba na san di de you qingli-diao! [individuating CL]  
 you BA that three CL DE oil clear-away
- c. \*Ni ba na san zhong de niu-rou qingli-diao! [kind CL]  
 you BA that three CL DE cow-meat clear-away

The above contrast tells us that with respect to the occurrence of *de*, the left-branching type is less constrained, whereas the right-branching type is licensed only in a quantity context. We try to explain this contrast in the next subsection.

Note that in 3.4, I argued against the claim that a left-branching structure encodes a quantity reading and a right-branching structure encodes a non-quantity reading. The pattern observed here further falsifies the claim.

### 3.5.3 Different sources of *de*

It is possible that there are two different sources of *de* related to a counting construction, and that the left-branching constructions can contain either of them, while the right-branching construction can contain only one of them, the one that is related to a quantity reading.

One argument for the quantity reading of the *de* version of the right-branching counting construction is the following. While a counting construction may have either a quantity reading or an individual reading (Y.H. A. Li 1998), if it has an exclusively individual reading in a certain context, it may not host *de*. This suggests that the *de* version of a counting construction is not compatible with an individual reading. I use (190) and (191) to show this point. In (190a), a modifier occurs to the left of the numeral *100*. Such a construction always has a specific and thus an individual reading (Zhang 2006). In (190b), the word *yigong* ‘altogether, in total’ signals a quantity context. In this context, a pre-numeral modifier may not occur, as shown in (190c). In the examples in (190), no *de* follows the CL *ge*.

- (190)a. [Shufen mai de] 100 ge xigua  
 Shufen buy DE 100 CL watermelon  
 ‘the 100 watermelons that Shufen bought’
- b. Ta yigong chi-le 100 ge xigua.  
 He total eat-PRF 100 CL watermelon  
 ‘He ate 100 watermelons in total.’
- c. \*Ta yigong chi-le [Shufen mai de] 100 ge xigua.  
 he total eat-PRF Shufen buy DE 100 CL watermelon

The contrast in (191) below shows that when *de* follows an individual CL, the

construction is subject to the same constraint, although no quantity adverb such as *yigong* ‘total’ shows up. (191b) is different from (190a) only in the presence of *de*. We can see that the *de* construction may not host a pre-numeral modifier (More examples showing a similar constraint are seen in Cheng & Sybesma 1998: 394; Tang 2005: 448). The constraint in (191b) is the same as the one in (190c). In both cases, a quantity context is in conflict with the exclusive individual reading of the pre-numeral modifier construction. The quantity context is provided by the adverb *yigong* ‘total’ in (190c), and by the post-CL *de* in (191b). Thus, the *de* version of the right-branching counting construction must have a quantity reading.

- (191)a. 100 ge de xigua  
100 CL DE watermelon  
‘100 watermelons’
- b. \*[Shufen mai de] 100 ge de xigua  
Shufen buy DE 100 CL DE watermelon

In the rest of this sub-section, I show that the *de* version of an individual CL construction is a quantity-comparative modification construction. The modification analysis of the *de* version of measure word constructions has been seen in Cheng & Sybesma (1998: 393) and Tang (2005). In X. P. Li (2011), the *de* construction is called the as-many/much-as construction. I now combine these insights and propose that the construction is a specific type of modification construction: elliptical comparative modification construction.

Elliptical comparative modification constructions are independently observed in Mandarin Chinese. In (192a), the pro-form *name da* ‘so big’ takes *zhima* ‘sesame seed’ as its antecedent. In such a construction, the word *name* ‘so’ can be deleted, without affecting the reading. (192a) and (192b) have the same reading. In this construction, *de* introduces a comparative modifier. (192c) is my analysis of (192b).

- (192)a. Shufen mai-le [yi ge [[zhima name da de] wanju]].  
Shufen buy-PRF one CL sesame so big DE toy
- b. Shufen mai-le yi ge zhima da de wanju.  
Shufen buy-PRF one CL sesame big DE toy  
Both: ‘Shufen bought a toy as big as a sesame seed.’
- c. Shufen mai-le [yi ge [[zhima ~~name~~ da de] wanju]].  
Shufen buy-PRF one CL sesame so big DE toy

Similarly, I claim that *de* in (193a) also introduces a comparative modifier. The full form of (193a) is (193b), where the first *pingguo* ‘apple’ and *name duo* ‘so many’ are deleted at PF. (194) shows the same point. In the following, I discuss (193) only.

- (193)a. Shufen chi-le yi-bai ge de pingguo.  
Shufen eat-PRF 100 CL DE apple  
‘Shufen ate 100 apples.’
- b. Shufen chi-le [[[yi-bai ge pingguo] ~~name duo~~ de] pingguo].  
Shufen eat-PRF 100 CL apple so many DE apple
- (194)a. Shufen chi-le san-fen-zhi-yi li de ganmao-yao.  
Shufen eat-PRF one-third CL DE cold-pill  
‘Shufen took one third of a cold-pill.’
- b. Shufen chi-le [[[san-fen-zhi-yi li ganmao-yao] ~~name duo~~ de] ganmao-yao].  
Shufen eat-PRF one-third CL cold-pill so much DE cold-pill

In (193b), the antecedent of *name duo* ‘so many’ is *yi-bai ge pingguo* ‘one hundred CL apple’, which is a syntactic constituent.

The deletion of the noun, i.e., *pingguo* ‘apple’ in (193b), is an instance of Backward Deletion, in which the licensing string (“antecedent”) occurs to the right of the ellipsis site, and both the licensing string and the ellipsis site must be right-peripheral in their respective domains (Wilder 1997: 92). In (195), for instance, Backward Deletion of the object in the relative clause of the subject is licensed by the object of the verb *like* (Wilder 1997: 87):

- (195) [Anyone [who meets ~~any of our sales people~~]]  
[really comes to like any of our sales people]

Similarly, in (193b), the ellipsis site of *pingguo* is right-peripheral in the domain of [yi-bai ge ~~pingguo~~], and its licensing string *pingguo* is right-peripheral in the domain of the object of the verb *chi-le* ‘eat-PRF’.

The operation of the deletion of the string *name duo* ‘so many’ in (193b) is parallel to the operation of the deletion of *name* in (192c). The nonparallel details of the two operations can also be explained. In (192c), the dimension word *da* ‘big’ may not be deleted with *name* ‘so’, since its absence will lead to a different reading. Compare (192b) with (196).

- (196) Shufen mai-le yi ge zhima de wanju.  
Shufen buy-PRF one CL sesame DE toy  
‘Shufen bought a toy that is made of sesame seeds.’

Following the same recoverability principle in deletion (Hankamer 1973, Chomsky 1965, 1968), the dimension word *duo* in (193b) must be deleted together with *name*, since its presence may lead to a partitive reading of *duo*, which is not the intended reading. Compare (193a) with (197).

- (197) Shufen chi-le yi-bai ge duo de pingguo.  
Shufen eat-PRF one-hundred CL more DE apple  
‘Shufen ate more than 100 apples.’

It is thus the general recovery condition of PF deletion that decides why the dimension word must not be deleted in (192), and must be deleted in (193).

There is a similarity between the *de* version of a counting construction and the elliptical comparative construction in (192). As noted in Cheng & Sybesma (1998: 392), in the *de* version of a container measure construction, the referent of a container measure does not have to be present in the discourse. In (198a), there are two container-denoting words, *wan* ‘bowl’ and *bei* ‘cup’, and neither is followed by *de*. It is unclear which one denotes the container as an instrument and which one denotes a measure. The sentence is unacceptable. In (198b), however, *bei* is followed by *de*, but *wan* is not. In this case, it is clear that *wan* denotes the instrument and *bei* denotes the measure (i.e., counting unit). In the discourse context of (198b), no cup has to be present. The wine can be contained in a jar or a bottle.

- (198)a. \*Ta yong xiao wan he-le san bei jiu.  
he with small bowl drink-PRF three cup wine  
b. Ta yong xiao wan he-le san bei de jiu.  
he with small bowl drink-PRF three cup DE wine  
‘He drank three cupfuls of wine from a small bowl.’

In the elliptical comparative construction in (192), similarly, the referent of *zhima* ‘sesame seed’ does not have to occur in the discourse. In this sense, (192) is parallel to the *de*

First, if an expression cannot occur in a full-fledged quantity comparative construction, it may not occur in a *de* version of a counting construction. The forms in (199b) and (200b) are not acceptable, nor are those in (199a) and (200a). This correlation supports my hypothesis that the a-forms and b-forms are derivationally related.

- |         |  |    |    |   |
|---------|--|----|----|---|
| (199)a. | *yixie de shu<br>some DE book                | <= | b. | *[yixie shu name duo de shu]<br>some book so many DE book<br>Lit.: ‘as many as some books’                |
| (200)a. | *mei (yi) ben de shu<br>every one CL DE book | <= | b. | *[mei (yi) ben shu name duo de shu]<br>every one CL book so many DE book<br>Lit.: ‘as many as every book’ |

Second, the noun to the right of *de* can be silent in other constructions, as in (201a), but not in the *de* version of a counting construction, as shown in (201b) (Tang 1990b, Cheng & Sybesma 1998: 397, fn. 6).

- (201)a. Zuo-bian you hong de fanqie, you-bian you huang de (fanqie).  
left-side have red DE tomato right-side have yellow DE tomato  
'There are red tomatoes on the left side and yellow ones on the right side.'
- b. Zuo-bian you 100 ge de fanqie, you-bian you 200 ge de \*(fanqie).  
left-side have 100 CL DE tomato right-side have 200 CL DE tomato  
'There are 100 tomatoes on the left side and 200 on the right side.'

Why do we have this constraint? My answer is that in (201b), the sentence-final noun is the licenser of an ellipsis of another noun to its left in the same argument. As shown in (202), *fanqie*<sub>3</sub> licenses the deletion of *fanqie*<sub>2</sub>, therefore it cannot be deleted.

- (202) \*... fanqie<sub>1</sub>, you-bian you 200 ge fanqie<sub>2</sub> ~~name duo~~ de fanqie<sub>3</sub>.  
tomato right-side have 200 CL tomato so many DE tomato

Also note that not all instances of Backward Deletion may have a Forward Deletion counterpart. For instance, while (203a) is fine, (203b) is not acceptable. Similarly, while (204a) is fine, (204b) is not acceptable.

- (203)a. [Anyone [who meets ~~any of our sales people~~]] (= (195)) Backward Deletion  
[really comes to like any of our sales people]  
b. \*[Anyone [who meets any of our sales people]] Forward Deletion  
[really comes to like ~~any of our sales people~~]
- (204)a. Shufen chi-le [[[yi-bai ge pingguo] name duo de] pingguo]. (= (193b))  
Shufen eat-PRF 100 CL apple so many DE apple



- b. \*Shufen chi-le [[[yi-bai ge pinguo] (name duo) de] ~~pingguo~~].  
 Shufen eat-PRF 100 CL apple so many DE apple

Thus unlike in other *de* constructions, in the *de* version of a counting construction, the NP following *de* may not be null, even an antecedent to its left is available (e.g., *fanqie*<sub>1</sub> in (202), and the first *pingguo* in (204b)).

In my elliptical comparative perspective, *de* introduces a modifier to the left of another element (i.e., the modifiee). The surface order is further derived by ellipsis. The syntactic position of *de* is the same as that of (192c). Crucially, the noun following *de* is not in a counting construction at all. The noun that is in a counting construction has been deleted, and the containing counting construction is embedded in the modifier. Thus the position of *de* in this case does not show the constituency of the elements within a counting construction (contra Hsieh 2008: 45; X. P. Li 2011: 115; 119).

We have seen that the *de* version of the right-branching structure is constrained by the quantity-reading condition, but for the *de* version of the left-branching structure, this condition is not forced. This contrast can be explained by the hypothesis that when *de* occurs in a left-branching counting construction, it is ambiguous between the *de* that introduces a comparative modifier and the *de* that does not. It is in the latter case that *de* occurs between two syntactic constituents within a counting construction. In the former case, *de* is a comparative modification marker, which is external to the counting construction. The two analyses in (205) show the contrast:

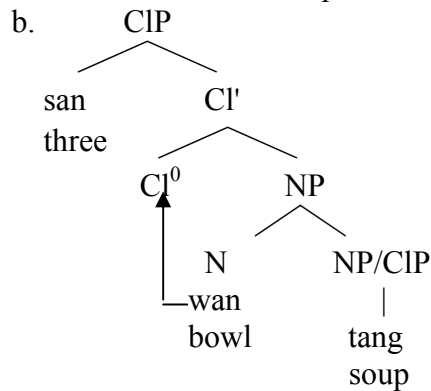
- (205)a. [[san bei ~~jiu~~] ~~name duo~~] de jiu  
 three cup wine so much DE wine  
 ‘three cupfuls of wine’
- b. [[san bei] de jiu]  
 three cup DE wine  
 ‘three cups of wine’

In (205a), *de* is out of the counting construction *san bei jiu* ‘three cup wine’, whereas in (205b), *de* occurs between two syntactic constituents of a counting construction, *san bei* ‘three cup’ and *jiu* ‘wine’.

I have proposed a fine-grained analysis of the *de* versions of counting constructions, to capture the constraint on the occurrence of *de* with individual, individuating, and kind CL constructions, and the absence of the constraint on other types of counting constructions. This analysis is different from Cheng & Sybesma’s (1998) relativization analysis, Tsai’s (2003: 173) NP-internal DP analysis, and Tsai’s (2011) clitic analysis, to be briefly illustrated below.

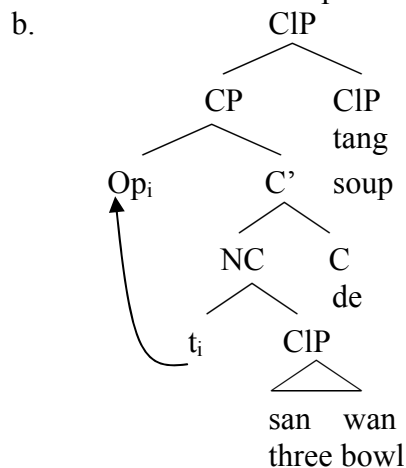
In Cheng & Sybesma (1998: 406), the *de*-less counting construction (206a) has the structure in (206b), where a container measure word moves from N to CL. The structure is a right-branching one, which I have argued against in 3.2.

(206)a. san wan tang  
 three bowl soup  
 'three bowls of soup'



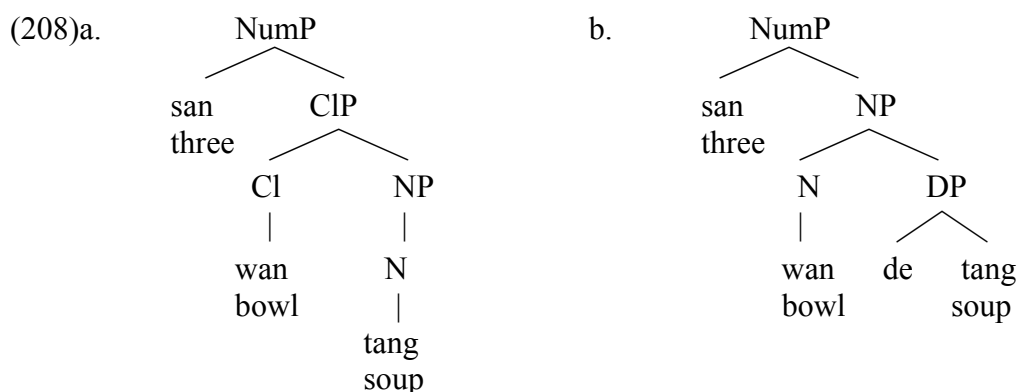
In their relativization analysis of the *de* version of counting constructions, (207a) has the structure in (207b) (Cheng & Sybesma 1998: 398), where *de* is always base-generated between *san wan* 'three bowl' and *tang* 'soup'. This is compatible with my (205b), but not (205a).

(207)a. san wan de tang  
 three bowl DE soup  
 'three bowls of soup'

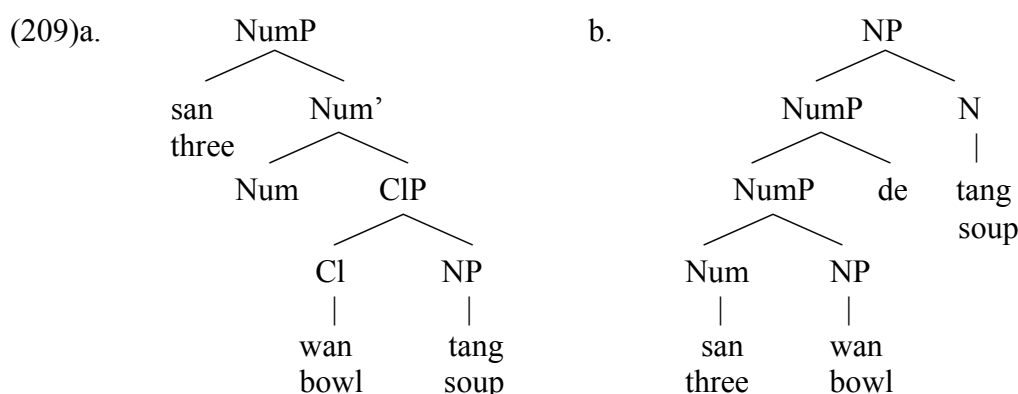


(NC = Nominal Clause)

In Tsai's (2003: 173) NP-internal DP analysis, (206a) and (207a) have the structures in (208a) and (208b), respectively. Both structures are right-branching, which cannot capture the facts presented in my 3.2.



In Tsai's (2011: 7) clitic analysis, (206a) and (207a) have the structures in (209a) and (209b), respectively (no argument is given in this paper of his for the branching contrast), and *de* in (209b) is analyzed as a clitic.



Tsai claims that in other constructions, *de* heads a functional projection and thus licenses an empty category to its right; however, since *de* in (209b) is a clitic, it cannot serve as a licenser of an empty category to its right. But, morphologically, we know that *de* is an enclitic in all constructions, in need of a phonological host to its left (Huang 1989). There is no non-clitic or pro-clitic form of *de*. It is also impossible for *de* to be both an enclitic and a proclitic. Empirically, as pointed out by Miaoling Hsieh (in the workshop where Tsai's paper was presented), the clitic analysis alone does not explain the reading contrast between the two structures in (209b).

Moreover, none of the three analysis, the relativization analysis, the NP-internal DP analysis, and the clitic analysis, considers the *de* constructions of other types of unit words. Accordingly, the arguments for my ellipsis comparative analysis of the constructions have not been taken into account.

### **3.6. Chapter summary**

In this chapter I have investigated the constituency of counting constructions in Chinese. Such constructions contain three elements: a numeral, a noun, and a unit word between them. I have argued that the syntactic relation between an individual CL and a noun is different from that between a measure word and a noun.

I have discussed four issues: the scope of a left-peripheral modifier; the dependency between the modifier of a unit word and that of a noun; the complement and predicate status of the combination of a numeral and a unit word; the semantic selection of a unit word on a noun. Based on the different behaviors of the different types of unit words, I have identified three structures: a left-branching structure for constructions of container measures, standard

measures, partitive CLs, and collective CLs; a right-branching structure for constructions of individual and individuating CLs; and a structure in which no two of the three elements form a constituent for constructions of kind CLs.

I have also falsified invalid arguments such as the co-occurrence of a numeral and a unit word and the position of the partitive markers *duo* ‘more’ and *ban* ‘half’. I have also argued against the quantity-individual semantic mappings with the different syntactic structures. Finally, I have presented a comparative deletion analysis of the constructions in which the functional word *de* follows a unit word.

A further issue to be investigated is the categorial labels of the nodes of the different structures. This issue will be discussed in the next chapter.

## Chapter 4      The Syntactic Representations of Counting Constructions

### **4.1. Introduction**

The goal of this chapter is to capture the tricky relations and interactions among different elements of a counting construction in syntactic representations.

In Chapter 3, we have reached the conclusion that there are three basic configurations of counting constructions in Mandarin Chinese: a left-branching structure for constructions of container measures, standard measures, partitive CLs, and collective CLs; a right-branching structure for constructions of individual and individuating CLs; and an extended right-branching structure, in which no two of the three overt elements form a constituent, for constructions of kind CLs. Thus the hierarchy and c-command relations have been identified, but no syntactic labels have been discussed for the structures.

In this chapter, we argue for two functional projections below DP: UnitP and DmsnP, in addition to NumP (or called #P or #<sup>max</sup>) and QuantP. Theoretically, we adopt Szabolcsi's (2011: 2) theory that "Each syntactic head carries one and only one feature". Our arguments for the two projections come from the syntactic licensing of ellipsis and stranding, and the licensing of certain types of adverbials or modifiers.

With the two newly recognized functional projections, we will present our derivations of the left- and right-branching structures of Chinese counting constructions, and address the realizations of the head of UnitP in different constructions, both cross-linguistically and in the same language.

I argue that a numeral and a unit word hold a Spec-Head relation of UnitP in their base-positions, and thus the occurrence of either of them means the projection of UnitP. But the occurrence of a plural marker does not correlate with the projection of UnitP. In the structure of mass nominals, there is neither UnitP nor DmsnP. This analysis is thus different from Borer (2005) in the base-position of numerals, in the syntactic relation between number and countability, and in the functional projections to encode countability. In discussing the cross-linguistic variation in the realizations of unit elements, the current research also challenges Wilhelm's (2008) numeral-oriented analysis.

The chapter is organized as follows. Section 4.2 argues that a free form CL heads UnitP and Section 4.3 argues that a reduplicated CL heads NumP. Section 4.4 then argues for DmsnP. Section 4.5 gives syntactic labels to the different major types of structures of counting constructions in Chinese and presents possible derivations of the constructions. In Section 4.6, I use the two features, numerability and dimensionality, to represent various kinds of null versions of individual and individuating CLs. Section 4.7 is a brief summary.

### **4.2. The projection of UnitP**

#### **4.2.1 Unit words head a functional projection**

We have seen in Chapter 2 that a unit word is [+numerable] and is thus always countable. It has been proposed by many syntacticians that the countability of human language is represented by a functional projection, such as DivP or CLP (e.g., Borer 2005). Chinese CLs have been generally considered to be the realization of the head of this functional projection. But, as I argued in 2.7.2, the general function of CLs is to represent a unit for counting, telling us what counts as one in counting. This general function of CLs is more than dividing. I thus change the label of DivP into UnitP.

Standard measures such as *gongjin* 'kilo' and container measures such as *bei* 'cup' in *san bei cha* 'three cup tea' also share syntactic properties with some types of CLs (Chapter 3). Measure words and CLs surface at the same syntactic position. Semantically, measure words

are also counting units, having the same function as CLs (2.7.2; also see Croft 1994: 152 and Allen 1977: 293). Both CLs and measure words have the so-called additive measure function, or have a monotonic interpretation (Schwarzschild 2006), which means that if we add *m* units of *x* and *n* units of *x* together, we get the sum (superset) of the two quantities; and if we divide *m* units, we get the subpart of the *m* units. I thus claim that measure words in counting constructions also surface at the head of the functional projection. I use the more general label UnitP, instead of CLP for this functional projection.<sup>21</sup>

In this chapter, new evidence from the perspective of Chinese syntax is presented to support the functional projection.

One fact supporting the head status of unit words is that such words license ellipsis.<sup>22</sup> As in other languages (e.g., Hankamer 1971; Sag 1980; Lobeck 1987, 1995; Chao 1988, Zagana 1988), head elements in Chinese may license the silence of the string to their right, whereas phrasal elements may not do so. In (210a), the VP ellipsis is licensed by the overt modal *hui* ‘will’. In contrast, in (210b), the VP ellipsis cannot be licensed by the adverbial NP *jin-nian* ‘this year’.

- (210)a. Baoyu *hui mai baoxian*, Daiyu *ye hui ~~mai-baoxian~~*.  
 Baoyu will buy insurance Daiyu also will buy insurance  
 ‘Baoyu will buy insurance, and Daiyu will also buy insurance.’  
 b. \*Baoyu *qu-nian mai-le baoxian*, Daiyu *jin-nian ye ~~mai-le baoxian~~*.  
 Baoyu last-year buy-PRF insurance Daiyu this-year also buy-PRF insurance

(211a) shows that the verb *mai* ‘buy’ licenses the silence of its object, which is to its right, and the meaning of the silent object can be recovered from the object of the previous sentence, i.e., *shu* ‘book’. This licensing function of head elements is seen in the surface order of a construction, regardless how the order is derived syntactically. Parallel to the ellipsis-licensing head elements in (210a) and (211a), the CL *ben* in (211b) may also license an empty NP to its right, and the meaning of the NP can be recovered from the previous sentence, i.e., *shu*. Similarly, the container measure *wan* ‘bowl’ may also license an empty NP to its right, and the meaning of the NP can be recovered from the previous sentence, i.e., *tang* ‘soup’.

- (211)a. Baoyu *mai-le shu*, Daiyu *ye mai-le ~~shu~~*.  
 Baoyu buy-PRF car Daiyu also buy-PRF book  
 ‘Baoyu bought books, and so did Daiyu.’  
 b. Baoyu *mai-le san ben shu*, Daiyu *ye mai-le san ben ~~shu~~*.  
 Baoyu buy-PRF three CL book Daiyu also buy-PRF three CL book  
 ‘Baoyu bought three books, and so did Daiyu.’  
 c. Baoyu *he-le san wan tang*, Daiyu *ye he-le san wan ~~tang~~*.  
 Baoyu drink-PRF three bowl soup Daiyu also drink-PRF three bowl soup  
 ‘Baoyu ate three bowls of soup, and so did Daiyu.’

<sup>21</sup> If the construction where words such as *gongjin* ‘kilogram’ and *bei* ‘cup’ occur is not a counting construction, such words are nouns, as in (i).

(i) a. *Gongjin shi zhongliang danwei.*                      b. *Gan bei!*  
 kilogram is weight unit                      dry cup  
 ‘Kilogram is a unit of weight.’                      ‘Bottoms up!’ (in the context of drinking alcohol)

<sup>22</sup> I adopt the theory that only head elements may license ellipsis. This theory does not entail that all kinds of head elements may do so. The complement of *that* and the determiner *the* in English do not license the ellipsis of their complements.

Head elements can not only license ellipsis, but also be stranded. In (212a), the verb *mai* ‘buy’ is stranded. The missing object has a dependency with the topic *xiaoshuo* ‘novel’. In (212b), the word *zhentan* ‘detective’ is not a head element and thus it cannot be stranded. Similar to the head element in (212a), the individual CL *ben* in (212c) and the container measure *wan* ‘bowl’ in (212d) are also stranded, and the missing NP has a dependency with the topic *xiaoshuo* in (212c), and with the topic *niurou-tang* ‘beef soup’ in (212d). This fact shows that unit words are head elements.<sup>23</sup>

- (212)a. Xiaoshuo, Baoyu yinggai mai.  
           novel      Baoyu should buy  
           ‘Novels, Baoyu should buy.’  
 b. \*Xiaoshuo, Baoyu yinggai mai zhentan.  
           novel      Baoyu should    buy detective  
 c. Xiaoshuo, Baoyu yinggai mai wu ben.  
           novel      Baoyu should buy five CL  
           ‘Novels, Baoyu should buy five copies.’  
 d. Niurou-tang, Baoyu yinggai he wu wan.  
           beef-soup    Baoyu should drink five bowl  
           ‘Beef soup, Baoyu should eat five bowls of it.’

A fact to support the claim that unit words are not only head elements, but also elements of a functional head is that such words license a special type of adverbials, namely, numeral-oriented adverbials, such as *yigong* ‘total’, *zuzu* ‘as many as’, and *duoda* ‘up to, as-many-as, as-much-as’. In (213a), there is no unit word and therefore the adverb *yigong* may not occur. Similarly, in (214a), no unit word shows up and thus the adverb *zuzu* may not occur. In the rest examples in (213) and (214), the two adverbs are licensed by the presence of a unit word, i.e., *tiao* in (213b, c) and (214b), and *xiang* ‘box’ in (214c).

- (213)a. \*Shufen yigong mai-le {yidian/henshao/henduo} xianglian.  
           Shufen total    buy-PRF a.little/few/many      necklace  
 b. Shufen yigong mai-le 50 tiao xianglian.  
           Shufen total    buy-PRF 50 CL necklace  
           ‘Shufen bought 50 necklace in total.’  
 c. Shufen yigong mai-le    ji            tiao xianglian?  
           Shufen total    buy-PRF how.many CL    necklace  
           ‘How many necklaces did Shufen buy?’  
 (214)a. \*Shufen zuzu            mai-le {yidian/henshao/henduo} xianglian.  
           Shufen as.many.as buy-PRF a.little/few/many      necklace  
 b. Shufen zuzu            mai-le    50 tiao xianglian.  
           Shufen as.many.as buy-PRF 50 CL necklace  
           ‘Shufen bought as many as 50 necklaces.’  
 c. Shufen zuzu            mai-le    haoji    da xiang xianglian.  
           Shufen as.many.as buy-PRF several big box    necklace  
           ‘Shufen bought as many as several boxes of necklaces.’

<sup>23</sup> The following question has been raised to me: why the string after the unit word *bei* in (ia) may not move, if the unit word is a head element. My answer is that *de* and the element to its right never form a maximal projection (Zhang 1999; 2009), thus such a string may not move (Chomsky 1994; 1995: 253).

(i) a. [[san bei] de jiu] (= (205b))            b. \*[de jiu]<sub>i</sub> .....[[san bei] t<sub>i</sub>]  
           three cup DE wine  
           ‘three cups of wine’

According to Travis (1988) and Cinque (1999), different functional projections license different types of adverbials. I thus claim that numeral-oriented adverbs are licensed by the functional projection headed by a unit word, i.e., UnitP. This is parallel to the situation that manner adverbs are licensed by agentive vP, which is also a kind of functional projection.

Note that licensing relation does not have to be an adjacent relation at PF. In (215), the manner adverbial *xiaoxinyiyide* ‘carefully’ is licensed by vP, but it occurs away from the vP. Thus the non-adjacent relation between the numeral-oriented adverb and the unit word in (213) and (214) does not affect the licensing relation.

- (215) Jiu zheyang, xiaoxinyiyide, Akiu<sub>i</sub> [<sub>vP</sub> zai di-shang t<sub>i</sub> hua-le yi ge quan].  
 thus so carefully Akiu at ground-on draw-PRF one CL circle  
 ‘In this way, carefully, Akiu drew a circle on the ground.’

The example in (216) shows that the plural nominal *duo-duo* (2.6.4) may not license *yigong* or *zuzu*. So this type of adverbials must occur with a unit word. Reduplicated CLs are not unit words.

- (216) Tian-shang (\*yigong/\*zuzu) piao-zhe duo-duo bai yun.  
 sky-on total/so.many fly-PRG CL-RED white cloud  
 ‘Many pieces of cloud are flying in the sky.’

As I introduced before, unit words are analyzed as nominal auxiliaries in Chao (1948, 1968: 584) and Z. Lu (1951: 42), and as light nouns in Huang (2009). Identifying the functional head status of such elements reflects the insight of these scholars.

Considering the fact that unit words are not a closed class (Aikhenvald 2003: 99; Zhang 2007: 57; Wu & Bodomo 2009: 490), one might doubt that a unit word takes a functional head position. However, as stated in Déchaine (2011), class size is not a reliable indicator of functional categories. On the one hand, any lexical categories can be closed-class, including V, as in Australian, A, as in Niger-Congo, and P (Déchaine 2011, and the references thereof). On the other hand, we also see that some functional heads can be realized by either elements of a closed class or a lexical element (e.g., Relator and Linker in den Dikken 2006). Moreover, coordinators form a closed set but they do not head an independent functional projection (Zhang 2009a).

In the literature, it has been claimed that elements with selectional properties should be treated as lexical, rather than functional elements (Cardinaletti & Giusti 2006: 52). Individual and individuating CLs have selectional restrictions (3.2.4). However, Cardinaletti & Giusti’s claim is challenged by the facts that English complimentizers *that* and *if* select [-Question] and [+Question], respectively, that German auxiliaries *haben* ‘have’ and *sein* ‘be’ select different semantic types of VPs (e.g., durative and non-durative eventualities, respectively), and that Spanish copulas are sensitive to the contrast between Individual-Level Predicates and Stage-Level Predicates. Therefore, it is plausible that all unit words are realizations of a functional head, i.e., Unit.

#### **4.2.2 The syntactic locality between a numeral and a unit word**

In a counting construction, a numeral and a unit word exhibit a dependency relation. From the perspective of numerals, they always occur with a unit word such as a CL in counting constructions in Chinese (Chao 1968: 585; among others). Semantically, a numeral needs an operator to access the unit of counting. In Krifka (1995: 400; also Wilhelm 2008: 55) the operator is called OU (for Object Unit), and a unit word such as a CL is a linguistic form of



OU. In Kobuchi-Philip (2007), a unit word is an argument of a numeral.

From the perspective of unit words, they also have a dependency on numerals. A unit word must occur with a quantifier such as a numeral. The fact that a unit word has to occur with a numeral or a quantifier can be semantically represented by a range assignment relation, introduced in Borer (2005: sec. 2.1.2). Specifically, I assume that a unit word has an open value and a numeral or quantifier assigns range to the open value. The open value of a unit word is obligatory to categorize the noun and it must have range assigned to it properly.

The main semantic function of numeral CLs is to specify a unit for counting, rather than to make a semantic classification (see 2.7.3). Therefore, the co-occurrence of numeral CLs with numerals makes numeral CLs different from other types of CLs that are incorporated into verbal expressions in sign languages (e.g., Sandler & Lillo-Martin. 2006) or the CLs in Bantu languages (e.g., Aikhenvald 2003; Svenonius's 2008 SortP).

While some scholars call CLs nominal auxiliaries, as I mentioned in the last subsection, others (e.g., Ōta 2003 [1958]: 146) call them numeral auxiliaries. We can see the general acknowledgment of the dependency between numerals and numeral CLs.

A non-numeral quantifier to the left of a CL has the same surface position as a numeral. Following Gebhardt (2009), I assume that a numeral quantifier has the feature [+absolute], for a precise quantity, and a non-numeral quantifier has the feature [-absolute], for a non-precise quantity.

It is necessary to be clarified that it is not true that a CL may occur with a demonstrative directly, without a numeral. Greenberg (1990 [1972]: 168) states that “Syntactically also there is variability in that the classifiers need not be confined to numerical constructions. In Mandarin and other languages the classifier is required with demonstratives even in non-numeral phrases.” The statement is cited in Croft (1994: 150) and seems to be adopted by many (e.g., Lyons 1977: 461; Gil 2008: 7; Huang et al. 2009: 14). However, Greenberg (1990 [1972]: 188) also points out that “in Mandarin the classifier *ben* required with *shu* ‘book’ with any number (e.g., *i ben shu* ‘one book’, *san ben shu* ‘three books’) occurs with the demonstrative also (*che ben shu* ‘this book’) but only in the singular.”[sic.] The description indicates that a numeral denoting ‘one’ is implied when a demonstrative is next to a CL (see Cheng & Sybesma 1999: 530 fn. 17) (see 3.4.1 for more discussions of the silent version of *yi* ‘one’). Thus a pre-nominal CL always occurs with a numeral.<sup>24</sup>

Numerals have been assumed to be base-generated at a Spec position (Borer 2005: 96). The relation between a numeral and a CL is represented as a Spec-Head relation in Cheng & Sybesma (1998: 406). To represent the dependency between a numeral and a unit word, following these scholars, I assume that a numeral is base-generated at the Spec of UnitP and a unit word is a realization of Unit. The base-positions of the elements in (217a) are shown in (217b):

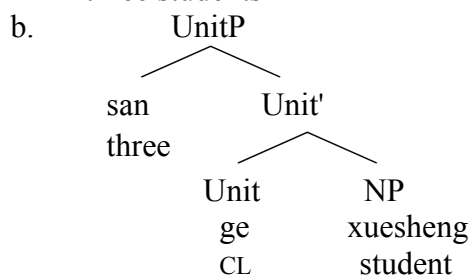
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<sup>24</sup> Because of reanalysis, *zhei*, which is usually decomposed into *zhe* + *yi* ‘this + one’, can also function as a single demonstrative, followed by a numeral other than *yi* ‘one’. So (i) is acceptable (Di 2009: (20c)):

(i) *zhei si zhang chuāng*  
this four CL bed  
‘these four beds’

The null function of *yi* in *zhei* here is similar to the null function of *et* ‘and’ in the phrase *and etcetera*, where two conjunctions (*and*, *et*) occur in a row, and *cetera* means ‘the rest’.

- (217)a. san ge xuesheng  
three CL student  
'three students'



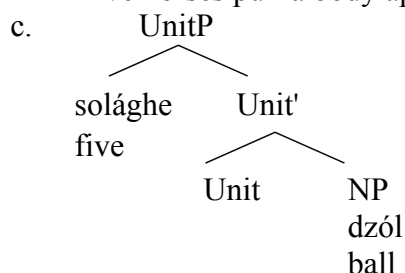
In the structure in (217b), the numeral asymmetrically c-commands the unit word. The locality of the dependency between the two elements is reduced to the “closest c-command” (see Chomsky 2000: 122).

Since a numeral and a unit word hold a Spec-Head relation, the occurrence of either of them means the projection of UnitP. But the occurrence of a plural marker does not correlate with the projection of UnitP. The structure in (217b) is different from Borer (2005: 96), where a numeral and a Num are in a Spec-Head relation. More about this difference will be addressed in Section 4.3.2.

Accordingly, for constructions that have a numeral, without a plural marker and a CL, UnitP is projected. In this case, the head of Unit is null. The base-positions of the elements in (218a) (Wilhelm 2008: 46) are represented in (218c). The string *wu ma* ‘five horse’ in the Chinese idiomatic expression in (218b) has a similar structure.

- (218)a. solághe dzól [Dëne]  
five ball  
'five balls'

- b. wu ma fen shi [idiomatic Mandarin Chinese]  
five horse divide body  
'five horses pull a body apart (as an ancient death penalty).'



The non-head status of numerals can be supported by the fact that unlike head elements in Chinese (see 4.2.1 above), numerals may not license ellipsis or be stranded. In (219a), the numeral *san* ‘three’ may not license the ellipsis of string to its right, i.e., *ben shu* ‘CL book’. In (219b), the numeral *wu* ‘five’ may not be stranded, and therefore the presence of the container measure *wan* to its right is obligatory (See 4.6.2 for a comparison between English and Chinese in this respect).

- (219)a. Baoyu mai-le san ben shu, Daiyu ye mai-le san \*(ben shu).  
Baoyu buy-PRF three CL book Daiyu also buy-PRF three CL book  
'Baoyu bought three books, and so did Daiyu.'

- b. Niurou-tang, Baoyu yinggai mai wu \*(wan).  
 beef-soup Baoyu should buy five bowl  
 ‘Beef-soup, Baoyu should buy five bowls of it.’

Moreover, cross-linguistically, numerals have been identified as NPs or APs (e.g., Zweig 2006, Corver & Zwarts 2006, Corver et al. 2007: 755; Stavrou & Terzi 2008). The phrasal status is compatible with the claim that they occur at Spec, rather than the head, of a functional projection.<sup>25</sup>

I put aside the details of the categories of the Spec and Complement of Unit. Such details do not affect the argumentation of this book. Regarding the Spec of Unit, it needs further study to specify whether the category of numerals in a specific language or construction is nominal or adjectival, or both (Zweig 2006, Danon 2009). Regarding the Complement of Unit, it is possible that the nominal complement of Unit is nP, or other functional categories (see 4.4.2).

### **4.2.3 The surface position of numerals and other quantifiers**

There are two major kinds of quantifiers: those that may be followed by the functional word *de* and those that may not, as shown in (220a) and (220b), respectively (2.5). As in Chapter 2, we only consider the ones that do not occur with *de*.

- |  |   |
|--|---|
| (220)a. daduoshu (de) xuesheng<br>most DE student<br>‘most students’ | b. haoji (*de) ge xuesheng<br>several DE CL student<br>‘several students’ |
|--|---|

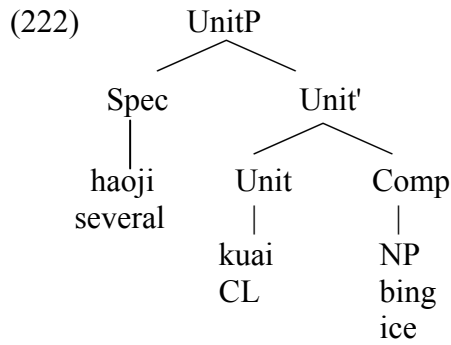
We have showed that within the quantifiers that do not occur with *de*, some of them, including numerals, must be followed by a unit word, and some reject a unit word. The examples of the two types are in (221a) and (221b), respectively.

- |   |  |
|---|--|
| (221)a. haoji *(kuai) bing<br>several CL ice<br>‘several chunks of ice’ | b. yidianr (*kuai) bing<br>a.little CL ice<br>‘a little ice’ |
|---|--|

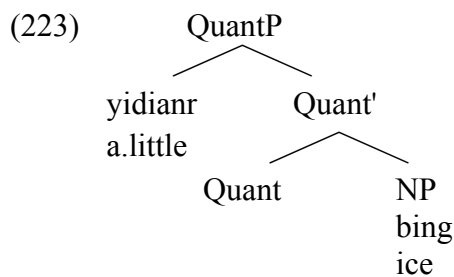
I have just argued that the base-position of a numeral is Spec of UnitP. I extend this claim to all quantifiers that need to occur with a unit word. The occurrence restrictions of such quantifiers are thus represented by the Spec-Head relation. So *haoji* ‘several’ in (221a) is also base-generated at Spec of UnitP. The base-positions of the elements in (221a) are shown in (222):

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<sup>25</sup> Yang (2005: 45) also claims that numerals are phrasal. But her two arguments are either incomplete or unconvincing. One argument is that a numeral can be replaced by the question phrase *ji* ‘how many’. But in order to show the numeral replaced by *ji* is phrasal, we need to see *ji* is phrasal. Another argument is that numerals can be conjoined. But conjuncts do not have to be phrasal (Zhang 2009a).



Moreover, following Borer (2005), I assume that all kinds of quantifiers surface at Spec of QuantP, and QuantP can be projected without UnitP (her Div<sup>max</sup>). If there is neither a numeral nor a unit word, as in (221b), UnitP is not projected. The structure of (221b) is (223):

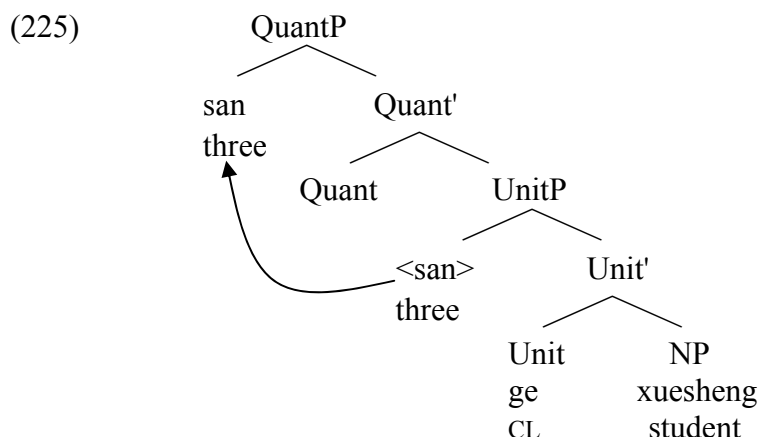


QuantP encodes a quantized entity, which can function as an incremental theme of a telic event (Krifka 1989a, Dowty 1991), as shown by the example in (224).

- (224) Li An manmande ao-hua-le yidianr bingtang.  
 Li An slow bake-melt a.little sugar  
 'Li An slowly baked a little sugar until it melted.'

Considering Y.H. A. Li's (1989) idea that pure quantity readings are represented by a functional projection below DP, I assume that QuantP is the functional projection for such readings (I do not use her label NumP, which is for number in my analysis; see next section).

I also adopt Borer & Ouwayda's (2010: 12) claim that a numeral must move from its base-position to Spec of QuantP. A numeral never occurs with another quantifier. This fact can be captured if numerals and quantifiers compete for the same surface position. So this numeral-raising hypothesis is plausible to us. Moreover, a numeral does not have to surface next to a unit word, whereas the base-generated Spec-Head relation may not be intervened by any other element (e.g., an adjective). From this perspective, the raising of a numeral away from UnitP is also plausible. Accordingly, a more complete form of (217b) should be (225):



Presumably, parallel to a numeral, the quantifier in (222) is also raised to Spec of QuantP.

Numerals may also move further to Spec of DP, to encode definite or generic readings. Wu (2006, contra Cheng & Sybesma 1999: 528-530) convincingly shows that numeral-initial nominals in Mandarin Chinese can yield a definite reading. In (226a) (Wu 2006: 129), *dou* 'all' does not show up, therefore, Cheng & Sybesma's (1999: 539) claim that the definite reading of a numeral-initial nominal is related to *dou* does not apply here. The preposed object *san ben shu* 'three CL book' in (226b) is also definite (Liao & Wang 2011: 158). Moreover, in (226c) (Wu & Bodomo 2009: 492), the two nominals both have a generic reading.<sup>26</sup>

- (226)a. San ge wen guan xia-de zhi daduosuo.  
 three CL rotten official scare-DE keep shiver  
 'The three rotten officials were shivering with fear.'
- b. Wo san ben shu kan wan yihou, you mai-le ling yi ben.  
 I three CL book read finish after then buy-PRF another one CL  
 'After I read the three books, I bought another one.'
- c. Yi jia feiji de sudu bi yi sou lunchuan de sudu kuai.  
 one CL plane DE speed than one CL ship DE speed fast  
 'An airplane's speed is faster than a ship's.'

### **4.3. The projection of NumP**

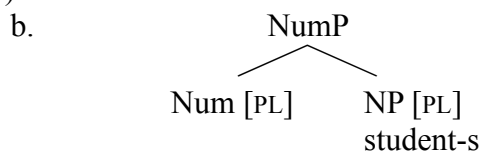
#### **4.3.1 CLs and NumP**

The notion of numerability is different from the notion of number (2.2.6; 2.6.2). Therefore, unlike Borer (2005), where unit words and number markers are represented in the same syntactic position, in my analysis, the two kinds of elements are represented in different projections. Adopting Ritter (1991), among others, I assume NumP (or called #P or #<sup>max</sup>) is for number, which is the locus of the contrast between morphological singularity and plurality (also see Gebhardt 2009 for the separation of CLP from NumP).

Number features are presented by NumP. The syntactic position of the English word in (227a) is represented in (227b).

<sup>26</sup> In Wu & Bodomo's (2009: 500) structure, it is not clear where the syntactic position for a numeral is.

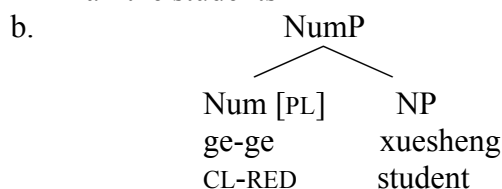
(227)a. students



The structure in (227b) has nothing to do with numerability, and thus can also represent the so-called mass plural (2.2.6).

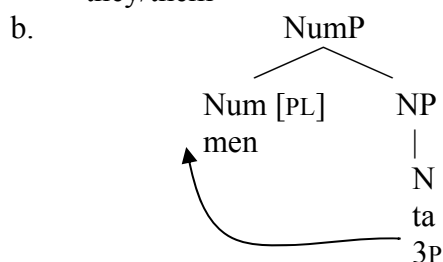
For Mandarin Chinese, NumP can host a reduplicated unit word (see 2.6.4). Such a word denotes plurality, but is not in construal with a numeral. Therefore, it is a realization of Num, rather than Unit. The base-positions of the elements in (228a) are represented in (228b).

(228)a. ge-ge xuesheng  
CL-RED student  
'all the students'



Presumably, the plural suffix *-men*, which is obligatory for plural pronouns and optional for human nouns in Modern Mandarin Chinese, is also base-generated at Num, and the N head of NP moves to Num, as shown in (229b) (cf. Y.H. A. Li 1999).<sup>27</sup> As claimed in X. F. Zhang (2008: 414), Mandarin Chinese pronouns are base-generated at N (3P = third person).

(229)a. ta-men  
3P-PL  
'they/them'



The plural suffix *-men* and a reduplicated CL never co-occur. It is thus plausible that they are both generated at Num.

Since a plural nominal with a reduplicated unit word or with *-men* is definite in Mandarin Chinese, it is possible that a NumP like that in (228b) and (229b) is always dominated by a definite DP.

CLs in a reduplicated form have different semantic functions and syntactic properties from the non-reduplicated ones. They do not encode a counting unit and are not in construal with any numeral. It is reasonable for them to be base-generated at a position different from that of the simple forms of CLs. In this way, our analysis is different from Yang (2005: 85 fn.

<sup>27</sup> Historically, the plural marker *-men* also occurred with non-human nouns such as *ma* 'horse' (Ōta 2003 [1958]: 316).

19). In her analysis, NumP is projected above CLP. In order to generate a reduplicated CL form, a CL moves from the head of CLP to the head of NumP, and then moves further to D. At D, it is spelled out as a reduplicated form.

So far, we have identified two syntactic positions for CLs: the head of UnitP (4.2.1 above) and the head of NumP.

### 4.3.2 UnitP and NumP

I have argued that a numeral and a unit word are in a Spec-Head relation of UnitP. Therefore, if one of them occurs, UnitP is projected. If neither occurs, UnitP is not projected. Moreover, if a quantifier occurs, QuantP is projected. In 4.2.3 I claim that UnitP is always dominated by QuantP. So in all cases where UnitP occurs, QuantP is also projected, but not vice versa. I have also assumed that if a PL marker occurs, NumP is projected. Some possible combinations of UnitP and NumP are listed in (230), illustrated by relevant examples below. (I omit the possible projection of DP above the functional projections in (230) and omit both QuantP that dominates UnitP and possible DP in the trees in this subsection).

(230)

non-numeral quantifier	numeral	CL	PL-marker	example	QuantP	UnitP	NumP
-	+	+	-	(225)	✓	✓	
-	+	-	-	(218a) (218c)	✓	✓	
+	-	+	-	(221a)	✓	✓	
+	-	-	-	(221b)	✓		
-	-	-	+	(227) (228) (229)			✓
-	+	+	+	(231)	✓	✓	✓
-	+	-	+	(232)	✓	✓	✓
+	-	+	+	(233)	✓	✓	✓

In the patterns represented by the first four rows of (230), there is no number marker. Therefore, NumP is not projected (note that for some languages, the number feature may get deleted in terminal nodes by morphological operations; see 2.6.3).

For constructions that have a number marker, in the absence of a numeral, NumP is projected. We have seen such examples in (227), (228), and (229). In none of the three examples does a unit word occur, and thus no UnitP is projected.

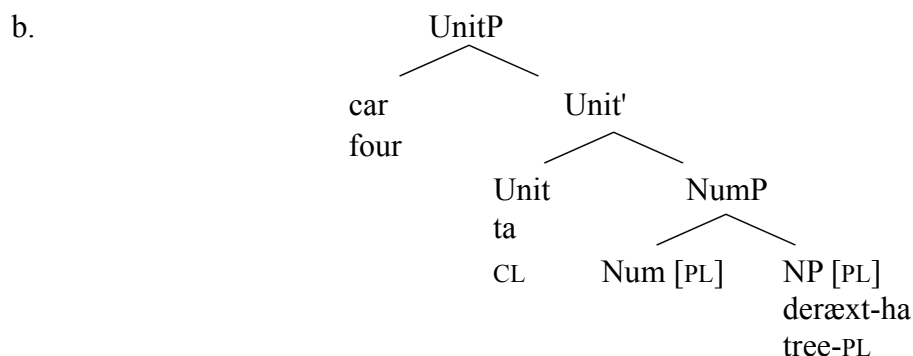
For constructions that have a CL, a number marker, and a numeral, both UnitP and NumP are projected. In this case, since a unit word is higher than a plural marker, UnitP is projected above NumP (Gebhardt 2009). In my analysis, the base-positions of the elements in (231a) (Gebhardt 2009: 227) are represented in (231b).<sup>28</sup>

(231)a.    car    ta deræxt-ha                      [Persian]  
               four CL tree-PL  
               ‘four trees’

<sup>28</sup> In Mandarin Chinese, the plural marker *-men* may occur with a collective CL (Chung 2011):

(i)    na    san    qun xuesheng-men  
        DEM three CL    student-PL  
        ‘those three groups of students’

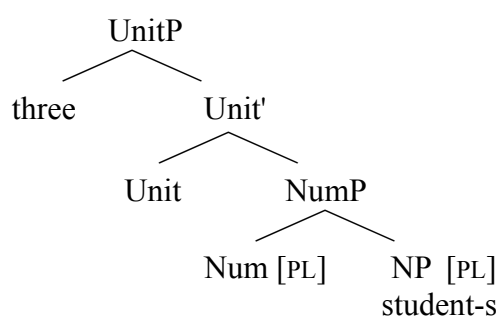
Collective CL constructions have a left-branching structure (Ch. 3 and 4.5.2). In (i), NumP headed by *-men* is not c-commanded by the UnitP headed by the CL *qun*. So the structure of (i) is different from (231b). See Chung (2011) for a syntactic analysis of (i).



The possible co-projection of NumP and UnitP captures the co-occurrence of a plural marker and a CL in the same construction (also see Allen 1977: 294; Aikenvald 2003: 100-101; Gerner & Bisang 2008; Csirmaz & Dékány 2010: 13, among others). In this respect, this analysis, as well as Gebhardt (2009), is different from Borer (2005), in which a plural marker and a CL are hosted in the same functional category, Div, and therefore, their co-occurrence is predicted to be impossible, contrary to the fact.

For constructions that have both a plural marker and a numeral, both UnitP and NumP are projected, although the head of Unit is null. The base-positions of the elements in (232a) are represented in (232b).

- (232) a. three students  
b.



For constructions that have a CL and a PL marker, but not a numeral, both UnitP and NumP are also projected. (233a) is an English example in which a kind CL, a PL marker, and a quantifier co-occur, without a numeral. In the Ahmao example in (233b) (Wang 1986: 76), similarly, the quantifier *pidzan* ‘several’ and a portmanteau morph *dzhai*, which contains a CL and a singular (SG) number morpheme, occur together, without a numeral. In such examples, both UnitP and NumP are projected, a configuration similar to (231b) and (232b).

- (233)a. many kinds of books  
b. pidzau dzhai tci [Ahmao]  
several CL.MED.SG.INDEF road  
‘several roads’

This approach is different from Borer (2005) in three major aspects: the base-position of numerals, the syntactic relation between number and countability, and the functional projections to encode countability. The last difference will be addressed later at the end of 4.4.1. The other two aspects are elaborated as follows.

First, numerals are base-generated in Spec of NumP in Borer (2005: 96; also Y.H. A. Li



1999: 86, Huang et al. 2009: 312), but in Spec of UnitP in the present approach.<sup>29</sup> Unlike Borer (2005), who claims that the presence of either a plural marker or a CL means the projection of DivP (correlating to my UnitP), I claim that the presence of either a numeral or a CL means the projection of UnitP. In my analysis, it is the Spec of UnitP, rather than the Spec of NumP, that hosts a numeral. This analysis captures the contrast between the dependency of a unit word on a numeral (or a quantifier of a certain type) and the lack of a dependency between a plural marker and a numeral. In (227), (228) and (229), the plural nominals have no numeral.<sup>30</sup>

Second, in my analysis, the projection of NumP is independent of the projection of UnitP. This less-rigid analysis is able to cover three facts: <i> the possible co-occurrence of a CL and a number marker, as in (231) and (233). A CL is always hosted at Unit, but a plural marker is related to Num. <ii> the presence of a plural marker in the absence of a unit word or numeral, as seen in (227) through (229). The former is represented by Num, whereas the latter is represented by Unit. <iii> the presence a unit word or numeral in the absence of a plural marker, as in (218), (221a), and (225).

Although UnitP and NumP are different, the features of the two functional categories may interact in various ways. In Dagaare, there are several plural markers (Grimm 2009). The plural marker *-ri* is for nouns that denote child and thus it seems to have the feature of an individual CL, in addition to the feature of plurality. The plural marker *-ree* is for “different kinds of x” (e.g., *fananee* ‘different types of soap’), and thus it seems to have the feature of a kind CL, in addition to the feature of plurality. So it is possible for these plural markers to be the morphological realizations of the features of both Unit and Num.

Another way of interaction between UnitP and NumP is seen in the mutual exclusiveness relation between a numeral and a plural marker, in languages such as Turkish, Hungarian, and Bangla (2.6.3).

In Chinese, when a unit word is in a reduplicated form, it is a realization of Num, and no UnitP is projected and thus no numeral may occur, as seen in (228). When a unit word is in a simple form, it is a realization of Unit, and a numeral or quantifier occurs at Spec of UnitP, as seen in (225).

A third way for NumP and UnitP to interact is seen in English, where the projection of UnitP always takes place with the projection of NumP. So whenever there is a numeral, which is base-generated at Spec of UnitP, one of the two values of the feature of Number is specified: when the numeral is *one*, [-PL] is specified, and for all other numerals, including *1.0*, [+PL] is specified, for the head of NumP (thus, *1.0 apples* vs. *\*1.0 apple*; *0.46 apples* vs. *\*0.46 apple*). But the dependency in the other direction does not hold. So NumP may be projected with or without UnitP, depending on whether there is a numeral. The presence of a numeral means the projection of UnitP, as stated before. If Unit is realized by a unit word, such as the individuating CL *drop* or *piece*, the kind CL *kind*, etc., NumP is also projected, to license the number marker on the unit word and on the noun.

<sup>29</sup> But in Huang et al. (2009: 296), a numeral is generated at the head of NumP. See Bartos (2011: 317) for a negative comment on Huang et al.’s inconsistent treatment of numerals.

<sup>30</sup> My analysis is compatible with Munn and Schmitt’s (2005: fn. 5) claim that “Num may not be the locus for overt numerals, which may be higher in the structure”. Massam (2009: 675) also points out that “in Niuean, it is clear that number and numerals are not in the same projection, as argued by Pearce (2007) also for various Oceanic languages.” Similarly, Espinal (2010: 987 fn. 8) states that her analysis of Catalan and Spanish suggests that, in addition to Num, a different function must be attributed to numerals. According to her, semantically, numerals introduce a cardinality function over singularities or pluralities.

## 4.4. The projection of DmsnP

### 4.4.1 DmsnP and the syntax of mass and non-mass readings

I have just argued that numerability is represented by the projection of UnitP. In Chapter 2, I have also argued that dimensionality is a feature independent of numerability. It is plausible to assume that dimensionality projects another functional projection. In de Belder (to appear; 2011), a more specific projection, SizeP, has been proposed. We have seen in Chapter 2 that dimensionality is related to not only size information such as big and small, but also shape information such as thin and round. I thus extend de Belder's SizeP into DimensionP, shortened as DmsnP.

Syntactically, the projection of DmsnP is attested in at least two aspects. One is that the head of such a projection can be realized by a diminutive marker, as argued in de Belder (to appear). The occurrence of a diminutive marker indicates atomicity and thus a non-mass reading.

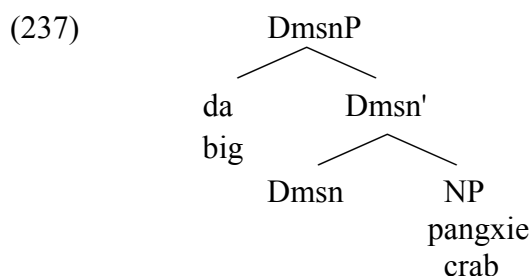
- |         |                          |    |                                      |           |
|---------|--------------------------|----|--------------------------------------|-----------|
| (234)a. | pane<br>bread<br>'bread' | b. | panino<br>bread-DIM<br>'bread roll'  | [Italian] |
| (235)a. | Brot<br>bread<br>'bread' | b. | Bröchen<br>bread-DIM<br>'bread roll' | [German]  |

Another consideration to support the projection of DmsnP is that a functional projection may license a particular type of modifiers (Travis 1988; Cinque 1999). The projection of DmsnP can license dimension modifiers.

It is obvious that a nominal with a dimensional adjective does not have to occur with a numeral or unit word, as seen in (236a), where the dimension adjective *da* 'big' occurs, without any numeral or unit word. Thus DmsnP can be projected in the absence of UnitP. On the other hand, a counting construction does not have to contain a dimension adjective, as seen in (236b), where the CL *zhi* occurs, without any dimension adjective. Thus UnitP can be projected without DmsnP. We thus see the independence of DmsnP from UnitP.

- |         |   |    |   |
|---------|---|----|---|
| (236)a. | Wo yao mai da pangxie.<br>I want buy big crab<br>'I want to buy big crabs.' | b. | Wo yao mai san zhi pangxie.<br>I want buy three CL crab<br>'I want to buy three crabs.' |
|---------|---|----|---|

With these two functional projections, UnitP and DmsnP, our theory, on the one hand, can precisely represent the syntax of non-mass and non-count nominals such as *furniture* in English and *pangxie* 'crab' in Chinese. While UnitP is responsible for numerability, which distinguishes count nominals from non-count nominals, DmsnP is responsible for atomicity, which distinguishes non-mass nominals from mass nominals. So for non-mass and non-count nominals, DmsnP can be projected, in the absence of UnitP. The structure of the object in (236a) is (237) (the possible DP projection dominating DmsnP is omitted):



On the other hand, mass nouns have neither UnitP nor DmsnP (see (223)). This analysis is thus different from the one in Borer (2005), where mass readings are represented by the absent of DivP (correlating to my UnitP) alone. This is the third major difference of the current analysis from Borer (2005), in addition to the two differences mentioned in 4.3.2. Instead of Borer's single functional projection DivP, we have both UnitP and DmsnP, to encode the contrast between count and non-count nouns, and the contrast between mass and non-mass nouns.

#### **4.4.2 The syntax and morphology of pre-unit word adjectives**

In this subsection, three issues will be addressed: the position of DmsnP, the category-level of pre-unit-word modifiers, and the representations of multiple dimension modifiers with the same nominal.

Recall that in Chinese, not only non-mass nouns, such as *pangxie* 'crab' in (238a), but also unit words, such as the CL *zhi* in (238b), can be modified by dimension adjectives (2.4.3 and 3.2.2):

- |   |  |
|---|--|
| (238)a.    san    zhi da pangxie<br>three CL big crab<br>'three big crab' | b.    san    da zhi pangxie<br>three big CL crab<br>'three big crab' |
|---|--|

One might claim that the adjective in (238b) has moved from the position in (238a). However, it is not always possible to associate a pre-CL adjective to a post-CL adjective, since mass nouns reject dimension adjectives, as shown in (239b) (Chapter 2):

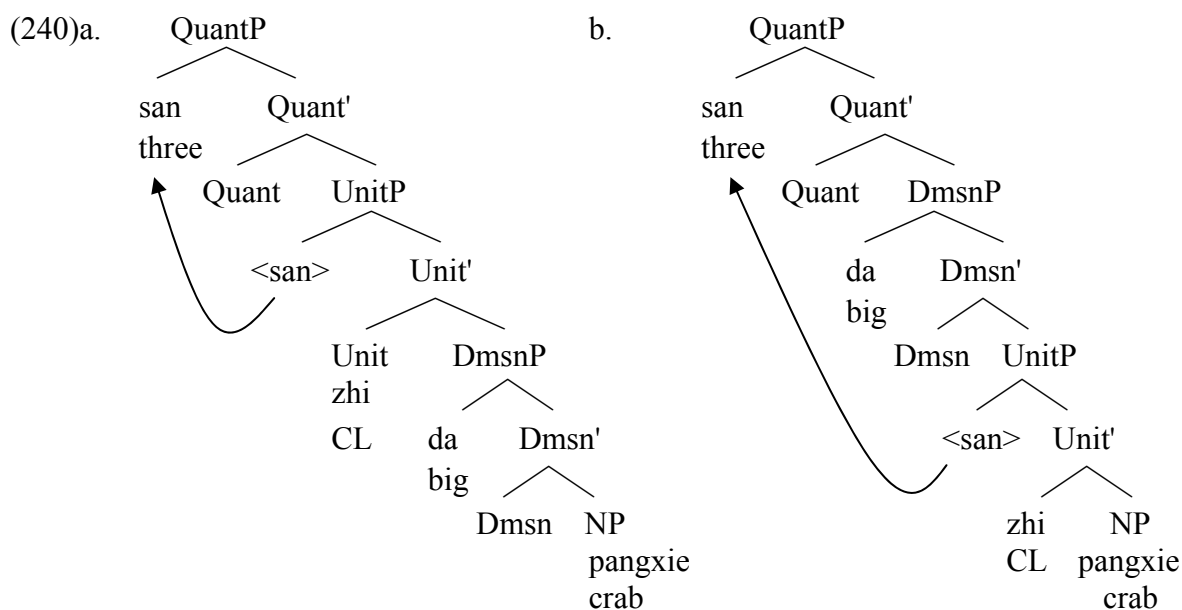
- |   |   |
|---|---|
| (239)a.    san    xiao    di shui<br>three small CL water<br>'three small drops of water' | b.    *san    di xiao    shui<br>three CL small water |
|---|---|

In (239a), the adjective *xiao* 'small' has to be base-generated above UnitP. Thus a DmsnP higher than UnitP is independently required. Accordingly, I claim that in (238a), DmsnP is projected below UnitP, and in (238b), DmsnP is projected above UnitP. In both sentences, the adjective occurs in its base-position, hosted by DmsnP. (240a) is the structure of (238a), and (240b) is the structure of (238b).<sup>31</sup>

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<sup>31</sup> Like other kinds of modifiers, dimensional modifier may also occur to the left of a numeral (N. Zhang 2006), or even the left of a demonstrative, with the support of the functional word *de* (see 3.2.1).

(i)    dada de san zhi pangxie big DE three CL crab 'three big crabs'	(ii)    da de nei        zhi pangxie big DE that.one CL crab 'the big crab'
---	---



Thus, DmsnP is not necessarily below UnitP. This claim is different from de Belder (to appear; 2011), where SizeP is under DivP. As I argued in Chapter 2, numerability and dimensionality are independent each other. To represent the independence, we should not dictate the derivation order of UnitP and DmsnP. In other words, it is possible that either of them is integrated into the structure-building earlier than the other, and therefore, there is no fix order between them. This is just like the situation of two symmetrical conjuncts. Either one can combine with the coordinator first. Both (241a) and (241b) are well-formed.

- (241)a. Bill likes to [play piano and learn foreign languages].  
 b. Bill likes to [learn foreign languages and play piano].

Returning to (238), we see the synonymous relation between (238a) and (238b). This semantically transparent relation is compatible with the right-branching structure in which the position of a pre-CL adjective is hosted by a higher DmsnP, and thus c-commands a possible post-CL adjective, which is hosted by a lower DmsnP (the representation of a left-branching structure is discussed in the next section).

We now turn to the category-level of pre-unit-word modifiers. When a dimension adjective modifies a noun, it can be followed by the functional word *de*, as seen in (242). In addition to the simple form of the adjective in (242a), a pre-*de* adjective can also be in a reduplicated form, as in (242b), in a coordinate construction, as in (242c), or with a degree word *hen* ‘very’, as in (242d) (Wang 1995: 306, 314). For the three complex forms, the occurrence of *de* is obligatory.

- |         |  |    |   |
|---------|--|----|---|
| (242)a. | chang de xianglian<br>long DE necklace<br>‘long necklace’                              | b. | chang-chang de xianglian<br>long-RED DE necklace<br>‘long necklace’     |
| c.      | chang erqie cu de xianglian<br>long and thick DE necklace<br>‘long and thick necklace’ | d. | hen chang de xianglian<br>very long DE necklace<br>‘very long necklace’ |

However, when an adjective modifies a unit word, no *de* is allowed to intervene between them, as seen in (243) (note that we are talking about the *de* to the left of a unit word, not to the right of a unit word; the latter issue has been discussed in 3.5). As expected, none of the

three complex forms may precede a unit word. The example in (243c) shows this constraint.

- (243)a. san chang (\*de) tiao xianglian      b. san da (\*de) xiang xianglian  
 three long DE CL necklace      three big DE box necklace  
 ‘three long necklaces’      ‘three big boxes of necklaces’
- c. san (\*chang-chang de) tiao xianglian  
 three long-RED DE CL necklace  
 ‘three necklaces’

The ban of *de* in data like (243) has been noted since Tang (1990b: 419). In Cheng & Sybesma (1999: 529 fn.16), it is conjectured that “This may be due to some obligatory cliticization of CL to Numeral” (also see Yang 2001: 72). However, in the presence of *chang* ‘long’, the CL *tiao* in (243) 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 *chang de* ‘big DE’ as its host in (243)? It is clear that the constraint in (243) is beyond the alleged clitic status of the CL.

It is well-recognized that pre-*de* modifiers are phrasal (e.g., Fan 1958, C. Huang 1989, Tang 1990b: 420). So the constraint under the discussion is the following generalization:

- (244) An adjective to the left of a unit word cannot be phrasal.

But such adjectives do not show properties of syntactic head elements. For instance, they do not license ellipsis:

- (245) \*Baoyu mai-le san da kuai doufu, Daiyu mai-le si xiao ~~kuai doufu~~.  
 Baoyu buy-PRF three big CL tofu Daiyu buy-PRF four small CL tofu

Therefore, I do adopt Tang’s (1990: 418) claim that the cluster *da-xiang* in (243b) is a complex head cluster. Instead, extending Matushansky’s (2006) theory, I assume that the pre-unit word adjective is syntactically at Spec of DmsnP, but it undergoes a morphological merger operation and is thus adjacent to the unit word at PF.

Such an adjective behaves like a phrasal prefix morphologically. Chinese has phrasal suffixes such as monosyllabic locatives. In (246), *-shang* ‘on’ and *-xia* ‘below’ are phrasal suffixes (Liu 1998).

- (246) Zhuo-shang you mao, zhuo-xia you gou.  
 table-on have cat table-under have dog  
 ‘There is a cat on the table and a dog under the table.’

Unlike clitics in general, however, such bound form can bear contrastive stress. In (246) above, the two locatives are in contrast. Similarly, a pre-unit word adjective may also bear contrastive stress, as in (247):

- (247) Ta zhua-le san da tiao yu, bu shi san xiao tiao yu.  
 he catch-PRF three big CL fish not be three small CL fish  
 ‘He caught three big fish, not three small ones.’

Two dimension modifiers can occur with the same nominal (I have not seen any

example in which there are more than two dimension adjectives to the left of a unit word). In each example in (248) and (249), two dimension adjectives occur in a row ((248c) and (248e) are cited from Y. Li 2000: 57). Thus either DmsnP may be projected recursively or a single DmsnP may have multiple Specs. I leave a choice between these two possibilities for future research.

- |  |  |
|--|--|
| <p>(248)a. si xiao yuan pian shuye<br/>four small round CL leaf<br/>'four small round leaves'</p> <p>c. yi xiao bo pian mianbao<br/>four small thin CL bread<br/>'four small thin slices of bread'</p> <p>e. si da chang chuan tang-hulu<br/>four big long CL sugar-fruit<br/>'four big long strings of sugared fruit'</p> | <p>b. si xiao fang kuai bing [pre-CL Adj]<br/>four small square CL ice<br/>'four small square chunks of ice'</p> <p>d. si da hou pian luobo<br/>four big thick CL turnip<br/>'four big thick slices of turnip'</p> |
| <p>(249)a. si pian xiao yuan shuye<br/>four CL small round leaf<br/>'four small round leaves'</p>  | <p>b. yi ge da fang hezi [pre-NP Adj]<br/>one CL big square box<br/>'four big square box'</p>  |

The order of multiple dimension modifiers follows the general rule of adjective ordering. For instance, a shape adjective should be closer to the modifiee than a size adjective (Vendler 1968). In Chinese, this default order is observed in the absence of the functional word *de* (Sproat & Shih 1988, 1990). Compared with (250b), (250a) is not acceptable. Similarly, compared with (251a), (251b) is not acceptable.

- |   |   |
|---|---|
| <p>(250)a. *yi pian yuan xiao shuye<br/>one CL round small leaf</p> | <p>b. yi pian xiao yuan shuye [pre-NP Adj]<br/>one CL small round leaf<br/>'one small round leaf'</p> |
| <p>(251)a. *si yuan xiao pian shuye<br/>one round small CL leaf</p> | <p>b. yi xiao yuan pian shuye [Pre-CL Adj]<br/>one small round CL leaf<br/>'one small round leaf'</p> |

DmsnP can also be projected both below and above the same individual UnitP, so long as the two encoded dimension meanings are compatible each other (more cases of multiple projections of DmsnP with the same UnitP will be introduced in Chapter 6):

- (252) yi xiao pian bo binggan  
one small CL thin biscuit  
'one small thin piece of biscuit'

If there are two adjectives to the left of a unit word, neither of them may occur with *de*, as seen in (253a), and thus neither of them may be phrasal. Thus all pre-unit-word dimension modifiers are consistently phrasal prefixes. They all undergo morphological merge with the unit words.

- (253)a. si xiao (\*de) yuan (\*de) pian shuye [pre-CL Adj]  
four small DE round DE CL leaf  
'four small round leaves'

- b. si pian xiao (de) yuan (de) shuye [pre-NP Adj]  
 four CL small DE round DE leaf  
 ‘four small round leaves’

The situation for an adjective to the right of CL, as in (253b), is different. In this case, DmsnP is projected below UnitP and there is no morphological constraint on the form of the dimension adjectives.

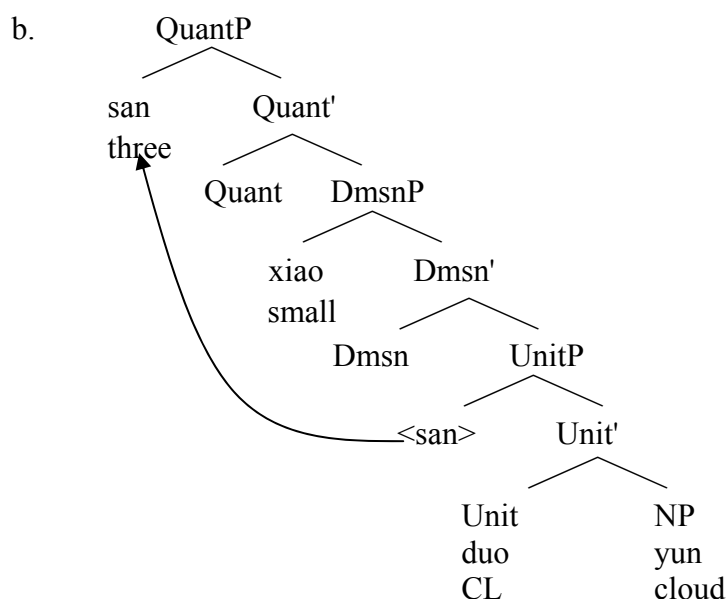
#### 4.5. The right- and left-branching counting constructions in Chinese

After establishing UnitP and DmsnP, in addition to NumP and QuantP, we are ready to label the nodes of the three syntactic structures argued for in Chapter 3: two right-branching structures and one left-branching structure.

##### 4.5.1 The representations of the two right-branching structures

Individual and individuating CL constructions have a right-branching structure (3.2). In (240a) and (240b) above, we have specified the labels of the constituent nodes for the right-branching structures of individual CLs. One more such example is (254a). In this example, the individual CL *duo* occurs. It has the structure in (254b). In (255a), the individuating CL *duo* occurs. It has the structure in (255b). We can see that there is no structural difference between the constructions headed by the two kinds of CLs.

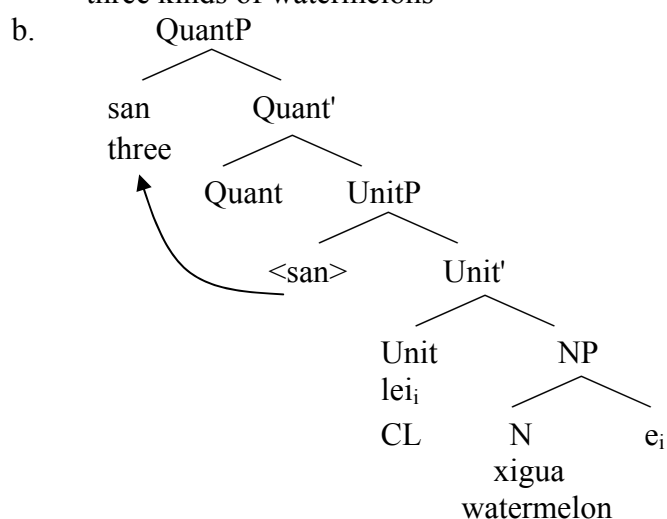
- (254)a. san xiao duo hua [individual CL]  
 three small CL flower  
 ‘three small flowers’
- b.
- 
- (255)a. san xiao duo yun [individuating CL]  
 three small CL cloud  
 ‘three small pieces of cloud’



As for constructions with a kind CL, we have presented an extended right-branching structure. We now specify the labels of the constituent nodes for the structure. (256a), where the kind CL *lei* occurs, has the structure in (256b).

(256)a. san lei xigua [kind CL]  
 three CL watermelon

‘three kinds of watermelons’



#### 4.5.2 The representation of the left-branching structure

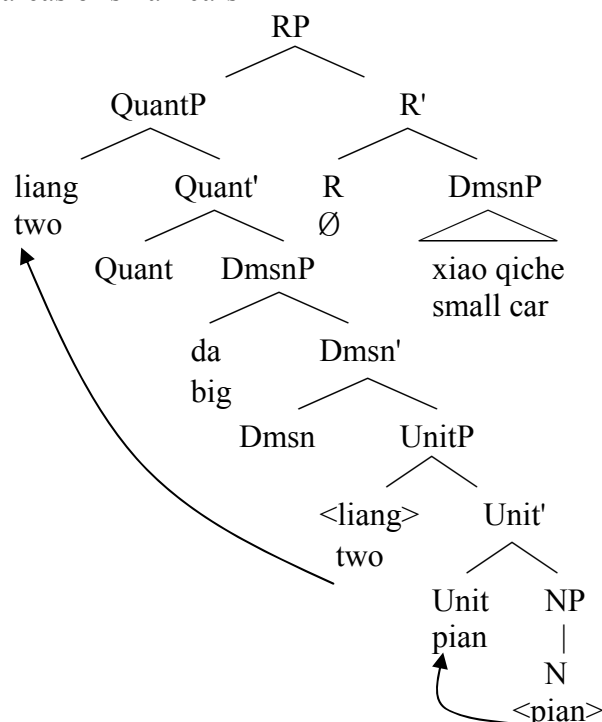
A left-branching structure is for counting constructions of container measures, standard measures, collective CLs, and partitive CLs (see 3.2). In this structure, the unit word does not c-command the associated NP. Therefore, the unit word and the NP may have incompatible adjectives, and the former does not have a selection relation with the latter.

I propose that the UnitP headed by such unit words and the NP are integrated together by RP in the sense of den Dikken (2006). The Spec and the Complement of RP may establish a subject-predicate, or predicate-subject, relation. Moreover, a noun base-generated at N undergoes head movement and surfaces at Unit, functioning as a unit word. For instance, the structure for (257a) is (257b).



- (257)a. liang da pian xiao qiche [collective CL]  
 two big CL small car  
 ‘two big areas of small cars’

b.



In this analysis, collective CLs, partitive CLs, standard CLs, and container CLs are all base-generated at N, and surface at Unit.

A similar head movement from N to a functional head is seen in Cheng & Sybesma (1998: 406; see (206b) above) for container measure constructions. Tang (2005: 452-453) presents three arguments against this kind of movement, trying to show that nouns such as *beizi* ‘cup’ and *benzi* ‘notebook’ are different from unit words such as the container measure *bei* ‘cup’ or *wan* ‘bowl’ and thus they may not move to the position of a unit word. First, a noun may not be followed by another noun, unlike either a measure word or an individual CL, as seen in (258a). Second, an NP can occur at an argument position, unlike a unit word, as seen in (258b). Third, a noun “cannot appear alone with numerals like *yi* ‘one’,” as in (258c).

- |         |                   |    |                            |    |              |
|---------|-------------------|----|----------------------------|----|--------------|
| (258)a. | yi ge wan (*shui) | b. | Da de wan hen gui.         | c. | yi *(ge) wan |
|         | one CL bowl water |    | big DE bowl very expensive |    | one CL bowl  |
|         | ‘one bowl’        |    | ‘Big bowls are expensive.’ |    | ‘one bowl’   |

However, all of these three arguments simply show that nouns and unit words, which are defined by their syntactic local relation to a numeral, have different distributions. Their surface positions are the result of syntactic operations. One can claim that if the word *wan* ‘bowl’ is base-generated at N, and then if the CL *ge* is base-generated at Unit, *wan* has no way to move to Unit. The surface order of (258a) is thus derived. In (258b), no numeral occurs and thus UnitP is not projected. Then there is no N-to-Unit movement. (258c) simply shows that Unit cannot be empty in Chinese. Therefore, the movement analysis is not challenged. An element has the function of a unit word only when it occurs in a specific syntactic position, i.e., syntactically local to a numeral. In none of the three examples in (258), the word *wan* is local to a numeral, and thus it is not a unit word. This is similar to the situation that Infl can be realized by an auxiliary or a raised verb, but the possibility of the

verb movement does not blur the distinction between auxiliaries and verbs.

Container measures may have complex forms, containing a non-dimensional modifier, such as *ma* ‘horse’ in (259a), and *suliao* ‘plastic’ in (259b). It is plausible that they are base-generated at N and moves to a functional position. In contrast, individual and individuating CLs may not have such complex forms, as seen in (259c). They are more like intrinsic functional elements, base-generated at a functional head.

- |  |  |
|--|--|
| <p>(259)a.    wu ma-che    liangshi<br/>                     five horse-cart food<br/>                     ‘five horse-carriages of food’</p> <p>c.        *wu    suliao-duo hua<br/>                     five plastic-CL   flower</p> | <p>b.    wu suliao-tong    qiyou<br/>                     five plastic-bucket gasoline<br/>                     ‘five plastic buckets of gasoline’</p> |
|--|--|

In my analysis, individual, individuating, and kind CLs are base-generated at Unit, unlike other types of unit words such as the collective CL *pian* in (257b), which are base-generated at N and surface at Unit. Thus the former three types of unit words are like auxiliaries, which are intrinsic functional elements. The contrast between the unit words that are base-generated at a functional head and those that start out in N has nothing to do with the contrast between count and mass status of nominals. My analysis is different from Cheng & Sybesma (1998, 1999; see my 2.7.4 above), where it is claimed that the so-called count unit words are base-generated at the functional head CL, whereas the so-called mass unit words start out in N and then undergo N-to-CL movement.

Following Roberts (2010) and Branigan (2011: 40), I assume that head movement can be an operation in narrow syntax. The N-to-Unit movement in the left-branching structure is an instance of nominal-internal head movement. Nominal-internal head movement has been independently attested in Modern Hebrew (Borer 1999, Ritter 1991), Irish (Duffield 1996), Welsh (Rouveret 1991), and Romance languages (Longobardi 1994), among other languages. Such head movement is parallel to the head movement in the verbal domain (Pollock 1989). Along with the literature cited above, this study of nominal-internal head movement shows the cross-categorical symmetry in displacement phenomena (Chomsky 1970).

In 3.5, I have analyzed the availability of the functional word *de* to the right of a unit word: it is available for the left-branching structure in general, and for the right-branching structure in the quantity reading, but not available for the right-branching structure in the non-quantity reading. In that section, I also argued that if *de* occurs in a right-branching construction, it is in fact out of the counting construction, since the surface order is the result of deletion from a comparative modification construction. From the structure in (257) we can see that the constituent boundary between the Spec of R and the complement of R makes the occurrence of *de* always possible. This captures the absence of the quantity-reading constraint on the occurrence of *de* in the left-branching structure.

## **4.6. Various realizations of the head of UnitP**

### **4.6.1 Three basic patterns**

In line with Chomsky’s (2001:2) Uniformity Principle, which states that “In the absence of compelling evidence to the contrary, assume languages to be uniform, with variety restricted to easily detectable properties of utterances”, I assume that universally, UnitP is projected for counting constructions. I have argued that in such a construction the numeral is base-generated at Spec of Unit, and the NP is hosted in the complement of Unit. Following Croft (1994: 151-152), I assume that standard measures (e.g., *kilo*), container measures (e.g., *bottle* in *three bottles of milk*), kind CL (*kind* in *three kinds of chocolate*), partitive CLs (e.g., *section* in *three sections of orange*), and collective CLs (e.g., *group* in *three groups of*

We now concentrate ourselves on the variations of the constructions of individual and individuating CLs. We have found three basic patterns of such constructions.

The second one is a pattern in which Unit is consistently covert. In languages such as Yudja (Lima 2010), Halkomelem Salish (Wilhelm 2008: 64), and Dëne (Wilhelm 2008), the head of UnitP is not realized by an overt element other than the above five types.

(260) txabĩa apeta (= (61)) [Yudja]  
 three blood  
 ‘three units of blood’  
 (the exact unit is decided by the context: drops, puddles, or containers)

(261)a. san-jiao-xing      b. wu-ma-fen-shi      c. wu-jin      shangdian  
three-angle-shape      five-horse-divide-body      five-medal shop  
'triangle'      'five horses divide a body'      'hardware store'

(262) a. three card trick      b. five spice powder

(263)a. solághe dzól                  b. \*solághe bēr                  [Dëne]  
five ball                              five meat  
'five balls'

The third pattern is a split one. In languages such as English, generally speaking, the silent Unit selects nominals with [+numerable], whereas an overt Unit selects nominals with

[-numerable]. So it is a split pattern between the two patterns above. In *three books*, where *books* is [+numerable], the Unit is silent. In contrast, in *three pieces of paper* or *three pieces of furniture*, where *paper* or *furniture* is [-numerable], the Unit is realized by *pieces*.

Comparing with Dëne, we can see that the silent Unit is licensed by the selection of numerability in English, but by the selection of dimensionality in Dëne.

Since Unit is always [+numerable], we can state that the selection of a silent Unit in English is also an Agree relation of [+numerable] between Unit and the noun.

We now specify the representations of the output of the three shifts introduced in 2.2.5. In the output of the Universal Grinder, neither UnitP nor DmsnP is projected, as in the structure of a mass nominal. Thus there is neither overt nor covert Unit or Dmsn for *apple* in (264).

(264) There is apple in the salad.

In the output of the Universal Sorter, such as *two chocolates* in (265) (de Belder, to appear: 1; 2011: 70), the head of UnitP is realized by a silent version of a kind CL, and the Spec of Unit is the base-position of the numeral of the construction.

(265) I studied two chocolates: a low fat variety and a normal one.

Note that English does have overt kind CLs such as *kind* and *type*, but if an overt CL occurs, the plural marker will occur on the CL, rather than the noun. So it is unlikely that the silence of the CL is the result of deletion. Moreover, as claimed in 4.3.2, Unit takes NumP as its complement in English, and thus the plural marker of the output of the shift is captured. This is also true of the Universal Packager. In the output of the Universal Packager, such as *two waters* in (266), the head of UnitP is realized by a silent version of a container measure. This silent container measure can be a pro-form, interpreted in the discourse. The numeral of the construction is base-generated at Spec of Unit. In this case, the null Unit patterns with that of Yudja.

(266) Give me two waters.

In this analysis, the features of numerability and dimensionality help us to identify not only covert forms of Unit, but also the types of the covert forms allowed in a language.

Grammatical formatives such as tense markers, definiteness markers (e.g., articles), and counterfactual markers (e.g., subjunctive mood markers) are found to be overt in many non-CL languages, but not overt in Chinese. In contrast to this pattern, individual CLs as unit words in counting constructions are obligatorily overt in Chinese but not overt in non-CL languages. Moreover, the effects of Universal Sorter and Universal Packager, which contain covert kind CLs and covert container measures, respectively, are also absent in Chinese. All of these indicate that Chinese does not show context-dependent flexibility in certain aspects. With more and more studies of syntactic issues, we cast a reasonable doubt on the belief that Chinese syntax is more discourse-dependent than other languages.

#### **4.6.2 A comparison with a numeral-oriented approach**

The classification of the various patterns of the realization of Unit, introduced in the last subsection, is made on the consideration of three fundamental factors: the overtness of the functional head Unit, the selection of the dimensionality feature by Unit, and the selection of the numerability feature by Unit.

In my analysis, no morphological plurality marker is considered for the syntax of

countability, and unit words can be silent. Considering languages such as Yudja, Dëne, and Tongan, where a bare noun may combine with a numeral directly, without any CL or number marker, I agree with Wilhelm (2008: 63-64) that “a grammatical marker of countability is not a universal requirement” (contra Doetjes 1997). In contrast to the overt grammatical marker approach, in my approach, silent unit words may encode countability in the syntactic structures of counting constructions. Like other types of linguistic items, human languages may differ in the overtness of certain kinds of unit words.

The idea that languages may have silent unit words is not new. For example, Sharvy (1978) states that English might have empty CLs correlating to Chinese individual CLs. Thus *three books* contains a silent individual CL, *Open three beers* contains a silent container measure, and *We tasted three Canadian beers* contains a silent kind CL. Krifka (2008: Sec. 6.3) also states that “[c]ount nouns in [+Num -CL] languages have meaning with ‘built-in’ classifiers” (also Krifka 1995: 406). Moreover, Delsing (1993), Van Riemsdijk (2005) and Vangsnes (2008) claim that kind readings in Germanic languages have a silent CL. Thus when *three wines* means ‘three kinds of wine’, a silent kind CL occurs. Csirmaz & Dékány (2010: 11) also argue for the existence of zero CLs in Hungarian.

The analysis of this book has developed the idea of silent CL, and further identified the possible conditions for a silent CL to occur. According to my investigation, the conditions for the availability of silent CLs, as well as the exact conditions for the availability of certain type of overt CLs in Chinese, may correlate with the selection restrictions of the CLs. Also, identifying the exact type of a silent unit element (kind CL or container measure, etc.) is decided by the context, as seen in (265). But generally speaking, the ambiguity possibility does not falsify the existence of empty unit words (contra Doetjes 1996: 48-49).

This unit word-oriented analysis of the language variation is different from the noun-semantics-oriented analysis and number-morphology-oriented analysis, which I have argued against in 2.6.2 and 2.6.3, respectively.

My unit word-oriented analysis of the language variation is also different from the numeral-oriented analysis proposed in Wilhelm (2008). Following Krifka (1995: 400), Wilhelm (2008: 54) first introduces an operator or function that specifies the objects to be counted as atoms. This atom-accessing function is called OU (short form for Object Unit) (1995: 400). He then makes the following statement (p. 56):

in general, counting involves an atom-accessing function OU. Languages differ in whether OU is part of the meaning of numerals or expressed separately by numeral CLs. In other words, I propose that there is crosslinguistic variation in the semantics of numerals, and that this variation is responsible for the difference between Chinese and Dëne/English. Chinese, Dëne, and English are the same, however, in that in each of them the count/mass distinction is based on atomicity, and not on number properties such as inherent singularity.

According to this numeral-oriented approach, in languages such as Dëne and English, the unit meaning of CLs is integrated into numerals, countability correlates with atomicity of the element denoted by a noun, and only count nouns may semantically be compatible with a numeral. In Chinese, however, unit meanings are expressed by CLs, rather than numerals.

I do not adopt this approach for the following four reasons.

First, in non-CL languages such as Yudja (Lima 2010) and Halkomelem Salish (Wilhelm 2008: 64), a numeral may occur with a mass noun, as in (260). Thus, if the unit meaning is integrated into the numerals in such languages, the theory cannot explain why the combination of a numeral with a mass noun is impossible in Dëne, but possible in Yudja and Halkomelem Salish. In my unit word-oriented approach, both types of languages may have

silent CLs and they differ in the selection of the dimensionality feature by the silent CLs. The variation correlates exactly with that between individual and individuating CLs in CL languages. In Wilhelm (2008), the pattern of Halkomelem Salish is mentioned, without an analysis (his p. 64).

Second, the five types of unit words listed at the beginning of 4.6.1 also exist in non-CL languages that have no plural markers. The following Dëne examples are from Wilhelm (2008: 47):

- |         |                            |    |                              |        |
|---------|----------------------------|----|------------------------------|--------|
| (267)a. | solághe <u>nedádhi</u> bër | b. | náke <u>tutılı</u> tı'ólátué | [Dëne] |
|         | five pound meat            |    | two bottle beer              |        |
|         | 'five pounds of meat'      |    | 'two bottles of beer'        |        |

In another non-CL and non-plural-marker language, Yudja (Lima 2010: 10-11), the partitive CL *txa* is available, to distinguish the part of an entity (e.g., pieces of meat from an animal) from the whole body of the entity (e.g., the whole animal). In the latter case, *txa* does not occur.

If a numeral always contains unit information in such languages, an additional operation is necessary to get rid of the information when the numeral occurs with any unit word of the five types. This is because a numeral is in construal with one unit only. For instance, when the meaning of 'five groups of students' or 'five boxes of books' is expressed, the numeral for 'five' in a non-CL language must exhibit the properties of the corresponding numeral in a CL language. It is not clear to me how this is achieved in this numeral-oriented approach.

Third, the assumption that the count and non-count distinction is based on atomicity is problematic for English and other languages. The problem is discussed in Rothstein (2010), Krifka (2008), Chierchia (2010), among others (see my 2.6.2). The numeral-oriented approach tries to cover English, as well as other languages, but does not explain the complexity of the languages. In my Chapter 2, I proposed a four way contrasts for the count-mass distinction. My new analysis can explain not only the regular cases, but also the cases that are labeled as "semantics-syntax mismatches" in Wilhelm (2008: 64), e.g., *furniture*.

Fourth, the two arguments used to support the idea that unit meanings are integrated into numerals in non-CL languages are weak. Both arguments are intended to show numerals in non-CL languages are different from those in CL-languages. The first argument is that some numerals in Dëne are specifically for human, which might mean that "Dëne basic numerals contain a general classifier that accesses the atoms or object units in the denotation" (Wilhelm 2008: 58). The argument implies that a numeral that contains unit information should not exist in CL languages. However, Mandarin Chinese does have words that encode the combination of a numeral and a CL. For instance, *lia* = *liang* 'two + CL', and *sa* = *san* 'three + CL'.

- |         |                                |    |                |
|---------|--------------------------------|----|----------------|
| (268)a. | lia mantou                     | b. | lia pingguo    |
|         | two+CL steamed.bread           |    | two+CL apple   |
|         | 'two items of steamed bread'   |    | 'two apples'   |
| (269)a. | sa mantou                      | b. | sa pingguo     |
|         | three+CL steamed.bread         |    | three+CL apple |
|         | 'three items of steamed bread' |    | 'three apples' |

In neither Dëne nor Mandarin Chinese, is such morphological contraction systematic. Therefore, they do not tell us the general structural contrasts between CL and non-CL languages.

The second argument to support the idea that unit meanings are integrated into numerals in non-CL languages is that “In English and Dëne, but not in Mandarin and other languages with obligatory numeral classifiers, numerals can be used pronominally. In the latter, only the numeral-classifier combination can be used pronominally.” In (270), *one* alone can mean ‘one new blanket’, whereas in the Mandarin Chinese examples in (271), *yi* ‘one’ alone may not stand for ‘one new blanket’.

- (270) I bought two new blankets. One is black and one is red.
- (271)a. Wo mai-le liang tiao xin tanzi. Yi tiao hei de, yi tiao hong de.  
 I buy-PRF two CL new blanket one CL black DE one CL red DE  
 ‘I bought two new blankets. One is black and one is red.’
- b. \*Wo mai-le liang tiao xin tanzi. Yi hei de, yi hong de.  
 I buy-PRF two CL new blanket one black DE one red DE  
 (Intended: ‘I bought two new blankets. One is black and one is red.’)

The data indeed show that numerals in the two languages behave differently. However, I doubt whether the contrast can show that a numeral contains unit information in non-CL languages. Data like (270) and (271a) can be derived by deletion. In (270), the NP *new blanket* is deleted after each instance of *one*.<sup>32</sup> In (271a), the NP *xin tanzi* ‘new blanket’ is deleted after each instance of *yi tiao* ‘one CL’. The deletion is licensed by the CL *tiao*, which is a head element (4.2.1). (271b) is not acceptable simply because a numeral is not a head element, and thus it cannot license the deletion of the string *tiao xin tanzi* ‘CL new blanket’. One might wonder why the deletion in (270) does not require this licensing condition. The fact is that we can find other examples in English in which deletion does not have to follow a head element. Assume sluicing is derived by deletion in English (Merchant 2001). In (272), the string after *which model*, which is not a head element, is deleted.

- (272) They discussed a certain model, but they didn’t know which model.

Chinese sluicing constructions, however, are not derived by deletion (Wei 2004). Instead, the *wh*-phrase in the constructions is the predicate of an empty subject. In (273a), the copula *shi* ‘be’ to the left of *shui* ‘who’ is obligatory. As illustrated in (273b), there is an empty subject for the predicate *shui*, but no deletion occurs in this sluicing construction.

- (273)a. Shufen gu-le yi ge zhushou, dan wo bu zhidao \*(shi) shui.  
 Shufen hire-PRF one CL assistant but I not know be who  
 ‘Shufen hired an assistant, but I don’t know who.’
- b. Shufen gu-le [yi ge zhushou]<sub>i</sub>, dan wo bu zhidao [pro<sub>i</sub> shi shui].  
 Shufen hire-PRF one CL assistant but I not know be who

The two approaches, the unit-word-oriented and the numeral-oriented approach to

<sup>32</sup> The word *one* in (270) is different from the pronominal use of *one* in data like (i) or (31a). In (i), the word *one* cannot be followed by a noun such as *car*.

(i) John bought a big car and Mary bought a small *one* (\*car).

counting constructions, have been seen in Quine (1969: 36), in a slightly different version. Quine states that a CL in a CL language can be treated as a constituting part of a numeral, so that a numeral is sensitive to the semantic type of the noun when it applies to the noun. On the other hand, a CL can also be treated as a unit word for the noun, so that a numeral can apply to the noun. Quine does not make a choice between the two approaches. But the present approach to individual and individuating CLs argues for the second one.

#### **4.7. Chapter summary**

In this chapter, I have argued for two functional projections below DP and NP: UnitP and DmsnP, in addition to NumP and QuantP. I have also identified reduplicated CLs, which are not unit words, as a realization of NumP. Numerals are argued to be base-generated at Spec of Unit and a unit word such as a CL heads UnitP. Thus the occurrence of either a numeral or a unit word means the projection of UnitP. But the occurrence of a plural marker does not correlate with the projection of UnitP. In the structure of mass nominals, there is neither UnitP nor DmsnP.

In the proposed analysis, countability is represented by functional structures, rather than lexical properties of nouns. In this aspect, the analysis is compatible with Borer's (2005) syntactic approach to countability, although the details of our functional structures are different.

Using the two new labels, UnitP and DmsnP, I have also presented the derivations of the left- and right-branching structures of Chinese counting constructions, established in Chapter 3. Then, based on the selections of the two features, numerability and dimensionality, I have represented various realizations of the head of UnitP in different types of languages, and within the same language. The null Unit in Yudja is a covert counterpart of either an individual or individuating CL in Chinese. The null Unit in Dëne is a covert counterpart of individual CL in Chinese. While identifying the differences in the realizations of the function head of Unit, I have argued against Wilhelm's (2008) numeral-oriented analysis of cross-linguistic variations of the presence of unit words.



## Chapter 5 Semantic Features in the Syntax of Container Measures

### 5.1. Introduction

In the previous chapters, we have discussed the syntax of counting constructions, and syntax-semantics interfaces revealed by various counting units, including CLs and container measures. In this chapter, we will see that counting constructions can tell us more about the computation of formal features of language. When we consider container measure constructions, we are confronted with some fundamental issues of the computation of language system, with respect to the projection of the semantic features.

Syntactic projection has been understood as representing the syntactic features, especially categorical-features (c-features), of a mother by those of the head daughter. The features of the non-head daughter play no role in the projection (Chomsky 1995: 244, López 2001). This chapter clarifies a hitherto unclear issue: is it possible to project semantic features (s-features) from an element that is not a syntactic head? A positive answer and relevant constraints will be presented.

Not much work has been devoted to the projection of s-features. This is probably because of the assumption that “the only features accessible to the syntax are those that can affect syntactic processes, i.e., grammatical features but not ‘purely semantic features’” (Schütze 2001: 128, following Emonds 1985). However, as we will see in this chapter, identifying the mismatch between syntactic and s-feature projection will help us to get a better understanding of the relation between syntax and semantics.

The empirical question to be considered for the theoretical issue is how to compute the selectional restrictions of the verb that takes a container measure nominal as its complement. The Chinese examples in (274) through (276) all have such a nominal as internal argument. In the a-sentences, the verb s-selects the containee, whereas in the corresponding b-sentences, the verb s-selects the container (the elements that are in an s-selection relation are underlined). In (274a), for example, the verb *he* ‘drink’ s-selects an argument with a [+liquid] feature. *Ping* ‘bottle’ does not satisfy this selection, whereas *píjiu* ‘beer’ does. In contrast, in (274b), the verb *kai* ‘open’ s-selects an argument with a [-liquid] feature. *Ping* ‘bottle’ satisfies this selection, whereas *píjiu* ‘beer’ does not. The container measure constructions in (274) through (276) have a containee reading in the a-sentences, but a container reading in the b-sentences.

- (274)a. Baoyu he-le san ping píjiu.  
Baoyu drink-PRF three bottle beer  
‘Baoyu drank three bottles of beer.’  
b. Baoyu kai-le san ping píjiu.  
Baoyu open-PRF three bottle beer  
‘Baoyu opened three bottles of beer.’  
(275)a. Baoyu niang-le san ping mi-jiu.  
Baoyu brew-PRF three bottle rice-wine  
‘Baoyu brewed three bottles of rice-wine.’  
b. Baoyu mifeng-le san ping mi-jiu.  
Baoyu seal-PRF three bottle rice-wine  
‘Baoyu sealed three bottles of rice-wine.’  
(276)a. Baoyu du-le san bao baozhi.  
Baoyu read-PRF three bag newspaper  
‘Baoyu read three bags of newspaper.’  
b. Baoyu chaikai-le san bao baozhi.  
Baoyu open-PRF three bag newspaper  
‘Baoyu opened three bags of newspaper.’

As we know, the verb in each of the examples above takes the whole counting construction, rather than either the container-denoting measure word or the containee-denoting noun, as its complement. The verb does not form a constituent with either the container measure or the containee-denoting noun. But the s-selection of the verb is satisfied by one of the two elements.

Since Selkirk (1977: 310ff; also Akmajian & Lehre 1976), the contrast between the two readings of such a construction in English has been studied. (277a) and (278a) have a containee reading, whereas (277b) and (278b) have a container reading.

- (277)a. She drank a bottle of that good wine.
- b. She broke a bottle of that good wine.
- (278)a. A cup of sugar was strewn on the floor.
- b. A cup of sugar smashed on the floor.

Corver (1998: 226) further notes that when a modifier of the container occurs to the right of the complex nominal, such as *with a long neck* in (279a) and *bigger than this* in (279b), only the container reading is available.

- (279)a. a bottle of water with a long neck
- b. a can of gasoline bigger than this

This can be analyzed as follows. Like in an extraposition construction, the separation of the container measure from its modifier makes the container reading focused, and thus the reading becomes the only reading accessible. In (280) and (281) (cited from Wright & Kathol 2003: 378), *mouth-watering* modifies the containee *beans*, which satisfies the s-selection of the verb *eat*, but not the verb *smash*. It is the container measure *can* that satisfies the s-selection of *smash*. The separation of the containee noun from its modifier in (280b) makes the containee reading focused, and thus block the container reading, as shown in (281):

- (280)a. I ate a can of mouth-watering beans.
- b. I ate a mouth-watering can of beans.
- (281)a. In protest, I smashed a can of their mouth-watering beans against my head.
- b. \*In protest, I smashed a mouth-watering can of their beans against my head.

Similar contrast can be found in Mandarin Chinese. In (282) and (283), *nongnong* ‘thick’ modifies the containee *tang* ‘soup’, which satisfies the s-selection of the verb *he* ‘drink,’ but not the verb *da-fan* ‘knock-down’. It is the container measure *wan* ‘bowl’ that satisfies the s-selection of *da-fan*. The separation of the containee noun from its modifier in (282b) makes the containee reading focused, and thus block the container reading, as shown in (283):

- (282) a. Shufen he-le yi wan nongnong de tang. [containee]  
           Shufen drink-PRF one bowl thick DE soup
- b. Shufen he-le nongnong de yi wan tang.  
           Shufen drink-PRF thick DE one bowl soup  
           BOTH: ‘Shufen ate one bowl of thick soup.’
- (283) a. Shufen da-fan-le yi wan nongnong de tang. [container]  
           Shufen knock-down-PRF one bowl thick DE soup  
           ‘Shufen knocked down one bowl of thick soup.’

- b. \*Shufen da-fan-le            nongnong de yi    wan tang.  
       Shufen knock-down-PRF thick            DE one bowl soup

The examples in (280) through (283) all show that the real contrast in Corver's data is not that between the presence and absence of a modifier, but the contrast between the presence and absence of a non-local modifier, which bears a focus.

As for local modifiers, the following Chinese data in (284) show that when the container measure has a local modifier, such as *da* 'big', the two readings are still both available. Similarly, the examples in (285) show that when the containee noun has a local modifier, *da* again, the two readings are also both available.

- (284)a. Siyu chi-le    san    da xiang yingtao.  
       Siyu eat-PRF three big box    cherry  
       'Siyu ate 3 big boxes of cherries.'  
       b. Siyu dakai-le san        da xiang yingtao.  
       Siyu open-PRF three big box    cherry  
       'Siyu opened 3 big boxes of cherries.'
- (285)a. Siyu chi-le    san    xiang da yingtao.  
       Siyu eat-PRF three box    big cherry  
       'Siyu ate 3 boxes of big cherries.'  
       b. Siyu dakai-le    san xiang da yingtao.  
       Siyu open-PRF three box big cherry  
       'Siyu opened 3 boxes of big cherries.'

The contrast between the containee and container readings is thus independent of the occurrence of modifiers.

If this issue is clarified, we wonder whether the two readings of a container measure construction correlate with different syntactic structures. The goal of this chapter is to falsify such a correlation.

My argument will proceed as follows. After falsifying three previous analyses of the issue in 5.2, I make my proposal in 5.3 that the nature of the contrast between the two readings is the two possible ways of s-feature projection. In Section 5.4, I show that the two ways of projection are independently attested, in simple DP, possessive DP, Degree Phrase, and modification constructions. I then propose a constraint on the projection optionality in Section 5.5. A brief theoretical discussion is presented in Section 5.6. Section 5.7 concludes the chapter.

## **5.2. Previous analyses**

### **5.2.1 The syntactic constituency analysis**

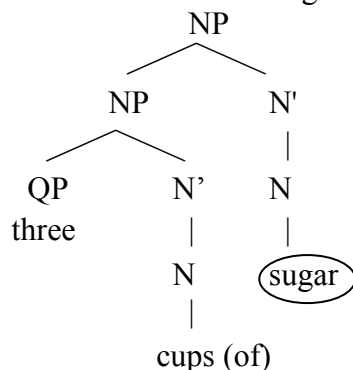
Both Selkirk (1977) and Corver (1998) propose contrastive syntactic structures for the two readings. However, the prediction made by their proposal is not born out.

Selkirk (1977) proposes that the two readings of a container measure construction correlate with two different kinds of syntactic constituency of the construction. Before the publication of Selkirk's paper, her analysis is cited and adopted in Akmajian & Lehrer (1976: 406). A similar analysis reappears in Rothstein (2009).

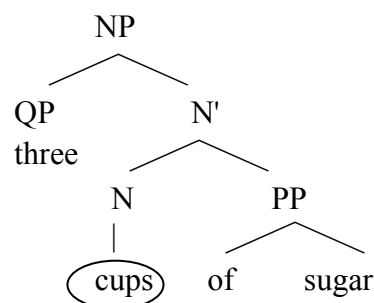
Selkirk (1977: 310) claims that in the containee reading, the containee-denoting noun is the syntactic head of the whole nominal complex, whereas in the container reading, the container measure is the syntactic head. In this analysis, the structure of *three cups of sugar*, for instance, is left-branching, *[[three cups] of sugar]*, for the containee reading, where *sugar* is the head, as shown in (286a). The word *of* has no syntactic status in this structure.

Rothstein (2009: 111) states that “*of* insertion is a late phenomenon, projecting no PP node, see Chomsky 1981”. In contrast, the same string has the right-branching structure [*three [cups [of sugar]]*], for the container reading, where *cup* is the head and the PP [*of sugar*] is its complement, as shown in (286b).

(286) a. the containee reading



b. the container reading



The contrast between the two structures, however, does not represent the contrast between the two readings of the construction. Consider extraposition first, which is used to test the complement status of a phrase in Selkirk’s same paper. PP complements may undergo extraposition, as seen in (287b) (Selkirk 1977: 309). The examples in (288a) and (289a) are intended to have a containee reading, and those in (288b) and (289b) a container reading. In the assumed structure in (286a), the containee phrase is not a PP complement, and thus fails to undergo the extraposition. Therefore the unacceptability of (288a) and (289a) is not unexpected. In the assumed structure in (286b), however, the *of*-phrase, which hosts the containee, is a complement, one thus expects the extraposition constructions in (288b) and (289b) to be acceptable. The expectation fails. The examples in (288) and (289) simply show that in neither reading may the examples undergo extraposition.

(287) a. A review of answers to your argument was given.

b. A review was given of answers to your argument.

(288) a. \*John drank three bottles yesterday (of) extremely expensive wine.

b. \*John broke three bottles yesterday of extremely expensive wine.

(289) a. \*Three bottles were drunk (of) extremely expensive wine.

b. \*Three bottles were broken of extremely expensive wine.

On the other hand, Akmajian & Lehrer’s (1976: 407) following examples show that both readings allow extraposition. Again, the assumed structure contrast between (286a) and (286b) disappears.

(290) a. Several bottles spilled of fine Spanish wine.

b. Several bottles broke of fine Spanish wine.

Regardless of how one analyzes extraposition, the examples in (288) through (290) simply tell us that the constructions in the two readings behave the same with respect to extraposition, and they do not support the contrast between (286a) and (286b).

Second, consider cleft constructions:

(291) a. It was wine that John drank three bottles of.

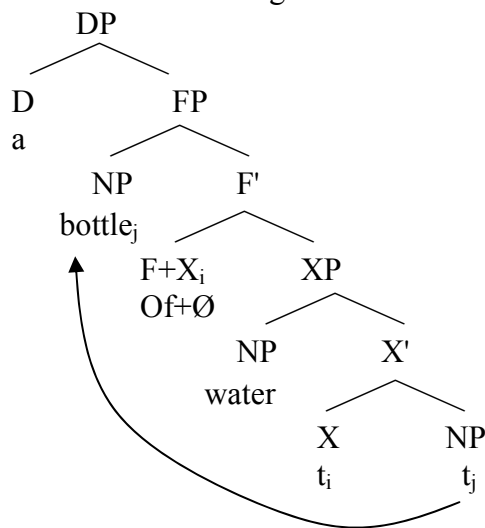
b. It was wine that John broke three bottles of.

In English, the preposition *of* can be stranded from its complement. The examples in (291) show that *of* can be stranded for both readings. This suggests that the containee noun is the complement of *of* for both readings. Again, the contrast between (286a) and (286b) is hard to be maintained.

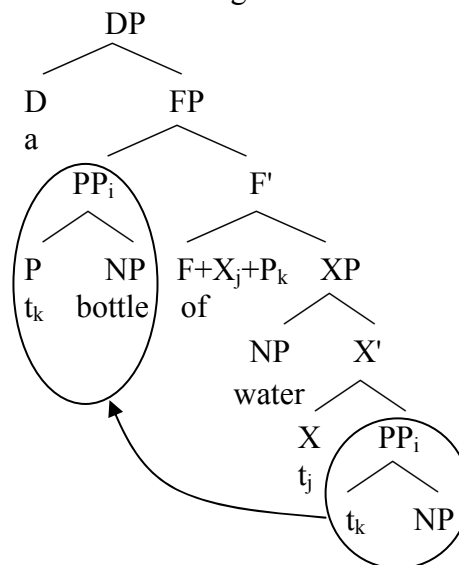
### 5.2.2 The predicate inversion analysis

In Corver (1998), the following two structures (on his p. 223 and p. 235, respectively) are proposed for the two readings of the container measure construction *a bottle of water*.

(292)a. the containee reading



b. the container reading



In both structures, the complement of X is a predicate (the bottom NP in (292a) and the lower PP in (292b)), the Specifier of X is the subject of the predicate, and the predicate moves across the subject, the NP *water*. There are also several instances of head movement or incorporation in the structures, and the final realization of the elements at F is *of*.

In both constructions, the container noun is, or is hosted by, the complement of the functional element X, and the entire nominal projection, FP or DP, is claimed to be an extension of the complement. Considering the base-position of the container noun *bottle*, it is claimed that in (292b), the container noun “originates as the syntactic head of the entire extended nominal projection”, and thus it is not unexpected that an element external to the projection enters into a selectional restriction with the container noun, rather than the containee noun (p. 235). However, the base-position of *bottle* in (292a) has the same status. One thus expects the two structures enter the same selectional restriction. We can see that the containee-container contrast is not encoded in the contrast between (292a) and (292b).<sup>33</sup>

### 5.2.3 The containee-as-container analysis

Hsieh (2008: 51) claims that the head of a container measure construction is consistent, i.e., it is always the last noun. For example, in the containee reading of *san ping ke* ‘three bottle

<sup>33</sup> The two structures in (292) contain other unclear parts. For instance, it is claimed that a measure is a DP-internal predicate, which undergoes predicate inversion, and a numeral is out of the domain of the inversion (Corver 1998: 229). However, in all of the examples to show the predicate status of a measure, a numeral is always next to the measure. Also, when the PP in (292b) moves, its head has already moved out. Such headless remnant movement is not a generally recognized operation (see Takano 2000: 146, among others).

coke’, *kele* ‘coke’ is the head, whereas in the container reading of this string, she claims that “when *ping* is used, *kele* ‘coke’ is considered to refer to the coke bottles and can thus be broken into pieces. In other words, it is marked with the [+solid] feature because the existence of *ping*.” In her analysis, *baozhi* ‘newspaper’ in (276b) should mean newspaper bags. Obviously, this analysis is ad hoc. Since *ping* also occurs in the containee reading of *san ping kele* ‘three bottle coke’, how can we make sure that in this case, the noun *kele* is not [+solid]? Moreover, if lexical items change their formal features when they are combined with other elements, the Inclusiveness Condition (Chomsky 1995: 228) is violated. Furthermore, if *kele* in *san ping kele* ‘three bottle coke’ means coke bottles, bottles will be counted by the container measure *ping* ‘bottle’, however, bottles are never counted by *ping* ‘bottle’. Instead, they are counted by the CL *ge* or other bigger container measures such as *xiang* ‘box’.

### **5.2.4 The individual-quantity analysis**

X. P. Li (2011), following Rothstein (2009), correlates the container reading with an individual reading (= his counting reading), which is assumed to have a right-branching structure, and correlates the containee reading with a quantity reading (= his quantity reading), which is assumed to have a left-branching structure. However, our following examples show that the two correlations are not justified. In the two examples in (293), *shi ping jiu* ‘ten bottle wine’ has a containee reading, and the word *zuzu* ‘as much as’ provides a quantity context in (293a), and thus a quantity reading is available. In X. P. Li’s approach, the expression has a left-branching structure. However, the reduplicate form of *ping-ping* ‘bottle-bottle’ provides an individual context (X. P. Li 2011: 116) in (293b) and thus *shi ping jiu* should have an individual reading. Likewise, container reading of *shi ping jiu* in (294) can have either a quantity reading, as in (294a), or individual reading, as in (294b).

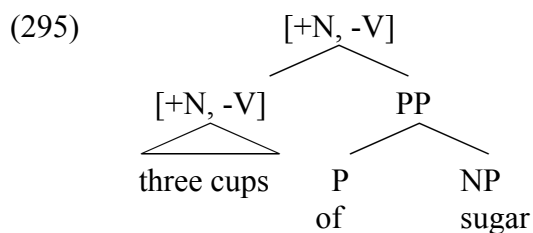
- (293)a. Wusong zuzu he-le shi ping jiu. [Containee, quantity]  
 Wusong as.much.as drink-PRF ten bottle wine  
 ‘Wusong drank as much as ten bottles of wine.’
- b. Wusong he-le shi ping jiu, ping-ping dou hen ku. [Containee, individual]  
 Wusong drink-PRF ten bottle wine bottle-bottle all very bitter  
 ‘Wusong drank ten bottles of wine, and every bottle was very bitter.’
- (294)a. Wusong lin-lai-le zuzu shi ping jiu. [Container, quantity]  
 Wusong bring-come-PRF as.many.as ten bottle wine  
 ‘Wusong brought as many as ten bottles of wine.’
- b. Wusong dasui-le shi ping jiu, ping-ping dou hen man. [Container, individual]  
 Wusong break-PRF ten bottle wine bottle-bottle all very full  
 ‘Wusong broke ten bottles of wine, and each bottle was very full.’

All of these facts simply show that the three contrasts are independent of each other: container vs. containee reading, quantity vs. individual reading, and the left-branching vs. right-branching structure.

## **5.3. Projecting s-features from the same structure**

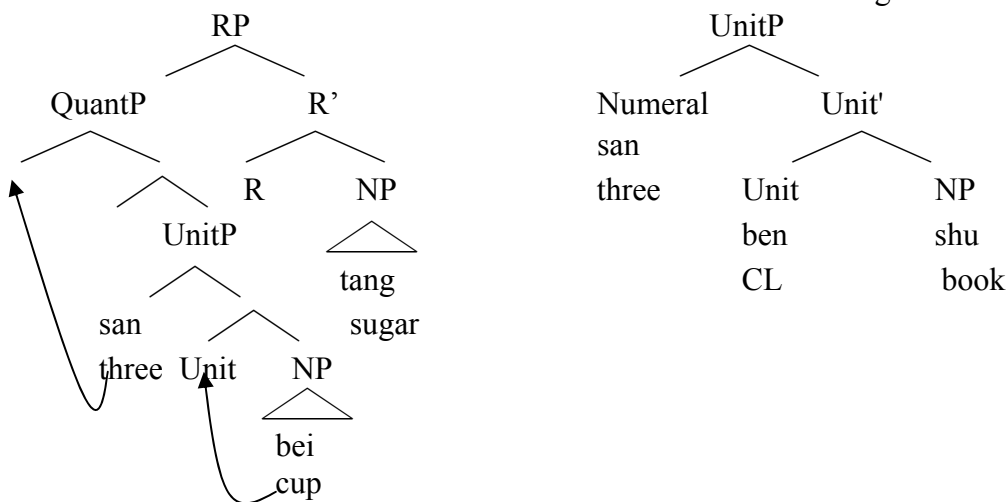
### **5.3.1 Unified left-branching constituency**

From the discussion in 5.2, we can see that the two readings have no syntactic contrast. It is possible that for both readings of the English constructions, the containee noun is the complement of *of*, and the numeral and the container measure form a constituent. A possible simplified structure is (295):



In Chinese, like in many other languages, no linking word parallel to the English *of* occurs in a container measure construction. Other than that, the word order of the construction is the same as in English. If the two trees in (286) are correct, one expects a left-branching structure for a containee reading and a right-branching structure for a container reading. However, I have argued in Chapter 3 that the left-branching configuration in (296a) is the structure of container measure constructions, while the right-branching configuration in (296b) is the structure of the constructions of individual CLs such as *ben* (for books) and individuating CLs such as *di* (for liquid), in the language (see 4.5).

(296)a. Container measure construction      b. individual & individuating CL construction



### 5.3.2 S-feature projection

If the contrast between the containee reading and the container reading of a container measure construction is neither a contrast in syntactic structure nor a contrast in the lexical semantics of a certain word in the construction, what is the nature of the contrast? It is clear that the s-features of the whole nominal are those of the containee in the containee reading, but are those of the container in the container reading. I thus claim that the contrast is related to the s-feature projection.

In each container measure construction, both the containee noun and the container measure start from an N position and thus are s-feature holders. It must be the case that the s-features of either element are projected to the whole complex nominal, so that the nominal can satisfy the selectional restriction of the relevant verb or predicate. We have shown that the structure in (295) and the structure in (296a) can be possible structures for such a construction in English and Chinese, respectively. In these structures, the containee noun and the container measure are also hosted in the two daughters of a certain node (the top [+N, -V] in (295) and RP in (296a)). In fact, in all other structures proposed in the literature, the containee noun and the container measure are hosted in the two daughters of a certain node, respectively. We know that in every binary branching structure there is only one syntactic head. If s-features can be projected from either the container measure or the containee noun,

we see that s-features may be projected from an element that is not a syntactic head, at a certain level of the syntactic derivation.

This is in contrast to the projection of syntactic features. C-features may not be projected from non-head sisters (Chomsky 1995: 244). Similarly, Cole et al. (1993: 110) show the impossibility of syntactic feature projection from complements in reflexive binding, and citing Harbert (1990), they also show the impossibility for wh-features to be projected from complements of verbs (p. 111). Likewise, López (2001) demonstrates the impossibility for Case features and theta-features to be projected from complements. Cole et al. (1993: 110, 113 fn.2) propose a feature percolation condition on syntactic features: “No feature can be percolated out of a lexical complement structure.” Brody (1998) calls the principle that a projection inherits all the properties of its head and nothing else Principle of Uniqueness.

#### **5.4. Two separate routes of s-feature projection**

Generally, s-features are projected from the syntactic head exclusively. In (297), for instance, the semantic features of *goat*, which is not the head of the nominal *goat milk*, are not projected, and thus the selectional restriction of *drinks* is satisfied by the s-feature [+liquid] of *milk*, and the feature [-liquid] of *goat* does not affect the computation.

(297) John drinks [goat milk].

In contrast to this situation, one situation in which s-features are projected from the non-head element exclusively has been recognized in the literature. This is the case when the head is not specified with the relevant features, especially when the head is a functional category. Let us look at four specific cases.

##### **5.4.1 Simple DP**

In a simple DP headed by a determiner, the s-features of the complement are projected (Cowper 1987: 330). In (298), the head of the object DP is *the*. However, it is the s-features of the NP *wine* (i.e., [+liquid]) that are projected to the whole DP, satisfying the s-selection of the verb *drank*. The D-head *the* has no relevant s-features.

(298) John drank the wine.

This issue is also discussed in Jackendoff (1968: 431-432). Here are his examples:

- (299)a. I proved {the theorem/\*the boy}
- b. I socked {\*the theorem/the boy}
- (300)a. I proved {some of the theorem/\*some of the boy}
- b. I socked {\*some of the theorem/some of the boy}
- (301)a. I proved {a bunch of theorems/\*a bunch of boys}
- b. I socked {\*a bunch of theorems/a bunch of boys}

In all of these examples, only the noun *theorem* or *boy* is specified with the semantic features that are selected by the verb.

Jackendoff uses these examples to show that if one insists that only the s-features of the head be projected, the noun *theorem* or *boy* should be analyzed as the head of all of the object nominals in (299) through (301). However, such an analysis is “unnatural for other reasons” (p. 432). Our current theory of the syntactic structures of nominals also rules out the syntactic head status of the two nouns in these examples. Jackendoff claims that “selectional restrictions are not applied to only the head noun of a noun phrase. Instead, the selection is



performed on the basis of the semantic reading of the entire noun phrase” (p. 432). The same conclusion is also found in McCawley (1968: 134). We can see that it is s-features, rather than c-features, that are the issue here.

#### **5.4.2 Possessive DP**

In a possessive DP, the s-features of the possessee NP are projected, although the NP is not the syntactic head of the DP. In (302), the possessee NP *wine* satisfies the s-selection of the verb *drank*. The D head of the DP has no relevant s-features (i.e. [+/-liquid]).

(302) John drank Mary’s wine.

#### **5.4.3 Degree Phrase**

In a Degree Phrase, the head is a degree word and its complement is an AP (or AdvP). It is the s-features of the AP that are projected. For instance, the verb *feel* s-selects an element that denotes a stage-level state. In (303), the requirement is satisfied by the AP *tired*, not the degree head element *very*, which has no relevant s-features.

(303) John felt [very tired].

#### **5.4.4 Modification Construction**

McCawley (1968: 133) discusses the following three examples:

- (304)a. \*My buxom neighbor is the father of two.
- b. \*My sister is the father of two.
- c. My neighbor is the father of two.

(304a) violates the same selectional restriction as does (304b), but the violation of the selectional restriction in (304a) has nothing to do with the head noun *neighbor*, since (304c) contains no selectional violation. In this case, it is the semantic features of the modifier *buxom* rather than those of the modified noun *neighbor* that violate the selectional restriction of the predicate *is the father of two*. We can see that the head noun *neighbor* is not specified with a gender feature, and thus it must be the case that the feminine feature of the modifier *buxom* is projected to the whole subject nominal.

#### **5.4.5 Cowper’s (1987) convention**

In all of the cases discussed in 5.4.1 through 5.4.4, s-features are projected from an element whose sister has no relevant s-features, or underspecified with the relevant features. This kind of feature projection is predicted to be possible in Cowper’s (1987: 324) following convention:

- (305) In a structure [ $_{\alpha}$   $\beta\gamma$ ], or [ $_{\alpha}$   $\gamma\beta$ ],  $\alpha$  projection of  $\beta$ , features from  $\gamma$  will percolate to  $\alpha$  iff  $\beta$  is not specified for those features.

Cowper does consider s-features in the convention, since she mentions (p. 330) that in the phrase *the dog*, the features [+animate], [-human], etc., of the NP *dog* are percolated to DP, simply because the D head *the* is not specified for these features.

In this section, we have seen that s-features are projected from either the syntactic head exclusively, as in (297), or the non-head element exclusively, as in (298) through (304a). The two possible projecting routes show the general availability of the two ways of s-feature projection.

However, container measure constructions are special, as pointed out by Akmajian & Lehrer (1976: 406), in the fact that the container-denoting element and the containee-denoting element have conflict semantic features ([-liquid] vs. [+liquid]), with respect to the selecting verbs. Since such a construction is acceptable in both container and containee readings, I claim, s-features must be projected from either the head or the non-head sister. It is clear that the convention in (305) is not applicable to container measure constructions, in which both sisters of the structure host relevant s-features.

## **5.5. The role of parallelism**

It is not always possible for either of the two contrastive s-features to be projected, from two sisters. We have seen the example of *goat milk*, the feature [-liquid] of *goat* is not projected. Another clear case is that if an element is an argument of another element, or if an element receives a theta-role from another element, its s-feature is not projected.

### **5.5.1 A thematic relation**

A thematic relation means one element assigns a theta role to another element. If one sister assigns a theta role to the other sister, the s-features of the latter are never projected. For instance, *yao* ‘want’ can s-select either an action-denoting element, such as *bao na ge xiaohai* ‘hug that CL kid’ in (306a), or an entity-denoting element, such as *na ge xiaohai* ‘that CL kid’ in (306b). In (306a), the nominal *na ge xiaohai* ‘that kid’ receives a theta role from the verb *bao* ‘hug’. In the VP complement of *yao*, *bao* ‘hug’ is the head and *na ge xiaohai* is not the head. If s-features were projected from the non-head element here, the individual meaning of *na ge xiaohai* would be projected to the whole VP, and (306a) would allow a reading similar to that of (306b). However, this is not true.

- |   |   |
|---|---|
| (306) a.   Wo yao   [ <sub>VP</sub> bao na   ge xiaohai].<br>I   want     hug that CL kid<br>‘I want to hug that kid.’<br>Not: ‘I want that child.’ | b.   Wo yao [ <sub>DP</sub> na ge xiaohai].<br>I   want     that CL kid<br>‘I want that child.’ |
|---|---|

The contrast between a thematic and non-thematic relation is one of the fundamental contrasts in language computation. Its effects are attested in many aspects. For instance, the movement chain of an element that has a thematic relation to another element shows no reconstruction effects in Condition C of binding, whereas the movement chain of an element that has no thematic relation to another element does show such an effect (see Takahashi & Hulsey 2009 for a recent review of the literature on the observation). It is thus not surprising that s-feature projection interacts with thematic relations.

If two elements have a theta-role relation, the major formal features of the two are in contrast. For instance, verbs or predicates have aspect specification, whereas their arguments do not; verbs or predicates may be modified by adverbs, whereas their arguments may not. This is different from container measure constructions, as shown in the next subsection.

### **5.5.2 Parallelism in container measure constructions**

Having identified certain cases in which s-features may not be projected from a non-head element, we start to investigate how special a container measure construction is, in order to find out why it allows s-features to be projected from either sister.

In none of the structures proposed in the literature are the container measure and the containee noun sisters in their base-positions. Instead, at least one of them is hosted in some functional or extended projection. In (295), the two daughters of the top node of the complex nominal have different categories: the left one is a nominal and the right one is a PP. This is

different from the cases such as the nominal *goat milk* in (297). In this nominal, *goat* and *milk* are merged into a constituent directly. Accordingly, one of them must be the head, and the other is the non-head, of the complex nominal. They are not parallel. In a container measure construction, however, the competing sets of s-features come from nominals that are not directly merged together. They are independently hosted in different constituents. Therefore, it is possible for them to show parallel syntactic properties.

As noted in Grimshaw (2007), the two nominals of a container measure construction can each have number marking and the number of the two can be inconsistent. In (307a), the container measure *bottles* is plural whereas the containee *water* is not; in (307b), the container measure *box* is singular whereas the containee *cookies* is plural.

- (307) a. John {drank/broke} bottles of water.  
b. John {ate/opened} a box of cookies.

Moreover, both the container measure noun and the containee noun can be modified by an adjective, and the adjectives of the two can be inconsistent. In both (308a) and (308b), the adjective of the container measure is an antonym to the adjective of the containee noun. We add similar Chinese data in (309) (also see 3.2).

- (308) a. a large box of small berries  
b. a small box of large berries  
(309) a. Siyu {chi-/dakai}-le yi da xiang xiao yingtao.  
Siyu eat/open-PRF one big box small cherry  
'Siyu {ate/opened} one big box of small cherries.'  
b. Siyu {chi-/dakai}-le yi xiao xiang da yingtao.  
Siyu eat/open-PRF one small box big cherry  
'Siyu {ate/opened} one small box of big cherries.'

All of these show parallel properties of the two nouns in a container measure construction. Such a parallelism is not seen in other pairs of s-feature-hosting sisters, such as the cases discussed in 5.5.1. Therefore, the two possible routes of s-feature projection correlate with the parallelism of other formal properties of the two nominals of the construction.

## **5.6. Theoretical discussion**

We have shown that s-features can be projected from either a syntactic head or a non-head element, if the s-feature bearing elements hosted by the two sisters show certain parallelism in their formal properties. As shown by the literature cited before, this kind of flexibility is banned for syntactic features. The ban is also seen in Cole et al.'s (1993: 90) following principle:

- (310) If the features of the daughter nodes conflict, the mother node will have the features of the head nodes.

Cole et al. (1993: 113 fn 2) are careful in stating that this principle is for syntactic features, and they clearly indicate that they do not discuss non-syntactic features. We now can clarify that (310) does not work for semantic features, as seen in container measure constructions. In both constructions, if the s-features of two daughters conflict, the s-features of the mother may be either those of the syntactic head or those of the non-head.

S-feature projection from a non-head element is independently observed, as shown in

5.4. Our claim that in one of the two readings of a container measure construction, s-features are projected from a non-head element adds no new stipulation to our theory.

The finding that s-features may be projected from either a syntactic head or a non-head element helps us to see a difference between the projection of syntactic features and the projection of s-features: they do not have to be projected from the same element. A mismatch is possible.

### **5.7. Chapter summary**

Empirically, this chapter has clarified that the contrast between a container reading and a containee reading of a container measure construction is neither the contrast in syntactic structures, nor an issue of the lexical semantics of any word in the construction. I have claimed that the two readings come from two different routes of s-feature projection. Mere s-selection differences do not correlate with different syntactic structures. I have also reported my observation that s-feature projection from an element that is not the syntactic head is impossible for theta-role assignment relations. I have proposed that the optionality in the two ways of s-feature projection correlates with the parallelism of other formal properties of the two nominals of the construction. Theoretically, I have shown how the two possible ways of projection reveal more about feature projection, and how s-feature projection is different from syntactic feature projection: they may be projected from different elements.

The facts discussed in this chapter lead us to see two sides of s-feature projection. On the one hand, it is restricted by syntactic structures: only sisters in certain syntactic relation, i.e., non-thematic relation, may project their s-features from either one. On the other hand, such projection exhibits a freedom not found in syntactic computations: both sisters may project their features. The study of this chapter is an endeavor to explore possible mismatches between syntax and semantics.

## Chapter 6      Noun-Classifier Compounds and Place-Holder Classifiers

### 6.1. Introduction

In Chinese, a compound can be made of a noun and a CL, as shown by the underlined part in the examples in (311). I will call the compound-internal CL lower CL, and the one out of the compound higher CL. In (311b), for instance, *qun* is the lower CL and *ge* is the higher one.

- (311)a.    *yi di shui-di*      b.    *yi ge yang-qun*      c.    *yi zu xian-tiao*  
          one CL water-CL      one CL sheep-CL      one CL line-CL  
          ‘one drop of water’      ‘one flock of sheep’      ‘one group of lines’

One goal of this chapter is to show that even for a nominal that has a built-in element to denote unit, another unit word is still required to link the nominal to a numeral in Chinese. Thus the occurrence of a CL between a numeral and a nominal in Chinese is clearly a syntactic issue. It reflects a syntagmatic relation between a numeral and a nominal in the language, as claimed in Chapter 2. In this respect, the language system has a consistent syntactic pattern, not affected by semantics.

Another goal of the chapter is to show how CLs exhibit different syntactic properties in different syntactic positions. The lower CLs are identified as a realization of Dmsn, if they are not kind CLs. If CLs can be a realization of Dmsn, in addition to the realization of Unit and Num (Chapter 4), we see how the syntactic context decides the syntactic status of linguistic formatives. The higher CLs in cases such as (311a) and (311b) are a place-holder of Unit, without semantic contents. I argue that a construction with a place-holder CL may have a different structure from the corresponding construction in which the same CL is not a place-holder.

Identifying the possible place-holder function of the higher CL in counting constructions is significant in at least two aspects. First, the surface position of a unit word in a counting construction must be the position of a functional head. Second, CLs provide one more instance of evidence for the parallelism between the syntax of nominals and the syntax of verbal or clausal constructions: both may have  $X^0$  place-holders. The English auxiliary *do* in the so-called *do*-support is a place-holder of a functional head in the verbal domain, regardless of how one analyzes the condition for its occurrence (see Bruening 2010). We now find similar place-holders in the nominal domain (See Aboh et al. 2010: 782 and the references thereof for a summary of more parallelisms between nominal and clausal constructions, with respect to the structural makeup and syntactic operations).

The chapter is organized as follows. Section 6.2 presents new data to show the syntactic similarities and differences between N-CL compounds and bare nouns in Mandarin Chinese. Section 6.3 reports, on the one hand, how the lower CL decides the dimensionality of the compound, and plays a role in the non-mass status of the compound when the noun root is a mass noun; and on the other hand, how the lower CL has no influence on the non-count status of the compound. These two properties lead us to see that, while the higher CL heads Unit, the lower CL never does so. Instead, it can be a realization of Dmsn. In Section 6.4, various relations between the higher CL and the lower CL are discussed. The section shows that if there is no place-holder CL, although there are two CLs, only the lower one can be an individuating CL, and only the higher one encodes a counting unit. The two CLs also interact with respect to dimension modifiers. In Section 6.5, I present the semantic emptiness of the higher CL, if it is *ge* or a copy of the lower CL, arguing for their place-holder status. In Section 6.6, I present the syntactic derivations of different counting constructions that contain

an N-CL compound, including those containing a place-holder. Section 6.7 is a brief summary.

## **6.2. Basic properties of N-CL compounds**

### **6.2.1 The components of N-CL compounds**

In some languages, one can find the so-called singulatives, as shown by the suffixes in (312b), (313b) (Acquaviva 2010: 7), and the right morpheme of the examples in (314) (Yi 2010: 94):

- |         |  |    |   |    |  |
|---------|--|----|---|----|--|
| (312)a. | hteb<br>‘fire wood’                        | b. | hteb-a<br>‘piece of firewood’           |    | [Moroccan Arabic]                        |
| (313)a. | glao<br>‘rain’                             | b. | glav-enn<br>‘raindrop’                  |    | [Breton]                                 |
| (314)a. | mwul-pangwul<br>water-drop<br>‘water drop’ | b. | pis-pangwul<br>rain-drop<br>‘rain drop’ | c. | kilum-pangwul<br>oil-drop<br>‘oil drop’, |
|         |  |    |   |    | [Korean]                                 |

Similar complex words are found systematically in Mandarin Chinese. The singulatives are just CLs. Any type of CL may occur with a noun, forming a compound, as seen in (315).

- |         |   |  |  |  |                    |
|---------|---|--|--|--|--------------------|
| (315)a. | shui-di<br>water-CL<br>‘water-drop’         | zhi-zhang<br>paper-CL<br>‘paper-piece’   | tu-dui<br>earth-CL<br>‘earth-pile’     |  | [individuating CL] |
| b.      | hua-duo<br>flower-CL<br>‘flower’            | shu-ben<br>book-CL<br>‘book’             | ma-pi<br>horse-CL<br>‘horse’           |  | [individual CL]    |
| c.      | huluobo-pian<br>carrot-CL<br>‘carrot-slice’ | pinguo-kuai<br>apple-CL<br>‘apple-chunk’ | hua-ban<br>flower-CL<br>‘flower-petal’ |  | [partitive CL]     |
| d.      | yang-qun<br>sheep-CL<br>‘sheep-flock’       | yaoshi-chuan<br>key-CL<br>‘key-bunch’    | shu-dui<br>book-CL<br>‘book-pile’      |  | [collective CL]    |
| e.      | shu-zhong<br>tree-CL<br>‘tree-type’         | dongwu-lei<br>animal-CL<br>‘animal-type’ | shipin-lei<br>food-CL<br>‘food-type’   |  | [kind CL]          |

CLs are thus systematically able to occur in an N-CL compound. Although accidental gaps occur (e.g., the CL *ge* may not occur in such a compound), the pattern of the compound is an attested construction in the language, and its generality should not be ignored in analyzing the formal properties of CLs. This is parallel to the situation that one does not deny the availability of the consonant-vowel combination in Mandarin Chinese, even though the combinations such as /k<sup>u2</sup>/, /ku<sup>2</sup>/, and /su<sup>3</sup>/ do not exist in the language.

Not only all types of CLs, but also both mass and non-mass nouns, may occur in an N-CL compound. The noun root *shui* ‘water’ in (315a) is a mass noun, and the noun root *hua* ‘flower’ in (315b) is a non-mass noun.

Furthermore, the selection of the dimensionality of a CL in an N-CL compound is identical to that of the corresponding free form CL. The individual CL *zhi* occurs with the non-mass noun *qiang* ‘gun’ in (316a), but not the mass noun *you* ‘oil’ in (316b). In contrast, the individuating CL *di* occurs with the mass noun *shui* ‘water’ in (317a), but not the non-mass noun *putao* ‘grape’ in (317b).

- (316)a. qiang-zhi                      b. \*you-zhi  
           gun-CL                      oil-CL  
           ‘gun’
- (317)a. shui-di                      b. \*putao-di  
           water-CL                      grape-CL  
           ‘water drop’

The unacceptability of data like (316b) and (317b) indicates that a CL has its consistent selection pattern, regardless of whether it is in a compound or not.

Furthermore, compound-internal CLs have a consistent position: they always surface at the end of a word in Chinese. The underlined morphemes in (318), which are not the last morphemes of the words, are lexical roots, not CLs, although they share forms with the nominal or verbal CLs in (319).

- (318)a. ge-zi                      b. ben-zi                      c. yi-xia-zi  
           height-suffix                      book-suffix                      one-down-suffix  
           ‘height (of a person)’                      ‘writing book’                      ‘immediately’
- (319)a. san ge haizi                      b. san ben shu                      c. Pai wo san xia!  
           three CL kid                      three CL book                      pat I three CL  
           ‘three kids’                      ‘three books’                      ‘Pat me three times!’

All CLs in Chinese have been developed from other lexical categories such as nouns and verbs. Thus the form-sharing is not surprising.

This fixed final position of CLs in the compounds makes them different from regular nominal components of a compound, which have no constraint on their positions:

- (320)a. dao-di                      ~                      di-dao                      b. ren-qing                      ~                      qing-ren  
           road-earth                      earth-road                      person-love                      love-person  
           ‘real’                      ‘real’                      ‘human relation’                      ‘lover’
- c. cha-hua                      ~                      hua-cha                      d. he-fan                      ~                      fan-he  
           tea-flower                      flower-tea                      box-meal                      meal-box  
           ‘tea flower’                      ‘scented tea’                      ‘meal in boxes’                      ‘meal box’

### **6.2.2 The distributions and readings of N-CL compounds**

The distributions of N-CL compounds are similar to those of bare nouns. Like a bare noun, an N-CL compound can occur in an argument position, as in (321a), and a predicate position, as in (321b):

- (321)a. Kefei kanjian-le hua-duo.                      b. Zhe shi hua-duo.  
           Kefei see-PRF flower-CL                      DEM be flower-CL  
           ‘Kefei saw (the) flowers.’                      ‘This is a flower.’  
           ‘Kefei saw {the/a} flower.’                      ‘These are flowers.’

Like a bare noun, the interpretation of an N-CL compound can be definite, or indefinite, as seen in (322a), generic, as seen (322b), or kind, as seen in (323). Also like a bare noun, such a compound does not have to denote plural or collective entities (contra Li & Thompson 1981: 82). Singular readings of (322a) and (322b) are possible.

- (322)a. Ta xiang yao hua-duo.  
 he want want flower-CL  
 ‘He want to have flowers.’  
 ‘He want to have the flower(s).’  
 b. Hua-duo hui diaoxie.  
 ‘Flowers can wither.’  
 ‘{That flower/Those flowers/Flowers} can wither.’
- (323)a. Zhang Zhongjing faxian-le shancha hua-duo.  
 Zhang Zhongjing discover-PRF camellia flower-CL  
 ‘Zhang Zhongjing discovered camellia.’  
 b. Zai zhe ge dao-shang, ma-pi yijing miejue-le.  
 at this CL island-on horse-CL already extinct-PRF  
 ‘On this island, horses have become extinct.’

But, as noted in X. P. Li (2011: 53), if the compound-internal CL is a kind CL, the compound is different from a bare noun. Such a compound shows properties of kind-denoting nominals only, whereas a bare noun can be ambiguous in kind and non-kind reading. I use (324) to show that such a compound may not be the argument of the presentational *fei-zhe* ‘fly-PRG’, whereas a bare noun can.

- (324) Tian-shang fei-zhe {niao/\*niao-lei}.  
 sky-on fly-PRG bird/bird-kind  
 ‘Birds are flying in the sky.’

If the kind meaning of the compound-internal kind CL is projected to the whole compound, the exclusive kind reading of such a compound is expected.

### **6.3. Dimensionality, numerability and N-CL compounds**

#### **6.3.1 Compound-internal CL as a realization of Dmsn**

In 2.4.3, we have seen that kind CLs may not be modified by a dimension adjective, whereas all other types of CLs may. This contrast remains for N-CL compounds. If the lower CL is a kind CL, the whole compound may not be modified by a dimension adjective, as seen in (325b) and (326b).

- |         |               |    |                 |
|---------|---------------|----|-----------------|
| (325)a. | hua-lei       | b. | *da hua-lei     |
|         | flower-type   |    | big flower-type |
|         | ‘flower type’ |    |                 |
| (326)a. | shu-zhong     | b. | *da shu-zhong   |
|         | tree-type     |    | big tree-type   |
|         | ‘tree type’   |    |                 |

However, if the lower CL is not a kind one, the whole compound may be modified by a dimension adjective, regardless of whether the noun itself may be modified by such an adjective if it occurs alone. In (327a), *hua* ‘flower’ is modified by *da* ‘big’, and thus there is no surprise to see that in (327b) *da* occurs with the compound *hua-duo* ‘flower-CL’. In (328a), however, *xue* ‘blood’ may not be modified by *da* ‘big’, but the compound *xue-di* ‘blood-CL’ can be modified by *da* in (328b).



- |         |                                      |    |   |    |  |
|---------|--------------------------------------|----|---|----|--|
| (327)a. | da hua<br>big flower<br>'big flower' | b. | da hua-duo<br>big flower-CL<br>'big flower'   | c. | yi da duo hua<br>one big CL flower<br>'one big flower' |
| (328)a. | *da xue<br>big blood                 | b. | da xue-di<br>big blood-CL<br>'big blood-drop' | c. | yi da di xue<br>one big CL blood<br>'big blood-drop'   |

In (328b), the values of dimensionality of the two elements of the compound are conflicted: *xue* 'blood' has [-dimension], as seen in (328a), and *di* has [+dimension], as seen in (328c). But the whole compound can be modified by a dimension adjective and thus has [+dimension].

The effect of the compound-internal CL is seen not only in modification, but also in predication. In (329a) and (329b), the mass noun may not be the subject of the dimension predicate *hen da* 'very big'. In (330a) and (330b), however, the corresponding N-CL compound, which has the same mass noun root as in (329), can be the subject of the dimension predicate.

- |         |   |    |  |
|---------|---|----|--|
| (329)a. | *You hen da.<br>oil very big                                | b. | *Qi hen da.<br>air very big  |
| (330)a. | You-di hen da.<br>oil-CL very big<br>'The oil drop is big.' | b. | Qi-tuan hen da.<br>air-CL very big<br>'The (ball-like) air-unit is big.' |

Like a diminutive marker, a compound-internal CL itself may not be modified, but it makes the whole compound able to be modified by a dimension adjective, or to be the subject of a dimension adjective. I conclude that a compound-internal CL contributes the feature [+dimension] to the whole compound, if it is not a kind CL. In other words, it is the compound-internal CL that contributes the non-mass status of the compound, when the noun root is a mass noun.

Syntactically, I thus claim that a compound-internal CL, if it is not a kind CL, is a realization of the head of DmsnP. The whole compound is thus a non-mass one, with the feature [+dimension]. If the compound-internal CL is a kind CL, it should be base-generated at N (see 3.2.5), with the feature [-dimension]. I will present the syntactic derivations of an N-CL compound in 6.6.1.

So far, we have identified three functional positions of CLs: first, as a realization of Unit (4.2.1) when it is in a free form; second, as a realization of Num (4.2.4), when it is in a reduplication form; and third, as a realization of Dmsn, when it is in a compound. So the syntactic status of a CL is context-dependent.

### **6.3.2 The non-count status of an N-CL compound**

Like other nouns in Chinese, N-CL compounds may not combine with a numeral directly, as seen in (331). A unit word is required for such a combination, as in (332). So N-CL compounds are also non-count nouns.

- |         |   |    |   |
|---------|---|----|---|
| (331)a. | *san shui-di<br>three water-CL                              | b. | *san hua-duo<br>three flower-CL                                   |
| (332)a. | liang ge shui-di<br>two CL water-CL<br>'two drops of water' | b. | liang pai shui-di<br>two CL water-CL<br>'two rows of water-drops' |

As expected, when quantifiers that need to occur with a unit word (see 2.5) combine with such compounds, a unit word must occur, as seen in (333a); and when quantifiers that reject a unit word combine with such compounds, no unit word may occur, as seen in (333b).

- (333)a. Nali you ji \*(ge) shui-di?  
 there have how.many CL water-CL  
 ‘How many water drops are there?’  
 b. Yusan-shang juran mei-you (yi)-dian (\*ge) shui-di.  
 umbrella-on even not-have some CL water-CL  
 ‘There is even not any water drop on the umbrella.’

Therefore N-CL compounds behave the same as regular nouns in the language, when they occur with numerals and various quantifiers. Such a compound is a non-count noun, with the feature [-numerable].

With the two features, [+dimension] and [-numerable], clearly, compounds like *shui-di* ‘water-CL’ are non-mass and non-count nouns, similar to *pingguo* ‘apple’ and the English word *furniture*. However, an N-CL compound contains a CL, a unit-denoting element. It expresses atomicity morphologically. But still, it requires the help of a unit word in order to show up with a numeral. Moreover, like simple nouns in the language, such compounds also reject the shifts of Universal Packager and Universal Sorter (2.2.5), since in no context may they combine with a numeral directly. This is in contrast to languages such as Yudja (Lima 2010). In the latter type of languages, any noun can combine with a numeral directly (4.5.1). N-CL compounds tell us that even for a nominal that has a built-in element to denote unit, another unit word is still required to link the nominal to a numeral in Chinese. Thus the occurrence of a CL between a numeral and a nominal in Chinese must be a syntactic issue.

## **6.4. The relations between the higher and the lower CLs**

### **6.4.1 No multiple individuating**

If an N-CL compound has [+dimension], it is a non-mass noun. Non-mass nouns do not occur with individuating CLs. Thus if the lower CL is an individuating CL, the higher one cannot be another different individuating CL. Both *di* and *tan* are unambiguously individuating CLs, as seen in (334a) and (334b). The examples in (334c) and (334d) show that they cannot co-occur in the same counting construction. So, semantically, only one individuating CL is allowed for one mass noun.

- |   |   |
|---|---|
| (334)a. yi di shui<br>one CL water<br>‘one drop of water’ | b. yi tan shui<br>one CL water<br>‘one puddle of water’ |
| c. *yi di shui-tan<br>one CL water-CL                     | d. *yi tan shui-di<br>one CL water-CL                   |

Other CLs such as *tiao*, *zhang*, *pian* can be ambiguous. *Tiao* is an individual CL when it occurs with *yu* ‘fish’, but an individuating CL when it occurs with *bu* ‘cloth’; *zhang* is an individual CL when it occurs with *zhuozi* ‘table’, but an individuating CL when it occurs with *zhi* ‘paper’; *pian* is an individual CL when it occurs with *shuye* ‘leaf’, but an individuating CL when it occurs with *bing* ‘ice’. If such a CL occurs as a higher CL, as in (335), one cannot exclude the possibility that the CL is an individual CL, representing the unit established by the lower CL. Thus, there is no case in which one mass noun occur with two individuating CLs.



- (339) \*san li mu-tiao  
three CL wood-CL

Also, as expected, conflict modifiers in the shape composition are not allowed, either, as seen in (340).

- (340) \*san da pian xiao mu-tiao  
three big CL small wood-CL

Recall that individual and individuating CL constructions are right-branching (Chapter 3), and thus a higher modifier and a lower modifier are in the same domain, which may not hold conflicting semantics. In 6.4.1, we have stated that when the lower CL is an individuating CL, the higher one, if it is neither *ge* nor a copy of the lower one, is an individual CL. So *pian* in (338a) and *tiao* in (338b) are both individual CLs. The ban of conflict modifiers between the higher CL and the nominal is expected in the right-branching structure.

In (341a), however, the higher CL is the collective CL *dui* ‘pile’. In this case, the shape of a pile is composed of wood pieces in the shape of strips, a hierarchical relation between the two shapes. Conflict modifications are possible, as seen in (341b), since the modifiers have different scopes. Recall that collective CL constructions are left-branching, and thus the two modifiers are not in the same domain (Chapter 3).

- |   |  |
|---|--|
| (341)a. san dui mu-tiao<br>three CL wood-CL<br>‘three piles of wood-strips’ | b. san da dui xiao mu-tiao<br>three big CL small wood-CL<br>‘three big piles of small wood-strips’ |
|---|--|

In this section, I have discussed various relations between the higher CL and the lower CL. I have shown that although there are two CLs, only the lower one can be an individuating CL, and only the higher one encodes a counting unit. The shape meanings of the two CLs can also both be projected.

## **6.5. The place-holder CLs**

So far, in all of the examples discussed above, the higher CL is neither *ge* nor a copy of the lower CL. In this section, we show that if the higher CL is *ge* or a copy of the lower CL, it functions as a place-holder. This means that the upper CL in such constructions has no semantics.

### **6.5.1 *Ge* as the higher CL**

If the higher CL is *ge*, the meaning of the lower CL is projected. First, the real counting unit is the lower one, rather than *ge*. In both (342a) and (342b), the higher CL is *ge*, but the shapes of the water-units are different. In (342a), the lower CL denotes a unit in a drop shape, and the counting unit denoted by the whole counting construction is also in a drop shape, identical to the one denoted by the lower CL. In (342b), the lower CL denotes a unit in a puddle shape, and the counting unit denoted by the whole counting construction is also in a puddle shape, identical to the one denoted by the lower CL.

- |   |   |
|---|---|
| (342)a. san ge shui-di<br>three CL water-CL<br>‘three drops of water’ | b. san ge shui-tan<br>three CL water-CL<br>‘three puddles of water’ |
|---|---|

Moreover, in the following three groups of examples, although *ge* follows the numeral immediately in all of the cases, the reading of the a-forms is decided by the lower CL, and is thus different from the meaning of the b-forms, where *ge* is the only CL.

- |         |  |   |    |  |
|---------|--|---|----|--|
| (343)a. | san ge luobo-pian<br>three CL carrot-CL<br>'three carrot-slices' | ≠ | b. | san ge luobo<br>three CL carrot<br>'three carrots' |
| (344)a. | san ge yang-qun<br>three CL sheep-CL<br>'three flocks of sheep'  | ≠ | b. | san ge yang<br>three CL sheep<br>'three sheep'     |
| (345)a. | san ge shu-zhong<br>three CL tree-type<br>'three kinds of trees' | ≠ | b. | san ge shu<br>three CL tree<br>'three trees'       |

We know that if there is only one CL, the unique CL encodes the shape of the counting unit. This is the case for the b-forms of (343), (344), and (345). We have also just seen in 6.4.2 that the higher CL denotes the counting unit. We now see that when an N-CL compound is preceded by the CL *ge*, it is the compound-internal CL that denotes the shape of the counting unit.

Second, if *ge* is the higher CL, it has no effect on the s-selection of the verb that takes the counting construction as its argument. In (346a), the CL *juan*, which denotes a unit in a roll-shape, satisfies the s-selection of the complex verb *ya-bian* 'press-flat', whereas the CL *pian*, which denotes a unit in a flat shape, does not. In (346b), although the higher CL is *ge*, we see the same s-selection pattern. In this example, the selection is satisfied by the lower CL, a non-local element. The examples in (347) show the same point.

- (346)a. Daiyu ya-bian-le yi xiao {*\*pian/juan*} zhi.  
Daiyu press-flat-PRF one small CL/CL paper  
'Daiyu pressed a small {*\*piece/roll*} of paper flat.'
- b. Daiyu ya-bian-le yi ge xiao zhi-{*\*pian/juan*}.  
Daiyu press-flat-PRF one CL small paper-CL/CL  
'Daiyu pressed a small {*\*piece/roll*} of paper flat.'
- (347)a. Lu-shang ji-le yi {*\*di/tan*} shui.  
road-on accumulate-PRF one CL/CL water  
'A {*\*drop/puddle*} of water has accumulated on the road.'
- b. Lu-shang ji-le yi ge shui-{*\*di/tan*}.  
road-on accumulate-PRF one CL water-CL/CL  
'A {*\*drop/puddle*} of water has accumulated on the road.'

Therefore, the higher CL *ge* has no semantic function, behaving like a place-holder.

### **6.5.2 The CL copying constructions**

If the higher CL has the same form as a collective CL, it is also semantically vacuous. For instance, if it is a copy of a collective CL, it does not behave like a collective CL. This can be seen in three aspects.

First, the higher copy of a collective CL allows a reading correlation between the construction in which an adjective precedes the higher CL and the construction in which the same adjective follows the higher CL. In (348a) the adjective *da* 'big' follows the higher CL *qun*, whereas in (348b), the same adjective precedes the higher CL *qun*. The two examples

mean the same.

- |         |  |   |    |  |
|---------|--|---|----|--|
| (348)a. | san    qun da yang-qun<br>three CL   big sheep-CL<br>'three big flocks of sheep' | = | b. | san    da qun yang-qun<br>three big CL sheep-CL<br>'three big flocks of sheep' |
|---------|--|---|----|--|

This is similar to the semantic correlation between (349a) and (349b), discussed in 3.2.2. Crucially, the CLs in (348) are collective and the ones in (349) are individual. Also, the correlation is seen in the N-CL construction in (350), where the CL *kuai* is not a collective CL.

- |         |   |   |    |   |
|---------|---|---|----|---|
| (349)a. | san    tou da niu<br>three CL big cow<br>'three big cows'                   | = | b. | san    da tou niu<br>three big CL cow<br>'three big cows'                   |
| (350)a. | san    kuai da bing-kuai<br>three CL   big ice-CL<br>'three big ice chunks' | = | b. | san    da kuai bing-kuai<br>three big CL   ice-CL<br>'three big ice chunks' |

For a real collective CL, such a correlation does not exist (3.2.2):

- |         |  |   |    |   |
|---------|--|---|----|---|
| (351)a. | san    qun da    yang<br>three CL   big sheep<br>'three flocks of big sheep' | ≠ | b. | san    da qun yang<br>three big CL sheep<br>'three big flocks of sheep' |
|---------|--|---|----|---|

Thus, the higher copy of a collective CL does not behave like a collective CL.

Second, if the higher CL is a copy of the lower collective CL, the left-peripheral modifier may not be incompatible with the modifier of the compound. In (352b), the left-peripheral modifier is *dada* 'big', which is in conflict with the adjective preceding the compound, *xiao* 'small'. This example is not acceptable. This is in contrast to the constructions in which there is only one collective CL, as in (353).

- |         |   |    |   |
|---------|---|----|---|
| (352)a. | san    qun yang-qun<br>three CL   sheep-CL<br>'three flocks of sheep' | b. | *dada de san    qun xiao yang-qun<br>big DE three CL   small sheep-CL                               |
| (353)a. | san    qun yang<br>three CL   sheep<br>'three flocks of sheep'        | b. | dada de san    qun xiao yang<br>big    DE three CL small sheep<br>'three big flocks of small sheep' |

The acceptability contrast between (352b) and (353b) also indicates that there is no evidence for grouping the numeral with the higher CL if it is a copy of the lower one. Such a construction is thus always right-branching. The dependency between the modifier of the higher CL and that of the lower CL in (348) and (350) also indicates that the former c-commands the latter, and thus the structure of the whole counting construction must be right-branching, patterning with that of individual or individuating CL construction (Chapter 3).

Third, if the higher CL is a copy of the lower one, dimension modifiers may either precede the CL, or next to the N-CL compound, as seen in (348a) and (348b), but not in both positions. In (354a), there are two dimension modifiers, but the higher CL *dui* is not a copy of the lower CL *pian*. In (354b), there are also two dimension modifiers, *chang* 'long' and *cu* 'thick', but there is only one CL, *tiao*. Similarly, in (354c), the unique CL *qun* has a

dimension modifier, *da* ‘big’, and the simple noun *yang* ‘sheep’ also has one, *xiao* ‘small’. In (354d), there are two modifiers, *da* ‘big’ and *baise* ‘white’ and two CLs, but *baise* is not a dimension modifier. All of these examples are fine.

- |         |  |    |  |
|---------|--|----|--|
| (354)a. | san    da dui xiao mu-pian<br>three big CL small wood-CL<br>‘three big piles of small wood-pieces’   | b. | san    chang tiao cu xianglian<br>three long    CL thick necklace<br>‘three long and thick necklaces’  |
| c.      | san    da qun {xiao/da} yang<br>three big CL    small/big sheep<br>‘three big flocks of small sheep’ | d. | san    da qun baise de yang-qun<br>three big CL white DE sheep-CL<br>‘three big flocks of white sheep’ |

In (355), however, the two CLs have the same form, *qun*, and both the higher CL and the compound have a dimension modifier. The example is not acceptable, regardless of whether the two modifiers are identical or not.

- (355)    \*san    da qun {xiao/da} yang-qun  
              three big CL    small/big sheep-CL

The constraint seen in (355) indicates that if the higher CL is a copy of the lower one, it cannot have a dimension modifier independent of that of the compound. Comparing this example with (354d), we can make a generalization that in a CL copying construction, only one dimension modifier is allowed. We have seen the identical meaning of (348a) and (348b) before. The position of a dimension modifier in a CL copying construction is free. Thus, it is plausible to assume that in (348b) and (354d), the unique dimension modifier *da* ‘big’ is actually in construal with the lower CL, although it precedes the higher CL. In other words, if the higher CL is a copy of the lower one, it is not modifiable. The higher CL has no independent semantics to host an independent modifier. If so, such a CL must be semantically defective.

### **6.5.3 The alternation possibility**

The above two subsections show that if the higher CL is *ge* or a copy of the lower one, it has no semantics, behaving like a place-holder. In this subsection, we provide further evidence for the place-holder status of such CLs.

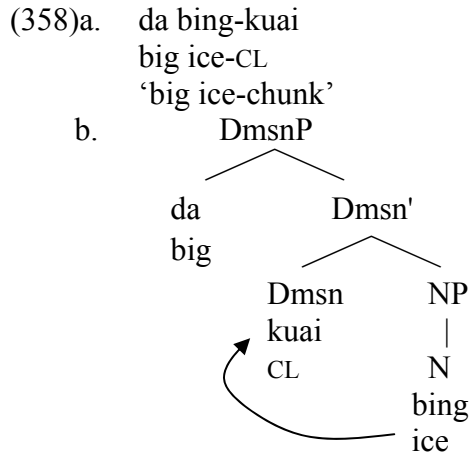
In (356), the forms in the three columns mean the same for each row. The higher CL is *ge* in column A, and a copy of the lower CL in column B. The forms in column C have only one CL each, which is identical to the lowerCL in the other columns.

- |       |  |   |   |
|-------|--|---|---|
| (356) | A  | B   | C   |
| a.    | san    ge shui-di<br>three CL water-CL<br>A/B/C: ‘three drops of water’    | san    di shui-di<br>three CL water-CL          | san    di shui    [individuating CL]<br>three CL water  |
| b.    | san    ge hua-duo<br>three CL flower-CL<br>A/B/C: ‘three flowers’          | san    duo hua-duo<br>three CL    flower-CL     | san    duo hua    [individual CL]<br>three CL    flower |
| c.    | san    ge luobo-pian<br>three CL carrot-CL<br>A/B/C: ‘three carrot-slices’ | san    pian luobo-pian<br>three CL    carrot-CL | san    pian luobo    [partitive CL]<br>three CL carrot  |
| d.    | san    ge yang-qun<br>three CL sheep-CL<br>A/B/C: ‘three flocks of sheep’  | san    qun yang-qun<br>three CL    sheep-CL     | san    qun yang    [collective CL]<br>three CL    sheep |





realization of Dmsn. In order to derive a possible N-CL compound, I claim that the N head of an NP moves to the head of DmsnP. The derivation of (358a) is (358b):



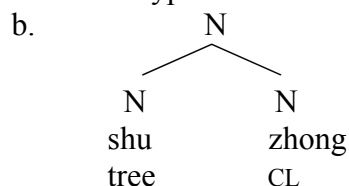
Since the NP lands to the left of the lower CL, the latter always shows up at the right-edge of the compound. This captures the position consistency of the lower CL, mentioned in 6.2.1.

After the N-to-Dmsn movement, the noun alone may not have a syntactic dependency with another element anymore. The N-CL *hua-duo* 'flower-CL' in (359a) is derived by the raising of *hua* at N to *duo* at Dmsn. After the raising, *hua* alone may not be related to the topic *hua* at the sentence-initial position, as shown in (359b). However, the whole compound *hua-duo* may be topicalized, as seen in (359c). The topicalization in (359c) is parallel to that in (360b), where the noun *hua* 'flower' alone does not undergo any head movement. The restriction follows the well-recognized constraint on head movement, which Platzack (2010: 8) formalizes as "If a head  $\beta$  moves to  $\alpha$ , the  $\{\alpha + \beta\}$  acts as one constituent." Of course, the effect of this constraint is the same effect as that of the traditional Lexical Integrity (e.g., Di Sciullo & Williams 1987).

- (359)a. Shufen mai-le san ge hua-duo.  
Shufen buy-PRF three CL flower-CL  
'Shufen bought three flowers.'
- b. \*Hua, Shufen mai-le san ge <hua>-duo.  
flower Shufen buy-PRF three CL flower-CL
- c. Hua-duo, Shufen mai-le san ge <hua-duo>.  
flower Shufen buy-PRF three CL flower-CL  
'Flowers, Shufen bought three.'
- (360)a. Shufen mai-le san ge hua.  
Shufen buy-PRF three CL flower  
'Shufen bought three flowers.'
- b. Hua, Shufen mai-le san ge.  
flower Shufen buy-PRF three CL  
'Flowers, Shufen bought three.'

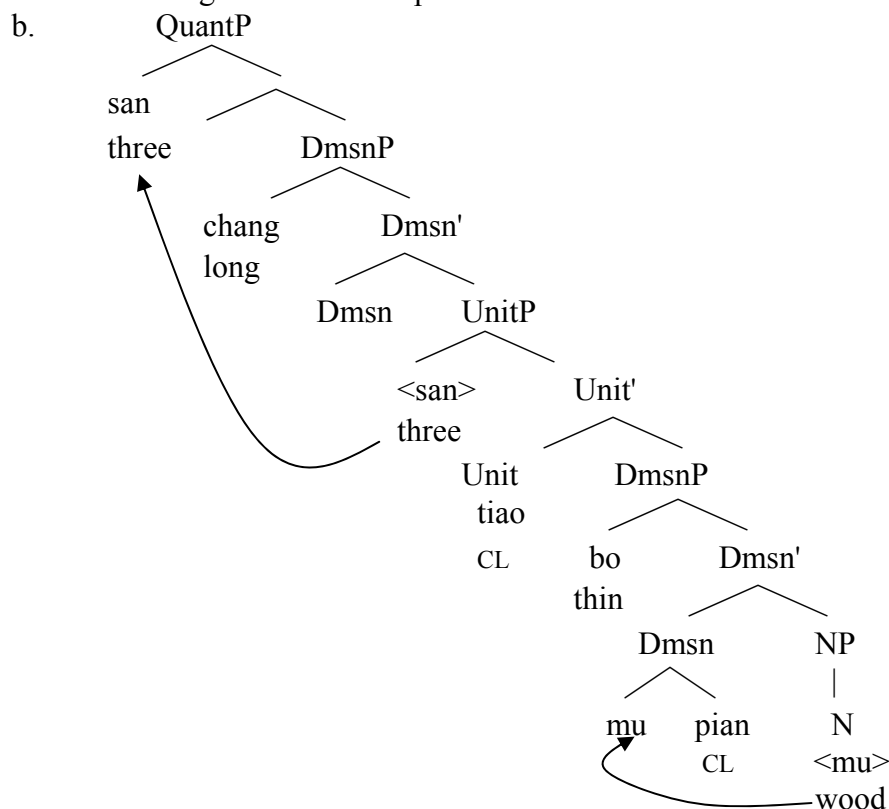
If the lower CL is a kind CL, since it does not project a dimensionality feature, it is base-generated simply at N, instead of Dmsn. Presumably, (361a), for instance, is derived by a direct merger of two N roots, as illustrated in (361b) (This is an overt version of the NP of the last tree of 4.5.1). As we discussed in 6.2.2, the kind meaning of the kind CL is projected to the whole compound.

(361)a. shu-zhong  
tree-CL  
'tree types'



Now let us see the structure of a counting construction that contains an N-CL compound. We have argued that the higher CL heads UnitP and the lower one, if it is not a kind CL, heads DmsnP. It is possible that both the higher CL and the compound each have a dimensional adjective, as seen in (362a). The derivation of (362a) is (362b). Note that the two CLs are different in this example and the higher one is not *ge*. Thus there is no place-holder CL in the structure. The higher CL is the counting unit.

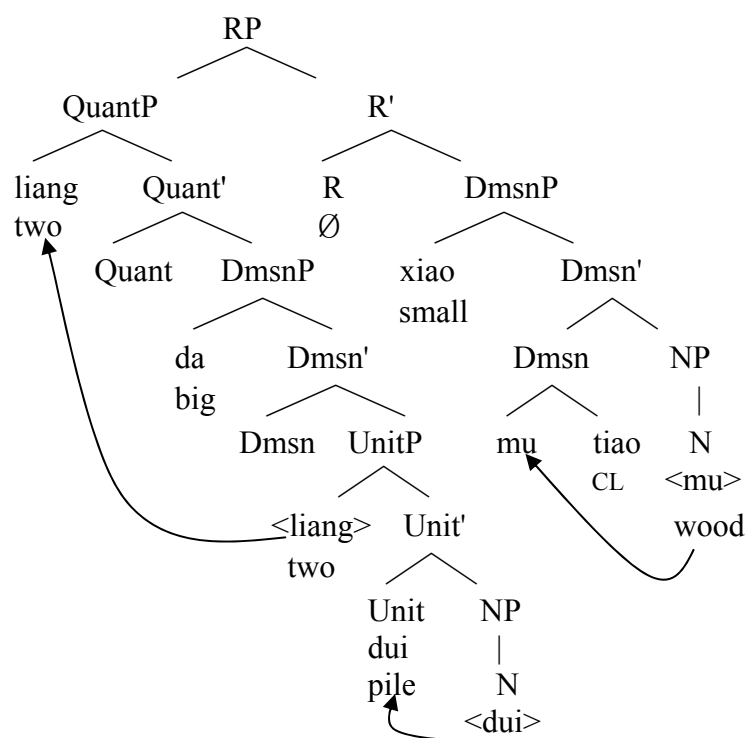
(362)a. san chang tiao bo mu-pian  
three long CL thin wood-CL  
'three long and thin wood pieces'



If the higher CL is a collective CL, as we argued in Chapter 3, the construction has a left-branching structure. (363b) is the structure of (363a).

(363)a. liang da dui xiao mu-tiao  
two big CL small wood-CL  
'two big piles of small wood strips'

b.

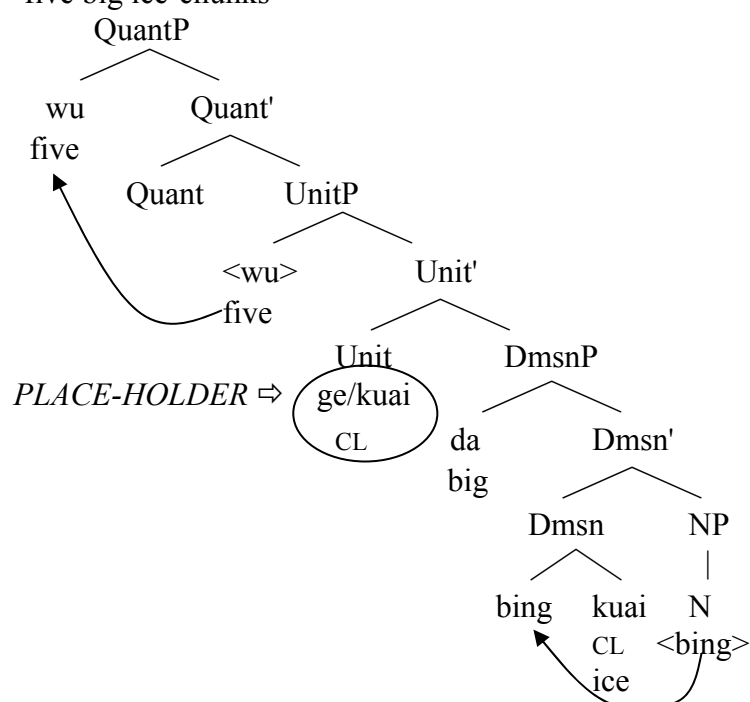


### 6.6.2 The constructions with a place-holder CL

We have claimed in 6.5 that if the higher CL is *ge*, it is a place-holder of Unit, and it always alternates with a copy of the lower CL. In (364a), *ge* may alternate with *kuai*. The structure of (364a) is (364b).

- (364)a. wu {ge/kuai} da bing-kuai  
 five CL/CL big ice-CL  
 'five big ice-chunks'

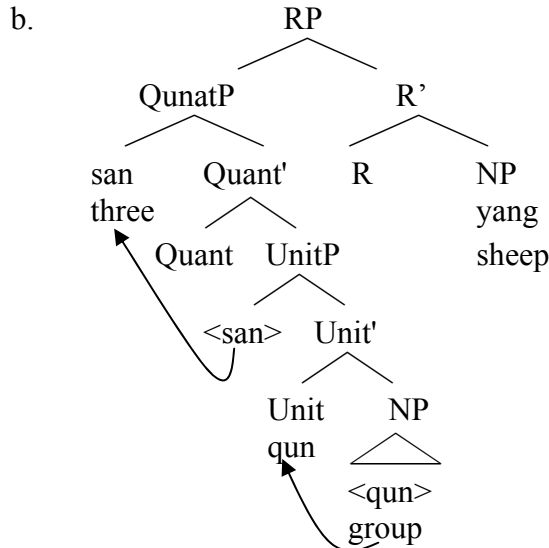
b.



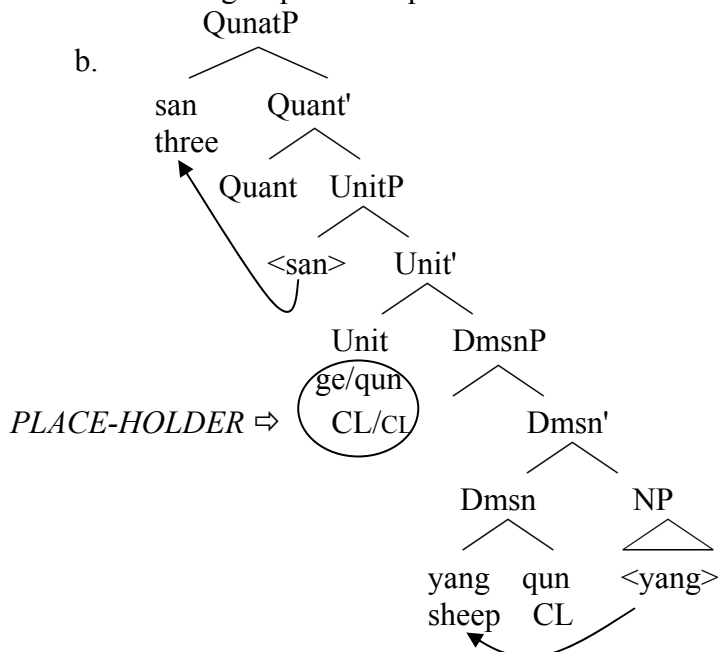
Recall that constructions of collective CLs have a left-branching structure, and the constructions of individual CLs have a right-branching structure (Chapter 3). In 6.5.2 above,

we conclude that if the higher CL is a copy of a collective CL, the structure of the whole counting construction is right-branching. (365b) is the structure of (365a), where no place-holder occurs, whereas (366b) is the structure of (366a) (= (352a)), in which the higher CL is a place-holder.

- (365)a. san qun yang  
three CL sheep  
'three groups of sheep'



- (366)a. san {ge/qun} yang-qun  
three CL/CL sheep-CL  
'three groups of sheep'



Since constructions with a place-holder CL have a consistent right-branching structure, we see the similarity in configuration between (366b) and (362b). The consistent right-branching structures are expected if place-holders must c-command their associates. In (366b), the place-holder CL *ge/qun* c-commands the lower CL *qun*.

The above structures capture the fact that CLs display different syntactic properties in different contexts. In addition to three possible functional head positions for CLs, Unit, Num, and Dmsn, the structures may also vary with the status of the higher CL. If a CL is a place-holder, the structure of the counting construction can be different from that of the corresponding construction in which the same CL is not a place-holder.

### **6.7. Chapter summary**

In this chapter, I have shown that even for a nominal that has an internal element to denote unit, another unit word is still required to link the nominal to a numeral in Chinese. Thus the presence of a CL between a numeral and a noun in Chinese is clearly syntactic, rather than semantic.

I have also shown how the presence of a lower CL decides the dimensionality of the compound on the one hand, and the presence of the unit word does not make a non-count nominal be a count nominal, on the other hand. These two properties have led us to see that a lower CL is a realization of Dmsn, rather than Unit. Therefore, in addition to Unit and Num, the two syntactic positions identified before, there is a third functional position for CLs: Dmsn.

I have also shown that if the higher CL is *ge* or a copy of the lower CL, it is a place-holder of Unit, without semantic contents. In this case, the structure of the construction may be different from that of the corresponding construction in which the same CL is not a place-holder. N-CL constructions thus tell us more about the syntactic nature of CLs, the syntactic positions of various types of CLs, and the cross-categorical availability of place-holders for functional heads.

## Chapter 7      Conclusions

This book has aimed to clarify three major empirical issues:

The countability issue, i.e., the relationship between CLs and the count-mass contrast;

The structure issue, i.e., the constituency and thus the syntactic structures of CL constructions;

A particular syntax-semantics mapping issue, i.e., the syntactic representations of the two readings of a container measure construction: a container reading and a containee reading.

The countability issue has been investigated from the following four aspects (A-D).

A. The relation between count and mass, from a syntagmatic perspective.

We have concluded that the contrast between count and mass is not a dichotomous contrast. Instead, there are two features to make the distinction: numerability and dimensionality. [+numerable] means that a noun may combine with a numeral directly, and [+dimension] means that a noun may be modified by a size (e.g., *big*) or shape (e.g., *round*) modifier. Like agentivity of VPs (i.e., whether an agent-oriented adverb is allowed) and gradability of APs (i.e., whether a degree word is allowed), numerability and dimensionality are defined syntagmatically. The two newly identified features can be attested in the occurrence restrictions of quantifiers and CLs, in pronominalization, and in the input or output of the Universal Grinder, Universal Packager, and Universal Sorter.

I have claimed that a count noun is defined exclusively by [+numerable]. It is generally recognized that such a combination possibility is the most reliable grammatical property of count nouns (e.g., Chierchia 2010: 104). This book has further argued that this is the only defining grammatical property of a count noun, cross-linguistically. The syntagmatic property of count nouns is clearly linguistic, rather than extra-linguistic. It is thus not surprising that countability is expressed in various ways, cross-linguistically and within the same language. For example, in Chinese, no noun may combine with a numeral directly, and therefore, no noun is a count noun (e.g., *san ge pingguo* ‘three CL apple’ vs. \**san pingguo*). Numerability of the language is instead represented exclusively by unit words, including CLs and measure words. In languages such as Yudja (Lima 2010), Halkomelem Salish (Wilhelm 2008: 64), and Hopi (Whorf 1956 [1941]: 141), every noun can combine with a numeral directly, and thus every noun can be a count noun. Between these two patterns, in languages such as English, in an unmarked situation, words like *cat* are [+numerable], and words like *oil* and *furniture* are [-numerable].

On the other hand, the notion of mass is not the direct negation of count. I claim that it is the combination of two syntagmatic properties that defines mass: [-numerable] and [-dimension]. Words such as *oil* in English and their counterparts in Chinese are mass nouns. This refined analysis makes it possible to precisely identify elements that may not combine with a numeral directly but allow a dimension adjective, e.g., *furniture* in English, and *pingguo* ‘apple’ in Chinese. They are non-count and non-mass nouns. Since such words may have size information but still non-count, this book argues against de Belder’s (to appear; 2011) claim that size features entail the count status.

Assuming numerals and size and shape modifiers are universally available, we are able to identify count and mass nominals in any language, with the same criteria.

This book also shows that in Chinese, even for a nominal that has a built-in unit-denoting element, i.e., a noun-CL compound, an independent unit word is still required to link the nominal to a numeral (*san ge hua-duo* ‘three CL flower-CL’ vs. \**san hua-duo*). Thus countability is clearly a syntagmatic relation between a numeral and a nominal in the language, rather than a semantic property.

#### B. The distinctive function of CLs of CL languages.

The obligatory presence of a CL in a counting construction in Chinese means that all nouns are non-count nouns in the language. CLs are thus numerability bearers in the language.

With the two newly identified features, and thus the recognition that not all nouns in Chinese are mass nouns, I have argued that the function of individual CLs, which distinguish numeral CL languages from other languages, is not dividing or individuating. The popular belief that it is the individuating (discreet set-creating) function of CLs that is special in CL languages (e.g., Greenberg 1972: 26; Senft 2000: 27, Grinevald 2000: 79, Krifka 2008: Sec. 6.3) needs reconsideration. Instead, numeral CL languages are different from other languages in that they have overt forms to represent the natural units of the elements denoted by non-mass nouns. Like other types of unit words, individual CLs tell us what counts as one in counting. English verbal counting constructions also require the presence of an individual CL (*Bill traveled to Paris three \*(times)*; see Krifka 2007: 39). Thus the presence of individual CLs has syntactic foundations.

#### C. The cross-linguistic patterns of the null versions of individual and individuating CLs.

This book presents a new study of language variation with respect to CLs. Five types of unit words are universally available: standard measures (e.g., *kilo* in *five kilos of apples*), container measures (e.g., *bottle* in *three bottles of milk*), kind CL (*kind* in *three kinds of chocolate*), partitive CLs (e.g., *section* in *three sections of orange*), and collective CLs (e.g., *group* in *three groups of students*), but individuating CLs and individual CLs are not found in every language. I have proposed that the functional projection UnitP is universal, and all types of unit words surface at the head of UnitP. In the absence of a numeral and a unit word, the head of UnitP has a null form. This book has presented various patterns of the null forms of Unit, based on the newly identified two features. In languages such as Chinese, the head Unit is always realized by an overt element such as a CL, in regular productive phrasal nominals. In languages such as Yudja (Lima 2010), Halkomelem Salish (Wilhelm 2008: 64), and Dëne (Wilhelm 2008), the head of UnitP is not realized by an overt element other than the above five types of unit words. However, the silent Unit in Yudja and Halkomelem Salish selects a nominal with either [+dimension] or [-dimension]. So it is a covert counterpart of either an individual CL or an individuating CL in Chinese. In contrast, the silent Unit in Dëne selects only nominals with [+dimension], i.e., non-mass nouns. Thus, the silent Unit in Dëne is a covert counterpart of a Chinese individual CL, but not that of an individuating CL. As a consequence, a numeral never combines directly with a mass noun in the language. In languages such as English, generally speaking, the silent Unit selects nominals with [+numerable], whereas the overt Unit selects nominals with [-numerable]. In *three books*, where *books* is [+numerable], the Unit is silent. In contrast, in *three pieces of paper* or *three pieces of furniture*, where *paper* or *furniture* is [-numerable], the Unit is realized by *pieces*. Comparing English with Dëne, we can see that the silent Unit is licensed by the selection of [+dimension] in Dëne, but by the selection of [+numerable] in English. This book also argues against Wilhelm's (2008) numeral-oriented theory of the cross-linguistic variation.

#### D. The relation between the count-mass contrast and morphological number.

Numerability, which is one of the two features responsible for the mass-count contrast, is different from morphological number, which is realized by the contrast between singularity and plurality. In this new perspective, nouns that have plural markers but reject numerals, such as *clothes*, *oats*, *grits*, and *masses* (McClawley 1979 [1975]: 172; Huddleston & Pullum 2002: 342), are [+plural, -numerable], and nouns that reject both plural markers and numerals, such as *furniture* and *school* in *at school* are [-plural, -numerable]. The new theory also covers various possible interactions between countability and number, cross-linguistically.

All types of CLs in Mandarin Chinese can be reduplicated to express distributive

plurality, as seen in (367). Such forms of CLs reject numerals, like the plural nominals in many languages such as Hungarian and Bangla.

- (367) Tian-shang piao-zhe (\*san) duo-duo bai yun.  
 sky-on fly-PRG three CL-RED white cloud  
 ‘Many pieces of white cloud are flying in the sky.’

The structure issue has been investigated from the following two aspects (E and F).

E. The constituency of counting constructions.

This book has examined the constituency of the construction that contains three basic elements: a numeral, a word that encodes a counting unit (i.e., a CL or measure word), and an NP in Mandarin Chinese. It identifies three structures: a right-branching structure for constructions of individual and individuating CLs; a left-branching structure for constructions of partitive and collective CLs, and for container and standard measures; and a structure in which no two of the three elements form a constituent, for constructions of kind CLs. I have argued that the last pattern has an extended right-branching structure, in which a covert form is merged with the noun. The identification of the three structures is based on the investigation of four issues: the scope of a left-peripheral modifier; the dependency between the modifier of a unit word and that of a noun; the complement and predicate status of the combination of a numeral and a unit word; and the semantic selection of a unit word on a noun.

F. The different syntactic properties of CLs in different syntactic contexts.

Two new functional projections are argued for in this book: UnitP and DimensionP (DmsnP). The arguments for the functional categories come from the licensing of ellipsis and stranding, and the licensing of certain types of adverbials or modifiers. This book argues that CLs are base-generated at different syntactic positions in different syntactic contexts. First, if a CL occurs with a numeral, it heads UnitP. The numeral and the CL hold a Spec-Head relation and thus the occurrence of either of them means the projection of UnitP. But the occurrence of a plural marker does not correlate with the projection of UnitP.

In the structure of mass nominals, there is neither UnitP nor DmsnP. Identifying the two functional projections in addition to NumP and QuantP, this approach is different from Borer (2005) in the base-position of numerals, in the syntactic relation between number and countability, and in the functional projections to encode the mass-count contrast.

Second, a CL in a reduplication form, as in (367) above, heads a functional projection that is responsible for number, NumP. Third, if a non-kind CL surfaces in a compound, as in (368a), it heads DmsnP. In (368a), it is the compound-internal CL *di* that licenses the dimension modifier *xiao* ‘small’. Moreover, if the CL preceding a noun-CL compound is *ge*, as in (368b), or a copy of the compound-internal CL, as in (368c), it is a place-holder of Unit. The structure of a place-holder CL construction can be different from the corresponding construction in which the same CL is not a place-holder.

- (368)a. Zhuo-shang you xiao shui-di.  
 table-on have small water-CL  
 ‘There are small drops of water on the table.’  
 b. Zhuo-shang you san ge xiao shui-di.  
 table-on have three CL small water-CL  
 ‘There are three small drops of water on the table.’  
 c. Zhuo-shang you san di xiao shui-di.  
 table-on have three CL small water-CL  
 ‘There are three small drops of water on the table.’



The possible place-holder function of CLs suggests that the surface position of a CL in a counting construction must be the position of a functional head. Moreover, CLs provide one more instance of evidence for the parallelism between the syntax of nominals and the syntax of verbal or clausal constructions: both may have  $X^0$  place-holders (cf. *do* in the *do*-support in English).

This book has argued that in counting constructions, individual and individuating CLs are nominal auxiliaries, which are base-generated at the functional head Unit. The formal features and the overtness of functional elements are subject to language variation, as expected.

The syntax-semantics mapping issue, i.e., the syntactic representations of the two readings of a container measure construction, has been investigated from the following aspect (G).

G. The possible projection of semantic features from elements that are not syntactic heads.

Arguing against Selkirk (1977: 310ff) (also Akmajian & Lehrer 1976: 406 and Rothstein 2009) and Corver (1998), this book claims that the availability of both a container and a containee reading of a container measure construction is the result of two possible routes of semantic feature projection: from the syntactic head or from the non-head element. This optionality correlates with the parallelism of other formal properties of the construction's two nominals. Generalizing the observations made in Jackendoff (1968: 431) and McCawley (1968: 133), this book demonstrates how the semantic feature projection from an element that is not the syntactic head is independently necessary, and how semantic feature projection is different from syntactic feature projection: they do not have to come from the same element, thus giving rise to syntax-semantic mismatches.

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