Bare singular phrases are mass in Brazilian Portuguese

Roberta PIRES DE OLIVEIRA
UFSC/CNPQ/CAPES-COFECUB
ropiolive@gmail.com

Susan ROTHSTEIN
Bar-Ilan University
susan.rothstein1@gmail.com

Abstract: This paper argues that bare singular noun phrases in Brazilian Portuguese are mass nouns denoting kinds. We show that the prima facie arguments against treating bare singulars as mass nouns do not hold water, since they contrast atomic bare singulars with substance mass nouns such as *ouro* 'gold', rather than with atomic mass nouns such as *mobília* 'furniture'. We show that in fact bare singulars and atomic mass nouns show the same properties with respect to distributive predicates and reciprocals. We then show that in distribution and interpretation, bare singulars behave like mass nouns and not like bare plurals. We give an analysis of the semantics of bare singulars/mass nouns in the framework of Rothstein (2010), treating them as kind denoting terms, while proposing that bare plurals are generated as plural predicates NPs, as proposed by Krifka (2004), and show how this explains the differences in distribution and interpretation. We conclude by showing that bare singulars can be the complements of mass quantifiers such as *muito* 'much' and *quanto* 'how much', in which case these behave semantically exactly like mass nouns: *quanto livro* with the bare singular asks about the overall measurements of a quantity of books in terms of volume or weight and is thus an expression of measure, while *quantos livros* with the plural count noun asks only for the cardinality of the set of books under discussion and thus is a question about counting.

Keywords: bare nouns, bare singulars, count-mass distinction, atomicity, kinds, Brazilian Portuguese

1. Bare singular may well be mass

In this paper we discuss data concerning bare nominals in Brazilian Portuguese: bare mass, bare plural and bare singular noun phrases. We show that the bare mass and the bare singular behave in the same way, while contrasting with the bare plural. In order to explain this distribution, we advance the hypothesis that the bare mass and the bare singular both denote kinds, derived from a set denoted by an abstract root noun via a lexical operation. Bare plurals denote plural count predicates which, following Krifka (2004) shift either to a kind-denoting expression or to an existential generalized quantifier. We show that the bare mass and the bare singular are identical from a grammatical point of view, and that, as expected on this theory, they behave in the same way in other respects. These include selection by mass quantifiers and interpretation in comparatives

Since Carlson (1977a, b), the literature on bare nouns has treated bare mass on a par with bare plurals, accepting Carlson's arguments that bare plurals and mass nouns denote kinds. Opinions have differed as to whether they always denote kinds and are type-shifted to a predicate reading in existential contexts (Carlson 1977a, b, Chierchia

1998, Landman and Rothstein 2010, Rothstein 2010a, b) or whether they are ambiguous between a kind-denoting and an existential reading (Heim 1982).[1]

Brazilian Portuguese (BrP) throws an interesting light on the interpretation of bare noun phrases. As is well-known, BrP, has a mass/count distinction in nouns, but allows bare singulars as well as bare mass and bare plural nouns. Thus, in addition to a bare plural form of the count nominal, (1a), and a bare mass phrase (1b), BrP allows a bare singular form, a 'singular' determinerless phrase[2], as exemplified in (1c). Bare singulars are apparently different from mass nouns, since they may occur with singular indefinite determiners, as the contrast between (1d) and (1e) shows.

(1) a. *Minhoca-s cav-a-m buraco-s.*[3]
Earthworm-PL dig-PRS.3PL hole-PL
'Earthworms dig holes.'
b. *Leite faz mal pra saúde.*
Milk do-PRS.3SG evil to health.
'Milk is not healthy.'
c. *Minhoca cav-a buraco.*
Earthworm dig-PRG.3SG hole
'Earthworms dig holes'.
d. *Uma minhoca cav-a buraco.*
An earthworm dig-PRG.3SG hole
'An earthworm digs holes.'
e. **Um leite faz mal pra saúde.*
A milk do-PRS.3SG evil to health.
Intended meaning: 'Milk is unhealthy.'

In general, the literature (see references cited above) has focused on the similarities between mass nouns and plural count nouns since, as Link (1983) pointed out, they are both cumulative: if A is in the denotation of *dogs* or *water*, and B is in the denotation of *dogs* or *water*, then the sum of A and B is in the denotation of *dogs* or *water*. The bare singular in BrP is also cumulative: If A is in the denotation of the bare singular *cadeira* 'chair' and B is in the denotation of *cadeira* 'chair', then the sum of A and B is also in the denotation of *cadeira* 'chair', although its elements cannot be counted. This is demonstrated by the example in (2):

(2) João*compr-ou cadeira*. *Maria compr-ou cadeira*. *Eles compr-ara-m cadeira*.
João buy-PAST.PERF.1SG chair. Maria buy-PAST.PERF.1SG chair. *They* buy-PAST.PERF.3PL chair.
'João bought chairs. Maria bought chairs. They bought chairs.'

However, for reasons that we will discuss below, bare singulars in BrP have been treated differently from bare plurals and mass nouns, and it has frequently been argued (Munn & Schmitt 2005, Schmitt & Munn 1999, Müller 2002 and Paraguassu & Müller 2008) that they are number neutral count nouns. In this paper we further compare the bare singular with both the bare mass noun and the bare plural count noun in BrP. We

[1] We argue at the end of section 3 that quantificational generic interpretations are not appropriate for bare singular terms.
[2] Singular is used here just to indicate absence of plural morphology.
[3] For the glosses we used *The Lepizig Glossing Rules*, www.eva.mpg.de/lingua/resources/glossing-rules.php

show that the behavior of the bare singular in BrP does not parallel that of the bare plural, but strongly parallels that of the bare mass noun, and we argue that the most obvious hypothesis, that bare singulars just are mass nouns, is in fact the correct one.

The outline of the paper is as follows. We begin in section 2 by showing that the prima facie arguments against treating bare singulars as mass nouns are not valid. Our claims are based on the fact that the literature has compared bare singular nouns with non-atomic mass nouns, and has shown that they behave differently with respect to the relevant tests. However, comparing bare singulars with naturally atomic mass nouns such as *mobília* 'furniture' gives very different results: bare singular nouns and atomic mass nouns behave in the same way with respect to distributive and reciprocal predicates. We then show, in section 3, that the bare singular displays the same distributional restrictions and the same interpretation as the bare mass noun both in episodic and generic contexts, a fact that, as far as we know, has gone unnoticed in the literature. This strengthens the case for treating them alike. In section 4 we give a semantics for mass nouns and count nouns in the framework of Rothstein (2010a, b), which allows for a unified analysis of bare singulars and mass terms, while maintaining the lexical distinction between mass and count nouns. In section 5, we explain the data from earlier sections in the light of the analysis, and give a semantics for bare plurals which explains the contrasts between the bare singular and bare plural forms. We also show that our account predicts that so called 'bare singulars' can occur with mass determiners and in 'mass' comparative constructions, and we give arguments to show that this prediction is correct.

2. Reciprocals, reflexives and distributivity.

In general the literature on the bare singular in BrP (Munn & Schmitt 2005, Schmitt & Munn 1999, Müller 2002 and Paraguassu & Müller 2008, Dobrovie-Sorin & Pires de Oliveira 2010), despite different theoretical perspectives, takes for granted that the bare singular cannot be treated as mass because the two forms do not show the same behavior with respect to individuating predicates: reciprocals, reflexives, and distributive predication. They note also that bare singulars do not show universal grinder effects, a topic we will discuss in section 5.2. The accepted view in the literature is that the bare singular in BrP is a number neutral count term, and that it does not behave like a mass noun. This is generally taken to support Link's (1983) hypothesis that the mass domain is ontologically distinct from the count domain because it is atomless.

The papers cited argue that bare singulars do not behave like bare mass nouns in constructions which are essentially individuating. The first set of data shows that bare singulars, but not mass nouns, can occur with lexically distributive predicates, as illustrated by the examples in (3) and (4), from Schmitt & Munn (1999):

(3) **Ouro pes-a duas grama-s.*[4]
Gold weigh-PRS.3SG two gram-PL.
Intended meaning: 'Pieces of gold weigh two grams'.

(4) *Criança (nessa idade) pes-a 20 kg*.
Child (at.this age) weigh-PRS.3SG 20 kg.
'Children (at this age) weigh 20 kg.'

[4] We understand that judgments of grammaticality are gradients. The sign * indicates ungrammaticality; the sign ?? indicates not acceptable; and ? indicates the expression is marked, though acceptable.

This result is expected under the view that distributive predicates must distribute over a set of atoms, and that, since mass nouns are not generated by sets of atoms, they are not compatible with this operation. Sentence (3) is ungrammatical because the predicate *pesa duas gramas* 'weighs two grams' cannot distribute over the bare mass noun *ouro* 'gold', since this substance has no atoms in its denotation. (Munn & Schmitt 2005, Schmitt & Munn 1999, also Paraguassu & Müller 2008). On the other hand, it is argued, the bare singular, though number neutral, is generated by a set of atoms because it is associated with a count predicate. Sentence (3) is fine, because *criança* 'child' is a count predicate.

These authors show that the same contrast shows up when we combine the bare mass and bare singular nouns with predicates like 'one after the other' that also distribute over individual atoms as exemplified below (the examples are from Müller 2007):

(5) **Ouro realça um atrás do outro.*
Gold enhance-PRS.3SG one behind of.the other.
Intended meaning: 'Pieces of gold fall down one after the other'.

(6) *Elefante anda um atrás do outro.*
Elephant walk-PRS.3SG one behind of.the other.
'Elephants fall down one after the other.'

The contrast is repeated when the reciprocal is in argument position. In (7) and (8), the reciprocal is fine with the bare singular, but not with bare mass nouns. Similarly, the cliticized reflexive is acceptable with a bare singular subject argument. Schmitt & Munn (1999) argue that this is because the reciprocal, like the distributive, must distribute over atomic individuals, and take it as further evidence that the bare singular has atomic individuals in its denotation, whereas the mass noun does not.

(7) **Ouro realç-a um ao outro.*
Gold enhance-PRS.3SG one to.the other.
Intended meaning: 'Pieces of gold enhance each other.'

(8) *Criança brig-a uma com a outra.*
Child fight-PRS.3SG one with the other.
'Children fight with one another.'

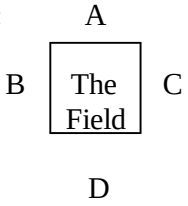
(9) *Criança sab-e se lav-ar sozinha.*
Child know-PRES.3SG REFL wash-INF alone.
'Children know to wash themselves alone.'

The examples discussed in the literature all use prototypical mass and count nouns, and thus the mass nouns denote substances and the count nouns denote inherently individuable entities, or natural units. Gold is prototypically mass since it does not come in natural units, and *criança* 'children' is prototypically count since children do come in natural units, and if you know the meaning of 'child', you should in the normal case know what counts as one child.

However, as Rothstein (2010 a, b) argues, this prototypicality provides neither necessary nor sufficient conditions for characterizing either mass or count terms

semantically. There are mass nouns which denote sets of inherently individuable entities, such as *furniture* and *silverware* (as argued by, among others, Gillon 1992 and Chierchia 1998) and there are count nouns which denote sets of entities where the choice of atoms is contextually determined, such as *fence* or *line*. For example, suppose that Figure 1, an example taken from Rothstein (2004), represents the situation in which four farmers have land adjoining a common field, and they each build a fence between their land and the field on the relevant side. We call the four farmers A, B, C, and D:

Figure 1:



When we count the number of fences in Figure 1, we come to different numbers, depending on what we choose to count as "one fence". Suppose we choose as "one fence", the outcome of a minimal building-a-fence event. Since each farmer built a fence, there will be four fences, one on each side of the field. If, however, we assume that a continuous stretch of fencing counts as one fence, then there is only one fence which encloses the field. And if A and B jointly financed their fence-building from one source while C and D jointly financed their fence-building from a different source, then there are plausibly two fences. This variety of answers to the question "How many fences are there?" is possible because *fence* is not a naturally atomic predicate, and the choice of what counts as "one" is contextually determined.

Rothstein (2010 a, b) argues that it is essential to distinguish *natural atomicity* from *semantic atomicity* (a claim we return to in sections 4 and 5). Natural atomicity is a characteristic of predicates which denote a set of entities where the minimal atomic units are not context dependent. Semantic atomicity is a property of count nouns, which denote sets of atoms indexed for the context in which they count as atomic. Natural atomicity can in principle be a property of both mass and count predicates: *furniture* is a naturally atomic mass predicate, and *child* is a naturally atomic count predicate. *Fence*, on the other hand, is a non-naturally atomic count predicate, since the set of atoms in the denotation of *fence* may vary from context to context, as illustrated in the example above. The set of atoms denoted by the count noun *child* (in English) may not in fact vary from context to context,[5] thus although the contextual parameter for the count noun is grammatically encoded, the choice of atoms is not dependent on choice of contextual parameter, as it is in the case of *fence*. We spell this out formally in some detail in section 4. This theory allows for prototypical and non-prototypical nouns of both sorts: while prototypical mass nouns are not naturally atomic and prototypical count nouns are, the theory predicts that there will be non-prototypical naturally atomic mass nouns like *furniture* and *silverware*, and non-prototypical non-naturally atomic count nouns

[5] Rothstein (2010 a, b) shows that while there may be different possible answers to the question "how many children are there in the room?", this is not because the choice of atoms is context dependent, because of 'borderline vagueness' in the sense of Kamp (1975), i.e underdeterminedness as to who is considered a child in the context. A sixteen year-old is a child with respect to tax laws, but not with respect to air-line fares. This means that the 'borders' of the set of children may be vague, but once these are fixed, the atomic structure of the set is not vague. Put differently, if we assume that *child* denotes a function from individuals (humans) to truth values, some of the values for CHILD(α) may differ depending on how we define the meaning of *child*, but the atomic structure of the set characterised by CHILD(α) is not underdetermined.

like *fence* and *line*. Rothstein (2010 a, b) shows that different grammatical operations may be sensitive to either natural atomicity or semantic atomicity or both.

With this in mind we can reexamine the examples in (3) – (9). We see that the effect of combining non-prototypical nouns, (naturally atomic mass nouns and non-naturally atomic count nouns) with individuating predicates leads to the conclusion that these predicates are sensitive not to the mass and count distinction, but to the distinction between naturally atomic and non-naturally atomic predicates. *Ouro* 'gold' is not naturally atomic since it denotes quantities of gold which do not have an inherent unit structure, but the mass noun *mobília* 'furniture' is naturally atomic since furniture usually comes in inherently individuable pieces.[6] When we consider the distributive predicates illustrated in (3)-(9), we see that naturally atomic bare mass nouns behave like count nouns with respect to distributivity, reflexivity and reciprocity, contrary to what Schmitt & Munn (1999) and Paraguassu & Müller's (2008) predict. [7]

(10) a. *Mobília (nesta loja) pes-a 20 kilo-s.*
Furniture (in.this store) weight-PRS.3SG 20 kilo-PL.
'Furniture (in this store) weighs 20 kilos.'

b. *Bijuteria (nesta loja) cust-a 3 reais.*
Jewellery (in.this store) cost-PRS.3SG 3 reai-PL.
'Jewellery (in this store) costs 3 reais.'

This is because *mobília* 'furniture' and *bijuteria* 'jewellery' denote sets of natural atoms, over which the predicates *pesa 20 kilos* 'weights 20 kilos' and *custa 3 reais* 'costs 3 reais' distribute. The same reasoning explains its acceptability with reciprocals as indicated in (11):

(11) *Mobília (dessa marca) encaix-a uma na outra.*
Furniture (of.this brand) fit-PRS.3SG one in.the other
'Pieces of furniture (of this brand) fit into each other.'

In the count domain, *criança* 'child' is naturally atomic, but nouns like *cerca* 'fence', *reta* 'line' and *linha* 'thread' are not naturally atomic, although they are grammatically count since they combine directly with plural morphology and numerals, as in *quatro retas* 'four lines', *duas cercas* 'two fences' and *três linhas* 'three threads'. As predicted by our account, the bare singular forms of these nouns do not easily combine with distributive predicates and reciprocals, contrary to what the previous approaches have predicted:

(12) *?? Cerca (nesse terreno) tem 2 metros.*
Fence (in.this property) have.PRS.3SG 2 meter-PL.
'Fences in this property has 2 meters'

[6] Psycholinguistic evidence is support of this claim is discussed in Barner and Snedeker (2005), Bale and Barner (2009), and syntactic evidence is brought in Rothstein (2010 a, b).

[7] See de Braga *et al* (2010) for empirical evidence concerning the evaluation of native speakers of BrP with respect to these sentences. The paper reports the results of a survey concerning sentences patterning like (10)-(13), and shows that speakers do not behave as predicted by Schmitt & Munn (1999), since they accept bare mass nouns with distributive predicates if the noun is naturally atomic has natural atoms, and do not accept bare singular nouns with distributive predicates if the noun is not naturally atomic.

(13) *?? Reta cruz-a uma com a outra*.
Line cross-PRS.3SG one with the other.
Intended meaning: 'Stretches of line cross with each other.'

These data show that there is good reason to reject the arguments that bare singulars are prima facie not mass nouns, and allow us to reopen the question of whether bare singular are really mass nouns. In the following section we investigate this further and show that bare singulars and mass nouns show similar behavior in many ways.[8]

3. Distributional Parallelisms between bare mass nouns and bare singulars

In this section we examine various contexts in which bare singulars, bare mass nouns and bare plurals can be used, and we see that bare singulars behave more like mass nouns than like bare plurals both in terms of distribution and interpretation. First, we show that in certain contexts the bare plural is ambiguous between a generic kind-level interpretation and an existential reading, while in the same contexts, neither the bare singular nor the bare mass noun is ambiguous; they only allow for generic readings. Moreover, we show that the constraints to which the bare singular and the bare mass noun are subjected are alike, in particular with respect to perfective aspect, while the bare plural is subject to no such constraints.

There are differences of intuitive judgments as to whether the bare singular can be in subject position of kind predicates (Schmitt & Munn 1999, among others, argue that it can, whereas Müller 2002 claims that it cannot). However, Pires de Oliveira *et al* (2010) found empirical evidence in a corpus analysis and an experimental survey that, for many speakers (for the survey around 80% of a population of 800), the bare singular can be the subject of a kind predicate. Thus, the first observation is that both bare singular and bare plural noun phrases can be subjects of generic sentences, and in particular that they may be subjects of kind predicates like *estar em extinção* 'to be on the verge of extinction'. However, they do not have the same range of meanings. (14) is ambiguous. On the kind reading it asserts that whales of all kinds, and thus the kind as a whole, are on the verge of extinction. On the taxonomic reading, discussed in Krifka *et al.* (1995), the bare plural denotes a set of sub-kinds of whales and the sentence asserts that some sub-kinds of whales are on the verge of extinction. This latter reading is not available for the bare singular. The sentence in (15) cannot be interpreted as making an assertion about sub-kinds, and it has only the kind reading.

(14) *Baleia-s estão em extinção*. (sub-kind and kind readings)
whale-PL be.PRS.3PL in extinction.
'Whales (in general) are/the whale is on the verge of extinction'. OR
'Some kinds of whales are on the verge of extinction.'

(15) *Baleia está em extinção*. (only kind reading)
Whale be.PRS.3SG in extinction.
'Whales are /the whale is on the verge of extinction.'

It is difficult to find unambiguously kind-level predicates which apply to mass nouns, but *abundante* 'abundant' is good example of one. (16) shows that *abundante* applies to

[8] It has been argued (Schmitt and Munn 1999) that if bare singulars are mass nouns, then they ought to have universal grinder interpretations. Rothstein (2010a, b) argues that this is not the case. We return briefly to the issue of the universal grinder in section 5.2

mass nouns and behaves exactly like a kind predicate applied to a bare singular: in (16) we see that it can be applied only to the substance as a whole, and cannot be used to make an assertion about sub-kinds of the substance – like low quality oil, for instance:

(16) *Petróleo é abundante*. (only kind reading)
Oil be.PRS.3SG abundant.
'Oil is abundant.'

Thus, like the bare singular, the bare mass noun only shows a kind reading, when in subject position of a kind predicate.

The same contrast appears when the bare noun phrases are in subject position passive 'invent' sentences, as exemplified in (17):

(17) a. *Computador-es foram invent-ado-s por Babbage*. (taxonomic / kind readings)
Computer-PL be.PST.PERF invent-PST.PTCP-PL by Babbage.
'Computers were invented by Babbage.' OR 'Some kinds of computers were invented by Babbage.'
b. *Computador foi invent-ado por Babbage*. (only kind reading)
Computers be.PST.PERF invent-PST.PTCP-Pby Babbage.
'Computers were invented by Babbage.'
c. *Plástico foi invent-ado pel-o-s ingles-es*. (only kind reading)
Plastic (the kind of substance) be.PST.PERF invent-PST.PTCP-P by.The-PL Englishmen.
'Plastic was invented by Englishmen.'

The contrast between the bare plural, on the one hand, and the mass and bare singular, on the other, becomes even sharper in object position of 'invent' predicates. (18a), with a bare plural direct object, is felicitous and the bare plural is interpreted as denoting a set of sub-kinds, or a set of types of computers, but the same sentences with bare singular and bare mass objects are just ungrammatical:

(18) a. *Babbage invent-ou computador-es*. (taxonomic reading)
Babbage invent-PST.PRF computer-PL
'Babbage invented computers.'
b. **Babbage inventou computador*.
Babbage invent-PST.PRF computer.
Intended meaning: 'Babbage invented the computer.'
c. **O-s ingles-es invent-ara-m plástico*.
The-PL English-PL invent-PST.PRF-PL plastic.
Intended meaning: 'The British invented the plastic.'

Thus the bare singular and the bare mass nouns pattern alike in that they cannot denote sets of subkinds, nor be the object of *invent* predicates.

A similar contrast can be seen in the examples in (19), based on Diesing (1992). While bare plurals with an existential stage-level predicate are ambiguous between existential and a kind reading, both the bare singular and the bare mass noun phrases only have a kind interpretation:

(19) a. *Bombeiro-s são utéi-s*. (generic OR existential readings)
Fireman-PL be.PRS.3PL available-PL.

'Firemen in general are available.' OR 'Some firemen are available.'

b. *Bombeiro é útil.* (ONLY generic reading)
Fireman be.PRS.3SG available.
'Firemen in general are available.'

c. *Petróleo é útil.* (ONLY generic reading)
oil be.PRS.3SG available.
'Oil is available.'

While the examples in (19) show that the bare singular and mass terms differ from the bare plural in these stage-level examples, the Brazilian Portuguese data demonstrates the contrast also with individual level predicates like *inteligente* 'intelligent', as illustrated in (20). Again, the bare plural subject is ambiguous between a generic and an existential reading, while the bare singulars and bare mass nouns allow only the generic, kind based reading.

(20) a. *Bombeiro-s são inteligente-s.* (generic OR existential readings)
Fireman-PL be.PRS.3PL intelligent-PL
'Firemen in general are intelligent.' or 'Some firemen are intelligent'.

b. *Bombeiro é inteligente*. (generic)
Fireman be.PRS.3PL intelligent
'Firemen in general are intelligent.'

A similar contrast shows up in object position of dispositional predicates like *gostar de* 'like'.

(21) a. *João gosta de cachorro-s*. (kind OR specimen readings)
João like-PRS.3SG of dog-PL.
'João likes dogs in general.' OR 'João likes some individual dogs.'

b. *João gosta de cachorro* (kind/*specimen)
João like-PRS.3SG s of dog.
'João likes dogs in general.'

c. *João gosta de suco.* (kind/*specimen)
João like-PRS.3SG of juice.
'João likes juice in general.'[9]

Another contrast shows up in the interpretation of dependent plurals. Schmitt & Munn (1999), following observations which they ascribe to Partee (1985), observe that the bare plural can be dependent on a plural subject in cases like (22). (We use GRD to mark the gerundive form.)

(22) a. John is looking for linguistics articles to present.

b. The students are looking for linguistics articles to present.

c. *O-s aluno-s estão procura-ndo artigo-s de linguística para apresentar* (ambiguous)
The-PL student-PL be.PRS.3PL look.for-GRD article-PL of linguistics to present.INF

[9] Since these ambiguities do not show up in English, we are led to the conclusion that our analysis of the semantics of bare plurals in Brazilian Portuguese may not be appropriate for English bare plurals. We leave an exploration of this for further work, and thank an anonymous reviewer for forcing us to make this point clear.

'The students are looking for linguistics articles to present.'
(Schmitt & Munn: 8, example (15a))

Partee (1985) argues that while Carlson is right in arguing that *linguistics articles* in (22a) must have narrow scope and thus looks like a kind denoting term, the same bare plural in (22b) is ambiguous between a reading in which it has the same narrow scope interpretation as in (22a) and two other readings in which it is interpreted existentially, with the existential quantifier having scope over the intensional verb. On the narrowest scope reading discussed by Carlson, the students as a group are looking for a particular kind of thing, namely linguistics articles. For example, in a context in which you want to know why the students are in a particular area in the library, you might get the answer, "The students are looking for linguistics articles, which are kept in that section of the library." On the second and third readings, the bare plural has a quantificational interpretation in which it distributes over *the students* with either wide scope or narrow scope. On the wide scope reading it means that there are articles which the students are all looking for (either collectively or individually) and on the narrower scope quantificational reading, it means that each student individually is looking for some, possibly different, set of articles. As Schmitt and Munn observe, the BrP correlate of (22b), given in (22c) has exactly the same scope possibilities as the English example. They observe that in contrast, the bare singular has only the 'narrowest scope' reading in which the sentences asserts that the students are all looking for a certain kind of thing. This is illustrated in (23) which only has the reading that all the students are looking for a certain kind of thing, namely linguistics articles.

(23) *O-s aluno-s estão procura-ndo artigo de linguística para apresentar*.
The-PL student-PL be.PRS.3PL look.for-GRD article of linguistics to present.INF
'The students are looking for linguistics articles to present.'
(Schmitt & Munn: 8, example (15b)

Although not previously noticed in the literature, bare mass nouns have the same interpretive possibilities as the bare singular, and *suco* 'juice' below only has the narrowest scope reading, where all the students as a group are looking for juice:

(24) *O-s aluno-s estão procura-ndo suco para beber*.
The-PL student-PL be.PRS.3PL look.for-GRD juice to drink.INF.
'The students are looking for juice to drink.'

So while the bare plural can distribute over a plural subject, the bare singular and the bare mass can only have the non-distributive narrow scope reading associated with the kind interpretations.

With respect to range of interpretations then, bare singulars and bare mass nouns pattern together, and contrast with bare plurals.

We now move on to examining the interaction between bare singulars and aspect, and in particular the parallelism between distribution and interpretation of bare singular and mass nouns in the subject positions of perfective sentences. As Schmitt & Munn (1999) pointed out, (see also Doron 2003 for Modern Hebrew), the bare singular can freely occur in the subject position of generic sentences, but it cannot be the subject of episodic sentences, unless it gets a list interpretation or is focalized. This is shown in (25a), which does not have a natural episodic interpretation, and is possible only in the context of giving a list of what different groups of individuals are doing e.g. the boys

played soccer, the girls played tennis and so on, or in a contrastive or otherwise focalized environment. This constraint does not apply to the bare plural; sentence (25b) is naturally grammatical:

(25) a. ?? *Menino jog-ou bola.*
Boy play-PST.PRF.3SG ball.
'Boys played soccer.'
b. *Menino-s jog-ara-m bola*.
Boy-PL play-PST.PRF-PL ball.
'Boys played soccer.'

To the observation illustrated in (25), we want to add two factors. First, the contrast in felicity (25) is connected to the perfective aspect of the verb, and it disappears when the verb is imperfective, as showed below in (26). However, it is replaced by a contrast in interpretation: in the imperfective, the bare singular in (26a) is only interpreted generically as an assertion about what boys in general used to do. However, the bare plural subject in (26b) may be interpreted either generically, describing a past habit of the kind, or existentially, as an assertion about some group of boys who used to play soccer. Thus we can assert something about the kind, as in "In my youth, boys played soccer: now boys play computer games" using either (26a) or (26b). However, to make an existential assertion about what some group of boys used to do, only (26b) with the bare plural is felicitous:

(26) a. *Menino jog-ava bola*.
Boy play-PST.IPFV.3SG soccer.
'Boys used to play soccer.'
b. *Menino-s jog-ava-m bola*.
Boy-PL play-PST.IPFV-PL soccer.
'Boys in general used to play soccer' OR 'Some boys used to play soccer.'

Second, the bare mass noun shows the same restriction as the bare singular: it cannot be used as the subject of a verb with perfective aspect unless it is focalized or receives a list interpretation. (27a) is highly marked (unless the subject is prosodically highlighted and thus interpreted as focalized), although the bare mass noun is plainly felicitous as the subject of an imperfective predicate with a generic interpretation as shown by (27b):

(27) a. ?? *Cerveja cust-ou caro.*
Bier cost-PST.PRF.3SG expensive.
'Bier was expensive.'
b. *Cerveja cust-ava caro.*
Bier cost-PST.IPFV.3SG expensive.
'Bier used to be expensive.'

Thus, it seems generally neither the bare singular nor the bare mass may combine with perfective predicates. There is one exception to this: bare singulars and bare mass nouns can be subjects of perfective predicates if the predicate can truly express a relation between an event and a kind. This is the case in examples in (28). In (28a), the property of having reached Brazil is predicated of the horse kind **as a kind,** though the event was witnessed by specific individual horses reaching the country, and a similar assertion is made about rice as a kind in (28b). Here too, the bare plural is ambiguous

between the taxonomic and the true kind readings, (as in the example in (14) above), while only the true kind reading is available for the bare singular and bare mass (as was the case in (15) and (16)).

(28) a. *Cavalo entr-ou no Brasil com o-s portugues-es*. (only kind)
Horse enter-PST.PRF.3SG in.the Brazil with the-PL portugues-PL
'Horses arrived in Brazil with the Portuguese.'
b. *Arroz entr-ou no Brasil com a imigração japonesa*. (only kind)
Rice enter-PST.PRF.3SG in.the Brazil with the immigration Japanese.
'Rice arrived in Brazil with the Japanese immigration.'
c. *Cavalo-s entr-ara-m no Brasil com o-s portugues-es*. (subkind/kind/existential)
Horse-PL enter-PST.PRF-3PL in.the Brazil with the-PL portugues-PL
'Horses/Some kinds of horses/some horses arrived in Brazil with the Portuguese.'

With respect to bare singulars in object position, the data are more complex. In contexts such as (29), there is no obvious contrast between the bare singular and mass nouns, and the bare plural:

(29) a. *João viu filme ontem.*
João see-PST.PRF.3SG film yesterday
'Yesterday João saw films.'
b. *João comeu bolo ontem.*
João eat-PST.PRF.3SG cake yesterday
'Yesterday, João ate cakes.'

However, in other lexical contexts, the contrasts we have seen in subject position show up again. The examples in (30) are not fully felicitous, unless they are interpreted as iterative:

(30) a. ??*Ontem João costur-ou blusa*.
Yesterday João sew-PST.PRF.3SG blouse.
'Yesterday, João sew blouses.'
b. ??*Ontem, João consert-ou mobília*.
Yesterday, João repair-PST.PRF.3SG furniture.
'Yesterday, João repaired furniture.'
c. *Ontem João costur-ou blusa-s.*
Yesterday João sew-PST.PRF.3SG blouses.
'Yesterday, João sew blouses.'

Again, this contrast does not show up when the verb is imperfective.

(31) a. *Ontem, João est-ava costura-ndo blusa*.
Yesterday, João be.PST.IPFV.3SG sew-GRD blouse.
'Yesterday, João was sewing blouses.'
b. *Ontem João est-ava consert-ando mobília*.
Yesterday, João be.PST.IPFV.3SG repai-GRD furniture.
'Yesterday, João was repairing the furniture.'

The data discussed in this section allows us to make several important points. First, bare singulars in Brazilian Portuguese have the distribution of mass nouns. Second, bare singulars and mass nouns crucially do not behave like bare plurals. In the cases where bare plurals are ambiguous between kind and existential readings, or kind and subkind readings, bare singulars and mass nouns have a strictly kind interpretation. This means crucially, that there is no good reason to assume that bare singulars are number neutral in the sense of Schmitt and Munn (1999), Munn and Schmitt (2005) or Müller (2002). Number neutrality implies that the bare singular is not specified for mass or count, and that context determines its interpretation. However, if this were the case, we would expect the bare singular to show exactly the same context dependent variation that the bare plural shows, and as we have seen, it doesn't. The fact that existential readings and subkind readings are impossible in the examples cited above indicates that the kind interpretation of bare singulars and mass nouns is lexically determined and independent of syntactic or semantic context.

The third point concerns our assumption that the generic interpretation of bare singulars is based on a kind interpretation. This has so far been based on the fact that most of our informants found examples (15) grammatical. Since these are cases where a kind-level predicate is predicated of a bare singular subject, there is clear evidence that there are contexts where bare singulars must denote a kind. However, we will argue, more strongly, that bare singulars only denote kinds. This is contra Müller's (2004) account of bare singulars as quantificational generics. But, even the examples that Müller herself brings – example (56), page 88 -, support a kind rather than quantificational interpretation of bare singulars. She discusses examples like:

(32) *Judeu está fazendo jejum hoje*.
Jew be.PRES.3PS do-GRD fasting today.
'Jews are fasting today.'

Assume this example is uttered on Yom Kippur, the Jewish festival of fasting and atonement. (32) as a statement about the kind Jews makes the assertion that it is a characteristic of Jews as a group that they are fasting today. A quantificational generic interpretation would assert that all non-exceptional Jews are fasting today, and in the modern 21-century world, when most Jews do not adhere to traditional practice, this quantificational reading is false. Since (32) can be used in the context given to make a true assertion, the data supports a non-quantificational generic interpretation in which the bare singular denotes the kind. We will assume in the continuation of this paper that this is the case, and present an analysis in which bare singulars in Brazilian Portuguese behave like, and in fact are, mass nouns and denote kinds. We return to justifying the claim that bare singulars in Brazilian Portuguese always denote kinds in Pires de Oliveira and Rothstein (in preparation).

In the following section of the paper, we will give a semantics for mass nouns based on Rothstein (2010 a, b) which allows us to explain most of the contrasts given above, and which will allow us to hypothesize why Brazilian Portuguese has 'bare singulars' while English does not.

4. A semantics for bare noun phrases

4.1 A semantics for mass and count nouns

The claim that bare singulars in many languages are best treated as mass nouns denoting kind was made in Rothstein (2010b), which itself is based on the account of

the mass /count distinction proposed in Rothstein (2010a). In this section we give a summary of the theory, and in section 5, we will use the theory to explain the data presented in the previous two sections. We shall argue that the bare singular in BrP is mass since both denote kinds and have the same distribution.

Rothstein (2010a, b) assumes, following Chierchia (1998), that all nominals are interpreted with respect to a single Boolean structure. She assumes that the structure is a complete atomic Boolean algebra[10] M, ordered by the part of relation $\leq_M$. Intuitively, M is the mass domain. $\sqcup_M$, the sum operation on M, is the complete Boolean join operation i.e. for every $X \subseteq M$: $\sqcup_M X \in M$. Following Chierchia (1998), it is assumed that the set of atoms A of M is not fully specified, but may remain vague, but nothing rests on this particular assumption. All nominals are associated with an abstract root noun, N_{root} which denotes a subset of M. More precisely, N_{root} is the Boolean algebra generated under $\sqcup_M$ from a set of atoms $A_N \subseteq M$ (so root noun denotation N_{root} has the same 0 as M, its atoms are A_N, and its 1 is $\sqcup_M(A_N)$). Root nouns are thus lexically plural in Chierchia's sense. Root nouns denote sets (i.e. are not intensional) and are indexed for the world in which they are interpreted.

However, root nouns never appear as lexical items.[11] Mass noun and count noun denotations are derived from $N_{root,}$ the root noun denotation. We assume following Carlson (1977 a, b) that mass nouns denote kinds, in this framework the kind associated with N_{root}. Chierchia (1998) defines the kind associated with a nominal denotation as the function from worlds into the maximal entity instantiating N in that world, and we adapt his definition to our terminology in (33). Thus for any N_{root} we derive the kind reading by abstracting over the world variable.

(33) $^{\cap}N_{root} = \lambda w.\ \sqcup_M(N_{root,w})$

Kind terms are expressions denoting intensional entities of type **k**.

Returning to mass nouns, we assume that the denotation of a mass noun, N_{mass}, is derived by applying the operation MASS to N_{root}, and thus deriving the associated kind. Given the definition of kinds in (33), we have the following:

(34) Mass nouns:

a. $N_{mass} = MASS(N_{root}) = (^{\cap}N_{root}) = \lambda w.\ \sqcup_M(N_{root,w})$. The extension of a mass noun is thus $MASS(N_{root})(w_0)$

b. $^{\cup}$ is the function from kind-extensions) to sets of individuals such that for every kind-extension) $\mathbf{k}(w_0)$: $^{\cup}(\mathbf{k}(w_0)) = \lambda x.x \leq_M \mathbf{k}(w_0)$

So mass nouns denote the kind associated with the root noun, while the predicative use of a mass noun can be recovered by the $^{\cup}$ function. The $^{\cup}$ function, when applied to the kind, will give back the set of instantiations of the kind in w_0, i.e. the subset of entities in N_{root} which exist in w_0. Since we are going to deal only with extensional contexts here, we will from now on not indicate the world variable (unless it becomes relevant) and treat N_{mass} or $MASS(N_{root})$ as short for $N_{mass}(w_0)$.

[10] Rothstein (2010a) points out that nothing hangs on this choice and that the theory can be adapted to fit different accounts of mass semantics. Note also that while Rothstein (2010a, b) uses a complete Boolean algebra, Chierchia (1998) actually uses a semi-lattice structure.

[11] Note that in this respect Rothstein (2010b) differs from Rothstein (2010a). In the latter paper, mass noun denotations are identical to root noun denotations i.e. they are predicates. Rothstein (2010b) argues that mass nouns denote kinds. In this paper, we follow Rothstein (2010b).

Rothstein (2010a) argues that count nouns too are derived from N_{root}. Count nouns differ from mass nouns because they allow direct grammatical counting. The author argues that the operation of counting entities is dependent on a contextually determined choice as to what counts as one entity. This is shown by nouns such as *fence, wall* and *bouquet*, which, as we saw in section 2, are count nouns and therefore must denote sets of countable atoms, but which nonetheless denote different sets of atoms depending on the context of interpretation. The particular context dependent choice of what counts as one entity is encoded the notion of (counting) context *k*:

(35) A **context** *k* is a set of objects from M, $k \subseteq M$, K is the set of all contexts.
The set of count atoms determined by context *k* is the set $A_k = \{<d, k>: d \in k\}$

While not all count nouns vary in choice of atoms depending on the context of interpretation, (35) makes it a part of the semantics of counting that such variation is possible. All count predicates are thus indexed for context, although naturally atomic count predicates such as *child* do not vary contextually in the choice of atoms. However, non-naturally atomic count predicates such as *fence, wall* and *bouquet* may well vary according to context. We return to this in a moment.

Singular count nouns meanings are derived from root noun meanings by a count operation $COUNT_k$ which applies to N_{root} and picks out the set of ordered pairs $\{<d, k>: d \in N \cap k\}$, i.e. the set of entities in N_{root} which count as one in context *k*.

(36) For any $X \subseteq M$: $COUNT_k(X) = \{<d, k>: d \in X \cap k\}$
The interpretation of a count noun N_{count} in context *k* is: $COUNT_k(N_{root})$.

$N_{\underline{k}}$ is the count noun denotation derived by $COUNT_k(N_{root})$.
Since we now have a set of ordered pairs as the denotation of a N expression, it will be convenient to have a simple way of referring to the first member, or projection, of the ordered pair and the second member, or projection, of the ordered pair. We thus define π_n as an operation which applies to the set of ordered pairs N_k and allows us to access the set $N_{root} \cap k$ and the index *k* separately:

(37) $\pi_1(N_k) = \{d: <d, k> \in N_k\} = N_{root} \cap k$
$\pi_2(N_k) = k$

We use this function, for example, in deriving plural count nouns via Link's plural operation *, which takes a set of atomic entities and returns the set of all available sums of these entities. Thus $*(X) = \{y: \exists Y \subseteq X: y = \bigvee Y\}$. Since N_k is a set of ordered pairs <d, *k*>, the plural of N_k must be is the set of indexed sums where the sums are derived from $*(N_{root} \cap k)$. So, plural count nouns are derived by applying the standard plural operation to the first projection of N_k, or $\pi_1(N_k)$, as given in (38), and pairing the sums with the relevant index.

(38) In default context *k*: $PL(N_{count}) = *N_k = \{<d,k>: d \in *\pi_1(N_k)\}$
"the plural of N_{count} in context *k* is the result of applying the plural operation to $N_{root} \cap k$ and pairing each resulting sum with the index *k*."

Examples: $STONE_{mass} = MASS(STONE_{root}) = {}^{\cap}STONE_{root}$ = **stone**
$STONE_{count} = COUNT_k(STONE_{root})$

$= \{<d, k>: d \in STONE_{root} \cap k\}$

So $STONE_{mass}$ and $STONE_{count}$ are different sorts of entities in w_o and are of different types. $STONE_{mass}$ is the kind in $w_{o,}$ of type δ i.e. the maximal quantity of stone in $w_{o.}$ $STONE_{count}$ is a set $\{<d, k>: d \in STONE_{root} \cap k\}$ of type $< d£k, t>$ i.e. the set of indexed entities which count as one in context *k*. We see that crucially root, mass and count terms are of different types. Root terms denote subsets of M and are of type <d, t>. Mass terms denote kinds and are of type δ. Predicates derived from mass terms via $^{\cup}$ are of type <d, t>. Count terms, which denote sets of pairs in M £ K, are of type $<d£k, t>$.

One of the advantages of this theory, as argued by Rothstein (2010a, b), is that it allows us to distinguish more precisely between *natural atomicity* and *semantic atomicity*. Semantically atomic predicates are singular count predicates. They denote sets of pairs <d, *k*>, sets of indexed entities bearing the identical index indicating the context in which they count as one. Naturally atomic predicates denote sets of (possibly k-indexed) inherently individuable entities, such as furniture or *child*. These sets may be either singular or plural (where the plurality may be either lexical or grammatical). Naturally atomic mass nouns and naturally atomic count nouns are defined as follows: A mass noun denoting the kind $^{\cap}N_{root}$ is naturally atomic if the N_{root} it is derived from is naturally atomic. A count noun denoting N_{count} (or its plural) is naturally atomic if its first projection is naturally atomic or the plural of a naturally atomic set.

We saw in section 2 that natural atomicity is neither a necessary nor sufficient condition of being a count noun, and lack of natural atomicity is neither a necessary nor a sufficient property of being a mass noun. Thus while canonical mass nouns such as *water* and *mud* are not naturally atomic, some mass nouns such as *furniture, cutlery, jewellery,* and *company* are. Conversely, while many count nouns are naturally atomic, not all count nouns are. Examples of non-naturally atomic count nouns were noted in Mittwoch (1988), Krifka (1992), Rothstein (1999), (2004), (2010a), and include *fence, wall, lawn, sequence, line, plane, twig*. Rothstein (2010a) argues that both natural and semantic atomicity are grammatically relevant. For example, only semantically atomic predicates, i.e. count nouns, can be modified by numeral modifiers. However, as we saw in section 2, naturally atomic predicates as well as semantically atomic predicates can be modified by individuating predicates and can provide antecedents for reciprocals in Brazilian Portuguese. Rothstein (2010a) gives other cases, for example, predicates like *big* distributes over natural atoms when predicated of mass nouns as in "the furniture in our house is big".

4.2 Where do bare singulars come from?

Rothstein (2010b) argues that in the default case in English, either the lexical rule deriving mass nouns applies to N_{root} or the rule deriving count nouns applies to N_{root}, but not both. This is formulated in (39):

(39) *The 'either/or' principle for the derivation of nouns*
Either $COUNT_k$ or MASS applies to a root noun, but not both.

While, in English, (39) is the default situation, there is a limited set of cases in which both MASS and $COUNT_k$ may apply to $N_{root.}$ In this case, alongside the count noun, there is a mass noun in the lexicon. This happens with nouns denoting foodstuffs such as *apple*(*s*) as in (40a), and substances such as stone(*s*), in (40b), as well as in a few isolated cases, where the bare singular clearly denotes a kind. Krifka *et al* (1995) bring

(40c) as an example of *man* used as a kind denoting term in English, though they do not give an analysis.

(40) a. John hates eating apples, but he likes apple in the salad.
b. There were a lot of stones in the garden, although together they didn't amount to much stone.
c. Man has lived in Africa for more than 2 million years (Krifka *et al* 1995: 6)

Rothstein (2010b) suggests that languages vary as to whether the default principle set out in (39) applies, and suggests that if a language generally allows bare singulars alongside count predicates, this is because (39) does not apply. In such a language, all count nouns will have a lexicalized mass correlate which, since mass nouns are morphologically singular, will show up as bare singulars variants of count nouns. Brazilian Portuguese is an example of such a language. On this account, bare singulars in Brazilian Portuguese denote kind terms (just as other mass nouns do). Thus the mass form of *menino* 'boy' is hypothesized to have the denotation $^{\cap}\text{BOY}_{\text{root}}$, while the count nominal denotes the set of ordered pairs $\{<x, k>: x \in \text{BOY} \cap k\}$. This of course explains straightforwardly why mass nouns and bare singulars show the same linguistic behavior – they are both instances of the same category. MASS applies freely to root nouns, whereas count is restricted.

Thus the claim is that bare singulars and mass nouns are the same phenomenon. The only difference is that bare singulars have count noun counterparts, which are morphologically identical but obey the rules for count syntax. Nouns traditionally labeled 'mass' have no count counterparts. We have very little to say about how Brazilian Portuguese constrains where COUNT applies. There are clear crosslinguistic generalisations about which nouns in a mass/count language are most likely to be count (human, animate, inherently spatially differentiated and so on), and there is also a fair amount of language specific idiosyncrasy, and Brazilian Portuguese is no different from other languages in this respect. So we have no explanations as to why COUNT_k applies to some naturally atomic root nouns (like *menino* 'boy'), and not to others, like *bijuteria* 'jewellery'.

In the following section, we show how this semantic analysis explains most of the properties of bare singulars in Brazilian Portuguese that we discussed in sections 2 and 3, and the contrast between bare singulars and bare plurals.

5. Explaining the Brazilian data

5.1 Individuating predicates

We begin with the data presented in section 2 where we discussed the claim that bare singulars are not mass because individuating predicates such as reciprocals, reflexives and distributive predicates like *pesar 20 kg* 'to weigh 20 kg' combine with bare singulars but not mass nouns. We showed there that this is not a good argument because this view considers only prototypical naturally atomic count nouns, and prototypical non-naturally atomic 'substance' mass nouns. When we consider non-prototypical count and mass nouns, the picture changes. Distributive predicates do not combine naturally with bare singular nouns which do not denote sets of natural atoms such as *cerca* 'fence', and *reta* 'line', while bare mass nouns which denote sets of natural atoms, such as *mobília* 'furniture', are acceptable as subjects of individuating

and distributive predicates, contrary to the predictions of the canonical view[12]. Rothstein (2010 a, b) argues that this is evidence that grammatical operations, and in particular distributivity, may be parameterized according to whether they are sensitive to natural or semantic atomicity. As section 2 showed, measure phrases such as *pesar 20 kg* 'to weight 20 kg' are sensitive to natural atomicity, and reciprocals in Brazilian Portuguese allow naturally atomic antecedents as well as semantically atomic antecedents. Note that sensitivity to natural or semantic atomicity may well be a parameter at which languages differ. In fact, while Brazilian (and indeed European) Portuguese allows reciprocals to find antecedents in the denotation of naturally atomic predicates, English does not. (41a) is ungrammatical in English, but grammatical in BrP, (41b), while (41c) is perfectly acceptable in both languages.
each other.'

(41) a. *Furniture is stacked on top of each other.
b. *Mobília está empilh-ada uma em cima da outra.*
Furniture be.PRS.3SG stack-PST.PTCP one in above of.the other.
c. Pieces of furniture/chairs were stacked on top of each other.

These data show that there is no foundation for the generalization that bare singulars are atomic while bare mass nouns are not, and, incidentally, that an account of distributivity phenomena must be much subtler than the simple statement that distributive predicates distribute over count noun denotations.

5.2 Absence of Universal Grinder readings

A second classic argument against treating bare singulars as mass, which we did not discuss in section 2, relates to the Universal Grinder readings. Munn and Schmitt (1999) argued that if bare singulars are mass nouns, we would expect them to have 'ground' readings analogous to the interpretations of the English examples like (42). In Universal Grinder readings, illustrated in (42), the predicate *dog* has only dog parts in its denotation and not atomic dogs. (1c) does not have this kind of ground reading:

(42) After the accident there was dog all over the road.
(1c) *Minhoca cava buraco.*
Earthworm dig-PRG-3SG hole big
'Earthworms dig holes.'

However, on the analysis of bare singulars and mass nouns given in section 4, there is no reason to expect bare singulars to have ground readings. Rothstein (2010 a, b) argues that the grinder reading in (42) is derived via a type shifting operation on a bare count noun. This type shifting operation is triggered by the fact that the count noun appears in a syntactic context in which count nouns are illegal, since singular count nouns are required to have a determiner. Thus the "Universal Grinder" effect (that, the effect of the type-shifting operation) is the result of a syntactic mismatch. But on the account of mass nouns and bare singulars given in section 4, the bare singular in (1c) enters into the derivation as a mass noun denoting the kind Earthworm. Since mass nouns do not require a determiner, there is no syntactic mismatch, and no type shifting or other sort of coercion will be triggered. (1c) does not have a Universal Grinder reading for exactly the same reason that *Jewellery was all over the table* does not have a ground reading in

[12]Schwarzschild (2009) independently notes that these predicates, which he calls 'stubbornly distributive predicates' distribute over minimal individual entities in the denotation of mass predicates.

English. In both cases the subject noun is a mass noun, and there is nothing ungrammatical about its appearing without a determiner. In general, there is no more reason to expect a ground reading for the bare singular than for the other naturally atomic mass terms in either language.[13]

5.3 Interpretation of bare nouns

We turn now to the data presented in section 3, showing that in many respects the bare singular and the bare mass behave alike and contrast with the bare plural. To recap, the data that we want to explain is the following. First, while bare singulars, bare mass and bare plurals may all denote kinds, only bare plurals have a so-called 'taxonomic' use, where they denote sets of subkinds. Second, where bare plurals are ambiguous between a kind and an existential reading, bare singulars and mass nouns have only the kind/generic reading. Thirdly, bare singulars and mass nouns are not normally felicitous subjects of perfective predicates, while there are no such restrictions on bare plurals, and there are also contrasts (though less clear cut ones) in direct objects of perfective verbs. Fourthly, mass and bare singular nouns always have narrowest scope, while bare plurals as dependent plurals can interact with other elements in the sentence. So, while Carlson's (1977 a, b) theory of bare plurals as kind-denoting terms drew the attention of linguists to the similarities between bare plurals and mass nouns, our data here forces us to go beyond this and focus on the differences in their linguistic behavior.

We will not attempt to explain all these contrasts here, especially since the interaction of bare nouns and the perfective/imperfective contrast is a very complex topic requiring a lot more research into the semantics of grammatical aspect than is currently available. However, we can give some preliminary account of what seems to be going on.

Looking at the data in section 3, the generalization seems to be that the bare plural allows interpretations which need access to the set expression related to the kind term, that is the set of indexed instantiations of the kind. Mass terms (and by now we take it for granted that this includes bare singulars) do not allow grammatical access to the set of instantiations of the kind. This leads to the conclusion that the two sorts of bare nouns are derived in different ways. What we propose is the following:

(i) Bare singular/mass nouns denote kinds, as proposed in section 4.
(ii) Bare plurals are generated as predicate expressions, as proposed in Krifka (2004).

[13] There are contexts in which a ground reading is available, e.g. (i):

(i) *Tinha cachorro pela parede toda.*
have.PST.IPFV.3SG dog across.the wall whole.
"There were dogs all over the wall" or "There was dog all over the wall."

(i) is ambiguous between a 'universal grinder' reading "there was dog all over the wall" and what Cheng Doetjes and Sybesma (2008) call the "wallpaper" reading, where (i) asserts that there were lots of dogs all over the wall, with the implication that the wall was decorated with pictures of dogs. The wallpaper reading is the preferred reading. We assume that the "wallpaper" reading arises when *cachorro* 'dog' is interpreted as denoting a kind: there were instantiations of the dog kind (presumably pictures) all over the wall. The ground reading will arise if *cachorro* is interpreted as a determinerless count noun, which will lead to a syntactic mismatch and trigger a universal grinder interpretation. At the moment we do not know why these universal grinder effects occur only in existential contexts such as (i), but the topic is too complex to discuss in this paper. Our point is only that we should not be surprised when bare singulars do not have this interpretation.

Krifka argues that bare plurals are generated predicate expressions denoting sets of individuals (or in our terms, sets of indexed individuals). They may type-shift, via ∃, to existential readings or via the $\cap$ operator to kind–terms depending on the context in which they occur. Thus, instead of shifting from the kind reading to the existential reading or to the predicative reading, the type-shifting is in the opposite direction.

We adapt Krifka's (2004) account to the theory of count nouns assumed here. There is a type shifting operation ∃, which shifts from the predicate reading of bare plurals at type <d£*k*, t> to the generalized quantifier reading as in (43a), and illustrate it by applying the rule to the denotation of the plural noun *dogs* in (43b). We use ***x*** as a variable over expressions of type <d£*k*, t>:

(43) a. Type shift ∃:
$\lambda \boldsymbol{x}.\pi_1(\boldsymbol{x}) \in {}^*\pi_1(N_k) \wedge \pi_2(\boldsymbol{x})=k \Rightarrow \lambda P \exists \boldsymbol{x}[\pi_1(\boldsymbol{x}) \in {}^* \pi_1(N_k) \wedge \pi_2(\boldsymbol{x})=k \wedge P(\pi_1(\boldsymbol{x}))]$

b. $\lambda \boldsymbol{x}.\pi_1(\boldsymbol{x}) \in {}^*\pi_1(DOG_k) \wedge \pi_2(\boldsymbol{x})=k \Rightarrow \lambda P \exists \boldsymbol{x}[\pi_1(\boldsymbol{x}) \in {}^* \pi_1(DOG_k) \wedge \pi_2(\boldsymbol{x})=k \wedge P(\pi_1(\boldsymbol{x}))]$

The generalized quantifier denotes the set of sets which have some (indexed) atomic dogs in their denotation.

We assume a second type-shifting operation which shifts from the predicate reading to the kind. Although we did not make it explicit in section 4, we assume that there is an implicit world index in the denotation of the count noun too, (since it is derived from the extensional $N_{root,w}$). Kind formation abstracts over the w index in ${}^*N_{k,w}$ to give the function from worlds to the maximal sum of N in w[14]. The sum of a count noun denotation is the pair consisting of the sum of the entities in $\pi_1(N_{count})$ and the index *k* indicating the context relative to which the count noun is derived, as defined in (44a). The type shifting rule $\cap$ which uses the sum operation is given in (44b):

(44) a. $t\,{}^*N_{count,w} = t\{<d,k>:d \in {}^*(N_{root} \cap k)_w\} = <t_M{}^*(N_{root} \cap k), k>_w$

b. Type shift $\cap$:
$\{<d,k>:d \in {}^*(N_{root} \cap k)_w\} \Rightarrow \lambda w.\, t({}^*N_{count,w})) = \lambda w.<t_M{}^*(N_{root} \cap k), k>_w$

(We will see later that type-shifting from the kind to the predicate reading does occur with bare singulars and bare mass, but it must be triggered by an overt operator such as a mass quantifier. The relevant examples will be discussed in section 6.)

With these assumptions we can return to the contrasts discussed in section 3.

First, both mass nouns and bare plurals can be subjects of kind level predicates such as *estar extinto* 'to be extinct', as in example (15), and *abundante* 'abundant', in example (16). We have argued that bare mass/singular expressions are inherently kind expressions, so their occurrence as subjects of these predicates is not surprising. Bare plurals enter into the derivation as predicate expressions, and the kind predicate triggers a kind reading via the operation $\cap$ in (44b).

Second, we saw that the choice of verb and of aspect constrains the distribution of bare mass/singular and bare plural expressions in different ways. We assume (essentially following Carlson 1977 a, b) that verbal predicates may lexically select for arguments which are individual or stage-level. A predicate like *know* or *own* naturally selects for an individual theme argument, while *meet* or *see* naturally selects for a stage level argument (since you own an individual house and know an individual person, but

[14] We assume that the kind operation abstracts over the world variable and keeps the context variable *k* constant. We are aware that this is open for discussion, but do not want to go into the matter here.

meet or see only a stage of that person). Some verbs may select for either individual or stage level arguments. We can use this to explain the contrasts in (21), repeated here.

(21) a. *João gosta de cachorro-s*. (kind OR specimen readings)
João like-PRS.3SG of dog-PL.
'João likes dogs in general' OR 'João likes some individual dogs.'
b. *João gosta de cachorro* (kind/*specimen)
João like-PRS.3SG s of dog.
'João likes dogs in general.'

We assume that *gostar de* 'to like', as a dispositional predicate selects for individual level arguments, including individual entities and kinds. The bare plural argument *cachorros* 'dogs' in (21a) enters into the derivation as a predicate and, since *gostar de* does not take a predicate complement it must shift to an appropriate type. In this case, it can shift to either a kind reading via the $\cap$ operation, (since kinds are appropriate arguments of *gostar de*), and it can also shift to the existential reading, with the constraint that the existential quantification is over individual entities and not stages of individuals. Thus (21a) is ambiguous between a kind and a specimen interpretation, depending on which type the predicate shifts to. Since the bare mass nouns *cachorro* 'dog' and *suco* 'juice', inherently denote kinds, they provide a natural argument for *gostar de*. No type shifting is required (or possible) and only the kind interpretation of the sentence is available.
Note that this explains the contrasts between (45a) and (45b):

(45) a.# *João gosta de Fido e Ben mas ele não gosta de cachorro-s*.
João like.PRS.3SG of Fido and Ben but he not like.PRS.3SG of dog-PL.
'João loves Fido and Ben but he doesn't like dogs.'
b. *João gosta de Fido e Ben mas ele não gosta de cachorr*.
João like.PRS.3SG of Fido and Ben but he not like.PRS.3SG of dog.
'João loves Fido and Ben but he doesn't like dogs.'

(45a) is odd because it seems like a contradiction. In the first clause, *gosta de* 'likes' takes individuals (and not kinds) as an argument, and this makes the existential reading of *cachorros* 'dogs' prominent in the second clause. This results in the contradictory assertion that João does like two dogs, but there are no dogs that he likes. In (45b), the singular *cachorro* 'dog' has only the kind reading, and this leads to the non-contradictory reading that while João likes Fido and Ben (who are dogs), these are exceptions and he does not like dogs as a kind.

Predicates such as *é útil* 'is available' illustrated in (19) select either stages or individuals as their arguments:

(19) a. *Bombeiro-s são utéi-s*. (generic OR existential readings)
'Fireman-PL be.PRS.3PL available-PL.
'Firemen in general are available.' OR 'Some plumbers are available.'
b. *Bombeiro é útil*. (ONLY generic reading)
Fireman be.PRS.3SG available.
'Firemen in general are available.'

As in the previous example, the bare plural in (19a) enters in to the derivation as a predicate and shifts either to the kind type, as in (46a), or the generalized quantifier type

as in (46a'), and thus the sentence is ambiguous between the kind and the existential reading. Since the bare singular (i.e. mass) noun enters into the derivation as a kind term, only the generic reading is available for (19b) illustrated in (46b).

(46) a. AVAILABLE($\cap^*$FIREMAN$_{count}$)
a'. $\exists x\,[x \in \pi_1(^*\text{FIREMAN}_{count}) \wedge \text{AVAILABLE}(x)]$
b. AVAILABLE (FIREMAN$_{\mathbf{kind}}$)

Note that the fact that the bare singular and mass always denote a kind does not prevent the sentence being witnessed by specific instantiations of the kind. In (21b), *João gosta de cachorro* 'John likes the dog kind', we assume that there are specific dogs which John likes as a result of his relation to the kind. What we argue is that there is no semantic existential quantification over instances of the kind in the interpretation of this sentence or other sentences with bare singular and mass subjects. For a more lengthy discussion of this point, see Landman and Rothstein (2010).

The third issue is the interaction of bare nominals with aspect, and in particular the infelicity of bare singulars and mass nouns as subjects of perfective predicates. We assume following Filip (2000) and others, that perfective aspect is a predicate which modifies the denotation of the VP and adds the information that the event which took place was total, i.e. that the running time of the event is included in the reference time. This is enough to give a tentative explanation of the contrasts in (25):

(25) a. ?? *Menino jog-ou bola.*
Boy play-PST.PRF.3SG ball.
'Boys played soccer.'
b. *Menino-s jog-ara-m bola.*
Boy-PL play-PST.PRF-PL ball.
'Boys played soccer.'

On the assumption that *menino* in (25a) denotes a kind, the sentence asserts that there was a total or complete event of playing soccer with the boy-kind as its agent, in other words this is an episodic interpretation. But this is normally a bizarre assertion since it is difficult to see what such a total event involving the kind could be. (25b) is acceptable since an alternative existential reading is available. (25a), however, is acceptable in a contrastive context such as (47):

(47) *Na festa, menino jog-ou bola e menina jog-ou tênis.*
At the party boy play-PST.PRF.3SG ball and girl play-PST.PRF.3SG tennis
'At the party, the boys played soccer and the girls played tennis.'

This is exactly because here the sentence can naturally be taken as an assertion about the boy-kind participating in a complete event: in the context of the party, there was a bounded event of playing soccer which the boy-kind (relative to the party) participated in, while the girl-kind did something else. Note that the definite article in the English translation of (47) is a reflection of the kind interpretation of the bare singular.
The examples in (28) illustrate the same point:

(28) a. *Cavalo entr-ou no Brasil com o-s portugues-es.* (only kind)
Horse enter-PST.PRF.3SG in.the Brazil with the-PL portugues-PL
'Horses arrived in Brazil with the Portuguese.'

c. *Cavalo-s entr-ara-m no Brasil com o-s portugues-es*. (subkind / kind)
Horse-PL enter-PST.PRF-3PL in.the Brazil with the-PL portugues-PL
'Horses/Some kinds of horses arrived in Brazil with the Portuguese.'

Here the completed arrival had the whole kind as a participant (since the arrival of a few horses in Brazil affected the status of the kind as a whole) and thus the perfective predicate can naturally take a bare singular, kind denoting expression as its subject. Since the bare plural begins as a predicate and can rise to either the generalized quantifier type or the kind type, the parallel sentence with a bare plural subject, illustrated in (28c) earlier, has either the kind or the existential reading.

A similar account explains the interpretation of the imperfective examples Imperfective aspect is associated with either a habitual or a progressive interpretation. Habitual predicates express properties of individuals while progressives are usually episodic, since they express that a particular event was 'in progress'. We expect then, that habitual predicates allow kind arguments, while kinds are much less plausible as subjects of progressives. This means that on the progressive reading, bare singulars, which only have a kind reading, should tend to be infelicitous, while bare plural predicates can have their natural existential reading through raising with ∃. This is indeed what we found in (26). Where the verbal predicate is imperfective, the bare singular allows only the past habitual reading, while the bare plural allows either the habitual or the progressive reading.

(26) a. *Menino jog-ava bola*.
Boy play-PST.IPFV.3SG soccer.
'Boys used to play soccer.'
b. *Menino-s jog-ava-m bola*.
Boy-PL play-PST.IPFV-PL soccer.
'Boys in general used to play soccer' OR 'Some boys used to play soccer.'

As we discussed in section 3, there are differences between bare singulars and bare plurals in object position of perfective predicates as well. We are not going to attempt to give an account of the interpretation of the bare singular in direct object position of perfective predicates here, since it requires an in-depth discussion of the semantics of perfectivity and lexical aspect which would take us far beyond the scope of this paper. (For some discussion see Pires de Oliveira 2011, Pires de Oliveira and Rothstein in preparation.) What is important for us is that the differences between bare singulars and bare plurals carry over to direct object position too. We will note that the theory presented in the last sections predicts that even in object position the bare mass denotes the kind. Thus (29a) is an assertion that João stood yesterday in the seeing relation with the film kind, and was thus involved in a certain kind of activity.

(29) a. *João viu filme ontem.*
João see-PST.PRF.3SG film yesterday
'Yesterday João saw films.'
b. *João comeu bolo ontem.*
João eat-PSG.PRF.3SG cake yesterday
'Yesterday, João ate cakes.'

Again, the so-called existential reading results from the existential implication, since João cannot stand in a seeing relation to the film kind unless there is some particular film that he saw at least part of. But this does not require existential quantification over entities as part of the semantic interpretation, as discussed in Landman and Rothstein (2010). In examples such as (30a, c), where the activity reading is not easily expressed by the perfective verb, the bare singular is highly dispreferred, while the bare plural has a natural interpretation.

(30a, c) *Ontem João costur-ou ??blusa/^{ok}blusa-s.*
Yesterday João sew-PST.PRF.3SG blouse/blouse-PL.
'Yesterday, João sewed blouses.'

Note that addition of a durative modifier improves the sentence with a bare singular, since the durative allows us to interpret *costur-ou blusa* 'sew-PST.PRF.3SG blouse' as a type of activity involving the kind rather than individual blouses.

(48) *João costur-ou blusa a tarde inteira.*
João sew-PST.PRF.3SG blouse the afternoon whole.
João sewed blouses the whole afternoon.

We assume that in general this supports our approach, and explore further the interaction of perfectivity with bare nouns in the work in progress cited above.

The last two contrasts to explain are the contrasts with dependent plurals and the taxonomic readings. We will only sketch outlines of a solution here since both issues are major topics of research in their own right and proposing serious solutions to them is beyond the scope of this paper.

Concerning dependent plurals, we saw, the bare plural in (22c) has both the kind interpretation discussed in Carlson (1977 a, b), and the dependent plural reading discussed in Partee (1985), where *artigos de linguística* 'linguistic articles' is dependent on the plural antecedent *os alunos* 'the students'. The bare singular object in (23) has only the first reading.

(22) c. *O-s aluno-s estão procura-ndo artigo-s de linguística para apresentar* (ambiguous)
The-PL student-PL be.PRS.3PL look.for-GRD article-PL of linguistics to present.INF
'The students are looking for linguistics articles to present.'
(Schmitt & Munn: 8, example (15a))

(23) *O-s aluno-s estão procura-ndo artigo de linguística para apresentar.*
The-PL student-PL be.PRS.3PL look.for-GRD article of linguistics to present
'The students are looking for linguistics articles to present.'
(Schmitt & Munn: 8, example (15b)

Partee (1985) suggests that the dependent plural readings of (22c) results from interpreting the bare plural direct object as a plural predicate bound by an existential quantifier rather than as a kind term. The narrowest scope reading in which the students are looking for a certain kind of thing is derived via interpreting *linguistics articles/ artigos de linguística* as a kind-denoting expression. The two quantificational readings are derived via interpreting the bare plural in both English and Brazilian Portuguese as a

predicate bound by an existential quantifier. On the widest scope reading, where there is some set of articles which all the students are looking for, the existential quantifier has scope over the subject of the sentence. On the narrower scope existential reading, the existential quantifier distributes over the set of students, so that each student may be looking for a different set of articles. The contrast with (23) indicates that the bare singular does not have either of the quantificational interpretations. This is explained on our approach since it only has an interpretation as a kind-denoting expression. The bare plural enters into the derivation of (22c) as a predicate expression. On the narrowest interpretation, it shifts to a kind-denoting term. We propose that on the dependent plural readings of (22c), it remains at the predicate type, and is later existentially bound either below or above the interpretation of the plural subject. The exact mechanisms of how the interpretation takes place or how the predicate *estão procurando artigos de linguística* 'are looking for linguistic papers' gets to distribute over the plural subject is beyond the scope of this paper.

The final contrast between mass/bare singulars, on the one hand, and bare plurals on the other is that bare plurals may have a taxonomic reading (in the sense of Krifka 1995 et al) while mass nouns/bare singulars may not have this reading, as illustrated in (14) and (15) repeated here:

(14) *Baleia-s estão em extinção*. (sub-kind and kind readings)
whale-PL be.PRS.3PL in extinction.
'Whales (in general) are/the whale is on the verge of extinction.'OR 'Some kinds of whales are on the verge of extinction.'

(15) *Baleia está em extinção*. (only kind reading)
Whale be.PRS.3SG in extinction.
'Whales are /the whale is on the verge of extinction.'

We explain this contrast by deriving the set of subkinds of a kind via the related predicate interpretation.

(49) Let $P(P_w)$ be a partition of the set of atoms in P_w.
We specify the operation $SK(P(P_w))$ which gives us the set of sums of the blocks of the partition P on P_w such that $SK(P(P_w)) = \{ t X: X \in P(P_w)\}$.

These sums are (extensionally) the subkinds of $^{\cap}P_w$. Obviously, there are many possible partitions on P_w and we assume that context determines which the relevant partition is. It is this set which is used in the interpretation of (14). *Baleias* 'whales' in (14) denotes the set of (extensional) subkinds of whales, $\{ t X: X \in P(*WHALE_{count,w})\}$. Type shifting by $\exists$ allows existential quantification over the set of (sub)kinds and allows the interpretation in (50) for the subkind interpretation of (14). Note that since *baleias* is a count predicate, the sums of the blocks of the partition are of type <d, *k*>:

(50) $\exists \boldsymbol{x}: \boldsymbol{x} \in \{ t X: X \in P(*WHALE_{count,w})\} \wedge$ ON-THE-VERGE-OF-EXTINCTION($\boldsymbol{x}$)
"There is some sum of whales (=subkind of whales) which is on the verge of extinction."

Since bare singulars enter into the derivation at the type of kinds, there is no predicate available to be the input to the SK operation, and the taxonomic reading is not available.

6. Some Predictions

In this section we will further explore our proposal, showing that it correctly predicts some facts that have not previously been mentioned in the context of the discussion of bare singulars in Brazilian Portuguese:[15] (i) bare singulars occur as complements of mass quantifiers, a surprising fact given that the literature on Brazilian Portuguese has always claimed that the bare singular is indeed bare; (ii) the bare singular displays interesting properties in comparative sentences.

6.1 Mass quantifiers

As we have already said, the literature on bare singular has always stressed that it is bare, that it always show up without any quantifier. Nonetheless, if our hypothesis is sound, and the bare singular is mass, then we expect that it may occur with mass quantifiers. In Brazilian Portuguese, mass nouns combine with *muito/muita* 'much', whereas plural count nouns only combine with *muitos*/*muitas* 'many':

(51) a. Tinha muito óleo na maionese.
Have.PST.IPFV.3PS much oil in-the mayonnaise
'There was too much oil in the mayonnaise.'
b. Tinha muitos/*muito alunos na sala.
Have.PST.IPFV.3PS many/much student-PL in-the room.
'There were too many students in the room.'

Muito always agrees with its complement in gender and number. When it takes a bare plural form it agrees in gender and is marked plural. With a mass noun it agrees with the complement in gender and there is no surface mark of plurality.

In addition to *muito* and *muitos* (and the matched feminine forms), Brazilian Portuguese uses analogous *wh*-expressions *quanto* or *quantos*: *quanto* 'how much' is used with mass predicates, whereas *quantos* 'how many' appears with plural count nouns:

(52) a. Quanto óleo vai na massa?
How oil go.PRS.3SG in-the dough
'How much oil goes in the dough?'
b. Quantos livros ele comprou?
How-PL book-PL he buy-PST.PRF.3SG
'How many books did he buy?'

[15] As one of the reviewers points out, singular count nouns occur with mass quantifiers in European Portuguese (Meisterfeld 1998) and Spanish (Kabatek 2008) although not completely productively in either language. Neither of these languages allows bare singular noun phrases. The reviewer suggests that the phenomenon illustrated in (51-58) below may not be related to general phenomenon of bare singulars, since some explanation is required for European Portuguese and Spanish too. This is of course possible. However, our point is that in a language with bare singulars, if the bare singulars are mass counterparts of count nous as we have argued, examples like (51-58) are naturally predicted, and easily accounted for within our analysis. This leaves open the question of how they arise in European Portuguese and Spanish. While this question is far beyond the scope of this paper, it seems to us plausible that the mass quantifier may induce a type-shifting operation from a count to a mass denotation, although a general interpretation of count nouns at the mass type is impossible.

Our theory predicts that if bare singulars are mass nouns, they should appear with *muito*, *quanto*, and other mass quantifiers. This is exactly what we find.

Consider the following context: João is travelling and has a huge amount of books on his hands. His mother can make the following remarks:

(53) a. Quanto livro você acha que pode levar!?
Much book you think-PRS.2SG that can-PRS.2SG to carry-INF
Intended meaning: 'What quantity of book can you carry?!'
b. É muito livro pra você levar!
be.PRS.3SG much book for you to carry-INF.
Intended meaning: 'The volume of books is too much for you to carry.'

In (53a) the mother is commenting on the volume of the quantity of books that he is carrying not on the cardinality of books. The sentence may be true even if he has few books, provided that the books are thick or heavy. Her comment in (53b) is also about the volume, the weight of the books is too much for him to carry. Here again, (53b) may be true in a situation where he has only few books but they are all very heavy. (Note that these examples cannot be derived from a universal grinder effect, since the sentences in the contexts given are clearly talking about quantities of whole, atomic books).

In contrast with (53a), the sentence in (54a) asks about the cardinality of the set of books that João bought, and (54b) likewise makes an assertion about cardinality of this set. Neither sentence can be about the volume of books that he bought. (54b) is false in a situation in which João has bought only a few books, even if the books that he has bought are thick ones:

(54) a. Quantos livros João comprou?
How many book-PL João buy-PST.PRF.3SG
'How many books did João buy?'
b. João comprou muitos livros.
João buy-PST.PRF.3SG many book-PL.
'João has bought many books.'

On the other hand, sentence (55) out of the blue is not felicitous. It requires a particular context in which what is measured is the volume or the weight of the books. Imagine a situation where books are sold by weight. In this context, the sentence is acceptable:

(55) ? Quanto livro você comprou?
How book you buy-PST.PRF.3SG
Intended meaning: 'What quantity of books did you buy?'

Since *muito* presumably quantifies over instantiations of the kind, we assume that it denotes a function of type <**k**, <d, t>> from kinds to a set of their instantiations:

(56) $\llbracket \text{muito}_{\langle \mathbf{k}, \langle d,t \rangle \rangle} \rrbracket = \lambda\mathbf{k}\lambda x.\text{INST}(x,\mathbf{k}) \wedge \text{MEAS}_{\text{vol}}(x) > d_{\text{norm}}$
"the denotation of *muito* is a function which applies to a kind to give a set of instantiations of the kind whose measurement on the appropriate dimensional scale is above the norm."

(57) $\llbracket \text{muito livro} \rrbracket = \lambda\mathbf{k}\lambda x.\text{INST}(x,\mathbf{k}) \wedge \text{MEAS}_{\text{vol}}(x) > d_{\text{norm}}\ (\text{LIVRO}_{\mathbf{k}})$

$$= \lambda x.\text{INST}(x,\text{LIVRO}_{\mathbf{k}}) \wedge \text{MEAS}_{\text{vol}}(x) > d_{\text{norm}}$$

Thus, contrary to the traditional view, the bare singular does not always have to be bare, but it can occur with mass quantifiers, a prediction of our theory. And while we have hypothesized that there is no lowering operation triggered by an episodic predicate, we do see here that the instantiations of a kind can be accessed by an explicit function introduced by a quantificational element such as *muito* in (57).

Finally, if what we are claiming is sound, then the bare singular should combine with expressions that are specialized for mass nouns such as *um pouco de* 'a little of'. And this is precisely what we find, as exemplified below:

(58) João guardou um pouco de livro no armário.
João kept-PST.PRF.3SG a little of book in.the shelf.
'João kept a few books in the shelf.'

There is another fact, unnoticed in the literature, in which the bare singular behaves like a mass noun with respect to explicit quantificational operators: unlike the bare plural, it may appear with a partitive preposition:

(59) a. Quanto de livro eu posso carregar?
How of book I can-PRS.1SG carry-INF
Intended meaning: 'What quantity of book can I carry?'
b. Quanto de leite eu ponho no bolo?
How of milk I put-PRS.1SG in-the cake
'How much milk should I put in the cake?'
c. * Quanto de livros eu posso carregar?
How of book-PL I can-PRS.1SG carry-INF

6.2 Comparative contexts

Finally, we comment briefly on the behavior of the bare singular in comparison sentences. Bale & Barner (2009) argue that the best test to distinguish mass from count nouns is their behavior in comparison sentences: comparing count nouns amounts to comparing the cardinality, whereas mass nouns may access different scales. Comparing *mobília* 'furniture', for instance, may be comparing the volume of two quantities of furniture or the number of pieces of furniture because it is a naturally atomic, but mass predicate. Comparing two sums in the denotation of *meninos* 'boys', can only be a comparison of cardinalities since *meninos* 'boys' is a count noun. Bale and Barner show that the comparative judgments shift according to the syntactic status of the noun as mass or count. Given our hypothesis we expect that the bare singular behaves like mass: it may be interpreted as comparing units or as comparing according to some other dimension.

(60) a. Esse jardim tem mais pedra do que aquele.
This garden have.PRS.3SG more stone of.the that that.
'This garden has more stone than the other one.'
b. João tem mais corda que Pedro.
João have.PRS.3SG more rope that Pedro.
'João has more rope than Pedro has.'

(60a) may be interpreted as stating that the volume of stones in one garden is greater than in the other or that the units of stones is greater in one than in the other. The ambiguity disappears with the bare plural which can only be interpreted as comparing number of units – example (61a). Similarly, (60b) may be true in two different situations: if João has more units of ropes than Pedro has or if the length of the rope that João has is wider that the length of Pedro's rope. Here again there is no ambiguity with the bare plural: (61b) compares the number of units that they have:

(61) a. Esse jardim tem mais pedras do que aquele.
This garden have.PRS.3SG more stone-PL of.the that that.
'This garden has more stones than the other one.'
b. João tem mais cordas que Pedro.
João have.PRS.3SG more rope that Pedro.
'João has more rope than Pedro.'

As our theory predicts, the bare singular behaves like a mass noun, and may compare cardinalities or quantities. Suppose two fishermen go to a store to buy living earthworms for fishing, and they are comparing cans with living worms. The following conversation is perfectly felicitous:

(62) a. Essa lata tem mais minhoca do que aquela.
This can have.PRS.3SG more earthworm of.the that that.
'This can has more quantity of earthworm than that one.'
b. Não esse tem 10 e aquele tem 12 minhocas.
No, this have.PRS.3SG 10 and that have.PRS.3SG 12 earthworm-PL.
'No, this can has 10, and the other one has 12 earthworms.'
c. Mas esse pesa mais.
But this weight-PRS.3SG more
'But this one is heavier.'

Thus again, the bare singular behaves like mass, as expected by our approach.

7. Conclusion

The aim of this paper was to explain the distributional parallelisms between the bare singular and the bare mass noun which have not so far been noticed in the literature, and to contrast them with the bare plural. We argued against the canonical view according to which the bare singulars are not mass and have shown that this view rests on an inappropriate comparison between naturally atomic bare singulars like *menino* 'boy' and substance mass nouns like *ouro* 'gold'. A comparison between *menino* 'boy' and naturally atomic mass nouns like *mobília* 'furniture' shows that there is no difference in interaction with individuating predicates and reciprocals. We gave an analysis of the bare singular based on the theory of mass/count nouns in Rothstein (2010 a, b), arguing that bare singulars are mass nouns and that like mass nouns they denote kinds. This allowed us also to posit a parametric difference between English and Brazilian Portuguese: while English adopts a default 'either/or principle' formulated in (39) which means that many nouns have either a mass or a count realization but not both, Brazilian Portuguese does not have such a principle. So all nouns have a mass realization, and some nouns have also a count form. The mass analogues of count nouns, which are not morphologically marked for plurality of course look like bare singulars.

We gave an explanation of the differences between so-called bare singulars and bare plurals based on the assumption that bare singulars denote kinds, while following Krifka (2004) in positing that that bare plurals enter into the derivation as predicates and raise either to the kind type or to the type of existential generalized quantifiers, and we showed how this type difference explains the differences in linguistic behavior. Bare singulars and mass nouns consistently had an interpretation as kind denoting terms, and lacked an interpretation which required existential quantification over an individual variable. Furthermore, bare singulars and mass terms were acceptable as subjects of perfective VPs only when the VP could be interpreted as denoting a relation between a kind and an event. We also, in section 6, made some predictions about the interpretation of the bare singular in comparative and measure constructions.

Our analysis has raised many questions which we do not pretend to have answered. Chief among them is the issue of perfective aspect and the interpretation of direct object bare nouns, and more generally the interaction between the aspectual properties of verbs and the interpretation of their arguments. But this is part of a set of much bigger issues which are beyond the scope of this paper.

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