Re-examining the Mass-Count Distinction*

Alan Bale (Concordia University) and Brendan Gillon (McGill University)

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Abstract

This paper argues that the mass-count distinction does not represent a fundamental division between the world's languages. We demonstrate that such a distinction, as commonly defined within the linguistic literature, often conflates two facts: the semantic fact, found in all languages, that some words have atomic denotations and some do not, and the morphosyntactic fact, found in languages with contrasting singular-plural morphology, that some nouns have both singular and plural forms while others have only one such form. By comparing English with Mandarin Chinese, we discuss whether this morphosyntactic distinction might correlate with the presence or absence of a rich classifier system (as well as other types of quantification). This potential correlation has greatly influenced how linguists have investigated nominal systems across languages and it has even led some to hypothesize that morphosyntactic subcategories might determine the ways in which a grammar can "count" and "quantify." We outline some important exceptions to this proposed correlation in languages such as Ch'ol, Mi'gmaq and Western Armenian. The paper concludes by arguing not only that there is no such correlation, but that linguists should rethink how they investigate nominal systems, focusing more on lexical variation (even within a single language) than on parametric variations across languages.

1 Introduction

Since the 1990's, a number of authors (Krifka 1995; Chierchia 1998; Cheng and Sybesma 1999 among others) have investigated salient differences between English and Mandarin Chinese. As has been widely noted, English nouns have contrasting grammatical number morphology, while Mandarin Chinese nouns generally do not. Furthermore, whereas Mandarin Chinese has an elaborate system of classifiers, English does not. Many researchers have suggested that these differences are an instance of a fundamental division

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in the world's languages, namely, that languages without contrasting grammatical number, such as Mandarin Chinese, often have classifiers and that languages with grammatical number contrasts, such as English, often exclude them. Moreover, such researchers suggest that this division reflects differences in the types of denotations assigned to nouns in the two types of languages.

In this paper, we show, first, that the contrast between English and Mandarin Chinese has important exceptions, second, that these differences between the two languages do not necessarily bear on the kinds of denotations assigned to common nouns, and third, that it does not reflect any fundamental division between the world's languages. With respect to the last point, we shall show that there are languages whose nouns pattern neither with English nor with Mandarin Chinese. Examples of such languages are Western Armenian, an Indo-European language, Ch'ol, a Mayan language spoken in northern Chiapas in southeastern Mexico, and Mi'gmaq, an Algonquian language, spoken in the northeast of North America.

The empirical observations discussed in this paper are similar to those mentioned in Borer 2005 and Wilhelm 2008. Borer (2005) also examines Western Armenian, demonstrating how a systematic singular-plural contrast can co-exist with a rich classifier system (see also Donabédian 1993). These facts will be reviewed in section 3.1. However, unlike Borer (2005), we highlight the denotational differences between Western Armenian and English singular nouns. Furthermore, we do not make any claims about classifiers and plural marking being in complementary distribution. However, this claim is irrelevant in the context of the mass-count distinction. Similar in spirit to Borer 2005, Wilhelm (2008) observes that some languages, such as Dëne Sųłiné, a Northern Athapaskan language spoken in Northern Canada, allow, like English, for numerals to combine directly with nouns and yet, like Mandarin Chinese, do not have a singular-plural contrast. Such languages are not compatible with prototypical mass-count and classifier languages. Although we do not review the facts in Dëne Sųłiné, we review similar facts in Western Armenian (section 3.1) and also demonstrate a complete dissociation between different means of numeral modification and nominal denotations (section 3.2).

Our reviews of Western Armenian, Mi'gmaq and Ch'ol contribute to a growing body of literature that has called into question whether there is a parametric distinction between classifier languages on the one hand and mass-count languages on the other, especially with respect to understudied languages. However, the discussion of other languages is often clouded by a misunderstanding and oversimplification of the differences between Mardarin and English which we hope to avoid. For example, the conclusions we reach from this review are quite different from those reached by Borer (2005) and Wilhelm (2008). First, we emphasize that the mass-count distinction, a morphosyntactic one, should not be confused with the semantic division of nouns into those with atomic denotations and those without. Such confusion only muddies the waters in terms of cross-linguistic observations. Second, we note how the existence of other types of languages such as Ch'ol, Mi'gmaq and Western Armenian weakens the claim that the mass-count distinction has any significant correlation with other parts of the grammar (i.e., the numeral system and/or the quantifier system). At best, the mass-count distinction seems to have a role similar to that of nominal features such as gender (±feminine, ±masculine) or animacy (± animate).

The aim of this paper is not to propose a new theory of the mass-count distinction,

nor is it to replace the old divisions with an upgraded more nuanced partition. As a result, there is much discussion of data but no formal theory. The goal of this paper is to call into question the whole project of searching for meaningful cross-linguistic divisions with respect to the mass-count distinction. This is not to deny that such a project has borne many fruits over the last few decades—it has led to a deeper analysis of number marking, quantifier distribution and numeral modification. However, at this point it might be more productive for researchers to concentrate on the various particular phenomena thought to be involved in assessing the mass-count distinction without trying to force correlations between them, indeed without even asking the question of whether any particular language is a "mass-count language" or a "classifier language."

2 Prototypical mass-count and classifier languages

English and Mandarin Chinese are often used as prototypical examples of mass-count and classifier languages respectively. In this section we will review some of the basic facts in these languages, discussing singular-plural contrasts, quantifier distribution, numeral modification and the nature of nominal denotations. As discussed, it is important to note some of the exceptions to certain generalizations commonly made about numeral modification and nominal denotations in the two languages. Furthermore, in comparing these two languages, it is vital to keep in mind that the mass-count distinction, as it is traditionally defined, does not parallel the semantic distinction between atomic and non-atomic denotations (see Bunt 1985; Gillon 1992; Chierchia 1998; Bale and Barner 2009; Rothstein 2010; Deal 2017). Although it is clear that both types of languages have a division between atomic and non-atomic denotations, this does not hold for the division of nouns into the subcategories of mass and count.

2.1 English: A mass-count language

Before discussing the details of the grammatical properties of English noun phrases, let us bear in mind some common sense observations about quantity and counting. To simplify matters, we will confine our attention to concrete, physical things. Let's first consider ways of measuring the quantity of objects, such as eggs (as opposed to substances like oil). Although eggs could be weighed or measured by volume, the most salient way of calculating their quantity is by counting the number of objects. Critically, counting involves individuating one object from another (i.e., a method of determining under what conditions a mass of stuff counts as a single egg, see the discussion in Simons 1987; Moltmann 1997). In contrast, determining the quantity of something such as oil is a little trickier. At least to common sense, oil does not comprise a collection of individuals which are distinguishable from one another. So, in such cases, one resorts to a replicable measure, say some standard sized cup. One counts up the number of measures that are equal to the quantity of oil. These two ways of determining quantity are not mutually exclusive. Suppose that there is some rice on the counter. To determine its quantity, one can, of course, count the number of grains (something we rarely do), or alternatively, one could place the grains in a equal sized containers and count the containers (as is usually done when cooking).

English has different grammatical expressions that roughly track these two different ways of counting. For example, English speakers will often directly modify singular and plural nouns with numerals to express the counting of individuals (e.g., *one egg* or *five eggs*), whereas they will use measure terms to express the counting of measurements (e.g., *one cup of oil* or *five litres of oil*).[1] Critically, while many English common nouns, such as *egg*, admit a contrast between a singular and plural form, many others, such as *oil*, do not—at least not without a shift in meaning. (See Gillon 2012 §2 for details.) Those that do admit this contrast were dubbed *count nouns* by Otto Jespersen (Jespersen 1924 pp. 198–200) and those that do not *mass nouns*. Leonard Bloomfield was one of the first linguists to discuss thoroughly the morpho-syntactic properties of this distinction in English (see Bloomfield 1933 pp. 205–206, 252). Here, in brief, are the properties he noted:

- **Singular-Plural Contrast**: Count nouns have alternate forms corresponding to singular and plural. Mass nouns do not have alternate forms: they have only a singular form (though there are some with only a plural form).
- **Antecedents**: Only noun phrases headed by count nouns in the singular serve as antecedents for the pronouns *another* and *one*.
- **Quantifier Distribution**:
  i. The indefinite article, the determiners *each*, *every*, *either*, *neither* and the cardinal numeral *one* modify only count nouns in the singular.
  ii. The determiners *few*, *a few*, *fewer*, *many*, *several* and the cardinal numerals greater than or less than *one* modify only count nouns in the plural.
  iii. The determiners *all*, *enough* and *more* may modify mass nouns or plural count nouns, but not singular count nouns; and mass nouns and plural count nouns, but not singular count nouns, may occur without a determiner.
  iv. Finally, *little*, *a little*, *less* and *much* modify only mass nouns.

Note with respect to point (iv), it is likely that *much*, *less* and *a little* are systematically related to *many*, *fewer* and *a few* respectively. For example, these modifiers seem to share an underlying meaning as demonstrated by the relative synonymy of the pairs *too*

[1] We say "roughly track" different ways of counting since grammatical expressions do not always correlate with methods of verification. For example, I could verify whether it is true that there are "two thousand people in the room" by counting each person or by organizing people into groups of twenty and then counting the groups. Indeed, it is this second method which Herodotus reports to have been used by Xerxes in determining the quantity of soldiers in the army he took to invade Greece in 480 bce:

> At Doriscus Xerxes was occupied in numbering his troops. The grand total, excluding the naval contingent, turned out to be 1,700,000. The counting was done by first packing 10,000 men as close together as they could stand and drawing a circle round them on the ground; they were then dismissed, and a fence, about waist-high, was constructed round the circle; finally other troops were marched into the area thus enclosed, and dismissed in their turn, until the whole army had been counted.
> (Herodotus *The Histories*, translated Aubrey de Slincourt, Penguin 1954, 1972: 465–6.)

much furniture vs. *too many items of furniture*, *less furniture* vs. *fewer items of furniture* and *a little furniture* vs. *a few items of furniture*. Given the synonymous nature of these pairs, it is plausible that the contrast between them is due to some kind of *suppletion*—e.g., *much* and *many* are phonological realizations of the same underlying morpheme. Under this analysis, the difference in how the morpheme surfaces would be triggered by the grammatical environment it appears in, in this case adjacent to a plural count noun or a mass noun (see Wellwood 2014 for more details). This phenomenon is typical of other forms of nominal subcategorization, such as gender. For example, the form of the definite determiner in French is determined by the gender and number features on the following noun: *le* before singular masculine nouns, *la* before feminine singulars, and *les* before plurals.[2]

The mass-count distinction, as elaborated by Bloomfield, is purely morpho-syntactic and should not be confused with the semantic distinction between having an atomic and non-atomic denotation. Let us explain what we mean by *atomic* and *non-atomic denotation*. By *denotation*, we mean the set of things of which the noun is true. For the sake of clarity of judgement, let us confine our discussion to common nouns for material things. The noun *shoe*, for example, is true of individual shoes, taken one at a time, but it is not true of any proper part of a shoe, say, of a shoe's heel, nor of any collection of shoes. The common noun *oil*, in contrast, is true not only of, say, the contents of a cup of oil, but also of virtually any arbitrarily chosen, observable portion of the cup's contents. We shall refer to the denotation of common nouns such as *shoe* as atomic, and to the denotation of common nouns such as *oil* as non-atomic. (For a more precise characterization of atomic denotations and a discussion of related problems, see Gillon 2012 section 3.2, Bale and Barner 2009, Link 1983, Chierchia 1998, Rothstein 2010, among others. For those interested in the ontological question of the relation between an atom, a whole, and its parts, see Simons 1987, especially Part II as well as Moltmann 1997.)

A moment's reflection shows that the mass count distinction, which is a morphosyntactic one, and the atomic non-atomic distinction, which is a semantic one, do not align. Thus, whereas each count noun has an atomic denotation, there are some so-called mass nouns with atomic denotations as well. Indeed, English has hundreds, if not thousands. To name just a few: *artillery*, *clothing*, *company*, *footwear*, *furniture*, *infantry*, *luggage*, *pottery*, *traffic*, *underwear* and *weaponry*. To determine the quantity of such things, one counts the things. Thus, for example, suppose that there are three suitcases in the lobby. Of course, if one uses the English count noun *suitcase* to express the quantity, the expression is just *three suitcase-s*. However, if one uses the English non-count noun *luggage*, the expression is neither *three luggage* nor *three luggages*. Rather, it is *three pieces of luggage*. To express the quantity of things which are denoted by a mass noun with an atomic denotation, one uses the same kind of expression as one uses with non-atomic mass nouns, but, instead of using measure terms, one uses terms such as *article*, *item*, *piece* etc. Thus, one speaks of *two articles of clothing*, *one piece of equipment*, *three items*

[2]One might wonder whether the form of the determiner is triggered by the denotational nature of it's complement noun. In other words, *many* appears with nouns whose denotations do have atomic minimal parts, whereas *much* appears elsewhere. However, the phonological realization of this morpheme seems to be purely syntactic. For example, the mass nouns *furniture* and *footwear*, which have atomic denotations, cannot appear immediately after *many* (e.g., *too much furniture/footwear*, **too many furniture/footwear*).

of furniture etc.

It is important to emphasize that evidence from comparative constructions demonstrate that competent speakers of English do indeed attribute to these words an atomic denotation. As shown by Bale and Barner (2009), the mass nouns with atomic denotations permit a comparison by number in comparative sentences in a way that is impossible for nouns with non-atomic denotations. For example, the sentences in (1a) and (1b) can be evaluated in terms of number of items. Even if John only has three small chairs, four small side tables and a small couch whereas Mary has two giant chairs and a huge couch that weighs more than all of John's items taken together, John still has more chairs and more furniture than Mary.

(1) a. John has more chairs than Mary.
b. John has more furniture than Mary.
c. John has more mud than Mary.

In contrast, nouns with non-atomic denotations, such as *mud* in (1c), never permit a comparison by number. Suppose John has five small buckets of mud whereas Mary has one huge bucket. If Mary's bucket has more mud in terms of mass or volume, then the sentence in (1c) is false no matter how the substance is divided.

Moreover, as first pointed out by Bunt (1985), adjectives such as *large*, which are true of denotationally atomic things, may be used as attributive modifiers of common nouns, whether count or mass, provided their denotation is atomic. (See also Schwarzschild 2011; Rothstein 2010; Bale and Barner 2009.) These same adjectives make no sense when used with mass nouns with non-atomic denotations, such as *metal*.

(2) a. The large chairs should go into the dining room.
b. The large equipment should be placed in the garage.
c. ? The large metal should be placed in the garage.

Another possible correlation with the mass-count distinction concerns the representation of number. In English, there is a class of bare nouns that clearly have a singular interpretation when they appear without number morphology. This can be seen with their behaviour in predicate position, where such nouns cannot be true of groups. Consider the behaviour of the count noun *boy* in (3) in contrast to the behaviour of the mass noun *furniture* in (4).

(3) a. John is a boy.
b. * John and Bill are a boy.

(4) a. This couch is furniture.
b. This couch and this chair are furniture.

The singular count noun can only be predicated of individuals whereas the singular mass noun can be predicated of either individuals or groups. It is important to point out that at least on the surface, there is a morphological distinction between the singular count nouns and mass nouns in predicate position, namely the presence of the indefinite article. However, the indefinite article in this position seems to be semantically vacuous in the sense that for any N, $[\![\textit{is a } N]\!]$ is denotationally equivalent to $[\![N]\!]$, at least with respect to number (see Partee 1987; Montague 1974; Keenan and Faltz 1985; Quine 1960, among

others).[3] Furthermore, the singular nature of the denotation of these nouns appears in other contexts where the indefinite article is not present. For example, *some couch* and *the couch* can only be used to talk about singular individuals whereas *some couches*, *the couches*, *some furniture* and *the furniture* can be used to talk about pluralities. This inability to be a predicate of groups seems to be a unique property of bare count nouns.

In summary, English has a morpho-syntactic mass-count distinction that does not parallel the semantic division of nouns into those with atomic and non-atomic denotations. The morpho-syntactic distinction has five main characteristics. 1) It serves as a trigger for allomorphic variation—e.g., *much* vs. *many*. 2) It restricts how numerals modify nouns—e.g., count nouns allow for direct modification, mass nouns require the use of measure words. 3) It restricts the distribution of non-numeral quantifiers—e.g., some quantifiers like *each* only apply to singular count nouns and others like *several* only apply to plural count nouns. 4) It restricts the forms of pronouns—e.g., only singular count noun phrases can serve as antecedents for *another* and *one*. 5) It restricts the interpretation of bare nouns—e.g., bare count nouns have a truly singular denotation whereas bare mass nouns are unspecified for number.

2.2 Mandarin: A classifier language

Mandarin Chinese, like English, distinguishes between proper nouns and common nouns (Chao 1968 ch. 7.1.8).[4] However, unlike English where an extremely large number of common nouns exhibit contrasting singular-plural morphology, almost no nouns in Mandarin Chinese do. There are a few exceptions, namely personal pronouns and some common nouns denoting humans, the singular versions of which are the bare noun and the plural versions of which have the suffix *-men* (Chao 1968 pp. 244–245), yet this type of plural marking is very limited and far different from English. In light of the almost complete absence of number morphology in Mandarin Chinese, it comes as no surprise that it simply has no counterpart of the morphosyntactic mass-count distinction. While Mandarin has no productive plural morphology, it does have a rich system of classifiers.

To explain what the properties of classifiers are in Mandarin, let us see how Mandarin expresses quantities. Suppose that one has determined a quantity of eggs by counting them. To express this quantity in Mandarin, one uses, like English, a common noun which is true of each of the items counted, namely *jī-dàn* 'egg'. The expression for the quantity comprises a cardinal numeral for the number of eggs, followed by a classifier, followed by the word *jī-dàn*. Thus, for example, if one counts five eggs, one would say the expression in (5a). If there had been only one egg, one would use the expression in

[3]Partee (1987) proposes a type shifting operator that lowers the Generalized Quantifier $[\![a\ N]\!]$ to a set denotation that is equivalent to $[\![N]\!]$. Montague (1974) and Keenan and Faltz (1985) propose that *be* is a function that maps Generalized Quantifiers to sets. In the end, $[\![is\ a\ boy]\!]$ is equivalent to $[\![boy]\!]$. A more traditional approach does not involve any coercion operators at all. Instead it simply assumes that the indefinite article in predicate position receives no interpretation other than to signal a predicative use of *to be*. See, for example, Quine (1960).

[4]Most of the observations discussed in this section have been adduced by a number of authors. They include Cheng and Sybesma 1998, 1999, 2013; Doetjes 1997, 2012; Li and Rothstein 2012; Li et al. 2009; Rullmann and You 2006. We have chosen to cite only the author we know to have adduced the observation first. In almost every case, this has been Chao Yuanren. Other observations, not found in Chao 1968, are taken from Zhang: 2012.

(5b).

(5) a. wǔ gè jī-dàn
five CL egg
'five eggs'

b. yí gè jī-dàn
one CL egg
'one egg'

(6) a. * wǔ jī-dàn
five egg
'five eggs'

b. * yī jī-dàn
one egg
'one egg'

Note that these expressions are typically unacceptable without the classifier, as shown in (6a) and (6b).

Slightly different from the word for egg is the one for oil, *yóu*. The denotation of this noun is not atomic and hence requires a measure word to express quantities. For example, one could specify that the oil should be counted in terms of cups, as in (7a).

(7) a. sān bēi yóu
three CUP oil
'three cups of oil'

b. sān bēi de yóu
three CUP SUBORD oil
'three cups of oil'

This is not, however, the only expression that is compatible with counting oil in terms of cups. One might equally well use the expression in (7b). The word *de* in Mandarin is a subordinator, indicating that the constituent to its left is subordinate to the constituent on its right.

In short, when a cardinal numeral is used with a common noun, if the noun has an atomic denotation, then a suitable classifier is placed between the cardinal numeral and the noun, if the noun has a non-atomic denotation, then a measure word is placed between the cardinal numeral and the noun (Chao 1968 ch. 7.2 (2), or p. 509). This is, in fact, no different from the alternation we saw above for English mass nouns, a cardinal numeral requires a measure word for a noun with an non-atomic denotation and a pseudo-measure word for a noun with an atomic denotation. There is, of course, a difference. In English, the preposition *of* is required before the noun in each case, whereas in Mandarin, the subordinator *de* is excluded from occurring before a noun when the subordinator occurs after a classifier, and it is permitted to occur before a noun when the subordinator occurs after a measure word.[5] In addition, there is the curiosity that a classifier may be omitted before a noun with an atomic denotation when the cardinal numeral is a proper multiple of ten, as shown in (8), where the parentheses mark optional material (Chao 1968 ch. 7.8 pp. 574–575).

(8) a. èr-shí (gè) rén
two-ten (cl) people
twenty people

[5] An anonymous reviewer has pointed out that German, for example, does not require any morpheme to intervene between a measure word and the word for the thing measured, as shown by *zwei Flaschen Wein*, literally translated as *two glasses wine*. Our description here is one of the facts in English and Mandarin; no cross linguistic generalization has been stated, nor is one intended.

b. sān-qián (jià) fēi-jī
three-thousand (cl) airplanes
three thousand airplanes

Another difference between measure words and classifiers is that the former have semantic content, whereas the latter have little or no semantic content. This is not to say, of course, that historically a noun and its correlated classifier do not have a semantic connection. Indeed, they do; but synchronically they do not. Again, the same point can be made with regard to mass nouns with atomic denotations and pseudo measure words in English: for example, *article*, as in *four articles of clothing*, or *item*, as in *five items of hardware*, or *piece*, as in *two pieces of furniture*.

There are many classifiers in Mandarin and the choice of classifier depends on the choice of noun. As Chao (1968 ch. 7.2 (1), or p. 507) points out, the common noun in Mandarin determines the classifier much as the common noun in German determines the gender. Here is a sample: *gè* (for anything), *pī* (for horses), *chúang* (for beds), *bǎ* (for objects with a handle), *wèi* (for people), *dào* (for doorways), *shàn* (for doors), *běn* (for books), *bù* (for works), *kuài* (for pieces), *tiáo* (for long thin items such as ribbons, roads, rivers, trousers), *gēn* (for long thin items such as cigarettes, guitar strings), *tóu* (for pigs and livestock), *zhī* (for birds and certain animals, some utensils, vessels), *zhī* (for sticks, rods, pencils), *kē* (for pearls, corn, grains, teeth, hearts, satellites), *kē* (for trees, cabbages, plants), *zhāng* (for flat items such as sheets and for votes), and *duǒ* (for flowers, clouds).

So far, we have confined our attention to expressions of quantity using properly cardinal numerals. But Mandarin, like English, has vague cardinal numerals and other quantificational determiners. These include: *jǐ* (*several, many*), *hǎo-jǐ* (*good many*), *měi* (*each*), *hěn-shǎo* (*very few*), *hěn-duō* (*very many*), *ruò-gān* (*a certain number*), *hǎo-xiē* (*a good deal , quite a lot*), *dà-duō-shù* (*a great number*), *dà-liàng* (*great amount*), *dà-bù-fen* (*large part, most*), *quán-bù* (*whole*), *suǒ-yǒu* (*all*), *rèn-hé* (*any*), *yī-diǎn* (*a bit, a little*), *yī-xiē* (*a few, a little*) and *liáo-liáo-wú-jǐ* (*very few*).

The quantifiers *jǐ* (*several, many*), *hǎo-jǐ* (*good many*), *měi*(*each*), like the cardinal numerals, require a classifier and exclude the subordinator *de*. Moreover, they require that the common noun have an atomic denotation. Similar to these quantifiers are the expressions *dà-duō-shù* (*a great number*) and *liáo-liáo-wú-jǐ* (*very few*). They too can only modify nouns with atomic denotations, however they differ from *jǐ*, *hǎo-jǐ*, and *měi* in that they prohibit the use of classifiers. Only direct modification is possible.

In addition to these expressions, Mandarin has several prenominal quantifiers which, like the English words *lots*, *all* and *more*, occur with common nouns regardless of the atomicity or non-atomicity of their denotations. These include: *hěn-shǎo* (*very few*), *hěn-duō* (*very many*) *dà-liàng* (*great amount*), *dà-bù-fen* (*large part, most*), *quán-bù* (*whole*), *suǒ-yǒu* (*all*), *rèn-hé* (*any*), *yī-diǎn* (*a bit, a little*), *yī-xiē* (*a few, a little*). The last two exclude both classifiers and the subordinator *de*. Thus, they must occur immediately preceding the common noun they are construed with. The first two occur with either or with neither. The remaining occur optionally with the subordinator.

The distribution of non-numeral quantifiers bears directly on the question of the relation between the mass-count distinction and counting so widely discussed in the literature. For example, Krifka (1995), Chierchia (1998) and others have hypothesized that classifiers play a critical semantic role in reconciling the semantic values of nouns with the semantic

values of the prenominal quantity expressions which go with them. Some researchers have even suggested that the nouns that seem on the surface to have atomic denotations do not, in fact, have an atomic denotation until they are in the presence of a classifier. Such a claim is not consistent with the distributional properties of many of the prenominal quantity expressions we saw above: several of them, including all cardinal numerals which are proper multiples of ten are compatible with nouns with atomic denotations regardless of whether or not a classifier is present. In addition, two such prenominal quantity expressions downright exclude the presence of a classifier when they occur before a noun with an atomic denotation. It is much more straightforward to adopt Chao's (1968) view that classifiers are associated with nouns with atomic denotations much like gender is associated with nouns in other languages. On this view, the obvious semantic values are assigned to the various components: nouns with atomic denotations are assigned just that, the set of things of which they are true, the prenominal quantity expressions are assigned the usual values associated with such expressions from other languages. Thus, for example, *měi* (*each*) is assigned a universal quantifier, defined only over nouns with atomic denotations, *suǒ-yǒu* (*all*) is assigned a universal quantifier, defined over both atomic and non-atomic denotations, and *dà-duō-shù* (*a great number*) and *liáo-liáo-wú-jǐ* (*very few*) are assigned vague quantifiers defined only over atomic denotations. Whether or not the prenominal quantity expression takes a classifier is a subcategorization feature of the prenominal quantity expression.

Another important issue to address regarding non-numeral quantifiers is whether the distribution of *dà-duō-shù* and *liáo-liáo-wú-jǐ*, which exclude classifiers and combine only with nouns with atomic denotations, is evidence that Mandarin has the morpho-syntactic subcategories of mass and count. A possible explanation for the distribution of these quantifiers is that they select for nouns with the count feature. This would explain why such quantifiers cannot combine with other types of nominals. However, it is also possible that the meanings of *dà-duō-shù* and *liáo-liáo-wú-jǐ* semantically requires that its complement have an atomic denotation. For example, such an interpretation is given for *liáo-liáo-wú-jǐ* in (9).

(9) $[\![$ liáo-liáo-wú-jǐ$]\!] = \lambda P\colon \textsc{atomic}(P).\ \lambda Q.\ |\sigma(\textsc{cl}_{\vee}(P \cap Q))| = n$, where n is a contextually determined value representing a very low count, σ is a function that selects the supremum (or equivalently the unique maximal element) from a given set, and $\textsc{cl}_{\vee}$ is the function that returns the join closure of a set.

The meaning in (9) presupposes that the nominal argument has an atomic denotation. Its combination with a non-atomic denoting noun would result in presupposition failure. Empirically speaking, it is often difficult to distinguish catastrophic presupposition failure from true cases of ungrammaticality. Since Mandarin Chinese has no cases of allomorphy similar to the *much-many* contrast and has no minimal pairs similar to *furniture* vs. *chairs*, there is no reason to think that the patterns within the DP reflects anything other than the semantic division between atomic and non-atomic denotations rather than the syntactic division into mass and count.

Besides the distribution of quantifiers, Mandarin is also quite different from English in that bare nouns have a univocal interpretation. Recall that in English, there is a difference between a bare noun like *chair* and one like *furniture*. Only *furniture* can be predicated of groups. In Mandarin, all nouns with an atomic denotation behave like

furniture. The noun *háizi* ('child') in (10) is representative of the general pattern.

(10) a. Zhāngsān shì háizi
Zhangsan be child
'Zhangsan is a child.'

b. Zhāngsān hé Lǐsì shì háizi.
Zhangsan and Lisi be child
'Zhangsan and Lisi are children.'

As shown in (10), *háizi* can be predicated of both groups and individuals. It is possible that this is a general property of classifier languages—i.e., they systematically lack a singular interpretation of bare nouns.[6]

In summary, unlike English, Mandarin has a rich classifier system, confines direct numeral modification to only a handful of syntactic environments, and lacks a productive distinction between singular and plural nouns. Furthermore, although a semantic distinction exists between atomic and non-atomic denotations, there is no evidence of nominal morpho-syntactic subcategories. The co-occurrence of quantifiers and nouns in DPs seems to track only the semantic distinction. There are no minimal pairs of nouns like *furniture* and *chair* where each noun has an atomic denotation but where one noun patterns with substance denoting nouns and the other does not. Similarly, there are no allomorphic variations in the quantifier system similar to *much* versus *many* where the same quantifier takes a different form depending on the subcategory of noun that it modifies. Finally, bare nouns in Mandarin have a number neutral interpretation across the board, much like English mass nouns.

3 Moving away from the prototypes

Researchers who study the mass-count distinction have done so under the very reasonable assumption that there is a connection between the list of differences discussed in sections 2.1 and 2.2. After all, it is clear that mass-count subcategories have some correlation with whether a noun has an atomic denotation (i.e., all count nouns have atomic denotations) and it is clear in English at least that direct numeral modification correlates with one of the subcategories. It is a natural hypothesis to assume that the major differences between English and Mandarin have their roots in the mass-count distinction. However, examinations of other languages cast doubt about whether this reasonable assumption is warranted.

In this section we discuss three languages that challenge the idea that the mass-count distinction is at the root of the differences between English and Mandarin. We present evidence first discussed by Donabédian (1993) and Borer (2005) that languages with a productive plural marker can also have a rich classifier system. Like Wilhelm (2008), we

[6] A reviewer suggested that *shì gè háizi* would be a more appropriate counterpart to the predicate *is a child*, where *gè* is the default classifier. Implicit here is the comparison of the classifier with the indefinite article. Although this might be the more appropriate translation (since *gè* does imply singularity), our purpose here is to assess the denotational characteristics of the bare noun rather than the denotational characteristics of a phrase that includes a classifier and a noun. As argued above, the indefinite article in predicate position in English seems to be semantically vacuous with respect to number and hence the bare noun in Mandarin provides the more appropriate comparison.

also note that direct numeral modification can apply to bare nouns that are unspecified for number (once again, unlike either English or Mandarin). Finally, we discuss evidence first presented by Bale and Coon (2014) that the presence or absence of direct numeral modification is completely independent of whether the nominal system has subcategories or not.

3.1 Western Armenian

Western Armenian shares many properties with Mandarin, but also bears some similarities to English. Like Mandarin, Western Armenian has a rich classifier system, lacks true singular interpretations, and lacks most of the morphological indications of there being a syntactic mass-count distinction. However, like English, there is a productive plural marker and numerals can combine with nouns without the mediation of a classifier.

On the surface, Western Armenian looks like a classifier language without a mass-count distinction. There are no quantifiers that demonstrate an allomorphic variation that depends on nominal subcategories (as with *much* vs. *many* in English). Furthermore, there are no minimal pairs, like *furniture* vs. *chair*, where both nouns have atomic denotations but only one patterns distributionally with substance denoting nouns.[7]

Given these facts, it is rather unsurprising that Western Armenian has a rich classifier system. Consider the DPs in (11) and (12).

(11) a. yergu had xentsor
two CL apple
'two apples'

b. yergu kilo xentsor
two CL apple
'two kilos of apples'

(12) a. yergu təgal shakar
two CL sugar
'two spoons of sugar'

b. yergu kavat chur
two CL water
'two cups of water'

As shown in (11a), Western Armenian has a default classifier *had* that appears between numerals and nouns. This default classifier, like *gè* in Mandarin, does not impose a unit of enumeration but rather licenses counting based on the intrinsic atomic parts in the denotation of the noun. Just as in Mandarin, such classifiers occupy the same position as other measure terms, as shown in (11b) and (12). Furthermore, these classifiers differ systematically from partitive constructions with measure nouns, as in the English expressions *two slices of cake* or *two items of furniture* (see Khanjian 2012 for a discussion).

Not only does Western Armenian have a rich classifier system, but bare nouns have a number neutral interpretation similar to bare nouns in Mandarin (Donabédian, 1993; Borer, 2005; Bale and Khanjian, 2008, 2014; Bale and Barner, 2012). Consider the sentences in (13).

[7]The evidence most indicative of a mass-count distinction is the bahaviour of nouns in true partitive constructions. As discussed by Khanjian (2012), nouns that have denotations with atomic minimal parts must appear in partitive constructions with a plural marker while nouns that do not have such a denotation must not appear with the plural marker. However, it is unclear whether this distinction is due to the different nature of the denotations rather than the presence of nominal subcategories. Recall that quantifiers in Mandarin are also sensitive to the atomic non-atomic distinction.

(13) a. Aram-ə dəgha e.
Aram-DEF boy be.PRES.3.SG
'Aram is a boy.'

b. Aram-ə yev Nanor-ə dəgha en.
Aram-DEF and Nanor-DEF boy be.PRES.3.PL
'Aram and Nanor are boys.'

The singular noun, *dəgha*, can be predicated of both plural and singular subjects, thus indicating that the predicate is true of both groups and individuals.[8]

In contrast with these Mandarin-like properties is the presence of a productive plural marker in Western Armenian.[9] This is shown in (14a).

(14) a. John-ə yev Brad-ə dəgha-ner en.
John-DEF and Brad-DEF boy-PL are
'John and Brad are boys.'

b. * John-ə dəgha-ner e.
John-DEF boy-PL is

This marker can attach to any noun that has atomic minimal parts in its denotation. In contrast to the bare noun, the plural noun can only be predicated of plural subjects, as shown in (14b) (Bale and Khanjian, 2008; Bale et al., 2011; Bale and Khanjian, 2014).

Also, unlike Mandarin, classifiers are completely optional for nouns that have atomic minimal parts in their denotation. Consider the sentences in (15) and (16).

(15) a. yergu dəgha
two boy
'two boys'

b. yergu dəgha-ner
two boy-PL
'two boys'

(16) a. yergu had dəgha
two CL boy
'two boys.'

b. * yergu had dəgha-ner
two CL boy-PL
'two boys.'

Although the classifier, *had*, can appear between the numeral, *yergu*, and the noun, *dəgha*, as shown in (16a), this is not required. Numerals can combine directly either with singular nouns or plural nouns, as shown in (15). Classifiers are never necessary and the only time they are prohibited is when the noun is plural, as shown in (16b). Borer (2005) provides a syntactic account of why plural marking cannot co-occur with classifiers. In contrast, Bale and Khanjian (2008) offer a semantic explanation, demonstrating that the plural has a more restricted denotation which prohibits it from appearing as a complement to a classifier. Doetjes (2012) observes that Borer (2005)'s syntactic account cannot hold cross-linguistically. Many languages allow plurals and classifiers to co-occur. However, the reasons for the unacceptability of (16b) does not affect our main point. The important

[8]Similarly, bare indefinite nouns are underspecified with respect to whether they quantify over plurals or groups and are the only nominal that participates in Derived Kind Predication (see Bale and Khanjian 2014 for a discussion of the facts).

[9]As noted in previous sections, there is a plural marker in Mandarin, namely *-men*, however this marker can only attach to nouns and pronouns denoting humans, and thus to words with atomic denotations. Its distribution is restricted and therefore not completely productive.

observation is that Western Armenian has a rich classifier system but still allows numerals to combine directly with nouns.

In summary, the patterns in Western Armenian argue against a strong correlation between a rich classifier system and the lack of productive plural marking or the inability to combine numerals directly with nouns. Furthermore, there seems to be no connection between bare nouns having true singular interpretations, plural marking and direct numeral modification (cf. Wilhelm 2008). In other words, Western Armenian does not demonstrate all of the characteristics of a prototypical mass-count language, nor does it have all the characteristics of a prototypical classifier language. Western Armenian is just one example, representative of many others. A closer inspection of the properties involved in diagnosing a mass-count distinction places many other languages in neither category.

3.2 Ch'ol and Mi'gmaq

Many of the grammatical characterizations of the mass-count distinction hypothesize a correlation between properties in the nominal domain (subcategorization and number marking) and the presence or absence of a classifier system. Languages such as Mi'gmaq and Ch'ol demonstrate that this connection is not a plausible cross-linguistic generalization. In these languages, the presence or absence of a classifier is dependent on the numeral modifier and completely independent of the nominal system. In other words, classifier systems might have no connection to the nominal system, and thus should not be viewed as an indication of whether a language lacks a mass-count distinction.

As discussed in Bale and Coon (2014), Mi'gmaq numerals between one and five cannot appear with classifiers when they modify a noun, while other numerals must.[10] Compare the forms in (17) and (18): in (17a) the numeral *na'n* ('five') combines directly with the noun *ji'nmug* ('men') and even acquires nominal agreement morphology, like other modifiers in the language. The classifier *te's* cannot appear between the numeral and noun, as shown in (17b).

(17) a. na'n-ijig ji'nm-ug
five-AGR man-PL

b. * na'n **te's**-ijig ji'nm-ug
five CL-AGR man-PL

(18) a. * asugom-ijig ji'nm-ug
six-AGR man-PL

b. asugom **te's**-ijig ji'nm-ug
six CL-AGR man-PL

In contrast, the numeral *asugom* 'six' cannot combine directly with a noun as shown in (18a). Rather, it must appear with the classifier *te's*, as shown in (18b).[11]

[10] It it not only the numerals from one to five that require the absence of classifiers, but also the complex numerals ending with a numeral from one to five. In other words, the property of requiring or not requiring a classifier is passed to the complex numeral based on the right-hand member.

[11] Since *te's* co-occurs with what appears to be a plural marker (i.e., *-ug*), one might wonder about its status as a classifier (i.e., perhaps it patterns like English measure nouns). Two points are relevant.

Similar facts hold for Ch'ol, although the nature of the contrast is slightly different (once again, see Bale and Coon 2014 for a discussion). Ch'ol, historically speaking, has a traditional Mayan numeral system—a base twenty system—as well as a system borrowed from Spanish. Younger Ch'ol speakers generally know and use traditional Mayan numerals only for numerals 1–6, 10, 20, 40, 60, 80, 100, and 400, the latter used for counting during the corn harvest (Vázquez Álvarez, 2011, 180). Otherwise they use the number words borrowed from Spanish.

As shown in (19), the Mayan numerals, like *cha'* ('two'), require a classifier which morphologically attaches to the numerals.

(19) a. cha'-**p'ej** tyumuty
two-CL egg

b. * cha' tyumuty
two egg

(20) a. * nuebe-**p'ej** tyumuty
nine-CL egg

b. nuebe tyumuty
nine egg

In contrast, the Spanish-based numerals, like *nuebe* ('nine'), cannot be used with classifiers, as shown in (20). It is important to note that this is not an instance of code switching between Spanish and Ch'ol. This pattern holds for monolingual speakers of Ch'ol as well as bilingual speakers.

This tight connection between numerals and the classifiers is reflected in the morphological and syntactic structures of Mi'gmaq and Ch'ol. In Ch'ol, the classifier appears as a suffix on the numeral separate from the noun. In Mi'gmaq, the numeral and classifier form a constituent which can be displaced from the noun as in (21b), although the numeral alone cannot be displaced without the classifier (see 21c).

(21) a. Etlenm-ultijig **asugom te's-ijig ji'nm-ug**
laugh.PRES-PL six CL-AGR man-PL
'Six men are laughing.'

b. **Asugom te's-ijig** etlenm-ultijig **ji'nm-ug**
six CL-AGR laugh.PRES-PL man-PL
'Six men are laughing.'

c. * **Asugom** etlenm-ultijig **te's-ijig ji'nm-ug**
six laugh.PRES-PL CL-AGR man-PL
'Six men are laughing.'

In summary, evidence from Mi'gmaq and Ch'ol demonstrate that certain numerals select for classifiers while others do not. The choice of noun is inconsequential. For these languages, it is untenable to hypothesize that the presence or absence of classifiers is determined by the semantic properties of the noun, as in Chierchia (1998). Rather, these languages favour an analysis in the spirit of (Krifka, 1995), where the numerals take

First, *-ug* cannot attach to inanimate nouns yet can attach to verbs and adjectives. It is questionable whether it has the same status as plural markers such as English *-s*. Second, Mi'gmaq has measure nouns but they do not fit the same syntactic pattern as *te's*. Furthermore, unlike measure nouns, *te's* has no semantic content other than its measure function. In this respect, it behaves more like Mandarin default classifiers. Also, as discussed in Doetjes (2012), Borer (2005)'s hypothesis that plural markers cannot co-occur with classifiers faces many empirical challenges. Several languages permit the two types of marking to be present in the same DP.

measure functions as arguments and classifiers grammatically instantiate these measure functions. Whether all languages have the same semantic and syntactic characteristics as Mi'gmaq and Ch'ol is an interesting empirical question, one that is impossible to address within the limits of this paper, and one which is, in any event, irrelevant to the issue at hand. What is relevant is that the mere existence of languages like Ch'ol and Mi'gmaq demonstrates that subcategorization in the nominal system (i.e., the mass-count division) is, in principle, not connected to classifier systems.

3.3 The case against parameters

The data in Mi'gmaq, Ch'ol and Western Armenian point to a more nuanced perspective regarding the differences between languages with respect to number, classifiers and plural marking. Rather than researching languages for paradigmatic differences in the setting of certain parameters, perhaps researchers should be more focused on the semantics of individual morphemes.

At least in languages like Ch'ol and Mi'gmaq, the requirement or prohibition of classifiers is not due to a global property of the language but rather the individual properties of certain numeral modifiers.[12] Critically, numerals which require classifier and numerals which prohibit them can exist in one and the same language.

An interesting question arises with respect the flexible use of classifiers in Western Armenian. It is possible that numerals in Western Armenian are systematically ambiguous, one meaning requiring classifiers and the other not. It is also possible that the ambiguity lies with the nominal system and that classifiers in Western Armenian are fundamentally different from those in languages like Mi'gmaq and Ch'ol—one set of classifiers serving as nominal arguments and another set as numeral arguments. However, a much more elegant solution would be to hypothesize that numerals can be subcategorized to take classifiers as arguments in much the same way that verbs can be subcategorized for objects. In English, some verbs require objects (e.g., *admire*) and some verbs prohibit objects (e.g., *laugh*), while others are flexible (e.g., *eat*). Perhaps Western Armenian numerals are subcategorized in much the same way as *eat* in English—i.e. the numerals are lexically specified as being flexible. Once again, the individual properties of Western Armenian might be more about the individual specifications of morphological entries rather than a global property of the language.

Similar conclusions can be drawn with respect to the plural morpheme in Western Armenian compared to Mandarin. As mention in section 2.2, Mandarin has a plural morpheme, namely *-men*. Unlike the plural in Western Armenian or English, *-men* can only attach to nouns that denote humans. However, this difference between Western Armenian/English on the one hand and Mandarin on the other need not be a fundamental property of the languages themselves. Rather, it could be a reflection of the idiosyncratic selectional restrictions associated with the morphemes *-s*, *-ner*, and *-men*.

In summary, it might be more productive in terms of advancing the semantic and syntactic analysis of understudied languages to consider the properties associated with the mass-count distinction to be a product of idiosyncratic lexical entries rather than a global property of certain languages. In other words, a child doesn't learn to set a

[12]To a much more limited extent, Mandarin supports the same kind of conclusion. As mentioned in section 2.2, numerals which are a multiple of ten can omit classifiers.

parameter, but instead learns the semantics of the specific morphemes he/she is exposed to. Seemingly global patterns such as "classifier systems" and "mass-count systems" are coincidental epiphenomena of certain lexical entries.

4 Conclusion

There are several conclusions that can be reached given our discussions. One concerns the consistent use of the terms *mass* and *count* when investigating and assessing different types of languages. Researchers should be careful to distinguish syntactic subcategorization from semantic divisions. The semantic division between nouns with atomic denotations and those without is a universal property of all known languages. As a universal property, it does not pattern with any language particular grammatical operation or category. The syntactic division into grammatical *mass* and *count* nouns is, for the most part, independent of the semantic distinction (although there are some implications: i.e., all count nouns have atomic denotations). This syntactic division is not a universal property of all languages.

With respect to this syntactic division, some interesting cross-linguistic questions arise. One is whether this syntactic division correlates with other grammatical properties. Previous literature either implicitly or explicitly assumes that the lack of a mass-count distinction is connected with the presence of a rich classifier system (Krifka 1995, Chierchia 1998, among others). In contrast, the presence of this distinction is connected to (i) allomorphy in the quantifier system, (ii) minimal pairs of atomic denotations, (iii) singular denotations for bare nouns, (iv) the presence of a productive plural marker, and (v) the ability for numerals to directly modify nouns without any classifiers or measure terms. The data from Western Armenian demonstrated that the presence of productive plural marking and the ability to combine numerals directly with nouns does not correlate with the other properties. The data from Ch'ol and Mi'gmaq demonstrated that the presence or absence of a rich classifier system in some languages depends solely on the semantic/syntactic nature of the numeral system. Whether nouns are divided into mass and count is completely inconsequential for these types of classifier systems.

Our discussions are not meant to suggest that classifiers are mediated by numerals in all languages. Rather, our modest point is that these languages weaken correlations between the syntax and semantics of classifiers and numerals on the on hand, and the syntactic mass-count distinction on the other. However, the consequences of this modest point are quite broad. It implies that researchers should not identify a language as having a mass-count distinction by searching for the presence or absence of plural markers or classifiers. It also implies that languages do not cleanly divide into those that are Mandarin-like and English-like. Rather, there is a continuum.

Clearly the dream of a cluster of grammatical properties around the mass-count distinction is fading as more empirical research reveals more varieties of patterns. With this, the hope of characterizing a parameter that links the nominal division to the counting system and numeral modification also fades. Children need to assess separately whether the language they are acquiring has a classifier system, a plural marker, direct numeral modification, true singular denotations or a syntactic mass-count distinction. Children will not be able to infer one property from the other.

One wonders, given these empirical observations, what remains of the mass-count distinction. We have not seen any counter-examples to the hypothesis that bare count nouns have a singular denotation, although we should be careful not to jump to conclusions here. Only a few languages have a formal semantic analysis of their nominal system. Also, not only is it difficult to establish whether a given language has a syntactic division on top of its universal semantic division, it is also difficult to assess whether a language has a true singular denotation. A more established generalization is the connection between allomorphy in the quantificational system and the syntactic mass-count distinction. For example, the difference between *too much furniture* and *too many items of furniture* seems to be purely syntactic. There is good evidence that *much* and *many* are allomorphs of a single underlying modifier. The words are in complementary distribution and have almost identical meanings. It is unlikely that the trigger for the different surface forms of the morpheme is semantic in nature. In almost any context, the denotations of *furniture* and *items of furniture* are practically identical (the set of all singular items and all groups formed from those singulars). Rather, the phonological form of the modifier seems to be dependent on whether the modified nominal has plural count features or mass features. However, there is nothing special about the mass-count distinction in this respect. The presence of allomorphy is well attested with other nominal subcategories, such as those that involve gender or animacy features.

This analogy with other nominal subcategories brings up an interesting question. If the mass-count distinction no longer has consequences for the grammatical representation of numeral modification, then are mass-count features any different from animacy or gender features? The evidence suggests that they are not. The illusory connection to the counting system was an accident of paying too much attention to differences between Mandarin and English.

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