Quantification and the Count-Mass Distinction in Mandarin Chinese

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This study examines the claim proposed by Cheng and Sybesma (1998, 1999) that classifiers encode the count-mass distinction in Chinese. I argue that classifiers by themselves do not quite do the job of distinguishing count nouns from mass nouns. In order to get a full picture of the count-mass distinction, we need to go beyond classifiers; in particular, quantification will need to be considered. Two quantifiers, *yidian* 'some' and *henduo* 'many/much' are used to probe the meaning of quantity in terms of whether they refer to number or volume when combined with a noun. As a result, three types of nouns are identified: count, mass and flexible. This distinction receives empirical support from results of a quantity judgment. The subjects consistently treated each type of nouns significantly differently than the other two types of nouns.

Key words: classifiers, count, mass, quantification

1. Introduction

The count-mass distinction has received much attention among linguists, philosophers and psychologists over the past few decades. For languages where the count-mass distinction is made in syntax (e.g. English), it serves as a test case of syntax-semantics relation. In English, count nouns exhibit count syntax in that they can combine directly with numerals, they have singular and plural morphology and they are quantified by *many* rather than *much*. Mass nouns, on the other hand, cannot directly combine with numerals, do not have a singular/plural distinction and are quantified by *much* rather than *many*. One issue that arises concerns how the count-mass distinction is manifested in semantics. Do count nouns refer to objects that are distinct, countable and individuated, while mass nouns refer to objects or substances that are non-distinct, uncountable and non-individuated? This issue has led to a number of approaches that differ mainly on the semantics of mass nouns, whose denotations include cumulative

reference (Quine 1960), kinds (Krifka 1995), sets of individuals and sets of pluralities in a semi-lattice (Chierchia 1998a, 1998b), and sets of elements in a semi-lattice in a non-atomic domain (Link 1983; Landman 1989).

When we look at Chinese, however, we face a different situation. Rather than the issue of how count-mass syntax relates to semantics, we are confronted with two more basic questions: Does Chinese make a distinction between count and mass nouns, and if so, how? This is because unlike English, Chinese is a language where nouns are not obviously count or mass. In fact, syntactically Chinese nouns are similar to mass nouns in English, as they cannot combine directly with numerals, but must combine with classifiers; they do not have singular/plural morphology,[1] and the same quantifier occurs with nouns that denote individuals and nouns that denote non-individuals. To date, there have been two views on the status of Chinese nouns. In the first view, advocated by Chierchia (1998b) and Krifka (1995), all of the nouns in Chinese are mass nouns. In this view, bare nouns denote a semi-lattice of sets of individuals and sets of pluralities (according to Chierchia), or kinds (according to Krifka), but not individuals. The second view is proposed by Cheng and Sybesma (1998, 1999), who argue that Chinese does have the count-mass distinction. The distinction is encoded on classifiers, which perform a task similar to count syntax in English. Count nouns occur with count (individual) classifiers, while mass nouns occur with mass classifiers (measure words).

In this study I will take another look at the count-mass distinction in Chinese. I will examine the role played by classifiers in the distinction. I will argue that although classifiers provide useful information, they alone do not do all the work of distinguishing count nouns from mass nouns. In order to get a full picture of the count-mass distinction, we need to go beyond classifiers; in particular, quantification, which has been suggested to be essential in the syntax and semantics of individuation (Gordon 1985; Bloom 1999; Barner & Snedeker 2005), will need to be considered. I will further argue that the count-mass distinction in Chinese is essentially a semantic distinction, and it is sometimes, but not always, encoded in syntax.

2. Semantic criteria

Before examining the role of classifiers in count-mass distinction, I will first consider two semantic criteria that have been proposed to distinguish count and mass nouns: cumulativity (Quine 1960; Link 1983; Landman 1989) and divisibility (Cheng 1973; Mittwoch 1988; Gillon 1992; Krifka 1992; Rothstein 2004, 2010). For languages that have count syntax, these criteria have been shown to run into problems of syntax-semantics mapping, but they might serve a different purpose in languages without count syntax, namely, they might provide a semantic

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[1] The suffix -*men* has often been considered a plural marker (e.g. Li & Thompson 1981; A. Li 1999). However, Iljic (1994) argues that -*men* is not a plural marker, since it not only has a limited distribution, it also has a narrow interpretation, being definite and discourse-bound.

basis for the count-mass distinction. As far as I know, this possibility has not yet been explored in Chinese. Therefore, I will apply these criteria to Chinese and find what they predict.

The property of cumulativity was first used by Quine (1960). If *a* is X, and *b* is X, then *a* and *b* together are also X. Quine assigned this property to mass nouns, but not count nouns. Consider the mass noun *water* first. If *a* is water and *b* is water, then *a* and *b* taken together are also water. In contrast, this property does not hold of count nouns, such as *horse*. If *a* is horse, and *b* is horse, *a* and *b* taken together are not horse, but horses. However, it has been noted that count plurals also satisfy cumulativity (Link 1983; Landman 1989). If *a* are horses, and *b* are horses, *a* and *b* taken together are also horses. Therefore, cumulativity does not distinguish count nouns from mass nouns.

The property of divisibility was first proposed by Cheng (1973). According to this property, if *a* is X, then a portion of *a* is also X. Again, only mass nouns are said to have this property. A portion of water is also water, but a portion of a horse is not a horse. This property also fails to distinguish count nouns from mass nouns. As pointed out in a number of studies (Mittwoch 1988; Gillon 1992; Krifka 1992; Rothstein 2004, 2010), in English there are count nouns that are divisible, such as *rope*, *string*, *wall*, and *tile*. A portion of a rope is still a rope. Conversely, there are also mass nouns that are not divisible, in particular, certain nouns that denote super-ordinate categories such as *furniture*, *silverware*, have atomic parts (Chierchia 1998a, 1998b, 2010) and have been shown to denote individuals (Barner & Snedeker 2005).

The failure of the above two criteria is mainly caused by a mis-match between grammatical countability and the existence of natural discrete units. Things that are grammatically countable don't necessarily present themselves in natural, discrete units, e.g. *rope*, *string*, while certain things that are not grammatically countable do come in discrete units, e.g. *furniture*, *silverware*. However, the issue of syntax-semantics matching may be put aside if these criteria are applied to Chinese, since Chinese does not have count syntax. Instead, the two criteria could make predictions about the count-mass status of nouns in Chinese in terms of semantic properties. Below we will see how they work out.

First, consider the property of cumulativity: if *a* is X, and *b* is X, *a* + *b* together is also X. Examples of nouns denoting non-individuated substance, individuated objects, both single and group, are illustrated in (1):

		a	b		a + b
(1)	a.	*shui*	*shui*	=>	*shui*
		'water'	'water'		'water'
	b.	*xuesheng men*	*xuesheng men*	=>	*xuesheng men*
		'students'	'students'		'students'
	c.	*shu*	*shu*	=>	*shu*
		'book'	'book'		'book/books'

As in English, the property holds of both nouns denoting substance and nouns denoting group objects, as in (1a) and (1b). But it is also true of nouns denoting single individuated objects (1c). Thus the property not only puts nouns denoting substance in the same class as nouns denoting group individuated objects, it also puts nouns denoting single individuated objects in that class. Given that cumulativity does not even distinguish *shui* 'water' from *shu* 'book' in Chinese, it is not useful for the count-mass distinction.

Next, we consider the property of divisibility: if *a* is X, a portion of *a* is also X. We apply it to nouns denoting substance (2a), single objects (2b), individuated objects but with no atomic units (2c), and super-ordinate categories (2d):

		a		portion of *a*
(2)	a.	*shui*	=>	*shui*
		'water'		'water'
	b.	*shu*	≠>	*shu*
		'book'		'book'
	c.	*shengzi*	=>	*shengzi*
		'rope'		'rope'
	d.	*jiaju*	≠>	*jiaju*
		'furniture'		'furniture'

The results show that while (2a) and (2c) have the divisibility property, (2b) and (2d) do not. That is, this property divides the four types of nouns into two groups; nouns denoting single objects are in the same group with nouns denoting super-ordinate objects, while nouns denoting substance and nouns denoting individuated objects but with no atomic units are in the second group. Therefore, this property may be useful to us; it predicts that if the count-mass distinction exists in Chinese, then *shu* 'book' and *jiaju* 'furniture' would be count nouns, while *shui* 'water' and *shengzi* 'rope' would be mass nouns. In short, of the two semantic criteria, cumulativity and divisibility, only the latter is potentially useful in assigning the count-mass status of nouns in Chinese, since the former doesn't even distinguish between *shui* 'water' and *shu* 'book'. I will return to the prediction made by divisibility later, in §4.

3. Classifiers

Aside from semantic differences, a more important question concerning the count-mass distinction is whether it is syntactically encoded in Chinese. Cheng and Sybesma (1998, 1999) give a positive answer. In this section we take a closer look at their analysis (§3.1), together with empirical support for the analysis (§3.2), and the challenges it faces (§3.3). In §3.4, I consider the limitations of classifiers in encoding the count-mass distinction.

3.1 Cheng and Sybesma (1998, 1999)

Cheng and Sybesma (1998, 1999) argue that although nouns in Chinese are similar to mass nouns in English, Chinese does make a count-mass distinction. However, unlike English, where the distinction is encoded on nouns, in Chinese the distinction is encoded on classifiers. Cheng and Sybesma point out that there is a cognitive distinction between things that have discrete units and things that don't, and this distinction has reflexes in the Chinese classifier system. There is a well-known distinction among classifiers (Tai & Wang 1990): some classifiers create a unit measure, while others simply name the unit entities naturally come in. The latter are individual classifiers, as they pick out a natural, discrete unit, while the former are non-individual classifiers, as they don't pick out a discrete unit. This distinction can be taken as reflexes of the cognitive distinction between individuals and non-individuals. Cheng and Sybesma refer to the two types of classifiers as count classifiers and mass classifiers (or massifiers) respectively. In this study, I will refer to the former as individual classifiers and the latter as measure words.

On the basis of Doetjes (1996), Croft (1994), Tang (1990) and Paris (1981), Cheng and Sybesma relate classifiers to grammatical number, in parallel to the number morphology in languages such as English: both are syntactic markers of countability. Further, drawing on Doetjes (1996), Paris (1981), Croft (1994), and Iljic (1994), Cheng and Sybesma (1999:517) suggest that the individual classifier has a singularizing function: "it picks out one instance of what is denoted by N." This is a function that the measure word does not have, and will serve as a basis for one of the diagnostic tests on count and mass nouns, presented in §4.

Cheng and Sybesma show that the two types of classifiers behave differently in syntax. This can be seen in two areas. First, as noted in Chao (1968), Paris (1981), and Tang (1990), the modification marker *de* can be optionally inserted between a measure word and the following noun, but not between an individual classifier and its following noun:

(3) Tang (1990)
    a. san   bang (de)   rou
        three pound DE   meat
        'three pounds of meat'
    b. liang xiang (de)   shu
        three box   DE   book
        'three boxes of books'

(4) a. jiu   gen   (*de) weiba
        nine   CL   DE   tail
        'nine tails'
    b. shi   zhang (*de) zhuozi
        ten   CL   DE   table
        'ten tables'

Second, also noted in Tang (1990), certain adjectives, such as *da* 'big' or *xiao* 'small' can be inserted between a numeral and a measure word, but not between a numeral and an individual classifier:

(5) Tang (1990)
    a. yi   da   zhang   zhi
       one big CL-sheet paper
       'one large sheet of paper'
    b. yi   xiao   xiang   shu
       one small CL-box book
       'one small box of books'

(6) a. *yi   da   zhi gou
      one big CL   dog
      'one big dog'
    b. *yi   da   wei laoshi
      one big CL   teacher
      'one big teacher'

In fact, *de* insertion and the presence of an adjective can be combined, as in (7):

(7) a. san   da   wan   de tang
      three big bowl DE soup
      'enough soup for three big bowls'
    b. liang da   bei   de shui
      two   big cup   DE water
      'enough water for two big cups'

Cheng and Sybesma (1998) propose different internal structures for the classifier phrase, depending on if it contains a count-classifier or a mass-classifier.[2] Thus classifiers not only reflect a cognitive distinction, they also have different syntactic structures.

This analysis, then, presents a neat picture, where a cognitive distinction is consistently reflected in the grammar, at the level of classifier and the level of syntax.

3.2 Empirical test of Cheng and Sybesma (1998, 1999)

Cheng and Sybesma's (1998, 1999) proposal is put to an empirical test in a recent study. Li et al. (2008) examine how adults and children interpret count classifiers and measure words

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[2] A count-classifier is the head of ClP, while a mass-classifier starts out in the complement of Cl, as a noun and later moves to the head of ClP.

without the help of the following noun, and to do this they investigate how participants extend classifiers to novel referents. The assumption is that if the count-mass distinction is encoded on classifiers, subjects should match individual classifiers with individual objects and measure words with non-individuated stuff. In the experiments, subjects were asked to pick out "one CL something" out of a number of choices. Li et al. find that when the classifier is an individual classifier, e.g. *gen* 'stick', adult subjects chose solid objects that match in shape, and rejected objects that didn't match in shape or objects that match in shape but were not solid. When the classifier is a measure word, e.g. *dui* 'pile', however, adult subjects chose non-solid substance that match in shape, but avoided solid objects that also match in shape.[3] Therefore, the judgments of adult subjects reveal a sharp contrast between individual classifiers and measure words: the former is matched with solid individuated objects, while the latter is matched with non-solid non-individuated substance. These findings offer support for Cheng and Sybesma's (1998, 1999) proposal.

However, even with the empirical evidence, we cannot quite conclude that classifiers encode the count-mass distinction in Chinese. For one thing, the classifiers used in the experimental studies are limited to a particular type; both the individual classifiers and measure words selected for the experiments are shape-based. Classifiers in Chinese can be organized into a number of types with respect to the entities they measure or count. Chao (1968) categorizes classifiers ('measures' in his terminology) into nine types. Gao and Malt (2009) re-organize Chao's system into five types: (a) group, (b) container, (c) standard measure, (d) temporary, and (e) individual, illustrated in (8):

(8) Five types of classifiers according to Gao and Malt (2009)
  a. group: *qun* 'group', *lie* 'line', *zu* 'section', *dui* 'pile', *tuan* 'wad'
  b. container: *he* 'box', *bei* 'cup', *ping* 'bottle', *xiang* 'box'
  c. standard measure: *bang* 'pound', *cun* 'inch', *chi* 'foot'
  d. temporary: words that can be temporarily used for counting or measuring, such as *shen* 'body' as in *yi shen ni* 'a whole body of'
  e. individual: *tiao* 'long, thin things', *kuai* 'chunk', *ben* 'book-type things', *duo* 'flower-shaped', *jian* 'piece', *gen* 'stick', *liang* 'vehicle'

(8a), (8b) and (8c) are generally grouped together as measure words, as is the case in Cheng and Sybesma's studies. Individual classifiers constitute the largest type, and they can be further distinguished in terms of semantic features. Allan (1977) categorizes individual classifiers in terms of seven semantic features: material, shape, consistency, size, location, arrangement and quanta. Tai (1992) uses the first four (material, shape, consistency and size) to describe Chinese classifiers; he also adds a category, parts of objects. Some examples of commonly used

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[3] The behavior of 4-6 year old children showed a similar pattern as adults, except that children were more likely to ignore solidity and base their choice simply on shape.

individual classifiers that belong to categories other than shape are given in (9):

(9)   Commonly used individual classifiers that are non-shape based:
    jian 'piece' — *yi jian yifu* 'a piece of clothing' (material)
    tou 'head' — *yi tou niu* 'a cow' (part of object)
    zhi 'piece' — *yi zhi yang* 'a sheep' (material—animacy)
    ba 'handle' — *yi ba san* 'un umbrella' (part of an object)

Besides individual classifiers, group classifiers, which are a subset of measure words, can also be further distinguished in terms of shape, consistency and possibly other features. For example, while *qun* 'group' is a general group classifier, *tuan* 'wad' and *dui* 'pile' are shape-based. That is, both individual classifiers and measure words have further sub-categories that include shape-based as well as non-shape-based members.

    Given that shape-based classifiers are a subset of classifiers, it would be premature to assume that the behavior of these classifiers is representative of all classifiers. In fact, below we will see that measure words don't all behave the same. Therefore, Li et al.'s findings, while supportive of Cheng and Sybesma's analysis, cannot be taken as conclusive.

3.3 Challenges

    There are also data that challenge Cheng and Sybesma's analysis. It concerns the two proposed syntactic characteristics that are used to distinguish between count classifiers and mass classifiers.

    The first characteristic, the possibility of optionally inserting *de* between a measure word and a noun, can sometimes be applied to individual classifiers as well, as Tang (2005:444) shows, since the former can also be followed by *de*:

(10)   a.   Tang's (27a) from Chinese Knowledge Information Processing Group
        Mei   chao   yue   sheng-xia   ershi-si   mei de   luan
        every nest   about give.birth-down twenty-four CL   DE egg
        'Every nest has about twenty-four eggs.'
    b.   Tang's (27b), from Chinese Knowledge Information Processing Group
        Yinian   yue   zhongzhi-le   yibai-sishi-duo-wan
        one-year about plant-asp   one.hundred-forty-more-ten.thousand
        ke-de   shumu
        CL DE   tree
        '(They) planted more than one million and four-hundred-thousand trees a year.'

Tang (2005) discusses a number of factors affecting the possibility of *de*, including the semantics of the noun phrase, the type of predicate, and information weight. Further examples

of *de* occurring with individual classifiers are offered by Hsieh (2008) and X. Li (2011). On the other hand, the characteristic does not seem to hold for all measure words. The examples in (11) are less than perfect:

(11) a. ?*Ta   you   san   tuan   de   mianhua
            he   has   three   wad   DE   cotton
            'He has three wads of cotton.'
      b. ?*Zher   you   wu   dui   de   tu
            here   there-is   five   pile   DE   dirt
            'There are five piles of dirt here.'

It appears that the *de* test excludes shape-based measure words, as in (11), but it works out well for container measure words, e.g. (3), and measurement of weight, height, etc, as in (12).

(12) a.   yi   bang   de   pingguo
          one   pound   DE   apple
          'one pound of apples'
      b.   yi   chi   de   bu
          one   foot   DE   fabric
          'one foot of fabric'

The second characteristic, the possibility of the presence of an adjective such as *da* 'big' and *xiao* 'small' preceding a classifier, also does not seem to hold. First, certain individual classifiers can be modified by *da* 'big' or *xiao* 'small'. This is noted by Cheng and Sybesma themselves (1998:410, fn.4), as in (13), and Tang (2005).

(13) a.   yi   da   ben   shu
          one   big   CL   book
          'one big book'
      b.   yi   xiao   duo   hua
          one   small   CL   flower
          'one small flower'

Conversely, not all measure words can be modified by an adjective:

(14) a. ?*yi   da   chi   bu
            one   big   foot   fabric
            'one big foot of fabric'
      b. ?*yi   da   bang   mianhua
            one   big   pound   cotton
            'one big pound of cotton'

It appears that classifiers that take adjectival modifiers are ones that denote shapes, containers, but not measurement. Since shape cuts across individual classifiers and measure words, we find both types of classifiers occurring with modifiers. This is also pointed out in X. Li (2011). Table 1 summarizes how the two tests work out:

Table 1: The two syntactic tests applied to classifiers

	insertion of *de*		presence of adj	
	Yes	**No**	**Yes**	**No**
measure words				
shape		✓	✓	
container	✓		✓	
measure	✓			✓
individual classifiers				
shape	✓(sometimes)	✓	✓	
other	✓(sometimes)	✓		✓

On the basis of Table 1, we can see that neither test results in a clear breakdown of measure words vs. individual classifiers. The first test excludes a subset of measure words (shape), but allows individual classifiers under certain conditions, while the second test picks out shape-based individual classifiers as well as shape- and container-based measure words.

3.4 Limits of classifiers

In the previous section we saw that the syntactic tests that Cheng and Sybesma (1998, 1999) use to distinguish individual classifiers and measure words don't actually produce clear results. The proposed mapping between the classifier level and the syntax level, therefore, cannot be established. In this section, I will examine classifiers further, and I will show that classifiers are limited in their capacity of encoding the count-mass distinction. The limitations can be seen in two aspects. First, the distinction of nouns at the cognitive level isn't clear, which undermines the other mapping between the cognitive level and the classifier level. Second, a classifier-based count-mass distinction does not allow flexibility or gradation; a noun is either count or mass depending on the classifier it goes with. However, I hope to show that certain nouns can be both count and mass.

3.4.1 Indeterminacy

Tai and Wang (1990), following Allan (1977), suggest that individual classifiers and measure words differ on a cognitive basis. Individual classifiers denote salient, permanent properties of entities denoted by nouns, while measure words denote contingent, temporary properties of entities denoted by nouns. In addition, individual classifiers categorize an object, while measure words simply measure an object, stated as follows (p.38):

> "A classifier categorizes as a class of nouns by picking out some salient perceptual properties, either physically or functionally based, which are permanently associated with the entities named by the class of nouns; a measure word does not categorize but denotes the quantity of the entity named by a noun."

Nouns that are marked by the same individual classifier share certain characteristics, whereas nouns that are marked by the same measure words don't necessarily share any characteristics. Tai and Wang illustrate this with the measure word *bang* 'pound'. It can occur with nouns such as *tie* 'iron', *sha* 'sand', and *pingguo* 'apple', and these nouns occur with different individual classifiers: *yi kuai tie* 'a piece of iron', *yi li sha* 'a piece of sand', *yi ge pingguo* 'an apple'.

However, these guidelines do not always result in a clear distinction between the two categories. One issue, briefly touched on by Tai and Wang, is that the distinction between the two categories is itself not clear-cut anyway. The same word, e.g. *kuai* 'chunk', could serve either as a classifier, as in *yi kuai shitou* 'a rock', or as a measure word, as in *yi kuai rou* 'a piece of meat', where *kuai* also denotes a portion in addition to the chunky shape. That is, according to Tai and Wang, the classifier *kuai*, besides the categorizing function of having a chunky shape, can sometimes also have the measuring function of denoting a portion. This creates a potential problem. If a classifier could be of either category, how do we know which category it belongs to? For a count-mass analysis that relies on a distinction at the cognitive level, this is an important issue. In the case of *kuai* 'chunk', it appears that the only reason that Tai and Wang consider *kuai* a measure word in *yi kuai rou* 'a piece of meat' is that it is followed by a mass noun *rou* 'meat', which does not necessarily come in the shape of chunks. If the noun is changed to the count noun *shitou* 'rock', *kuai* would be considered an individual classifier. Therefore, to resolve the indeterminacy of the status of a classifier, we need to rely on the following noun. Sometimes, however, even when the following noun is considered, we still cannot decide, because the noun and the classifier seem to possess both qualities. Consider (15):

(15)　yi　　tiao　shengzi
　　　 one　 CL　　string
　　　 'one string'

Is *tiao* an individual classifier or measure word? As a shape-based classifier, *tiao* normally occurs with nouns denoting long and thin entities. A string is indeed long and thin, therefore here *tiao* performs a characterizing function and can be considered an individual classifier. However, a string is not necessarily a discrete unit; a portion of string is also a string. Therefore, *tiao* could be said to perform a measuring, temporary, function, which is to measure a stretch of a string. In the end, we don't really know what status *tiao* has in (15). Given that classifiers reflect the count-mass distinction of nouns, this indeterminacy comes from the unclear status of the noun. That is, we are not able to know whether *shengzi* 'string' is count or mass because, at the cognitive level, string can be perceived either as individuated or non-individuated.

In short, cognitive considerations are helpful in making a distinction between count and mass nouns and the two types of classifiers, but they leave the status of certain nouns and classifiers undecided. We do not always know if a noun is count or mass, and whether a classifier is an individual classifier or a measure word. Earlier, in §3.3, we saw that the syntactic tests presented by Cheng and Sybesma (1998, 1999) also do not distinguish the two types of classifiers either. Together, these findings point to the limitations of classifiers: they are not sufficiently distinguished syntactically and they are not always able to encode the status of a noun.

3.4.2 Lack of flexibility

The second limitation of classifiers concerns lack of flexibility. Even if classifiers distinguish count nouns from mass nouns, relying solely on classifiers would lead to the situation that Chinese nouns are strictly divided into count and mass nouns. That is, a noun would be either count or mass, but not both. This, I argue, is not a desirable outcome.

Let's first examine how a noun is assigned the count-mass status, assuming that classifiers can provide this information. There is actually an asymmetry between individual classifiers and measure words in that although individual classifiers only occur with count nouns, measure words in principle can occur with both count nouns and mass nouns. For example, *dui* 'pile' can occur in *yi dui shu* 'a pile of books' and *yi dui ni* 'a pile of mud'. Therefore, only count classifiers, but not measure words, could serve to distinguish count nouns from mass nouns. If a noun takes an individual classifier, it is a count noun, and if it does not, it is a mass noun. The two types of nouns are identified differently: while count nouns are identified positively, by their ability to occur with individual classifiers, mass nouns are identified negatively, by their inability to occur with individual classifiers. On this view, a noun in Chinese is either count or mass, but not both. But this is not a correct characterization of Chinese nouns. Certain nouns are both count and mass. In fact, Chinese nouns show different degrees of countability, as will be demonstrated in the next section.

4. Three diagnostic tests

In this section, I offer an alternative view of the count-mass distinction in Chinese. I assume that whether nouns are count or mass depends on a semantic property, namely, whether they refer to individuals. Classifiers offer some information in this respect; however, classifiers alone are not sufficient. We need to look beyond classifiers in order to find out if a noun denotes individuals. In particular, we need to rely on quantifiers. A number of studies (Gordon 1985; Bloom 1999; Barner & Snedeker 2005) point out that a good tool with which to explore the count-mass issue is quantification. Barner and Snedeker (2005:48) state that "Perhaps the most transparent measure of whether words refer to individuals is provided by natural language

quantification." In English, Barner and Snedeker show that count nouns and object-mass nouns refer to individuals since they quantify by number, over individuals, not by volume, over substance or stuff; substance-mass nouns, on the other hand, do not refer to individuals since they quantify by volume, not number. Applying this method to Chinese, in the following subsections, besides a test on classifiers, I will use two quantifier tests to probe the quantifying properties of a noun. Another assumption that I adopt is that the count-mass distinction in Chinese is not clear-cut. Nouns in Chinese show different degrees of countability. A count noun may be more or less countable than another count noun; furthermore, while certain nouns are clearly count or mass, other nouns are intermediate and have both count and mass characteristics.

Before we proceed further, a note about the scope of my analysis is in order. The proposed analysis covers concrete nouns only, as is the case of Cheng and Sybesma's analysis. Whether and how the count mass distinction is made in abstract nouns is an issue that I will leave for future research.

4.1 Individual classifiers

The first test concerns the ability of a noun to take an individual classifier. Cheng and Sybesma (1999), on the basis of syntactic evidence (Doetjes 1996; Paris 1981; Croft 1994), suggest that individual classifiers have the singularizing function, while measure words do not (cf. §3.1). Following this line of reasoning, we assume that a noun that takes an individual classifier is more countable (individuated) than a noun that does not. To avoid the problem of indeterminancy, we assign a permanent status to classifiers. A classifier is an individual classifier if it is selected by a noun denoting an individuated object. For example, *kuai* 'chunk' is selected by *shitou* 'rock', therefore, it is an individual classifier. Accordingly, whenever *kuai* is used as a classifier with the meaning of 'chunk', it is considered an individual classifier, including when it occurs in *yi kuai rou* 'a piece of meat' where the noun *rou* 'meat' is considered a mass noun (Tai & Wang 1990). By the same token, *tiao* in *yi tiao shengzi* (15) is also an individual classifier. On this point I differ from Tai and Wang, who take *kuai* in *yi kuai rou* 'a piece of meat' as a measure word, as we saw earlier.

There has not been a consensus on the number of individual classifiers in Chinese. Chao (1968) lists 51 individual classifiers, while Gao and Malt (2009) identify 126 individual classifiers. But in practice this will not be a problem for us, since to perform the test we don't really need to put all of the individual classifiers to use. A good strategy is to apply the general individual classifier *ge*, which occurs with just about any noun that denotes individuated entities. If a noun can occur with *ge*, I consider it passing the test. The test divides nouns into two groups. Table 2 provides some examples.

Table 2: Examples of nouns that do and do not occur with an individual classifier

	Yes	No
yizi 'chair'	✓	
beizi 'cup'	✓	
jiaju 'furniture'	✓	
shengzi 'string'	✓	
mianbao 'bread'	✓	
shazi 'sand'	✓	
yu 'rain'		✓
fanqiejiang 'ketchup'		✓

4.2 Quantifier *henduo*

The second test concerns the quantifier *henduo* 'many, much'; in particular, how it is interpreted with different nouns. It is well-known that *henduo* occurs with nouns that denote both individuated and non-individuated entities, referring to number or volume, respectively. This characteristic is often mentioned in the context that Chinese nouns do not show the kind of count-mass distinction found in English, because the same quantifier *henduo* can quantify over both individuals and non-individuals. Nonetheless, the fact that it is associated with different interpretations—number or volume—suggests that *henduo* does distinguish between two types of nouns; it's just that the distinction is made in semantics rather than syntax. Furthermore, *henduo* can also have a flexible interpretation, referring to both number and volume. This is illustrated in (16):

(16) Wo   chi-le   henduo   dangao
      I   eat-PERF many/much   cake
      'I ate a lot of cake/cakes.'

This sentence is true in a situation where the speaker ate a large piece of cake, or one where the speaker ate many, possibly small, cakes. This can be compared with (17) and (18):

(17) Lisi na-le   henduo yizi   lai
      Lisi bring-PERF many   chair over
      'Lisi brought over many chairs.'

(18) Zuotian   xia-le   henduo yu
      yesterday fall-PERF   much   rain
      'It rained a lot yesterday.'

(17) cannot be true in a scenario where Lisi brought over a single, large chair; rather, it is understood as Lisi brought over many chairs. In contrast, (18) can only mean the volume of

rain is large, as rain doesn't come in natural units. Thus the flexibility of *dangao* 'cake' sets it apart from both *yizi* 'chair' and *yu* 'rain'.

There are therefore three possible interpretations for the phrase *henduo* N: number, volume and number/volume. This is given in Table 3:

Table 3: How *henduo* is interpreted with different nouns

	number	volume
yizi 'chair'	✓	
beizi 'cup'	✓	
jiaju 'furniture'	✓	
shengzi 'string'	✓	✓
mianbao 'bread/roll'	✓	✓
shazi 'sand'		✓
yu 'rain'		✓
fanqiejiang 'ketchup'		✓

As can be seen in Table 3, *henduo* divides nouns into three groups. Nouns with the number interpretation are more like count nouns, nouns with the volume interpretation are more like mass nouns, and nouns with the flexible interpretation are intermediate between count and mass. There is also a syntactic correlate for the three-way distinction. An individual classifier can optionally occur after *henduo* for nouns with the number interpretation as well as flexible nouns, but not for nouns with the volume interpretation, as in (19a-b). For flexible nouns, the presence of an individual classifier induces the number interpretation, as in (19c):

(19) a. *henduo zhang yizi* 'many chairs'
          henduo jian jiaju 'many pieces of furniture'
          henduo ge beizi 'many cups'
       b. *henduo ge yu 'much rain'
          **henduo ge huashengjiang* 'much peanut butter'
       c. *henduo kuai doufu* 'many pieces of toufu'
          henduo ge mianbao 'many bread rolls'

4.3 Quantifier *yidian*

The third test involves the quantifier *yidian* 'a few, a little'. *Yidian*, which is a combination of *yi* 'one' and *dian* 'dot, point', has a wide distribution. It occurs before a noun, serving either as a quantifier, as in (20), or as a num-classifier phrase, as in (21). In addition, it also occurs after a predicate, as a degree modifier, illustrated in (22), and before a predicate, as a negative polarity item, illustrated in (23):

(20) Wo you   yidian dongxi gei ni
     I   have some   thing   to   you
     'I have something for you.'

(21) Ta tichu-le   yi/san   dian yiwen
     he bring-perf one/three point question
     'He brought up one/three question(s).'

(22) Ni zhan yuan yidian, jiu   keyi kanjian nazuo xin jianzhu   le
     you stand far   a-little then can   see   that-cl new building prt
     'If you stand a little farther, you will be able to see that new building.'

(23) Laoshi shuo de hua   ta yidian ye   bu   ting
     teacher say   de words he a-bit   also not listen-to
     'He does not listen to anything the teacher says.'

The last two uses can be easily distinguished from the first two, due to distribution differences. The quantifier use and the num-cl use, however, may not be so easily distinguished. In certain contexts *yidian* is ambiguous as a quantifier or as a num-cl phrase:

(24) Wo you yidian   jianyi
     I   have some/one point suggestion
     'I have some suggestions.'
     'I have one suggestion.'

There is one aspect where the two differ: if *yi* in *yidian* is a number phrase, it can be replaced by other numbers, e.g. *san* 'three' in (21),[4] while *yi* in the quantifier *yidian* cannot be replaced by any other number. Despite the potential ambiguity, most of the occurrences of pre-nominal *yidian* have the quantifier use, because there are few nouns that take *dian* as a classifier. The latter nouns are generally abstract, including *yijian* 'opinion', *jianyi* 'suggestion', and *yiwen* 'question'.

    What we are interested in is the pre-nominal, quantifier *yidian*, as in (20). As with the *yidian* test, we would like to find out whether the phrase *yidian* N refers to number or volume. But first, *yidian* differs from *henduo* in that it does not occur with all concrete nouns. Certain concrete nouns are incompatible with *yidian*, such as the ones in (25):

(25) *lanqiu* 'basketball'   *zixingche* 'bike'
     gou 'dog'   *chuangzi* 'window'
     xiaotiqin 'violin'   *dianshiji* 'TV set'
     zhong 'clock'   *yisheng* 'doctor'

---

4   In this case, as pointed out by a reviewer, the classifier *dian* can also be replaced by *ge*.

It appears that the nouns in (25) include animate nouns, and inanimate nouns denoting things that are usually conceptualized individually and singularly. This can be contrasted with nouns that also denote individuated objects, but do occur with *yidian*, illustrated in (26):

(26) *panzi* 'plate'   *shu* 'book'
       shuzhi 'tree branch'   *qianbi* 'pencil'
       danzhu 'marble'   *xiangjiao* 'banana'
       lazhu 'candle'   *beizi* 'cup'

One difference we can note between nouns in (25) and (26) is that although the latter also denote individuated objects, the objects are often conceptualized in a group, rather than individually or singularly.

As shown in Table 4, *yidian* divides concrete nouns into four categories:

Table 4: Compatibility between *yidian* and nouns and how it is interpreted

	incompatible	number	volume
yizi 'chair'	✓		
beizi 'cup'		✓	
jiaju 'furniture'		✓	
shengzi 'string'		✓	✓
mianbao 'bread'		✓	✓
shazi 'sand'			✓
yu 'rain'			✓
fanqiejiang 'ketchup'			✓

It should be pointed out that there may be variations among speakers on the acceptability or interpretation of a quantifier + N phrase. For example, while some speakers may consider *yidian shazi* 'some sand' judged by number, other speakers may consider it judged by volume. At this point, such variations do not matter to the point we are trying to make, which is: *yidian* divides concrete nouns into four groups, while *henduo* divides nouns into three groups. The membership of each group may differ among speakers, but there is a general agreement on the existence of the breakdown of nouns.

4.4 Count, mass and flexible nouns

The combined results of the three tests are presented in Table 5:

Table 5: Example of nouns divided in terms of the three tests combined

	Examples	CL	*yidian*	*henduo*
1.	*yizi* 'chair'	yes	no	number
2.	*beizi* 'cup'	yes	number	number
	jiaju 'furniture'	yes	number	number
3.	*shengzi* 'string'	yes	number/volume	number/volume
	mianbao 'bread/roll'	yes	number/volume	number/volume
4.	*shazi* 'sand'	yes	volume	volume
5.	*yu* 'rain'	no	volume	volume
	fanqiejiang 'ketchup'			

The three tests result in five types of nouns, numbered to the left of the examples in Table 5. A few more examples of each type are given in (27):

(27)   Type 1: *xuesheng* 'student', *gou* 'dog', *zixingche* 'bike'
Type 2: *lazhu* 'candle', *xiangjiao* 'banana', *jiaju* 'furniture'
Type 3: *zhi* 'paper', *xian* 'string', *shuiguo* 'fruit'
Type 4: *doufu* 'tofu', *mi* 'rice', *yan* 'salt', *tusi* 'bread/slices'
Type 5: *jiangyou* 'soy sauce', *ni* 'mud', *youqi* 'paint'

The five types of nouns form a hierarchy of countability. Type 1 nouns are highly individuated nouns, as they take an individual classifier, cannot be quantified by *yidian*, and denote number when quantified by *henduo*. This is followed by type 2 nouns, which are similar to type 1 nouns except that they can be quantified by *yidian*, indicating number. Type 3 nouns have both features of count nouns (denoting number when quantified) and features of mass nouns (denoting volume when quantified). Type 4 and type 5 have mass noun features, as they denote volume when quantified. They differ from each other in that the former can take an individual classifier, while the latter cannot. I will take type 1 and type 2 nouns as count nouns, type 3 as flexible nouns and type 4 and type 5 nouns as mass nouns, as shown in (28):

(28)   Type 1 ⟍
Type 2 ——————⟶ count
Type 3 —————— flexible
Type 4 —————⟶ mass
Type 5 ⟋
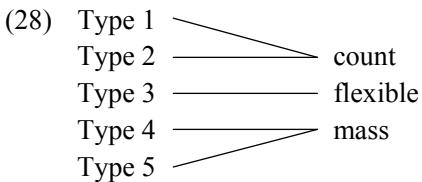
Grouping the 5 scales of nouns into a three-way contrast allows us to make a generalization that count nouns are quantified by numbers, mass nouns by volume, and flexible nouns by either number or volume. The distinction therefore is semantically-based. Looking closely at the features that are responsible for the three-way contrast, we see the contrast can be derived simply on the basis of the *henduo* test without the other two tests. Nonetheless, the two other

tests also provide useful information; the interpretation of *yidian* offers supporting evidence for the *henduo* test, and the test of whether a noun is compatible with *yidian* or an individual classifier reveals differences within count nouns and mass nouns. These within-group differences are partially responsible for the gradation of countability among nouns.

The two tests, the test of individual classifiers and the test of *yidian*, indicate that syntax also serves some function distinguishing between count nouns (type 1 and type 2), and between mass nouns (type 4 and type 5), since whether a noun takes an individual classifier, and whether a noun can be quantified by *yidian* are syntactic properties. Both properties have a semantic basis, however. Individual classifiers are associated with the concept of individuation. If a noun takes an individual classifier, the entity it denotes has the potential to be viewed as individuated. Conversely, based on the observation made in §4.3 concerning nouns that can and cannot be quantified by *yidian*, I suggest that the quantifier *yidian* is associated with the notion of group, or lack of individuation. If a noun occurs with *yidian*, it denotes entities that can be grouped together or are likely to be viewed as such. Altogether, the semantic features at work are number, volume, individual, and group, with the former two more dominant than the latter two. Importantly, the four features are not in conflict with one another. A noun may have both the individuation and group features; similarly, a noun may have both the number and volume features. In fact, a noun may have all four features, which makes it a flexible noun. This is seen in Table 6:

Table 6: The five types of nouns and their semantic features

Examples	number	volume	individual	group
1. *yizi* 'chair'	✓		✓	
2. *beizi* 'cup'	✓		✓	✓
3. *shengzi* 'rope'	✓	✓	✓	✓
4. *shazi* 'sand'		✓	✓	✓
5. *yu* 'rain'		✓		✓

In short, the count-mass distinction in Chinese is mostly a semantic distinction, but syntax also plays a role, distinguishing within-group nouns.

Nouns in English have also been argued to have different degrees of countability. Allan (1980) argues that nouns in English are basically mass, but they show varying degrees of countability preferences. Gathercole (1986) adopts the prototype theory and proposes that nouns have seven degrees of countability. These proposals are mainly based on whether a noun can occur with various quantifiers, e.g. *much*, *many*, *a*, *several*, *two*, *all*, and *about 50*. In the case of Chinese, to arrive at the five types of nouns, we relied on classifiers and two quantifiers, and both distribution and interpretation. It is possible that if more quantifiers are tested, finer degrees of countability will be observed, but this should not affect the overall three-way contrast of count, flexible and mass.

In fact, just on the basis of the two quantifiers, *henduo* 'many/much' and *yidian* 'a little/a

few', variations can already be observed. For example, *henduo dangao* 'many/much cake(s)' has both the number and the volume reading, while *yidian dangao* 'a little/a few cake(s)' seems to favor the volume reading. I will take *dangao* as a flexible noun.

A few other observations can be made about Tables 5 and 6. First, flexible nouns (type 3) are strikingly similar to the flexible nouns in English that can be used in both mass and count contexts, e.g. *string*(*s*), *paper*(*s*), *stone*(*s*). This seems to indicate that the ontological category of entities denoted by the nouns play a role in the count-mass distinction in both English and Chinese. In the two languages these nouns have both count and mass characteristics, although these characteristics are reflected differently in the two languages—in English they are reflected in syntax, while in Chinese they are reflected in semantics. This is also a good place to bring in the semantic criterion of divisibility again. Recall in §2 we saw that the criterion assigns *shu* 'book' and *jiaju* 'furniture' into one group and *shui* 'water' and *shengzi* 'string' into another group. What this means is that divisibility groups flexible nouns together with mass nouns (type 4 and type 5). Thus the criterion successfully separates count nouns from other nouns in Chinese, but the distinction it makes is too coarse, as it cannot distinguish nouns that are mass and nouns that are flexible.

Another observation concerns nouns that belong to super-ordinate categories such as *jiaju* 'furniture'. In English, nouns like *furniture* represent a distinct type of mass nouns in that they individuate. Such nouns cause a problem for Quine's (1960) approach that mass nouns denote non-individuals; they also cause a problem for the criterion of divisibility—they do not satisfy the criterion and yet they are mass nouns. In Chinese, *jiaju* 'furniture' shows mostly count noun properties, and is a count noun (type 2). A number of other nouns of super-ordinate categories are also of this type, including *daocha* 'silverware', *buben* 'notebooks', *riyongpin* 'daily necessities', *shuiguo* 'fruit', and *shuji* 'books'. However, not all super-ordinate categories are count nouns. Nouns such as *huowu* 'commercial products' and *shiwu* 'food' are mass nouns, as they denote volume when quantified by *henduo* 'many, much'. In English, whether a noun of a super-ordinate category is count or mass is not predicable, e.g. *spaghetti* vs. *noodles*, whereas in Chinese the distinction is semantically-based.

A consequence of this analysis is that a noun that takes an individual classifier is not necessarily a count noun. Thus *rou* in *yi kuai rou* 'a piece of meat' is a mass noun even though *kuai* is an individual classifier. That is, my analysis does not link the count-mass distinction to the distinction between the two types of classifiers. But the fact that *rou* 'meat' occurs with *kuai* distinguishes it from other mass nouns such as *yu* 'rain'; *rou* has some count qualities which are absent in *yu* 'rain', i.e. the ability to be measured by *kuai* 'chunk'.

This analysis also argues against Krifka (1995) and Chierchia (1998a, 1998b) that nouns in Chinese are all mass nouns. One of the arguments for the mass noun view is that this would explain why Chinese nouns need classifiers in order to be counted. But the *henduo* test shows that nouns can be counted without classifiers. In §5 we will see that the same conclusion is reached in a quantity judgment experiment.

4.5 Summary

In the above section, I used three diagnostic tests to probe the count-mass status of a noun: whether a noun takes an individual classifier, whether it can be quantified by *yidian*, and whether *yidian* and *henduo* is interpreted by number or volume. The three tests assign nouns to five levels on the scale of countability. I then grouped the nouns into count, flexible and mass according to whether they are quantified by number or volume, the latter serving as a basis for the three-way distinction. I further suggested that four features distinguish nouns with respect to countability: number, volume, individual and group. Thus, similar to English, Chinese relies on the noun for clues of count-mass distinction, although it does not display much count-mass syntax. The count-mass distinction in Chinese is basically a semantic distinction, revealed by quantification. It is sometimes reflected in syntax: when a noun does not take *yidian*, it is a count noun, and when a noun does not take an individual classifier, it is a mass noun (but when a noun takes an individual classifier, it is not necessarily a count noun). Other times, it is the meaning of quantifiers that determines the status of a noun.

5. Empirical evidence

I now turn to some empirical evidence that bears on my analysis. The purpose is to see if the three-way count-mass distinction proposed in §4 is conceptually motivated. To do this, I will find out if nouns in Chinese denote individuals and if so, to what extent. The issue of individuation by nouns is important for both languages with count-mass syntax and languages with classifiers. For the former, this issue is related to whether the count-mass syntax affects the meaning of nouns. For the latter, the issue concerns whether classifiers play a role in the meaning of nouns, and what bare nouns denote. As mentioned in §1, one approach to Chinese nouns (Krifka 1995; Chierchia 1998a, 1998b) takes the view that Chinese bare nouns are mass nouns. For both types of languages, the technique that has been used to explore this issue is quantity judgments, first employed by Gathercole (1985), where subjects are asked to compare one or two large objects with three or six small objects and evaluate which group is more in quantity.

For count-mass languages, Barner and Snedeker (2005) show that in English certain nouns are not affected by the syntax, while others are. In particular, in quantity judgment tasks, subjects base their judgments on number for object-mass nouns such as *furniture*, but their judgments vary for flexible nouns such as *string* and *stone*—the judgments are based on number in the context of count nouns, and on volume in the context of mass nouns. Inagaki and Barner (2009) further show that for cross-linguistic variable nouns such as *spinach*, which is singular in English, but plural in French, subjects base their quantity judgments on volume in English, but on number in French. These studies suggest two things: first, objects that have natural discrete units, e.g. furniture, are not necessarily grammatically countable in English; second, count-mass syntax affects a particular type of nouns—flexible nouns, but it does not

affect count nouns and mass nouns, either substance-mass nouns or object-mass nouns.

For classifier languages, Inagaki and Barner (2009) and Barner et al. (2009) show that in Japanese there is also variation on quantity judgments with respect to type of nouns. Subjects base their judgments on number for nouns comparable to English count nouns and object-mass nouns, on volume for nouns comparable to English substance mass nouns, and about half on number for nouns comparable to English flexible nouns. This suggests that in Japanese some of the nouns denote individuals, and that classifiers are not necessary for nouns to specify individuation. There have also been quantity judgment studies on Chinese. Li and Lin (2008, 2009) look at whether nouns differ on the basis of the type of classifiers they take. They find that subjects base their judgment on number for nouns that take individual classifiers, and on volume for nouns that take measure words. Cheung (2010) tests whether classifiers are necessary for specification of individuals, and the results show that they are not. Thus, for classifier languages these studies suggest that classifiers do not play much role in the specification of individuals, and that nouns differ in their ability to denote individuals. However, these studies do not relate their results to a grammatical distinction of count and mass nouns in Chinese.

Guided by the proposal made in §4, I conducted an experiment on quantity judgments to find out if the three-way distinction proposed above is conceptually motivated. The analysis proposed here predicts that count nouns will be judged by number, mass nouns by volume, and flexible nouns in the middle range. In particular, it predicts that judgments of the three types of nouns will be significantly different from one another. We will see if this prediction is borne out.

5.1 Methods

254 undergraduate students of a university in Taiwan participated in a quantity judgment task. 20 nouns were included in the study, which covered count nouns, mass nouns and flexible nouns. Each noun was represented by a picture which included two characters, one with one or two large items, and the other with three or six small items. The volume of the one large item was greater than the combined volume of all the small items. For mass nouns, one character had one or two large portions of substance or stuff, while the other had three or six small portions. For flexible nouns, the entities are presented in individualized forms, e.g. two long strings vs. six short strings, and one large piece of paper vs. three small pieces of paper. One of the flexible nouns denoted a super-ordinate category, *shuiguo* 'fruit', and the picture contained a large watermelon and three apples. In addition, some of the stuff denoted by mass nouns was presented in containers, such as Coke in bottles and tea in tin cans. The purpose was to find out if the presence of containers would increase the chance of some substance or stuff being viewed individually. The pictures were presented in random order, and the subjects were asked to make quantity judgments on each of the 20 pictures, deciding which character has more (e.g. *shei de jiaju bijiao duo*? 'Who has more furniture?') by making a choice between the two characters.

Figure 1: Sample pictures used in the study

5.2 Results

The overall results are given in Figure 2, arranged in terms of the three-way distinction given in (29) below. The percentage is the percentage of subjects that judged an object based on number.
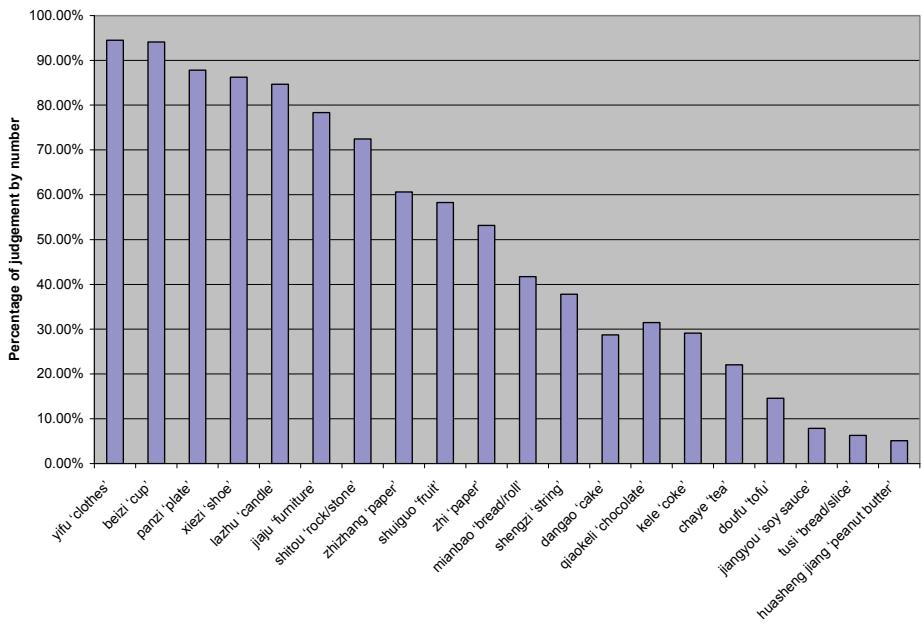

Figure 2: Percentages of twenty nouns judged by number

The objects were classified into three groups according to the semantic criteria discussed above; that is, count nouns are quantified by number, mass nouns quantified by volume and flexible nouns quantified by either. The three groups and their members are shown in (29):

(29) Three types of nouns

(a) <u>count</u>	number	volume	% of number	score
yifu 'clothes'	240	14	94.49%	226
beizi 'cup'	239	15	94.09%	224
panzi 'plate'	223	31	87.80%	192
xiezi 'shoe'	219	35	86.22%	184
lazhu 'candle'	215	39	84.65%	176
jiaju 'furniture'	199	55	78.35%	144
shitou 'rock/stone'	184	70	72.44%	114
(b) <u>flexible</u>				
zhizhang 'paper'	154	100	60.63%	54
shuiguo 'fruit'	148	106	58.27%	38
zhi 'paper'	139	115	53.15%	24
mianbao 'bread/roll'	106	148	41.73%	−38
shengzi 'string'	96	158	37.80%	−62
dangao 'cake'	73	181	28.74%	−108
(c) <u>mass</u>				
qiaokeli 'chocolate'	80	174	31.50%	−94
kele 'coke'	74	180	29.13%	−106
chaye 'tea'	56	198	22.05%	−142
doufu 'tofu'	37	217	14.57%	−180
jiangyou 'soy sauce'	20	234	7.87%	−214
tusi 'bread/slice'	16	238	6.30%	−222
huasheng jiang 'peanut butter'	13	241	5.12%	−228

The findings clearly show that nouns in Chinese behave differently with respect to specification of individuals; some nouns refer to individuals, some do not, and still others do not show clear tendencies. The three groups (count, flexible, and mass) show mostly non-overlapping percentage ranges. All of the count nouns received higher percentages than all of the flexible nouns, and all of the flexible nouns except for one (*dangao* 'cake')[5] are higher than all of the mass nouns.

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[5] The reason *dangao* 'cake' received a lower percentage on number than *qiaokeli* 'chocolate' and *kele* 'coke' might be due to the fact that both of the latter were presented in bottles and packages, which increased the degree of individuality.

We will now compare the three groups. If concrete nouns in Chinese show a three-way distinction, as proposed here, we would expect the subjects to respond to the three groups of objects differently from one another. That is, we would expect significant effect between any two groups in (29). To see if this is the case, ANOVA was used. First, all of the responses that were based on 'number' were coded as 1, and all of the responses that were based on 'volume' were coded as –1. The resulting scores of the three groups are given in the last column in (29). These three sets of scores were entered into a one-way ANOVA; the independent variable is the noun distinction (count, flexible and mass), and the dependent variable is the judgment score. The result is significant $F(2, 17) = 75.19$, $p < .0001$. Post-hoc tests further show that significant effect is found between all three pairs, (a) (b), (a) (c) and (b) (c), $p < .01$ for all three. This means the subjects treated each type of nouns differently than the other two types of nouns. This is strong support for a grammatical distinction of nouns in Chinese into three types.

6. Conclusion

This study argues that the count-mass distinction in Chinese does exist, but the distinction is made by resorting to both syntax and semantics and not by syntax alone. Despite the potential link between classifiers and the count-mass distinction, classifiers only play a secondary role in the distinction. Information on whether a noun is count or mass resides on the noun itself, and not on the classifier. Therefore, classifier syntax is not the same as count-mass syntax as it does not reliably distinguish count nouns from mass nouns. A three-way distinction among Chinese nouns is proposed: count, flexible and mass. The distinction receives empirical support from quantity judgments. The subjects treated each of the three types of nouns differently than the other two types of nouns, suggesting that the postulation of a three-way distinction of nouns in the Chinese grammar is conceptually motivated and psychologically real.

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