Count-Mass asymmetries: the importance of being count

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4 Count–Mass Asymmetries: The Importance of Being Count

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1. Introduction

The term count–mass distinction (or mass–count distinction), despite its success as a name for a domain of research, suggests a symmetry between count and mass that is not supported by cross-linguistic data. In different domains of grammar, data point towards the idea that 'count' plays an important role in linguistic systems while 'mass' is better characterized as 'not count'.

A first asymmetry is related to the grammatical encoding of count vs. mass. Whereas grammatical markers that are associated with count meaning are common (e.g. number markers, sortal numeral classifiers), grammatical markers that are restricted to mass meaning are at best rare (see for instance Doetjes 1997; Borer 2005; Pelletier 2012).

A second asymmetry between count and mass is related to the sensitivity of quantity expressions to count and mass meaning and count morphology. As in the case of sortal and mensural classifiers, quantity expressions can be divided in two classes, depending on whether they only combine with expressions that have a count denotation or not. Numerals are examples of quantity expressions that are sensitive to count meaning, and so are distributive universal quantifiers and expressions such as *several*. Degree related quantity expressions, such as expressions denoting a large quantity, are examples of quantity expressions that are often insensitive to the count–mass distinction; cf. English *a lot of water/books*. Mass-only expressions (such as *a bit*, *much*) share most of their properties with quantity expressions that are insensitive to the count vs. mass meaning of nouns, and I will argue below that these should not be considered

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to be direct counterparts of count-only quantity expressions such as *several* and the numerals.

A third asymmetry concerns possible meanings of nouns. Whereas there is strong evidence that an opposition between count and mass meanings plays an important role in the lexicon even of languages that seem at first mass-only, there do seem to exist count-only languages (see in particular Lima's work on Yudja; Lima 2014a, 2016; Lima and Rothstein 2020). Deal's (2017) recent arguments against this claim (and in favor of the universality of the count–mass distinction) will be argued to be inconclusive. The linguistic importance of count meaning both for nouns and for selectional properties of grammatical expressions will be argued to reflect the cognitive salience of countable units (objects, agents) and counted quantities (number) in core knowledge systems (see also Doetjes 2017a; for an overview of core knowledge systems, see Spelke and Kinzler 2007).

The second part of the paper will consider count meanings across languages. What types of meanings are count? What are reliable diagnostics for count meaning? Are there differences in this respect between obligatory number marking languages (also commonly called 'count–mass languages') and languages that do not have obligatory number? It turns out that the types of nouns that can be used in count contexts (e.g. in combination with numerals) are strikingly similar across languages.

The data discussed in the paper offer evidence that something like 'natural atomicity' or 'natural countability' exists, but this property is broader than 'atomicity' in a strict sense. The difference between languages with and without inflectional number marking does not seem to be related to fundamental differences in available count meanings, but rather to the presence vs. absence of a grammatical system of number marking and the use a language can make of such a system in order to express what Grimm (2012b) calls 'degrees of individuation'. Despite clear tendencies, whether a noun can or cannot have a count or mass meaning depends often on arbitrary choices.

The organization of this paper is as follows. Section 2 gives a brief overview of the ways in which the terms count and mass have been used in the literature and makes clear how these terms will be used in the current paper. Section 3 focusses on count–mass asymmetries, while Section 4 examines nominal countability and the notion of 'natural atomicity'. Section 5 gives an overview of the main conclusions.

2. Background: What Do Linguists Mean by Count and Mass?

The difference between nouns that can be pluralized and ones that cannot because of the type of meaning they have goes back to early grammatical descriptions, as illustrated by the following description of the meaning of

nouns that name metals in *The Port-Royal Grammar*, written in the seventeenth century by Antoine Arnauld and Claude Lancelot:

> la ressemblance si grande qui est entre les parties des metaux, fait que l'on considere d'ordinaire chaque espece de metail, non comme une espece qui ait sous soy plusieurs individus ; mais comme un tout qui a seulement plusieurs parties. (Arnauld and Lancelot 1660: 38)

> the great resemblance which obtains between the parts of metals results in our considering each species of metal, not as a species which has under it several individuals, but only as a whole which has several parts (Translation: Rieux and Rollin 1975: 75)

The grammar mentions on the same page that certain nouns do not have a plural 'par le simple usage'; in other words, they are simply not used as plurals even though there is no clear reason why.

Tracing the history of the terms 'mass' and 'count', Lasersohn (2011) attributes the first use of the term 'mass', or rather 'mass-word', to Jespersen (1914), who used the term 'thing-word' for (at least some types of) count nouns. The term 'count' was introduced later, around the 1950s. Gleason (1955: 224) explicitly divides English nouns into count nouns and mass nouns: 'English nouns fall in two major classes with regard to the semantic value of number. They may be referred to as count nouns and mass nouns.' Even though mass nouns typically refer to some quantity of substance, Gleason insists on the fact that the classification is in many cases arbitrary: while *rice* is mass, *beans* is count, and *molasses* is mass or count plural, depending on the dialect. Normally, plurals of mass nouns will result in a type reading, e.g. the plural *metals* is used for types of metal. But he also notes that this is not necessarily the case: in *the beauties of poetry* the word *beauties* is plural but does not seem to denote a plurality. The difference that is made between count and mass is thus based on grammatical properties of nouns that are typically found in English. Gleason also acknowledged the general possibility of using typical count nouns with a mass interpretation, as illustrated by his famous example of a mother termite complaining about her son Johnny in (1) (Gleason 1965: 136–7). He concludes that given the right context, all nouns may well have mass and count uses.

(1) Johnny is very choosey about his food. He will eat book, but he won't touch shelf.

Within the philosophical literature, Quine (1960) focuses on semantic properties of 'count terms' and 'mass terms.' Quine observes that mass terms are characterized by the referential property of cumulative reference, as illustrated in (2):

(2) Any sum of parts which are water is water. (Quine 1960: 91)

The type of reference that characterizes count terms such as *apple* is called divided reference. The noun *apple* gives information of 'how much counts as *an* apple' (Quine 1960: 91); in other words, it contains information on what the units of counting are. Divided reference is reserved for count terms. Mass terms do not divide their reference, and this is considered to be a property of the term rather than of the stuff they name: *shoe*, *pair of shoes*, and *footwear* 'range over exactly the same scattered stuff, and differ from one another solely in that two of them divide their reference differently and the third not at all' (Quine 1960: 91).

Plurals also have divided reference (that is, *shoes* differs in this respect from *footwear*). In the first stages of acquiring plural forms, however, children may well not be aware of this, because they may treat plurals as if they were mass terms, which lack divided reference (Quine 1960: 93). The parallels between plural and mass expressions can be illustrated by the validity of the inference in (3), which shows that plurals are characterized by the property of cumulative reference illustrated in (2) for mass nouns as well (see Cartwright 1979 for further parallels and differences between plurals and mass nouns).

(3) If the animals in this camp are horses, and the animals in that camp are horses, then the animals in both camps are horses. (Link 1983: 303)

C.-Y. Cheng (1973) formalizes the absence of divided reference observed for mass expressions in terms of distributive reference. In addition to cumulative reference, mass nouns are claimed to also have distributive reference, resulting in the validity of the following inference:

(4) a. If A is water, then a subpart of A is water as well.
b. 'Any part of the whole of a mass object which is *w* is *w*.' (C.-Y. Cheng 1973: 287)

Distributive reference distinguishes mass nouns from plurals, as illustrated by the invalidity of the inference in (5):

(5) If A is apples, then a subpart of A is apples as well.

The combination of distributive and cumulative reference is called homogeneous reference. The concept of distributive reference has widely been acknowledged to be problematic: even for nouns such as *water* it is clear that at some point it will not be possible to divide a quantity of water into two subparts that are water as well (see for instance Quine 1960; Bunt 1979; Hoepelman and Rohrer 1981; Landman 2000). For nouns such as *furniture* or *footwear* the question is even more serious, as the inference in (6) is similar to the inference in (5).

(6) If A is furniture, then a subpart of A is furniture as well.

Whereas for the noun *water* one can maintain that it cannot be determined what counts as a minimal part, it is very clear what a minimal part of furniture is. A subpart of a piece of furniture is not a piece of furniture (McCawley 1975), despite the fact that the noun has the distribution of a mass noun (see Bunt 1985; Lønning 1987; Nicolas 2002b for discussion on how to interpret distributive reference in such a way that it applies to these nouns as well).

Link (1983) also makes a distinction between mass and count terms, but focuses mainly on the difference between objects and substances, claiming that there is a difference between a count domain and a mass domain, both of which are subsets of the domain of individuals, which is formalized as a Boolean algebra. The distinction between the two domains makes it possible to distinguish between an object and the material this object is made of, which explains the so-called ring paradox: a ring can be new, while the gold the ring is made of is old. The same physical object can thus be old and new depending on whether we consider it as a special type of object (a ring) or a piece of material (gold). As in the case of C.-Y. Cheng (1973), the focus is on material denoting mass terms, and the distinction between object denoting mass nouns and substance denoting mass nouns is not explicitly made.

While count terms denote sums of atoms (and can be pluralized), the mass domain is ordered by the relation $\leq_m$, a relation between portions of matter and their material parts. The distinction between material parts vs. atomic individuals is particularly well suited to showing the relation between mass and count uses of the same noun, e.g. *shelf* and *book*, which may get substance readings. However, it is not clear what status predicates such as *furniture* should have in this type of system: the noun *furniture* does not denote a substance, but rather collections of objects, that themselves have material parts (see also Bale forthcoming). Even though Link's system accounts for the ring paradox, the proposed distinction between two domains does not account for similar properties of nouns such as *furniture*. Wooden furniture can be made of old wood, resulting in exactly the same paradox that Link describes for the noun *ring*: the furniture could be new while the wood would be old. Since Link, it is commonly accepted that the domain of individuals corresponds to a Boolean lattice (or, depending on whether the null element is included or not, a complete join semi-lattice), even though the way the terms mass and count are used varies depending on the author.

Chierchia (1998a, 1998b) emphasizes the fact that real distributive reference does not exist, as even in the case of typical, substance denoting mass nouns such as *water*, there are minimal parts: at some point, if we divide a quantity of stuff which is *water*, the subparts will not be *water* anymore. He concludes that all nominal predicates are atomic in the sense that they have minimal parts. Nouns such as *water*, for which it is not so clear what the minimal parts are, are claimed to have 'vague minimal parts.' Distributive reference and atomicity do

not play a role in defining the count–mass distinction, which is based on a difference in the way a noun enters syntax: mass nouns denote individuals (kinds) while count nouns denote singular predicates (sets of atoms).

This basic difference accounts for a number of properties of the two types of nouns. A count noun, that is, a noun that enters syntax as a singular predicate, can be pluralized, and as only plurals can be transformed into kinds, kind-denoting count nouns must be plurals. A mass noun comes into the syntax as a kind-denoting expression, which can be turned into a number neutral predicate. The minimal parts of mass nouns are not salient enough for numerals, resulting in the insertion of measure words or classifiers. Moreover, mass nouns typically do not denote singular predicates or undergo pluralization, and can be used as bare nouns with kind-denoting predicates.

Obligatory classifier languages such as Mandarin are analyzed as languages with only mass nouns. Nouns cannot combine with numerals unless a classifier is inserted:[1]

(7) a. sān běn shū [Mandarin]
three CL^{volume} book
'three books'
b. liǎng jīn mǐ
two CL$^{1/2\ kilo}$ rice
'two half-kilos of rice'

Chierchia assumes that all nouns in numeral classifier languages enter the syntax as kind-denoting expressions. On the other hand, a language with obligatory number marking such as English has both mass nouns and count nouns: nouns with a singular–plural opposition are count and enter the syntax as singular predicates that can undergo pluralization, while nouns that are incompatible with numerals are mass and enter the syntax as kinds.

The proposed parametrization does not take into account languages that lack both number marking and numeral classifiers, as illustrated by the Northern Athapaskan language Dëne Sųłiné, a language which lacks nominal number marking and classifiers (as documented in Wilhelm 2008):

(8) a. sǫlághe k'ásba
five chicken
'five chickens'
b. #sǫlághe ʔejëretth'úé/ bë́r
five milk/ meat
c. ??náke tł'ólátúé
two beer
'two beers' (acceptable in the sense of two servings, as in English)

[1] The following abbreviations are used in the glosses: CL classifier; COP copula; IMPERF imperfective aspect; PL plural; PRES present tense; SG singular; PRT particle.

d. sǫlághe nedádhi bə́r
five pound meat
'five pounds of meat' (Dëne Sųłiné; Wilhelm 2008: 46, 47)

These data also illustrate the fact that a difference between count and mass meaning can play a role in languages that lack the type of morphologically marked count–mass distinction that is found in languages such as English, which are commonly called 'count–mass languages'.

In the absence of inflectional number, effects such as the ones illustrated in (8) are often seen as an ontological rather than linguistic phenomenon. According to Wiltschko (2005, 2012), for instance, roots in languages without inflectional number marking may have ontological properties that make them incompatible with, e.g. numerals, while Rothstein (2010) uses the term 'natural atomicity' for inherently individuable meanings, which exist cross-linguistically, independently of whether a language is a grammatical 'count–mass language' or not.

Rothstein (2010) distinguishes three types of atomicity that play a role in natural languages. The first type of atomicity is atomicity in the sense of Chierchia (1998a): all nominal predicates are atomic, including mass predicates. Atoms are in some cases well defined (e.g. in the case of *furniture*), but can also be vague (e.g. in the case of *water*).

The second type of atomicity is natural atomicity. The meaning of a naturally atomic noun is inherently individuable, as in the case of mass nouns such as *furniture* and most count nouns.

Natural atomicity is neither a sufficient nor a necessary condition for the meaning of count nouns in a grammatical count–mass language such as English: count nouns are characterized by a third type of atomicity, which is semantic atomicity. Root nouns are subsets of the mass domain M and denote Boolean lattices, which can be either naturally atomic or not. A root noun can be turned into a semantically atomic predicate and thus become a count noun by the operation COUNT_k, which turns a nominal root into a set of ordered pairs of an individual and a context. This introduces a context dependency, which makes it possible to define atomicity for those nouns in which atoms may vary depending on the context. Nouns such as *fence* and *bouquet* are problematic for the claim that count nouns have atomic reference: fences can be made up of several smaller fences, and a big bouquet can be divided into several smaller ones. Therefore, these nouns are not naturally atomic: depending on the context a different unit can be selected as a unit for counting (see in particular Rothstein 2010).

Semantic atomicity is to a certain extent an arbitrary property: a noun can be count in one language and mass in another. Inflectional plural forms are only possible for count nouns, which restricts count nouns to languages with inflectional plurals such as English. If a language lacks semantic atomicity,

natural atomicity may still play a role. The patterns in Dëne Sųłiné above can thus be attributed to natural atomicity, as the language does not have the type of grammatical count–mass distinction that is present in English.

It is clear that in languages such as English, the count–mass distinction has an important morphological component. Nouns such as *furniture*, which lack a singular–plural opposition, fail to combine with expressions such as *several* and numerals, despite their atomic meaning. Morover, number marking plays an important role in triggering meaning shifts as in (1). On the other hand, the examples of Dëne Sųłiné show that there is also a distinction between nouns based on the availability of count vs. mass meanings in languages that lack a morphologically marked count–mass distinction (Wilhelm 2008). It is this non-morphological distinction that will be at the center of the discussion in this paper.

In what follows, I will make a difference between count vs. mass grammar on the one hand, and count vs. mass meanings on the other. In Section 3, I will argue on the basis of count–mass asymmetries that mass should be interpreted as the absence of count. Count grammar presupposes the availability of units that can be counted, and as such it is only compatible with predicates that have count meanings in the sense that they provide such units, which, for the time being, one may think of as non-vague atoms. Non-count grammar is indifferent with respect to the presence vs. absence of count meaning, while non-count meaning fails to provide information about countable units. I will be abstracting away from more complex cases of count meaning, as illustrated by *fences* and *bouquets*. In Section 4, I will include these types of count meanings as well, and turn to the question of which types of count meanings are found cross-linguistically, and how these meanings relate to (natural) atomicity.

3. Count–Mass Asymmetries

As indicated above, asymmetries between count and mass can be found at the level of syntactic environments in which nouns are used on the one hand, and at the level of noun meanings on the other. In what follows, I will discuss three types of asymmetries between count and mass, focusing first on grammatical expressions (grammatical markers in Section 3.1 and quantity expressions in Section 3.2) and then on the meanings of nouns that are used in count environments (Section 3.3). Each of these sections will include discussion on cognitive aspects of countability.

3.1. Grammatical Markers

Grammatical markers that are known to interfere with the count–mass distinction are number marking on the one hand and classifiers on the other.

Number markers are normally found on nouns that have a count interpretation, and come in many different forms (see among many others Corbett 2000; Dryer 2005; Cabredo Hofherr forthcoming). In Tagalog, for instance, the number marker *mga* is optionally added to noun phrases that have plural reference, even though it is incompatible with numerals. According to Schachter and Otanes (1972: 112): 'Tagalog makes a distinction between pluralizable and unpluralizable nouns that is like a distinction made in English. [. . .] In general, Tagalog count nouns correspond to English count nouns and refer to items that are perceived as distinct units: e.g., *bahay* "house", *baro* "dress", *bata* "child".' On the other hand, Wiltschko (2012) claims that non-inflectional plural markers can be combined with all nouns, based on evidence from Halkomelem (Central Salish) and Blackfoot (Algonquian), and takes this to be evidence for the absence of a count–mass distinction in these languages. Note however that the examples she gives do not always make clear whether a plural interpretation is present; Mathieu (2012b) treats the plural in Halkomelem as a so-called 'plural of abundance', which is exceptional in the sense that it expresses abundance rather than plurality (for mass plurals in Greek, see also Tsoulas 2009; Alexiadou 2011):

(9) a. th'exet th'exeth'éxet
gravel gravel.PL
b. spehál̓s spelhál̓s
wind wind.PL (Halkomelem; Wiltschko 2012: 153)

On the other hand, some of the Blackfoot data presented in the article (cited from Frantz and Russell 1995) clearly indicates a plural interpretation for the noun in the context of the plural marker, suggesting that the use of the plural marker triggers a count interpretation:

(10) aiksinoosak aiksinoosakiksi
'bacon' 'bacon' (slabs or slices of) (Blackfoot; Wiltschko 2012: 153)

Similarly, the Sahaptian language Nez Perce (Deal 2017) allows easily for plural markers in the context of nouns such as *maayx* 'sand', triggering a type of meaning that is excluded for the corresponding count plural in English:

(11) Yiyoosyiyoos maayx wewluq-se-∅.
PL.blue sand want-IMPERF-PRES
'I want quantities of blue sand.' (Nez Perce; Deal 2017: 144)

As already indicated above, the distribution of inflectional number markers in a language such as English is quite complex: it is by no means the case that all nouns that have a count interpretation also have a singular–plural opposition and can be classified as 'count nouns' (cf. *furniture*, *scissors*, etc.). On the other hand, the presence of a singular–plural opposition normally forces a count interpretation.

Numeral classifiers come in two types, depending on whether they are similar to measure words in a language such as English (mensural classifiers) or not. The two types are illustrated in the example in (7), repeated in (12):

(12) a. sān běn shū (Mandarin)
three CL^{volume} book
'three books'
b. liǎng jīn mǐ
two CL$^{1/2\ kilo}$ rice
'two half-kilos of rice'

The classifier *běn* is a sortal classifier, which Grinevald (2005: 1020) defines as follows: 'Sortal classifiers [. . .] specify units (not quantity) in terms of which the referent of the head noun may be counted [. . .]. They often appear to be semantically redundant, expressing one of the inherent semantic characteristics of the head noun.' Numeral classifier languages usually have a closed set of sortal classifiers. There is often one so-called general classifier, which does not provide any information about the form or shape of the referent. This general classifier is not very different from a number marker in the sense that it does not provide information about the units that are counted; this information must come from the noun (Doetjes 1997).

According to Chao (1968: 508), the general classifier can replace almost any sortal classifier, while it is incompatible with nouns that have a mass interpretation, such as *shuǐ* 'water'. It seems, however, that the possibility of using nouns such as *shuǐ* 'water' with the general classifier, resulting in a count interpretation, is subject to variation. Among the speakers I consulted, most rejected forms such as *yī/sān ge shuǐ* 'one/three CL^{general} water'.[2] One of them specified that *shuǐ* could be used with the general classifier when it refers to the character for the noun *shuǐ* (水) but not to refer to quantities of water. On the other hand, several speakers indicated that in colloquial, informal speech *yī/sān ge shuǐ* could be used to refer to standard portions of water (or other liquids), provided an appropriate context. The use of *shuǐ* with a general classifier typically occurs in informal situations when ordering standard bottles of water in a shop or in a restaurant (for count interpretations in restaurant contexts in various languages, see, among others, Borer 2005). One of the speakers added that it would be very odd to use these forms to ask for a drink when visiting a friend. Among the speakers who at first rejected the use of the general classifier with *shuǐ* 'water', some mentioned that they could use it more easily with other nouns that denote drinkable liquids, such as *píjiǔ* 'beer', and one of them noted that this is easier if the numeral is left out (for bare

[2] I would like to thank Hang Cheng, Han Hu, Chou Mo, Jianan Liu, Jing Sun, and Yang Yang for their judgments and examples.

classifier–noun structures, see, among others, Cheng and Sybesma 2005). These preliminary data indicate that some kind of mass-to-count shifting processes may occur in the context of the general classifier *ge* in colloquial Mandarin, but they also show that these shifts are heavily context dependent and subject to speaker variation and lexical variation.

Whereas sortal classifiers are sensitive to count meaning, mensural classifiers are indifferent to the presence vs. the absence of count meaning, as illustrated in the examples in (13):

(13) a. liǎng jīn mǐ/ píngguǒ
two CL^{half_kilo} rice/ apple
'two half-kilos of rice/apples'

b. liǎng píng (de) mì/ gǎnlǎn
two CL^{pot} (DE) honey/ olive
'two pots of honey/olives' (Mandarin; Doetjes 2021)

In this respect they are similar to measure words in English, as illustrated by the English translations. More generally, while number marking and sortal classifiers are both commonly found across languages, grammatical markers that depend on the presence of mass meaning are at best rare. In other words, grammatical markers typically signal count meaning, rather than mass.

The observation that grammar marks count as opposed to mass plays an important role in the work of Borer (2005). Borer hypothesizes that count meaning is syntactically introduced in the grammatical structure of noun phrases by a Classifier Phrase, which hosts grammatical expressions with the abstract feature *div*. This expression can be a number marker, a classifier, or an indefinite article. The feature *div* is responsible for making nouns compatible with numerals and other count quantity expressions. Mass is in this respect default: no grammatical marking is required, while count meaning requires grammatical marking.

For Pelletier (2012), the lexicon is blind to the count–mass distinction: a noun such as *chocolate* has a denotation that comprises both chocolates and portions of chocolate-stuff. The combination of count syntax and a noun activates a semantic rule that deletes the 'mass part' of the meaning of the noun, while mass-syntax deletes the 'count part' of the meaning of the noun.

In both approaches, the count grammar is necessary to trigger or extract a count meaning for a noun, suggesting that mass is in a sense the default that can be left unmarked, while count needs to be marked. Another way of looking at this is in terms of cognitive salience. The reason why grammatical markers typically signal count as opposed to mass could be the importance of countability from a cognitive point of view.

Recent approaches to human cognition argue for a small number of innate core knowledge systems, which center 'on a set of principles that serves to

individuate the entities in [their] domain[s]' (Spelke and Kinzler 2007: 89). Core knowledge systems are innate, basic systems of knowledge representation within the brains of humans as well as animals, and include systems of object representation, agent representation, and number representation. Object representation is based on cohesion (the fact that objects form integrated wholes that remain the same in space and time), continuity (objects do not disappear and reappear), and contact (objects influence each other in direct contact, not at a distance). Moreover, object representation is assumed to be limited to about three objects at a time (Feigenson, Dehaene, and Spelke 2004). The core system of agent representation sets agents apart from other countable entities. For instance, agents may interact without contact, even when they are goal oriented, and act in reciprocal ways Spelke and Kinzler (2007). For number representation, a distinction is made between the approximate representation of numerical magnitude, which is characterized by a ratio limit, and precise representations of distinct individuals, which are absolute number representations limited to about three entities. These systems underscore the importance of counting and countability for human cognition. According to the 'Whole Object Assumption', object representation also plays a role in language acquisition. Children expect nouns to refer to whole objects when acquiring the meaning of count nouns (Macnamara 1972; Carey 1978; Markman 1991). Experiments by Shipley and Shepperson (1990) and Brooks, Pogue, and Barner (2011) confirm this assumption.

The importance of countability and individuation for cognition can be seen as the source of the asymmetry between count and mass in languages: the prevalent presence of grammatical markers that signal or presuppose count meaning across languages does not imply that mass is default in the sense that nouns are mass unless they are grammatically marked as count, but rather results from the fact that count is cognitively salient.

3.2. Quantity Expressions

As the following examples show, quantity expressions can be subdivided into three types depending on their sensitivity to count and mass properties of nouns. They can be limited to count nouns, they can be indifferent to the count–mass properties of the nouns they combine with, or they can be limited to mass nouns. The first pattern is found for cardinal numerals and other cardinal quantity expressions (e.g. *several*) as well as for distributive universal quantifiers (e.g. *every*), and I will refer to this class as COUNT QUANTITY EXPRESSIONS. As illustrated in the examples below, these expressions require the presence of either a singular or a plural count noun in English:

(14) a. one/a single/every house
b. #one/a single/every water/furniture
c. two/several/few/many house*(s)
d. #two/several/few/many waters/furnitures

The second pattern is found for many degree expressions and for the non-distributive universal quantifier *all*. I will refer to this class as NON-COUNT QUANTITY EXPRESSIONS. In English the noun that follows is normally a count plural noun or a mass noun. In the case of *all* the complement can be a definite DP.

(15) a. more/a lot of houses/water/furniture
b. all of the houses/water/furniture

When used with degree related quantity expressions such as *a lot* or *more*, singular count nouns may be used, resulting in a particular type of interpretation:

(16) Buy more house for less money!

In this example, *more* indicates the amount of space a house defines and not a number of houses (see for instance Beviláqua and Pires de Oliveira 2014 and their chapter in this volume, Chapter 8 for recent discussion on this type of reading). This could be seen as a type of mass use (*house* is not interpreted as a type of object but as an amount of space that one can live in), but one could also assume that *more* defines a measure on a singular object. In English as well as many other languages, non-distributive universal quantifiers can also be used with singular nouns, in which case they quantify over subparts of the object denoted by its complement (cf. *all of the house*). Languages may vary in this respect, as illustrated by the fact that Dutch *alle* 'all' is incompatible with count singular nouns.

The third type of quantity expression typically combines with mass nouns. Again, these expressions are often degree related expressions, and often indicate small quantities. I will refer to this type of quantity expression as ANTI-COUNT QUANTITY EXPRESSIONS. In English, these nouns typically combine with mass nouns:

(17) a bit of furniture/water/#house

At first sight, the properties of quantity expressions seem symmetrical: they can be sensitive to count or to mass, or otherwise they are indifferent with respect to the count–mass properties of their complements. Below I will first argue the symmetry between count and anti-count is apparent and that anti-count quantity expressions should be seen as a subtype of non-count quantity expressions rather than as a type of its own. Then I will show that count and non-count quantity expressions can be found across languages

and do not depend on the presence of inflectional number, and I will argue that these two types are related to two different ways of representing quantities.

3.3. Anti-Count Quantity Expressions and Blocking

Quantity expressions that indicate a relative degree can fall in all three classes of quantity expressions, as illustrated by the triple *many*, *a lot*, *much*. If these expressions are not restricted to count contexts, they often have a life outside of the nominal domain, as illustrated by the examples in (18), which show that *lot* and *much* can modify eventive and gradable verbs, while the count quantity expressions *many* and *few* cannot be used to modify verbs:

(18) a. He works a lot/more/too little/too much/*(too) many/*(too) few.
b. *She jumped many/few.
c. much/a lot/*many appreciated

The set of count quantity expressions contains many members that do not have an anti-count homologue. This is by definition the case for the numerals, but also vague quantity expressions such as *various*, *different*, *several* do not have an anti-count equivalent. The set of anti-count quantity expressions is much smaller, and they typically form pairs with count quantity expressions with a similar meaning that are restricted to count nouns: *many* and *much*, *little* and *few*, and *less* and *fewer*. This makes it possible to account for the distribution of these expressions in terms of blocking or the Elsewhere Condition (see Di Sciullo and Williams 1987 for the difference between *many* and *much*). This means that anti-count expressions are not inherently incompatible with count nouns; rather, the existence of a count alternative that is restricted to nouns with a count meaning will block the use of anti-count expressions in these contexts.

It is important to realize that this type of approach implies that there are specific pairings of quantity expressions that trigger the elsewhere effect. Whereas the distribution of *much* is blocked by *many* in the context of plural nouns, *a lot*, which has a similar interpretation, is not blocked and can be found with count nouns. Even though this may seem a reason not to assume blocking at first, there are strong arguments to assume that this type of pairing exists in the domain of quantity expressions. This can be illustrated on the basis of French. French degree expressions usually combine with nouns, verbs, and adjectives. However, certain degree expressions are only used with nouns and verbs, while a special form is used in the context of adjectives (the data are actually slightly more complicated; see Gaatone 1981). The two patterns are illustrated for *tellement* ‘so, so much/many’ and for the pair *si* ‘so’ and *tant* ‘so much/many’:

(19) a. si/tellement/*tant beau (French)
'so beautiful'
b. tant/tellement/*si de livres
'so many books'
c. tant/tellement/*si dormir
'to sleep so much'

Data with pronominalization strongly suggest that the more limited distribution of *tant* is due to blocking by *si* in '*much*-support' contexts (Corver 1997). *Much*-support is illustrated in (20). Even though the adjective *fond* can normally be modified by the degree expression *as*, *much* needs to be inserted when *fond* is replaced by the pronominal form *so* (see Corver 1997: 127).

(20) a. John is as fond of Mary as Bill.
b. John is fond of Mary. Maybe he is as much so as Bill/*as so as Bill.

Similar data can be found for the French pair *si* 'so' and *tant* 'so much/many.' Whereas *si* is used as the modifier of an adjective, *tant* needs to be used as the modifier of the corresponding pronominal form. This pattern suggests a blocking analysis of the distribution of *tant*: the form is equivalent to *si*, but in those contexts where *si* can be used, the more specific form is used. The example in (21a), taken from an article by Yaël Eckert in *La Croix*, illustrates the use of *tant* in the context of a pronominalized adjective. As shown in (21b,c), *si* must be used when no pronominalization takes place and cannot be used when the adjective is replaced by a pronoun. The last example shows that *tellement* is not affected and can replace both *si* and *tant*.

(21) a. Philosophe, Mafalda [. . .] l'est tant que ses interrogations nous parlent encore, cinquante ans plus tard [. . .][3] (French)
'Malfalda is philosophical; she is even so much so that her interrogations still talk to us, fifty years later'
b. Elle est si/*tant Philosophe que . . .
she is so philosophical that . . .
c. Philosophe, elle l'est si que . . .
philosophical she it is so that
d. Elle l'est tellement/ est tellement philosophe que . . .
she it is so much/is so philosophical that . . .

[3] The article by Yaël Eckert from which this example has been taken was published on 19 March 2014 in *La Croix* at the occasion of the fiftieth birthday of Quino's Mafalda comic strips: www.la-croix.com/Culture/Livres-Idees/Livres/La-petite-Mafalda-a-50-ans-2014-03-19-1122702 (last consulted in July 2019).

The fact that *tellement* unlike *tant* is not replaced by *si* in the context of an adjective, despite their very similar meanings, shows that blocking is not an automatic, necessary process, but applies to specific pairs.

A further argument in favor of the idea that blocking requires some sort of a lexical pairing of two expressions is the distribution of English *less*. According to prescriptive grammar, *less* can only be used with mass nouns, and has to be replaced by *fewer* when combined with count nouns. On the one hand, the Oxford English Dictionary notes that, despite this rule, *less* with count plurals is frequently attested, even though it is 'generally regarded as incorrect' (see also Kperogi 2015: 104–5). On the other hand, *fewer* and *less* coexisted for a long time before the rule existed. According to the *Merriam-Webster's Dictionary of English Usage* this rule was first introduced in a rather tentative form in 1770, when the grammarian Robert Baker stated that *less* 'is most commonly used as speaking of a Number; where I should think *Fewer* would be better' (Baker 1770: 55). This formulation explicitly formulates the restriction of *less* in terms of *fewer* in terms of blocking: *fewer* is 'better' and should therefore be used. At the same time the absence of the rule in some varieties of English (see also Kperogi 2015: 104–5) and the absence of the rule before the end of the eighteenth century also shows that blocking does not automatically take place whenever a more specific alternative form exists.

Note also that the expression *a bit* can lose its anti-count behavior when modified by *quite*. Whereas *a bit of books* is odd, *quite a bit of books* is much better, and for many speakers just fine. This type of change is not observed for count quantity expressions: a modifier such as *several* or *few* does not lose its count character due to the presence of a modifier. This asymmetry also suggests that anti-count quantity expressions do not have the same kind of status as count quantity expressions.

A final argument for a blocking analysis of anti-count quantity expressions comes from acquisition. Gathercole (1985) shows that children first use *much* both with count and mass nouns; that is, they use the expression *much* as if it were a non-count rather than an anti-count expression. They start to use it correctly when they have acquired the correct use of *many*. This corresponds to the type of acquisition pattern that is described for blocking phenomena in morphology (cf. Pinker 1995; Ferdinand 1996).

To conclude this section, count and anti-count quantity expressions are not similar categories, one of which is sensitive to count and the other to mass. Rather, anti-count quantity expressions behave as non-count quantity expressions, the distribution of which is restricted by the existence of a more specific count quantity expression.

3.4. *Quantity Expressions Across Languages*

The types of quantity expressions discussed in the previous section are not limited to English (see Doetjes 2021). It is quite plausible that all languages have quantity expressions that presuppose counting. Even languages that have limited numeral systems – e.g. Mundurucu (Pica et al. 2004) – seem to have quantity expressions that resemble numerals or expressions such as *several* in the sense that they presuppose the availability of units to count. Similarly, all languages seem to have non-count quantity expressions.

The cross-linguistic parallels are obscured by the fact that languages differ from each other in terms of their grammatical properties. In a language such as Mandarin, count quantity expressions typically trigger insertion of a classifier. In English, count quantity expressions are usually restricted to morphologically marked count nouns. In other words, they are not only sensitive to count meaning, but also to count grammar: numerals and other count quantity expressions are not used with nouns such as *furniture* despite their count meaning. This shows that in addition to being sensitive to count meaning, these expressions are also sensitive to the inflectional count–mass system of English.

In Mandarin, count quantity expressions usually require insertion of a classifier, as illustrated in (7) for numerals. Other count quantity expressions, such as *jǐ* 'how many, a few', also trigger insertion of classifiers. Non-count quantity expressions normally combine directly with nouns and do not allow for classifier insertion (e.g. *dàliàng* 'a lot'), while *hěn duō* 'a lot' allows insertion of a classifier depending on the dialect. The expression *yī diǎnr* 'a bit' is typically found with nouns that have a mass interpretation and is incompatible with classifiers (Iljic 1994); in case of a count interpretation, *jǐ* 'a few' is used, suggesting that this restriction may be analyzed in terms of blocking as well.

In many languages the difference between count and non-count quantity expressions is not morphologically marked, but still existent. This can be illustrated by Hungarian examples below (Anikó Lipták, p.c.):

(22) a. Mennyi/Hány könyv áll a polcon?
how.many book stand.3SG the shelf.on
'How many books are on the shelf?'
b. Mennyi/*Hány por áll a polcon?
how.many dust stand.3SG the shelf.on
'How much dust is on the shelf?' (Hungarian; Doetjes 2021)

Whereas *hány* is a count quantity expression that triggers a count interpretation of the noun, *mennyi* is indifferent with respect to whether a noun has a count or

a mass interpretation. Similar differences have been claimed to exist between quantity expressions in Tagalog; whereas *marami* 'a lot' is compatible with all nouns, *ilan* 'a few' triggers a count interpretation (Schachter and Otanes 1972). As will become clear in the next sub-section, even Yudja, a language in which all nouns can be directly combined with numerals, offers evidence for a difference between count and non-count quantity expressions. As in the case of grammatical markers, quantity expressions offer evidence in favor of the idea that the context in which nouns are used are sensitive to count meaning and/or grammar rather than to mass; cases where sensitivity to mass is found were analyzed in terms of blocking rather than as an inherent selectional property.

The basic types of quantity expressions found across languages may well be related to the ways in which quantities can be mentally represented. Within the literature on magnitude representation, a distinction is made between number representation on the one hand (Dehaene 1997; Feigenson, Dehaene, and Spelke 2004) and global quantity representation on the other (Lourenco and Longo 2011). Lourenco and Longo discuss a number of experiments showing that dimensions such as space, time, and number interact, and take this as evidence for the existence of a general system of magnitude representation with a scalar structure. The two types of magnitude representation may well be at the origin of the distinction between count quantity expressions (corresponding to number representation) and non-count quantity expressions (corresponding to global magnitude representation).

3.5. *Count and Mass Meanings and Count and Mass Languages*

Next to an opposition between grammatical expressions and quantity expressions that are sensitive to count grammar and/or meaning and ones that are not, one can make a distinction between count and mass meanings for nouns. As shown by the experiments of Barner and Snedeker (2005), nouns such as *furniture*, *silverware*, and *footwear* pattern in certain respects with count nouns such as *tables*, *forks*, and *shoes* rather than with nouns such as *toothpaste*. In a magnitude judgment task, participants were asked to answer the question *Who has more N?* In one of the experiments the participants were confronted with a big object as opposed to three small ones, or in the case of substance nouns, with one big heap of the substance or three small ones. In reaction to this, both children and adults opted almost systematically for an evaluation in terms of number for both count nouns and object denoting mass nouns such as *furniture*. In the context of substance denoting mass nouns, the judgment was based on volume rather than on number. The differences between children and adults were quite small and only a few answers were given that did not correspond to this general pattern (never more than five percent; for the children in all

conditions and for the adults only in the object mass condition; Barner and Snedeker 2005: 51). The results of the experiment show that English offers evidence for the linguistic relevance of count and mass meanings for nouns (cf. Hungarian and Dëne Sųłiné).

Mandarin and other obligatory numeral classifier languages are sometimes called 'mass-only' languages. It is clear that this cannot mean that the language lacks nouns that have count meaning. Languages with numeral classifiers offer linguistic evidence for the presence of count meaning, as already indicated in Section 3.1 above (see, among many others, Chao 1968; Doetjes 1997; Cheng and Sybesma 1998; Grinevald 2005; Zhang 2013). Psycholinguistic evidence in favor of the idea that nouns in numeral classifier languages lack count meaning (Lucy 1992; Lucy and Gaskins 2001) has been shown to be due to a language-on-language effect introduced by the experimental task (Li, Dunham, and Carey 2009). Quantity judgment studies similar to the ones of Barner and Snedeker (2005) on Mandarin (Cheung, Barner, and Li 2009; Lin and Schaeffer 2018) and Japanese (Inagaki and Barner 2009) also show evidence for individuated meanings.

A linguistic argument in favor of a distinction between count and mass nouns at a lexical level comes from the distribution of classifiers in Cantonese, which has bare classifier–noun structures that can have a definite interpretation (Cheng and Sybesma 2005):

(23) a. zek^{3} gau^{2} soeng^{2} gwo^{3} maa^{5}lou^{6}
CL dog want cross road
'The dog wants to cross the road.'
b. Wu^{4}fei^{1} jam^{2}-jyun^{4} wun^{2} tong^{1} la^{1}
Wufei drink-finish CL^{bowl} soup particle
'Wufei finished eating the soup.' (Cantonese; Cheng and Sybesma 2005)

When the so-called 'plural' classifier *di^{1}* is used instead, a plural reading can be obtained, but only when the noun it combines with has a count meaning (Doetjes 2017b). In the context of the noun *gau^{2}* 'dog', replacing the sortal classifier *zek^{3}* by *di^{1}*, the result is a definite plural interpretation. In the context of the noun *tong^{1}* 'soup', replacing the mensural classifier *wun^{2}* 'CL^{bowl}' by *di^{1}* results in a definite mass meaning.

(24) a. di^{1} gau^{2} soeng^{2} gwo^{3} maa^{5}lou^{6}
CL dog want cross road
'The dogs want to cross the road'
b. Wu^{4}fei^{1} jam^{2}-jyun^{4} di^{1} tong^{1} la^{1}
Wufei drink-finish CL soup PRT
'Wufei finished eating the soup' (Cantonese; cf. Doetjes 2017b)

The only way in which numeral classifier languages could be called 'mass-only' seems to be to use the term mass in the sense of triggering obligatory

classifier insertion. Even this is not completely straightforward, as there is evidence that in some cases classifiers are inserted because of properties of numerals rather than because of properties of nouns. Bale and Coon (2014) show that Mi'gmaq (Eastern Algonquian) and Chol (Mayan) have two types of numerals: some numerals are incompatible with classifiers while others require insertion of a numeral classifier. They conclude that classifiers are inserted in order to make the numerals compatible with nouns, rather than to make nouns compatible with numerals (cf. Krifka 1995). For this type of language it is not possible to assume that classifiers are inserted because of some property of nouns that one could call 'mass.'

Whereas mass-only languages do not seem to exist, count-only languages may well exist. In the Tupi language Yudja, numerals and other quantity expressions combine with all nouns, and all nouns naturally get a count interpretation which is not due to coercion (Lima 2014a):[4]

(25) a. Txabïu ali wãnã.
three child ran
'three children ran' (Yudja; Lima 2014a: 38)

b. Txabïu y'a ipide pe.
three water on the floor drip
'three (drops of) water dripped on the floor' (Yudja; Lima 2014a: 112)

Lima (2014a) assumes that all nominal roots in Yudja can be turned into count predicates by a function KO that maps kinds to objects. This function also applies to what Lima calls notional mass nouns: applying KO to the root *apeta* 'blood' 'yields the characteristic function of the set of atoms of blood in the world of evaluation' (Lima 2014a: 110). As a result, all nouns can have a count (contextually) atomic denotation.

According to Deal (2017), this does not mean that Yudja is a count-only language, however, as the fact that all nouns can have a count meaning does not imply that all nouns need to have a count meaning. Her argument is based on a particularly interesting set of data from Nez Perce (Sahaptian). First of all, Nez Perce is similar to Yudja in freely using notional mass nouns with numerals. At first, this suggests that Nez Perce, too, might be a count-only language, but Deal shows that this is not the case. In the context of the quantity expression *'ilex̂ni* 'a lot', plurality is obligatorily marked if possible in case of a count meaning of the noun. Plural is marked on nouns for human nouns, and on adjectives for non-human nouns:

[4] See also Whorf (1944: 202), for similar observations on Hopi.

(26) a. ‘ileχ̂ni ha-ham/*haama
a.lot PL-man/*man.SG
‘a lot of men’
b. ‘ileχ̂ni ??tiyaaw’ic / ti-tiyaw’ic wiχ̂si’likeecet’es
a.lot ??sturdy / PL-sturdy Chair
‘a lot of sturdy chairs’ (Nez Perce; Deal 2017: 149, 150)

For nouns such as *samq’ayn* ‘fabric, piece(s) of fabric’, plural marking is necessary in order to trigger a count interpretation of the noun:

(27) a. ‘ileχ̂ni cimuuxcimux samq’ayn
a.lot black fabric
‘a lot of black fabric’
b. ‘ileχ̂ni cicmuxcicmux samq’ayn
a.lot PL.black fabric
‘a lot of pieces of black fabric’ (Nez Perce; Deal 2017: 152)

Based on this, Deal concludes that notional mass nouns in Nez Perce also have a mass interpretation. In her view, all languages have a lexical count–mass distinction, which plays an important role in language acquisition, and she claims that results of quantity judgment studies (Lima 2014a) show that Yudja, too, offers evidence for the existence of non-count meanings for notional mass nouns.

Lima carried out quantity judgment experiments using several quantity expressions, including *itxïbï* ‘many’ and *bitu* ‘more.’ Whereas questions with *itxïbï* ‘many’ gave systematically rise to judgments based on number, *bitu* ‘more’ also permitted evaluations based on volume, suggesting that the former is a count quantity expression while the latter is a non-count quantity expression.

(28) a. Ma de itxïbï asa dju a’u?
who many flour have
‘Who has many portions of flour?’
b. Ma de bitu asa dju a’u?
who more flour have
‘Who has more flour?’ (Yudja; Lima 2014a: 182, 120)

Both in a condition in which one big heap of flour was compared to three small ones, and in a condition where two big heaps were compared to six small ones, participants gave judgments based on number in a majority of the cases. On the other hand, when they were asked to make a comparison between one big heap and a small heap, eighty-eight percent would opt for a volume reading. This shows, according to Deal, that mass meanings are available.

The interpretation of the data becomes less straightforward when notional count nouns such as *xãã* ‘bowl’ are taken into account as well:

(29) b. Ma de itxïbï xãã dju a'u?
who many bowl have
'Who has many bowls?'
a. Ma de bitu xãã dju a'u?
who more bowl have
'Who has more bowls?' (Yudja; Lima 2014a: 183, 121)

Again, the experiment with *itxïbï* 'many' resulted in number-based answers only. In the case of *bitu*, there were again both answers in terms of number and volume. The percentages of number-based answers for notional mass and notional count nouns were almost identical in the experiment with one big heap vs. three small ones (notional count: 85% and notional mass: 83%). In the experiment where the participants had to compare two big heaps and six small ones, there were more volume readings overall, and there were more number-based answers for notional count nouns (76%) than for notional mass nouns (64%). Still, as a whole, the experiments show that number-based answers are strongly preferred in the context of *bitu*, unless the pictures did not allow for an evaluation based on number (that is, comparing one big and one small heap). These results beg the question what is meant by 'mass meaning', as the effects that Deal ascribes to mass meaning of the noun are hardly more readily available for notional mass nouns than for notional count nouns.

An alternative explanation of the data attributes the effects to *bitu* rather than to the meaning of the noun. The results of the experiments show that *bitu* does not force a comparison based on number. It shares this property with non-count quantity expressions such as *more* in English. From a semantic point of view, expressions such as *more* include a measure function, which measures quantities on a context-dependent scale (see for instance Chierchia 1998a), resulting in the availability of different types of interpretations in terms of, e.g., volume, weight, or cardinality, depending on the context. Given that *more* allows both for volume readings and for number readings, it is plausible that this can also be the case for *bitu* in Yudja.

As it turns out, Brazilian Portuguese offers evidence that evaluations in terms of volume do not depend on mass meaning, but rather on the absence of number marking. As shown in the following examples, the noun *farinha* 'flour' is incompatible with count quantity expressions such as the numeral *duas* 'two', but can be combined with the non-count quantity expression *mais* 'more.' The incompatibility of *farinha* and *duas* cannot be attributed to the lack of number marking, as number marking is optional in informal varieties of Brazilian Portuguese (see Ferreira forthcoming):

(30) a. *duas farinha, mais farinha (Brazilian Portuguese)
two flour, more flour
b. duas/mais livro, duas/mais livros
two/more book two/more books
'two/more books'

The results of quantity judgment tests show that number marking plays a crucial role in the availability of number readings (Beviláqua and Pires de Oliveira 2014 and in this volume, Chapter 8; see also Pires de Oliveira and Rothstein, 2011). The experimental context favored an evaluation based on volume. Substance denoting nouns systematically gave rise to volume readings, and plural object denoting nouns were judged on the basis of number (72%) or as having both options (21%). For singular object denoting nouns most answers were based on volume (61%), even though they were also judged on the basis of number (20%) or as having both options (19%).

These data show that plural marking introduces a strong bias for number-based answers.[5] They also show that all nouns, even when marked for plural, may get a volume-based interpretation in a context that favors an evaluation based on volume. This is clearly different from a count-to-mass shift as in the case of *shelf* or *book* being eaten by termites, where we really seem to talk about the substance shelves or books are made of (see example (1) above).

Given that the Yudja stimuli in (28) and (29) do not contain number markers (number marking is optional and possible for human nouns only), the strong bias for number-based judgments as well as the fact that notional count nouns and notional mass nouns behave similarly shows that the availability of the volume interpretation is not sufficient to conclude that the nouns are interpreted as mass. Rather, the data strongly suggest that the notional mass nouns always have a count meaning, given that count meaning alone does not impose number-based answers in quantity judgment tasks with non-count quantity expressions.

To conclude, there is no clear evidence for treating Yudja as a language which permits both count and mass readings for nouns. Rather, *bitu* 'more' behaves as a non-count quantity expression, and as such is indifferent towards the presence vs. absence of count meaning. As in the case of English *more* and Brazilian Portuguse *mais*, it permits an evaluation of quantity in terms of different scales. The fact that quantity judgment studies show that both nouns with a count meaning and the presence of number marking or a count quantity expression (*itxïbï* 'many') introduce a bias for judgments based on number illustrate the asymmetry between count and mass and the importance of countability, rather than showing that volume readings would require mass meaning.

3.6. To Sum Up: Countability Matters

The data presented in the preceding sub-sections show that there are asymmetries between count and mass at different levels. Grammatical markers typically encode countability rather than the absence thereof, quantity expressions are

[5] In Doetjes (2021), I argue that count quantity expressions, number marking, and sortal classifiers can trigger an effect of 'individuation boosting': the fact that these expressions presuppose the presence of count meaning makes individuated, count meaning more salient.

either sensitive to countability or indifferent with respect to count vs. mass properties of the nouns they modify, and whereas a mass-only language seems inconceivable, Yudja may well be a language in which nouns systematically have count meanings. What non-count means depends on the level one is talking about: in the case of quantity expressions, non-count means indifference towards the opposition between mass and count meanings and indifference with respect to count vs. mass grammar. At the level of nouns, a non-count meaning lacks information about countable units. As indicated in Section 2, the lexical effects of a count–mass distinction in languages without inflectional number are sometimes assumed to be due to 'natural atomicity' or ontological properties of referents (Rothstein 2010; Wiltschko 2012). The next section will investigate count meanings and the concept of natural atomicity in more detail based on cross-linguistic comparison.

4. Natural Atomicity and Natural Countability: Count Meanings Across Languages

So far, it has been argued that all languages make use of grammatical expressions (number markers, quantity expressions) that can only be interpreted in relation to nouns that may have a count meaning. In inflectional number marking languages such as English, count quantity expressions are sensitive to grammatical properties of nouns as well, resulting in a grammatical count–mass distinction that does not always reflect the opposition between count vs. non-count meanings of nouns. The discrepancy between count, individuated meaning, and count syntax as realized by inflectional number marking is particularly evident in the results of the quantity judgment experiments of Barner and Snedeker (2005), in which grammatical mass nouns such as *silverware* pattern with count nouns such as *shoes* rather than with substance denoting mass nouns such as *toothpaste*.

In this section I will examine several types of count meanings from a cross-linguistic point of view, focusing on parallels and differences between typologically different languages.

4.1. The Linguistic Representation of Aggregates: Furniture

The existence of nouns such as *furniture*, which are mass from the point of view of their grammatical properties while being count from the point of view of their meaning, is typical for languages such as English, which present an obligatory singular–plural opposition for count nouns and sensitivity of count quantity expressions to this grammatical marking. These properties make it possible to allow for exceptions that act as mismatches of the system (Chierchia 2010; Doetjes 2021).

It has often been observed that this type of phenomenon typically occurs for certain types of nouns (Bale and Barner 2009; Grimm 2012b). Nouns such as *furniture* are also called collective nouns, and the fact that they are used to refer to collections of items is relevant: the individual pieces of furniture are in a sense put to the background by the absence of a singular–plural contrast. When looking for nouns that, despite their clearly individuated meaning, behave grammatically as mass nouns, nouns that denote collections such as *luggage* and *furniture* are among the usual suspects that one should check. Nouns such as *furniture* illustrate that the opposition between 'there are units that can be counted' and 'there are no units that can be counted' that I argued play a crucial role in the meaning of quantity expressions is too black and white in view of the much more subtle differences in the salience of individuation between types of referents in the real world. These more subtle differences led Grimm (2012b) to postulating the concept of 'degrees of individuation', based on an ordering of types of referents according to their degree of individuation:[6]

(31) individual entities > collections of entities > granular substances > non-granular substances.

I assume that expressions that presuppose the presence of units that can be counted (that is, number markers, sortal classifiers, and count quantity expressions) trigger an effect of 'individuation boosting': their presence 'boosts' an individuated reading of the noun they combine with (Doetjes 2021). Turning back to nouns such as *furniture*, one can observe that a language such as English normally marks nouns that have a count meaning by means of a singular–plural opposition. However, the noun *furniture* is not marked for number, and following Cowper and Hall (2012), I will assume that these nouns have a morphological property that makes them incompatible with number marking, despite their meaning. As number marking in English is highly grammaticized, numerals and other quantity expressions that presuppose counting are not only sensitive to noun meaning but also impose the grammatical requirement of being combined with a noun that bears number. Within a system with systematic number marking, exceptions are possible, which results in making the units of counting less salient. As generally acknowledged (see Section 2 above), one cannot predict which

[6] I will only consider nouns whose referents correspond to collective aggregates here. Grimm discusses a much larger number of phenomena, including singulatives (see also Acquaviva 2008) and inverse number marking that reflects salience of individuation (see also Grimm 2012b). For discussion on granular substances, where the presence vs. absence of count meaning is less clear, see Sutton and Filip (2016b).

nouns will be treated as exceptions, which remains to a large extent arbitrary and language specific.

One of the questions is how much obligatory plural marking is necessary for a linguistic system in order to have nouns such as *furniture*. On the one hand, the phenomenon is not restricted to the specific type of number marking found in English. In the Ekoid language Ejagham (Watters 1981), number is marked by means of a noun class system, in which there exist pairs of noun classes that correspond to singular and plural forms of a noun (for number marking in noun class systems, see Marten forthcoming). As Watters shows, Ejagham has a large class of nouns that fall in a single noun class despite their countable meaning, and these nouns behave as *furniture* in the sense that they need insertion of a unit term (which Watters calls a classifier) in order to be combined with numerals. On the other hand, in languages with less contexts in which number marking occurs and/or is obligatory, such as Hungarian and Brazilian Portuguese, the evidence for exceptions is less clear, though perhaps not completely absent. According to Anikó Lipták (p.c.), the nouns *bútor* 'furniture' and *cucc* 'luggage' (informal) have plural forms but sound odd when directly combined with a numeral, while other nouns with similar meanings (e.g. *csomag*, the standard word for 'luggage') do not share this property. As for Brazilian Portuguese, while Pires de Oliveira and Rothstein (2011) treat the noun *mobília* 'furniture' in Brazilian Portuguese as an object denoting mass noun, younger speakers report using the word directly with numerals. More research is needed in order to determine what types of exceptional behavior can be found in inflectional number systems and how this relates to the pervasiveness of plural morphology in the system.

As for languages with numeral classifiers, L. Cheng (2012) observes that the special status of certain types of reference can be encoded by properties of the sortal classifiers that are typically used with these nouns. As shown by Cheng and Sybesma (1998), sortal classifiers in Mandarin differ from mensural classifiers by not allowing adjectival modification of the classifier nor insertion of the predicate marker *de*:

(32) a. sān (*xiǎo) zhī (*de) gǒu
three small CL DE dog
'three dogs'

b. wǔ dà bēi de jiǔ
two big CL^{cup} DE wine
'five big cups of wine' (Mandarin; L. Cheng 2012: 209–10)

The classifier that is used for the noun *jiājiù* 'furniture' is deviant: on the one hand it can be modified by a size adjective, but the obligatory absence of *de* shows that it does not pattern with mensural classifiers such as *xiāng* 'box':

(33) sān dà jiàn (*de) jiājiù
three big CL^{piece} DE furniture
'three big suitcases' (Mandarin; L. Cheng 2012: 211)

In this case the special status of the noun is encoded by particular properties of the sortal classifier with which it is typically combined. A different effect in classifier languages is observed by Erbach et al. (this volume, Chapter 7), who claim that the count quantity expression *nan-byaku-to-iu* 'hundreds of' in Japanese is infelicitous with nouns like *yūbinbutsu* 'mail', *kōtsū* 'traffic', *kaimono* 'shopping goods', despite the fact that they have count meaning.

This brief discussion shows that languages differ in how they can make use of their grammar in order to grammatically mark certain nouns (or classifiers) as being associated with less salient referents. Even though there is a clear tendency as to what types of nouns are affected, it is to a large extent also arbitrary which nouns fall in this category. At the same time, one needs to realize that even in a language such as English, ordinary count nouns with referents that fall in the category of collective aggregates may well have distributional properties as a group that can be attributed to the reduced individuation of their referents. In the psycholinguistic literature, nouns are categorized as plural-dominant if they are more easily associated with a plural form than with a singular form (Baayen et al. 1997). This property can correlate with lower individuation (Grimm 2012a), but it is important to realize that, in English, plural dominant nouns are still count nouns from a morphological perspective. Similarly, Lin and Schaeffer (2018) claim based on corpus-data that nouns that have less clearly individuated referents (which they call aggregate nouns) are much less frequently used with classifiers than nouns that have clearly individuated referents. As in the case of plural dominance, this property is based on frequency of certain combinations of lexemes, which is different from the grammatically encoded reduced individuation of nouns such as *furniture*. The type of number system found in English turns out to be particularly suitable for permitting exceptional cases, and thorough comparison of different types of systems is important to get more insight in the way degrees of individuation are encoded in language.

4.2. *Measure Words*

Whereas nouns such as *furniture* are clearly atomic, despite the 'reduced individuation' of their referents, measure words constitute a category of expressions that in many languages behave like count nouns, even though they name units that are not necessarily individuated. Cross-linguistically, measure words can be subdivided into two types: some have special syntactic

properties and are clearly distinct from ordinary nouns, whereas others behave as ordinary nouns with a count meaning.

English is an example of a language in which measure words are used in a fairly similar way as count nouns in terms of number marking and compatibility with count quantity expressions. This is not only true when they are used on their individuated 'counting' reading but also on their abstract 'measuring reading' (see Rothstein 2009, 2017; Partee and Borschev 2012). As the following examples show, count quantity expressions such as *every* or *several* can be combined with measure words such as *inch* and *yards* on their measuring reading. In these examples the cloth and the fabric are not cut into individuated pieces of one inch/yard (Doetjes 2021):

(34) a. Every inch of cloth is used, nothing is wasted.
b. If you want to make that dress, you will need several yards of fabric.

This is not expected under an analysis that treats measure words as measure functions that map individuals onto numbers, in which case one would expect them to occur with numerals only (cf. Chierchia 1998a: 75; Lasersohn 2011).

Dutch is different, as a subdivision can be made between two types of measure words: one type does not take number marking, and the other type behaves like ordinary nouns (see, among others, Klooster 1972; Doetjes 1997; Vos 1999). Without number marking, only a measuring reading can be obtained. Examples are *twee liter* lit. 'two liter', *twee meter* lit. 'two meter', *twee jaar* lit. 'two year', and *twee uur* lit. 'two hour.' Not all measure words can be used without plural marking, however. Even though some northern varieties of Dutch allow the use of *twee maand* lit. 'two month', the standard variant requires the use of a plural noun (*twee maanden* 'two month-PL'; 'two months'), in which case *maanden* behaves grammatically as a count noun. If a measure word of the first type is used on its 'counting' interpretation, the plural form is used, but this is not the only condition in which the presence of the plural suffix is required (35a). Certain count quantity expressions such as *enkele* 'some, several', which contain the agreement marker *-e*, are incompatible with unmarked measure words irrespectively of the reading they have (35b).

(35) a. twee meter(??s) stof
two meter fabric
'two meters of fabric'
b. enkele meter*(s) stof
several.AGR meter.PL fabric
'several meters of fabric'

The use of the plural marker in (35a) is only (marginally) possible under a counting reading, that is, there would need to be three separate objects

corresponding to one meter of fabric each. This effect is absent in (35b), which is not marginal, and which does not imply that there are several separate objects. To sum up, some measure words in Dutch always behave as nouns, while others show a special grammatical behavior if they have a measuring reading and they are combined with a restricted set of cardinal count quantity expressions (roughly: cardinal numerals and *een paar* 'a few'); if one of these two conditions is not met, they bear number morphology. The subdivision between the two classes is arbitrary, and subject to dialectal variation.

It turns out that numeral classifier languages also offer evidence in favor of two types of measure words. As illustrated in the Mandarin examples below, *tiān* 'day' is incompatible with a classifier, which is usually taken to be an indication that it functions as a mensural classifier itself (cf. *twee jaar* 'two year' in Dutch). Given that *tiān* 'day' is a measure word, this is what we expect under the hypothesis that classifiers are some kind of measure words.

(36) a. sān tiān
three day
'three days'
b. *sān ge tiān
three CL^{general} day (Mandarin; Li and Thompson 1981: 105)

However, as in Dutch, measure words do not behave as a homogeneous group in this respect: *yuè* 'month' and *zhōngtou* 'hour' need insertion of the general classifier *ge*, and as such behave like ordinary nouns rather than as classifiers:

(37) a. liǎng ge yuè
two CL^{general} month
'two months'
b. *liǎng yuè
two month
c. jǐ ge zhōngtou
a.few CL^{general} hour
'a few hours'
d. *jǐ zhōngtou
a.few hour
(Mandarin; Li and Thompson 1981: 169)

The Austronesian languages Taba (Bowden 2001) and Mokilese (Harrison and Albert 1976) are other examples of obligatory classifier languages in which measure words behave as ordinary nouns in the sense that they require insertion of a numeral classifier (Doetjes 2017c).

To conclude, measure words can have noun-like behavior in typologically distinct languages. Despite their abstract, non-individuated meaning, they typically pattern with nouns that can have a count meaning: they take number marking in English or Dutch, and they combine with the general sortal classifier *ge* in Mandarin. Given that they introduce clear information about how much counts as one unit of counting, a possible way of interpreting this is to assume that we are dealing with an abstract type of non-atomic count meaning (cf. Lasersohn 2011).

4.3. Atomicity and Count Meaning: Fences *and* Bouquets

A known problem of atomicity as a defining property of count meaning is that some count nouns in English are not atomic (see for instance Feldman 1973; Wiggins 1980; Zucchi and White 2001; Nicolas 2004; Rothstein 2010). Rothstein (2010) focuses on this type of noun in her analysis of the count–mass distinction in languages such as English. Nouns such as *rope*, *bouquet*, and *fence* are typically not atomic: a rope that is cut into two parts is turned into two ropes; one can put two smaller bouquets together to form one new big bouquet, and fences can be made up of objects that could also be called fences. Rothstein analyzes these nouns as 'semantically atomic' as opposed to 'naturally atomic' (see Section 2 above). According to Filip and Sutton (2017), these nouns become quantized in specific counting contexts, while Grimm (2012b) makes use of a connectedness condition to explain the behavior of this type of nouns, an approach that is also adopted by Lima (2014a) to explain the count properties of notional mass nouns in Yudja.

In this section, I will briefly discuss some cross-linguistic occurrences of this type of noun. It turns out that the type of meaning that we are dealing with is a generally occurring type of meaning for nouns that are compatible with count selecting grammatical expressions (sortal classifiers) or with count quantity expressions.

Consider first the following data from Mandarin. The following example illustrates that the noun *fence* has similar properties as its English counterpart (Yang Yang, p.c.):

(38) zhè-ge dà líba yóu sì-ge líba zǔchéng
this-CL^{general} big fence by four-CL^{general} fence composed
'This big fence is composed of four fences.' (Mandarin; Yang Yang, p.c.)

The noun *huā-shù* 'flower bunch, bouquet' is used in a similar context. This noun contains the classifier *shù* 'bunch'. The compound takes the general classifier *ge*:

(39) zhè-ge dà huā-shù yóu sì-ge xiǎo huā-shù zǔchéng
this-CL^{general} big flower-bunch by four-CL^{general} small flower-bunch composed
'This big bunch of flowers is composed of four small bunches.' (Mandarin; Jianan Liu, p.c.)

Indonesian, an optional classifier language that has been claimed to easily permit count meanings for notional mass nouns (Dalrymple and Mofu 2012), also permits context-dependent count meanings, as illustrated by the noun *pagar* 'fence' in (40):

(40) Pagar besar ini terdiri dari empat (buah) pagar.
Fence big this composed of four (CL^{inanimate}) fence
'This big fence is composed of four fences.' (Indonesian; Nurhayu Santoso, p.c.)

Even though these are just a few examples, it seems that the type of noun exemplified by *fence* and *bouquet* is commonly used in grammatical count contexts across languages, suggesting that this is a natural type of count meaning.

A property that a subclass of these nouns have in common is that they behave as flexible nouns (Filip and Sutton 2017). Again, this correlation is also found for Mandarin and Indonesian, which both also permit measure uses of these nouns, as in Mandarin *liǎng-mǐ líba* 'two CL^{meter} fence' and Indonesian *dua meter pagar* 'two meter fence.'

4.4. *Flexible Nouns and Shifts*

The phenomenon that one and the same noun can be shown to have both a count and a mass use is very common, as already indicated by Gleason (1965). Whereas in some cases it is hard to say which use is at the basis of the other (see for instance the nouns in Sections 4.1–4.3), other shifts can be described as coercions, as one of the two uses seems to be forced by the grammatical environment in which the noun occurs. At the same time, Lima (2014a) convincingly argues that the types of meanings that are found for nouns such as *apeta* 'blood' and *y'a* 'water' in Yudja do not constitute cases of coercion, unlike #*two waters* in English, which is only permitted in particular contexts.

As coercion is triggered by the grammatical environment of a noun, the possibilities for coercion may vary depending on the grammatical properties of a language. Again, the morphological system of English seems particularly suited for marking exceptions and thus facilitating coercion. The absence of obligatory plural marking on a noun that normally is marked for a singular–plural opposition can force a count-to-mass shift, as illustrated in the example in (1) above. As shown by Cheng, Doetjes, and Sybesma (2008), Mandarin nouns often resist 'grinding', the metaphor generally used for the shift that transforms an object denoting count noun into a mass noun that denotes the substance the original object was made of (Pelletier 1975). The Mandarin example in (41) only has a 'wallpaper reading':

(41) qiáng-shang dōu shì gǒu
wall-top all COP dog
'There are dogs all over the wall.'
NOT: 'There is dog all over the wall.'
(Mandarin; Cheng, Doetjes, and Sybesma 2008: 50)

Grinding is typically productive in languages that systematically mark the difference between mass and count meanings by morphology. In most cases, a bare singular noun in English can only be interpreted as a mass noun, and therefore the use of a bare count noun that lacks plural marking is interpreted as having a mass meaning. This is why nouns such as *furniture*, which

grammatically behave as mass, cannot undergo grinding, as there is no possible trigger for coercion (see Bale and Barner 2009 for a different type of analysis, in which all grammatical count nouns are treated as flexible nouns).

When looking at the types of meanings that are found for nouns that may have both count and mass meanings across languages, one can observe similar patterns on the one hand, and arbitrary differences on the other. When nouns that correspond to the English noun *water* are used in a count context, often a portion reading or a type reading can be obtained, and in many languages this is described as coercion. At the same time, the types of meanings that are obtained cannot be completely explained based on the properties of referents and world knowledge. The Algonquian language Ojibwe is an example of a language which productively allows for pluralization of mass nouns. As observed by Mathieu (2012a), certain types of count meanings, despite their frequent occurrence in other languages, cannot be obtained: liquid-denoting nouns do not permit pluralization and cannot be used in either portion readings or in kind readings; kind readings do not seem to be permitted for other nouns either. When comparing Dutch and English, two typologically similar languages, my impression is that English allows for mass-to-count shifts and pluralization of mass nouns much more easily. The use of *gold* for *gold medal* as in *two Olympic golds* is not possible in (my) Dutch, and *twee bieren* means only *two beers* in the sense of 'two types of beers'; for the serving reading a diminutive form is used (*twee biertjes* 'two beer-DIM-PL').

As for abstract nouns, even more variation seems to occur, both within and across languages (Pelletier and Schubert 1989). Whereas English *advice* and *news* are mass, the corresponding French noun *conseil* and *nouvelle* are count. The difference between the English and French forms could be compared to the difference between English *blush* and French *rougir*. Even though these verbs are near synonyms, the meaning of *rougir* marks the transition between not blushing and blushing (it is a change of state verb), while English *blush* is not: it describes the blushing 'activity' (it is an activity verb). Without assuming that these differences have repercussions on the way French and English speakers perceive the world, it is plausible that there is no one-to-one mapping between phenomena in the real world (particularly abstract ones) and the linguistic representation of these phenomena in the mental lexicon.

As in the previous sections, several observations can be made. In the first place, grammatical systems, and in particular the type of obligatory number marking system of English that requires plural marking in a large number of contexts, makes both coercions and exceptions possible. In the second place, the types of count meanings that are found cross-linguistically are

similar, even though some types of count meanings that are easily present in one language may be absent in others (e.g. type of Noun meanings). As far as I can see, there are no systematic differences in the types of meanings that are found between inflectional number marking languages and other languages, and the particular properties of the count–mass distinction seem to be in the first place morphological in nature. Finally, despite the tendencies, one can find a large amount of variation, much of which is rather arbitrary: in many cases nouns seem to have or not have certain count meanings 'par le simple usage'.

5. Conclusions

Count and mass are asymmetrical notions, both when used to describe the properties of grammatical expressions or quantity expressions that interact with countability, and when used to describe the types of meanings nouns may have. In both cases, what seems to be encoded is count: quantity expressions and grammatical markers are sensitive or insensitive to the presence of count meaning, and nouns can have count meanings or meanings that are incompatible with count quantity expressions because they lack information about countable units. Moreover, whereas mass-only languages do not exist, it may well be the case that in some languages, such as Yudja (Lima 2014a), all predicative nouns have count meaning.

The system of English, on which many formal models of count vs. mass are based, is particularly complex, because the systematic requirement to mark singular and plural forms for nouns that have countable meaning offers opportunities to create exceptions that introduce a large amount of extra arbitrariness in the system. Moreover, count quantity expressions are typically limited to nouns that have a singular–plural opposition, and as such they interfere with the morphological complexity introduced by number inflection.

The small cross-linguistic comparison of types of nouns that can be used in the context of grammatical expressions that depend on count meaning suggests that count meanings are rather similar across languages. Something like 'natural atomicity' seems to exist, but 'natural countability' seems a better term, as the different classes of count meanings show that this property is broader than atomicity in a strict sense. In all cases, what seems crucial is that the noun provides information about what counts as a single unit of an N, which comes close to the way Quine defined divided reference, but abstracts away from the morphological complications of the English system. The difference between languages with and without obligatory number marking seems not to be related to fundamental differences in available count meanings, but rather to the presence vs. absence of a grammatical system of number

marking and the use languages can make of such a system in order to express a lower degree of individuation or to coerce meaning shifts. It is clear that these claims are at this point rather tentative, and that large-scale cross-linguistic comparison is necessary to gain a deeper understanding of countability in natural language.