

Bare NPs Cross-linguistically

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1. Introduction:

The study of bare noun phrases spans thirty years of semantic research, beginning with the influential study of English bare plurals by Carlson (1977). These thirty years can be divided almost evenly into two phases. The first phase focused on the proper analysis of bare plurals, with particular emphasis on determining the role of reference to kinds and the principles of quantification in statements involving bare plurals. The second phase took insights from the study of bare plurals beyond English to other languages. While questions regarding denotation and quantification remained important, this second phase was marked by a concern with cross-linguistic issues. Three questions have emerged as particularly significant in this enterprise: Can variation in the mapping between form and meaning be systematically predicted? How does number morphology impact on the properties of bare NP's and kind terms? What is the correlation between determiners in a language and available readings for bare NPs? In this survey, we will limit ourselves to a discussion of these questions. Considerations of space force such a choice upon us, but we also note that there are several detailed surveys that cover the first phase of the investigation, to which we refer the reader (Krifka et al 1995, Carlson 1999, Delfitto 2006, among others).

2. The Empirical Landscape

The research questions listed above can be used to draw a picture of the empirical landscape that current work on the topic assumes. Beginning with English, the most familiar and well-understood case of bare NPs, we note that bare singulars typically do not occur as arguments, setting aside exceptions like *man is mortal*, *war is war* etc. English does have bare mass nouns, which trigger singular agreement on the verb, but they can be classified with bare plurals as far as the readings discussed below are concerned.

Bare plurals have three primary readings, kind, generic and existential:

- 1a. *Dinosaurs* are extinct.
- b. *Computers* were invented by Babbage.
- c. *Humans* have evolved from *apes*.

- 2a. *Dogs* bark when they are hungry.
- b. *Lions* are ferocious animals.
- c. *Italians* usually drink wine with dinner.

- 3a. *Dogs* are barking.
- b. *Children* have scribbled on this wall.
- c. *Birds* were singing.

An intuitively natural way of grouping these sentences might be to classify (1) and (2) together as statements applying to a whole class or species, separating them out from (3), which describe properties of some members of the class or species at particular points in time. Although (1) and (2) both contain general statements, there is a crucial difference between them. While it is possible to relate the statements in (2) to corresponding statements in which the predication applies to a particular individual, it is not possible to do so with the statements in (1): *Fido barks* vs. **Fido is extinct*.

Apart from this, we also know that bare plurals in English cannot refer to salient entities in the discourse or be used anaphorically. The definite determiner is needed for those purposes:

- 4a. **(The) dogs*, namely Fido and Rover, are barking.
- b. Some *dogs_i* are barking. **(The) dogs_i* must be hungry.

This suggests an inverse correlation between the presence of overt determiners and meanings of bare NPs but two points are worth noting in this connection. One, noun phrases with definite determiners and bare plurals are not truly in complementary distribution. Condoravdi (1992) discussed contexts in which bare plurals can be substituted by definites without a shift in meaning:

- 5. There was a ghost on campus. *The students/students* were aware of the danger.

Two, if the generalization about the relation between overt determiners and bare plurals is to hold, there must be some distinction between the existential and generic readings of bare plurals and such readings of indefinite noun phrases. Carlson (1977) established that there are some readings that indefinites, singular as well as plural, have that bare plurals do not:

- 6a. Miles didn't see *policemen/a policeman*.
- b. Miles is looking for *policemen/a policeman/some policemen*.
- b. *#A building/#Some buildings/Buildings* will burn in Berlin and in Frankfurt.

(6a-b) with a bare plural can have only a narrow scope reading, while (6a-b) with indefinites can have a wide or a narrow scope reading. The readings of bare plurals are not, however, a subset of the readings of indefinites. (6c) with either indefinite cannot have the plausible reading in which different buildings burn in the two cities. (6c) with a bare plural readily allows for this differentiated scope reading.

Generic readings of bare plurals and singular indefinites can also be separated. Generic indefinites seem to be restricted to statements in which definitional properties rather than accidental ones are at issue, though what counts as definitional or accidental may be somewhat open to contextual manipulation. The contrast in (7) is discussed in Krifka et al (1995), cases like (8) by Greenberg (1998) and Cohen (1999). The unacceptability judgments indicated here hold, of course, only for the generic reading of the indefinite:

- 7a. *Madrigals* are polyphonic/popular.
 b. A *madrigal* is polyphonic/#popular. *under the intended generic reading*
 c. A *basketball player* is popular.
 8a. *Italian restaurants* are closed today.
 b. # *An Italian restaurant* is closed today. *under the intended generic reading*

The rough generalization, then, is that bare plurals are a distinct kind of noun phrase, characterized by their ability to serve as arguments of kind-level predicates, by their propensity to take narrowest scope when they serve as arguments of object-level predicates in the episodic, and by their more liberal distribution in generic statements.

This empirical picture has been extended in a number of directions. A minimal but significant modification results from a consideration of Romance languages, which are like English in generally disallowing bare singular arguments. They differ from English, however, with respect to bare plurals and mass nouns. French does not allow bare plural arguments while Italian and Spanish allow them only in those syntactic positions that may be considered well-governed. So, for example, they are acceptable in object but not subject positions (the following Italian examples are from Chierchia 1998a):

- 9a. * *Bambini* sono venuti da noi
 Children have come by us
 “Kids came by.”
 b. Ho preso *biscotti* con il mio latte
 “I had cookies with my milk.”

Furthermore, these bare plurals do not have kind readings, or at least it is debatable to what extent they do. Typically they do not have generic readings:

10. **Leo odia gatti*
 Leo hates cats
 “Leo hates cats.”

It bears emphasizing though that there are two respects in which Romance bare plurals are like English bare plurals. They do not refer deictically to salient individuals or allow for anaphoric readings. Neither do they admit wide scope readings of the sort associated with ordinary indefinites.

A different extension of the empirical landscape is presented by languages like Chinese which do not display morphological number distinction in their nominal system. In such languages, bare nominals display the full range of readings associated with English bare plurals (the following Chinese examples are from Yang 2001):

- 11a *Gou juezhong le*.
 dog extinct Asp
 ‘Dogs are extinct.’
 b. *Gou shi burudongwu*.
 dog be mammal

- ‘Dogs are mammals.’
 c. Wo kanjian *gou* le.
 I see dog Asp
 ‘I saw some dog(s) & ‘I saw the dog(s).’

Chinese bare nominals depart from English bare plurals, however, with respect to their ability to function like definites. They can be used to refer to entities previously mentioned or otherwise salient in the discourse (cf. 11c). This is in keeping with the fact that Chinese does not have a definite determiner. Chinese bare plurals are also thought to have readings associated with indefinites, again in keeping with the fact that Chinese does not have an indefinite determiner. However, this generalization is subject to two caveats. In subject position, there is a tendency, though not an absolute requirement, that the bare NP have a definite rather than an indefinite reading. And, in positions where an indefinite reading is readily perceived, the bare nominal only allows for narrow or differentiated scope readings. That is, in spite of the absence of an indefinite determiner in the language, Chinese bare nominals behave like English bare plurals, not like English indefinite NPs, with respect to scope.

Finally, it is sometimes thought that Chinese has a plural morpheme *-men*, which if it were true, would have very different implications for theories of cross-linguistic variation. As discussed in Yang (1998), Li (1999) and Kurafuji (1999, 2004), however, the distribution of Chinese *-men*, and its Japanese counterpart *-tachi/-ra*, is restricted. They point out that the addition of this morpheme results in definite plural readings, as shown by the contrasts in (12):

- 12a. You *ren* / **ren-men* lai-le.
 have man man-PL come-Asp
 ‘There is somebody/some people coming.’
 b. Tamen shi *xueshen* / **xueshen-men*.
 they be student student-Pl
 ‘They are students.’

This raises doubts about the status of the morpheme as a bona fide plural marker and we will continue to treat languages like Chinese and Japanese as not specifying number in their nominal system.

Finally, there are languages that fall in between Chinese and English. Hindi and Russian, for example, display morphological number distinctions like English but like Chinese do not have definite or indefinite determiners. Interestingly, these languages freely allow bare singular arguments in addition to bare plurals and both display kind and generic readings. However, bare singulars are not a trivial variant of bare plurals. There are contexts in which bare singulars yield implausible readings while bare plurals are completely natural (the following Hindi examples are from Dayal 2004):

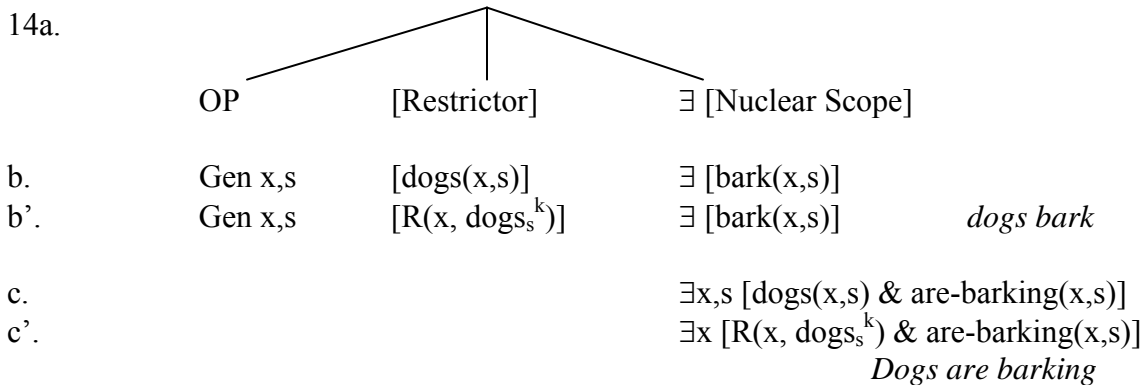
- 13a. #caaro taraf *bacca* khel rahaa thaa
 four ways child play PROG PAST
 ‘The (same) child was playing everywhere.’
 b. caaro taraf *bacce* khel rahe the

four ways children play PROG PAST
 “(Different) children were playing everywhere.”

In (13a), the bare singular seems to behave like a wide scope indefinite but standard diagnostics, such as those shown in (6), show that they resist wide scope readings just like bare plurals. The bare singular, we can conclude, picks out an entity in the domain that uniquely satisfies the descriptive content of the noun phrase. While this may be confusingly similar to a wide scope indefinite it is not identical to it. Languages like Hindi or Russian thus reveal the need for paying close attention to number morphology as well as overt determiners in identifying interpretive possibilities for bare NPs.

This cross-linguistic picture of bare NPs is brief and therefore partial. Nevertheless we will stop for now and move on to three current accounts that attempt a principled explanation of these core facts. In presenting these accounts we will bring in some further details about the languages mentioned above. We will then return to the discussion of cross-linguistic variation, focusing on languages not covered so far and note the problems that remain open for theories of variation.

As preparation for the discussion to follow, however, I will briefly present the two basic approaches to the semantics of English bare plurals that we can take as the current theoretical baseline. Both approaches follow Carlson (1977) in including kinds in the ontology. Both approaches also agree with him that the quantificational force of bare plurals is external to the NP, and specifically, that quantification in bare plurals is sensitive to the same factors that Lewis (1975), Kamp (1981) and Heim (1982) identified for indefinites. They differ, however, in whether bare plurals must always refer to kinds. According to one view they refer to kinds in kind level predication but are property denoting otherwise. The other view follows the original Carlsonian idea that object level predication also takes kinds as arguments but is able to access the instantiation set of such entities. The two approaches are represented schematically below, where the superscript *k* indicates reference to kinds and R the realization relation between entities and the kinds they are associated with:



Wilkinson (1991) and Gerstner and Krifka (1993) were early proponents of the first approach, what has been called the ambiguity view of bare plurals, followed by Kratzer (1995) and Diesing (1992). Carlson (1989), Chierchia (1998a) and Dayal (2004) can be considered neo-Carlsonian in their approach. As we can see from (14), the two approaches yield essentially the same truth conditions for the core cases. However, given

the fact that bare plurals and indefinites do not display identical behavior, there is some need to treat them as formally distinct. From this perspective the neo Carlsonian view may have an advantage over the alternative (see Dayal 2004 for further discussion).

3. Theories of Variation: Syntactic Parameterization

In a series of influential papers, Longobardi (1994, 2000a, 2000b, 2001, 2005, 2006) has addressed the variation between English, as an exemplar of Germanic, and Italian, as an exemplar of Romance. According to him, they instantiate different settings of a parameter, which can be described in terms of weak vs. strong reference. Setting aside the more recent developments of this theory, where parameterization is refined and extended to other languages, we can distill the essence of the account, as given below. (15a) is a universal, (15b) a parameter and (15c) a general constraint on available options:

15a. Individuals are denoted in D

b. D must form a chain/CHAIN with N overtly or covertly where

a chain is formed by movement:

$$[\text{DP } N_i \text{ } [\text{NP } t_i]]$$

a CHAIN is formed by association with an expletive:

$$[\text{DP } D_{i \text{ expl}} \text{ } [\text{NP } N_i]]$$

c. Avoid an overt chain/CHAIN except as a last resort.

Longobardi's theory of cross-linguistic variation is framed within the DP hypothesis (Abney 1987). The view that the noun phrase is made up of two functional projections, DP and NP, each with its own lexical head has its theoretical roots in similar developments in the analysis of clause structure (Chomsky 1981, 1986, 1995). Longobardi follows Szabolcsi (1994) and Stowell (1991) in taking reference to individuals to be tied exclusively to D. Longobardi's theory appeals to two subcases of this dependence. Either a referential argument can be associated with D by virtue of its denotation in type <e> or a non-referential predicative term can be associated with D by virtue of being bound by a quantifier in an operator-variable relation.

Longobardi adduces strong empirical support for his position from the following paradigm in Italian, ignoring cases involving focus:

16a. *Il mio Gianni* ha finalmente telefonato

the my Gianni has finally called up

b. *Gianni mio* ha finalmente telefonato

Gianni my has finally called up

c. **Mio Gianni* ha finalmente telefonato

my Gianni has finally called up

"My Gianni has finally called up."

The core generalization here is that an adjective precedes a proper name only in the presence of a definite determiner. Taking D to be the locus for marking arguments and taking proper names to be referential and quintessentially argument-like, Longobardi derives the paradigm from the requirement of syntactic dependency between the proper name and the position at which reference is checked, ie D:

- 17a. [DP [D il_i [AP mio [NP Gianni_i]]]]
 b. [DP [D Gianni_i [AP mio [NP t_i]]]]
 c. *[DP [D e [AP mio [NP Gianni]]]]

In (17a) Gianni forms a CHAIN with a semantically vacuous element in D, satisfying the need for association with the relevant structural projection. In (17b) the need is satisfied by internal movement of Gianni from N to D. (17c) is ungrammatical because the proper name remains inside NP and there is no overt element in D to associate with. A proper name, being argumental, cannot enter into an operator-variable relation with a covert operator in D. The strong D feature therefore remains unsatisfied. We see, then, that grammaticality judgments about word order provide compelling evidence for Longobardi's claim regarding the dependence between a syntactic node D and the semantics of proper names.

Longobardi argues that common nouns, like proper names, must also associate with D. Unlike proper names, however, they do not form a chain via movement but they can participate in CHAIN formation or in operator-variable relations. That is, the structure analogous to (17b) is ruled out for common nouns while structures analogous to (17a) and (17c) are possible. (18a) is a clear instance of CHAIN formation. (18b), which represents perhaps a more natural word order, is a potential problem but it can be accommodated into the theory by taking N to move to a position below D:

- 18a. *I grandi cani* abbaiano
 the big dogs bark
 b. *I cani grandi* abbaiano
 the dogs big bark
 "Big dogs bark."
 c. [DP I_i [XP cani_i [AP grandi [NP t_i]]]]

Compared to Longobardi's account of proper names, his account of common nouns is less clear-cut. The analogy with the proper name version in (16a), for example, is not perfect. Since the expletive in D cannot effect semantic changes, Longobardi must assume a covert type shift from $\langle e, t \rangle$ to $\langle e \rangle$ in order for the CHAIN to be well formed (see Longobardi 2006), as shown in (19a):

- 19a. [DP I_{i-\langle e \rangle} [AP grandi [NP (cani_{\langle e-t \rangle})_i]]] =>
 [DP I_{i-\langle e \rangle} [AP grandi [NP SHIFT(cani_{i-\langle e, t \rangle})_{\langle e \rangle}]]]
 b. *[DP [SHIFT(cani_{i-\langle e, t \rangle})_{\langle e \rangle}] [AP grandi [NP t_i]]]
 c. [DP $\exists \langle e, t \rangle, \langle e, t \rangle \langle e \rangle$ [AP grandi [NP cani_{\langle e, t \rangle}]]_{\langle e, t \rangle}]

A question that might legitimately be raised in this connection is what blocks N to D movement, of the kind shown in (19b), since the situation is now essentially parallel to the proper name case. A possible answer to this would be that CHAIN formation with an expletive in D is precisely the trigger needed to activate the requisite type shift, appealing perhaps to the principle of last resort as an underlying motivating factor.

Turning to the second available option, namely (19c), Longobardi posits a null existential operator in D. This allows him to derive the restricted syntactic distribution of

bare plurals by requiring the null operator to be syntactically licensed through government (following Contreras 1986). It also provides an explanation for the absence of kind readings and unexpected restrictions on generic readings. Like regular indefinites in English or Italian, Italian bare plural indefinites are not expected to denote kinds. Syntactic licensing prevents the bare plural from occurring above VP, which according to the mapping hypothesis in Diesing (1992) rules out the possibility of generic readings for them. Longobardi (2000a) shows that when syntactic conditions such as focus or modification allow bare plurals to occur above VP, the generic reading becomes available.

Let me note in passing that there is some unclarity about the role of the operator inside bare plurals. I have represented it as a quantificational determiner here which fits in with the idea of an operator-variable chain. It does not fit in with Longobardi's view of indefinites as Heimian predicates bound by external operators. This is, however, a technical issue. The essence of Longobardi's explanation could be maintained by melding Diesing's Mapping Hypothesis with a quantificational view of indefinites of the kind proposed in Chierchia (1995), for example.

For languages in which D is weak, such as English, Longobardi's theory predicts that overt association of N with D via chain/CHAIN formation will not be available. This is due to the economy principle which takes chain/CHAIN formation to be a last resort. The result is that English proper names cannot occur with an expletive determiner nor can they precede adjectives. The requisite association with D occurs only at LF. Correspondingly, plural count nouns are not forced to form a chain/CHAIN till LF either, allowing for the possibility of bare plurals and mass terms with the order adjective-noun:

- 20a. (**The*) *Ancient Rome* was beautiful.
 b. **Rome ancient* was beautiful.
 c. (**The*) *dinosaurs* are extinct.

- 21a. [DP e [NP Rome_{<e>}/Dinosaurs_{<e,t>}]]
 b. [DP Rome_{<e>}/ [SHIFT(Dinosaurs_{<e,t>})_{<e>}] [NP t_i]]

As shown in (21), English is postulated to have an empty D in overt syntax (21a). N to D movement takes place at LF, with covert type shift yielding kind reference for bare plurals (21b). This implies that kind formation is not dependent on the presence of an overt element in D, a dependence that we suggested could be used to rule out N to D movement of Italian bare plurals. Clearly, parametric differences between the two languages would have to be brought into the picture to explain the cross-linguistic variation in type-shifting possibilities in these cases.

Longobardi's postulation of an empty D in English forces further comparisons with Italian bare plurals. He suggests that the licensing of empty determiners occurs at LF in English but at S-structure in Italian, taking structures like (21a), with the N inside NP and an empty D in DP, to have the same semantics as indefinites. As mentioned above, he follows Diesing (1992) in taking indefinites inside VP to map into the nuclear scope and yield existential readings while taking indefinites outside VP to map into the restrictor and yield generic readings. Since licensing works differently in the two languages and Italian bare plurals are necessarily VP-internal, they only have existential

readings. English bare plurals, on the other hand, because they are not syntactically restricted, can be mapped into either domain resulting in existential as well as generic readings.

The case of English bare plurals in subject positions with existential readings, however, remains problematic for Longobardi. The presence of an empty D in the subject position of episodic sentences is needed to ensure existential interpretation, but N to D movement has to take place in order to make it possible for bare plurals to appear in the ungoverned subject position. To deal with this, Longobardi proposes that existential interpretation is read off prior to LF movement but licensing is checked after LF movement in English.

Turning to singular terms, Longobardi explains the Italian definite singular as involving the CHAIN in (22b), following Vergnaud and Zubizarreta (1992):

- 22a. *Il dodo è estinto*
the dodo is extinct
b. [_{il_{expl}} [dodo_{<e>}]]
c. [_{il<<e,t>,e>} [dodo_{<e,t>}]]

The evaluation of this proposal depends on the analysis of the bare singular as a kind term. It is generally thought that the type-shift used to derive plural kind terms is not defined for singular terms (Dayal 1992, Chierchia 1998a, Dayal 2004). If, however, bare singulars are taken to be inherently kind denoting, it should be possible for it to form a chain with an expletive, as shown in (22b). The problem with this view is that it makes the wrong prediction for English. Just as English bare plurals correspond to Italian definite plural kind terms, we would expect English bare singulars to correspond to Italian definite singular kind terms. We know, of course, that the two languages converge in ruling out bare singular kind terms. An alternative approach to singular kind terms is to take the singular common noun to denote predicates of taxonomic kinds, bound by *iota* (see section 5 for more on this). Under this view, the definite determiner is semantically contentful, denoting a function from sets to entities, as shown in (22c). This delivers the correct result for Italian and English, but it undercuts the notion of the definite determiner as an expletive.

To conclude this admittedly brief discussion, Longobardi's parametric approach gives a very compelling account of the association of proper names with D in terms of chain/CHAIN formation. It also gives a very plausible account of the structural restrictions on the occurrence of bare plurals in Italian. As pointed out in the discussion above, the notion of an expletive determiner in the case of common nouns and the conditions under which type-shifting operations can be invoked raise some questions. Nevertheless, there is no doubt that Longobardi's work, tying the issue of interpretation with fixed positions in the syntax, was extremely influential in propelling cross-linguistic investigation into the syntax and semantics of noun phrases.

4. Theories of Variation: Semantic Parameterization

Another very influential theory of cross-linguistic variation in this domain was proposed by Chierchia (1998a, 1998b). This theory has ignited a lot of research on the syntax-semantics interface and has, as a consequence, been subjected to close scrutiny. I first

discuss the essential features of the account, reserving modifications and criticisms prompted by further investigations to later sections.

4.1 *The Nominal Mapping Parameter: Germanic vs. Romance*

Chierchia (1998a, 1998b) starts at the other end of the spectrum from Longobardi, taking languages to vary with respect to whether reference to individuals can be located at the NP level or whether it is restricted to DPs. (23) lists the set of principles that derive the full range of paradigms considered by him:

23a. *The Nominal Mapping Parameter* (NMP): $N \Rightarrow [+/- \text{ pred}, +/- \text{ arg}]$

Languages without Mass-Count Distinction

i. $[- \text{ pred}, + \text{ arg}]$ every lexical noun is mass \Rightarrow Chinese

Languages with Mass-Count Distinction

ii. $[+ \text{ pred}, + \text{ arg}]$ bare arguments are allowed: articles \Rightarrow Germanic

no article \Rightarrow Slavic

iii. $[+ \text{ pred}, - \text{ arg}]$ bare arguments disallowed: $\delta_{\text{null-det}} \Rightarrow$ Italian, Spanish

no $\delta_{\text{null-det}} \Rightarrow$ French

b. *Avoid structure*: Apply SHIFT at the earliest level.

c. *Blocking Principle* (Type Shifting as Last Resort):

For any type shifting operation π and any X : $* \pi(X)$ if there is a determiner D such that for any set X in its domain, $D(X) = \pi(X)$.

d. Ranking: $\wedge > \{t, \exists\}$

Beginning with his account of bare plurals in Germanic and Romance, Chierchia treats English as a $[+ \text{ pred}, + \text{ arg}]$ language. Bare plurals are NPs that begin life as predicative type $\langle e, t \rangle$ but shift via the kind forming operator NOM (24a) to type $\langle e \rangle$, consistent with the $[+ \text{ arg}]$ setting of the parameter. This respects economy of structure, as stated in (23b). The rest of the data follows under a neo-Carlsonian approach to kinds where bare plurals uniformly denote kinds but the mapping on to the quantificational structure, determined on independent grounds, is roughly the same as in the case of indefinites. With object level predicates the inverse operation PRED (24b) comes into play, allowing for quantification over instances of the kind. Most importantly, Chierchia appeals to local existential binding (24c), which delivers the narrow scope behavior that Carlson had shown to be an integral feature of kind denoting bare plurals:

24a. NOM (\wedge): $\lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda s \iota x [P_s(x)]$

b. PRED (\cup): $\lambda k_{\langle s, e \rangle} \lambda x [x \leq k_s]$

c. *DKP*: If P applies to objects (ie. ordinary individuals) and k denotes a kind, then $P(k) = \exists x [\cup k(x) \wedge P(x)]$

Turning to Italian, Chierchia takes bare plurals to also be kind terms. The difference is that Italian being a [+pred, –arg] language, the bare plural must project a DP structure, where D hosts a null determiner with the semantics of NOM. The subject-object asymmetry observed in Italian bare plurals follows from the licensing requirement on null determiners, as in Longobardi’s theory. The absence of generic readings is accounted for by the theory of mapping proposed in Chierchia (1995). The details are not of immediate concern here so we will not delve into them. It is sufficient to note that the difference between English and Italian with respect to generic readings for bare plurals rests on the absence of D in the first case and the need for licensing a null D in the second case.

Chierchia gives some examples in support of his claim that Italian bare plurals are kind terms:

- 25a. Qui, *ragazze in minigonna* sono rare
 here girls in miniskirts are rare
 “Girls in miniskirts are rare here.”
- b. *Insegnanti davvero dediti* nella scuola di oggi sono quasi estinti
 really devoted teachers in schools of today are nearly extinct
 “Really devoted teachings are nearly extinct in today’s schools.”

What drives Chierchia’s analysis is the propensity of Italian bare plurals for obligatory narrow scope, a property that is entailed by an analysis in terms of kind reference but not readily captured in alternative accounts of the bare plural as indefinite. Nevertheless, Chierchia’s claim that Italian bare plurals are kind terms has been challenged, quite forcefully, by Longobardi as well as Zamparelli (2002). At the same time, the data in (25) are not easily accommodated into the view that Italian bare plurals are non kind denoting indefinites. A point worth keeping in mind in connection with (25) is that they all involve phrasal modification of bare plurals, a feature that explanations have not sufficiently explored (see Dayal 2005 for some discussion).

Chierchia’s analysis of Italian bare plurals has an interesting consequence for his analysis of Italian definite plurals. The *Blocking Principle* in (23c) dictates that null determiners or any covert operation not duplicate the meaning of lexical operators. This is well substantiated by the fact that in languages with determiners, bare plurals cannot be used deictically or anaphorically while in languages without definite determiners, they can. But, now, if the Italian bare plural is indeed a kind term, the *Blocking Principle* raises the question of its relation to the definite plural generic in Italian. Chierchia avoids the problem by appealing to a formal difference between NOM for the bare plural (26c) and an equivalent derivation involving the intensionalising of *iota* for the plural definite (26b):

- 26a. *I cani* sono diffusi
 the dogs are widespread
 “Dogs are widespread.”
- b. widespread ($\lambda s \iota$ dogs_s)
 c. widespread (NOM(dogs))

- 27a. *I cani abbaiano*
 the dogs bark
 “Dogs bark.”
- b. GEN s,x [$x \leq t$ dogs_s & C(s)] [bark (x,s)]

This does not fully account for the cross-linguistic difference between English and Italian. If it is possible to abstract over the world variable in a definite in Italian, there is no reason why it should not be possible to do so in English, but we know that English definite plurals are not kind terms. Chierchia is, of course, aware of this and appeals to *Avoid Structure* to explain it. According to him, economy dictates that the simplest possible structure be utilized for a given meaning and since English allows NPs to denote kinds, that is preferred over DPs with a definite determiner for that purpose. Note, however, that this explanation rests on the premise that $NOM([NP_{\langle e,t \rangle}])$ is in competition with \hat{THE} in English. In proposing that the Italian bare plural is a kind term, on the other hand, Chierchia argues that NOM is not subject to the *Blocking Principle* precisely because the two are not in competition with each other. Thus there seems to be some conceptual unclarity about the relation between these two equivalent ways of deriving kind readings.

Turning now to singular terms in English and Italian, Chierchia draws on the idea that the uniqueness imposed by number morphology on kind formation clashes with the notion of kinds. On the basis of this, he rules out bare singular kind terms. Languages that are like English or Italian in having the singular-plural distinction but unlike them in not having articles, then, need to be accounted for.

As noted earlier, such languages do have bare singulars in addition to bare plurals. Chierchia analyzes Russian, for example, as a [+arg, +pred] language like English. However, because it does not have a lexical definite determiner, the *Blocking Principle* does not block *iota* from functioning as a covert type shift. Consequently, bare nominals are able to have deictic and anaphoric readings. Furthermore, because Russian does not have an indefinite determiner, he suggests, it will also allow indefinite readings for them. Finally, bare plurals will be able to denote kinds via the application of NOM but not bare singulars. The specifics of Chierchia’s account of languages like Russian have been challenged by Dayal (1999 and 2004). We will review those arguments and present modifications of his theory in section 5.1. Here we will continue with the application of the *Nominal Mapping Parameter* to languages that show a different setting of the parameter than Germanic ([+pred, +arg]) and Romance ([+pred, -arg]), namely those which have the [-pred] specification.

4.2 The Nominal Mapping Parameter: Chinese

The discussion so far has revolved around count nouns, which denote predicates that shift covertly to argument type if the language is [+arg, +pred] and, if the language is [-arg, +pred], requires an overt or null D in DP. We now turn to mass nouns which require us to step back a bit and place Chierchia’s cross-linguistic claims within his view of the count-mass distinction. This will also allow us to separate those predictions that derive from his account of the mass-count distinction independently of the *Nominal Mapping Parameter* from those that rely crucially on the [+arg, -pred] setting of the parameter.

Contrary to the view of mass nouns as mereological sums, Chierchia takes mass nouns to have the same atomic structure as count nouns. He points to the fact that an individual chair or table would be identified as atomic parts of the denotation of mass nouns like *furniture*. Similarly, the denotation of mass nouns like *water* also includes atoms, even though those atomic entities may not be ordinarily identifiable. The real difference between count nouns and mass nouns, he claims, is that the former denote a set of atomic entities, with plural entities entering the denotation as a result of pluralization, whereas the latter come out of the lexicon with both atomic and plural entities already in their denotations:

28a. $PL(F) = \lambda x [\neg F(x) \ \& \ \forall y [y \leq x \ \& \ AT(y) \rightarrow F(y)]]$

b. Example (count noun):

$$\begin{array}{c} \text{dogs} = \left[\begin{array}{ccc} & \{f, b, s\} & \\ \{f,b\} & \{f,s\} & \{b,s\} \end{array} \right] \\ \uparrow \\ \text{PL} \\ \text{dog} = [f \quad b \quad s] \end{array}$$

c. Example (mass noun):

$$\begin{array}{c} \text{furniture} = \left[\begin{array}{ccc} & \{t, c, s\} & \\ \{t, s\} & \{t, c\} & \{c, s\} \\ t & c & s \end{array} \right] \end{array}$$

(28a) defines the semantic contribution of the plural morpheme as an operation that takes a set of atomic entities and returns a set of non-atomic entities, all of whose atomic parts are in the original set. That is, it returns all the pluralities minus the singularities. (28b) illustrates the denotation of singular and plural count terms. If Fido, Barky and Spotty are all the dogs in the world, the singular term will be true of them while the plural term would be true of all the groups they belong to but not of them. (28c) illustrates the denotation of mass nouns. If an individual table, chair and sofa are all the items of furniture in the world, the mass noun will denote them as well as the four groups they are part of.

Chierchia's claim is that the absence of pluralization on mass nouns and the inability of numerals to combine directly with mass nouns follows from the distinction between count and mass nouns sketched above. Consider the fact that mass nouns do not show a singular-plural contrast: *coins* vs. **changes*, *tables* vs. **furnitures*. PL applied to a mass noun would denote the empty set: $PL(\textit{furniture}) = \emptyset$. Since all the pluralities were already in the original set, they would all be removed. This, according to Chierchia, is why mass terms do not pluralize. (Note that even if PL did not exclude members of the original set, one could argue that pluralization would be ruled out because it would be

vacuous for inherently plural mass nouns: $PL(furniture) = furniture$.) Furthermore, mass nouns do not lend themselves to direct counting by numerals because counting requires there to be a salient level of individuation. In the case of count nouns, this is the level of atoms. In the case of mass nouns, no distinguished level is available since the singular-plural distinction is neutralized in the basic meaning of the common noun. A measure phrase serves the function of individuating an appropriate level for counting, hence the contrast between **three furniture(s)* and *three items of furniture*. Every language is expected to have some mass nouns for extra-grammatical reasons (there are substances whose atomic elements are not normally perceptible) and these properties will hold of them. Parameterization is not at play. Semantic parameterization is brought into the picture to account for languages in which all nouns have the two properties mentioned above, the absence of visible plural morphology and the inability of numerals to combine with nouns directly. It is worth noting here that Chierchia's system does not take languages which only have the first property to fall in the same class (see section 6 for further discussion).

Languages like Korean, Chinese and Japanese are taken to be languages in which NPs are obligatorily individual denoting, languages that are [+arg, -pred]. Chierchia points to the following properties characteristic of such languages: (a) generalized bare arguments, (b) the extension of all nouns is mass, (c) no pluralization and (d) a generalized classifier system. Properties (b)-(d) cluster together, as already discussed. It is (a), the absence of determiners, where the semantic parameter plays a crucial role.

Chierchia takes mass nouns to always denote individuals, specifically kinds. But we know that kinds can be shifted to properties by PRED. Thus the following schematic possibilities are available in principle (note that Chierchia does not have expletive determiners in his system but I include the option here for completeness):

- 29a. $[_{DP} D_{expl} [_{NP} N_{\langle e \rangle}]]$
 b. $[_{DP} D_{\langle \langle e, t \rangle, e \rangle} [_{NP} PRED(N_{\langle e \rangle})_{\langle e, t \rangle}]]$
 c. $[_{NP} N_{\langle e \rangle}]$

In a [+arg, -pred] language like Chinese, (29b) is not an option since NPs cannot denote properties, by hypothesis. Of course, there could be an expletive determiner (29a) but economy of structure would rule that out. Thus the only remaining option is (29c). Thus the fact that we do not know of languages with a generalized classifier system having definite determiners is explained in a surprisingly simple way. Now consider mass nouns in [-arg, +pred] languages. Here the only option is (29b), which is precisely the situation that is attested in languages like Italian. The distribution and interpretation of mass terms mirrors the distribution and interpretation of plural count nouns in requiring a definite determiner. Finally, consider [+arg, +pred] languages like English. Here (29b) is allowed and we indeed see the definite determiner with mass nouns in anaphoric and deictic contexts. We also see (29c) with kind denoting bare mass nouns, (29a) being ruled out by economy. One question that arises for such languages is why the extension of the kind (the maximal entity that is the sum of the instantiations of the kind at a given index) cannot be used to deliver the interpretive functions of *iota* without added structure resulting in the unattested definite readings for bare nominals. By and large, however,

the patterns of distribution and interpretation across languages are captured by the interaction of the *Nominal Mapping Parameter* with economy of structure.

Finally, although Chierchia seems committed to the view that count nouns start out as properties while mass nouns start out as kinds, it is not clear if there is much riding on it. As far as predicting the form of mass nouns is concerned, the same results can be obtained in his system by allowing them to denote properties. Consider:

- 30a. [DP D_{expletive} [NP NOM(N_{<e,t>})_{<e>}]]
 b. [DP D_{<<e,t>, e>} [NP N_{<e,t>}]]
 c. [NP NOM(N_{<e,t>})_{<e>}]

In [+arg, -pred] languages like Chinese, NPs would be forced to denote individuals at the NP level, shifting from properties to individuals covertly via NOM (or *iota*), as in (30a) or (30c). Economy would rule out (30a) resulting in languages without determiners. The explanation for the obligatory presence of the determiner in [-arg, +pred] languages with mass nouns would follow exactly as in the case of count nouns. (30a) and (30c) would be ruled out by the [-arg] setting. And the selective occurrence of the determiner in [+arg, +pred] languages would follow the explanation for the same pattern in count nouns. Reference to kinds would be derived most economically in (30c) while (30b) would be needed to host the definite determiner for deictic or anaphoric reference.

Although I have suggested that the choice between properties and kinds is not crucial for predicting distribution and interpretation, it does have different implications for Chierchia's overall picture of variation. If mass nouns are basically kind denoting and the language prevents a shift to properties at the NP level, it requires determiners to be functions from expressions of type <e>. The shift to properties via PRED has then to be built into the meaning of the determiner: $\lambda x^k \iota[\text{PRED}(x)]$. Though Chierchia does not propose this, it is in keeping with his proposal for numerals and classifiers, which builds on the view of Chinese nouns as kind terms in Krifka (1995). (There is another possibility for deriving the deictic and anaphoric readings of bare nominals, which is simply to take the extension of the kind at the relevant index. This would be the simplest and most economical solution but not one that Chierchia entertains.) This move is obviously not required if mass nouns are properties that *iota* can apply to directly. Determiners can continue to be thought of as functions from properties, albeit with the intervention of measure phrases/classifiers for the requisite individuation where required. A question worth speculating on is whether languages that do make the count-mass distinction but do not have determiners could be thought of as [+arg, -pred] languages. This would align Russian and Hindi with Chinese rather than English. It is not clear, without a deeper investigation, whether such a proposal would be tenable.

To sum up, I have tried to separate out three aspects Chierchia's theory of mass nouns, the claim that mass nouns have an atomic structure like count nouns but are lexically plural, the claim that mass nouns are necessarily kinds and the claim that the parameter setting predicts the presence or absence of the determiner. These distinctions will be useful to keep in mind when we discuss languages that have been claimed to be problematic for *The Nominal Mapping Parameter* in section 6. In section 5, however, we

will consider some modifications to the theory that are not specifically related to this parameter.

In closing this section, it is worth emphasizing that Chierchia's is the first substantive proposal that addresses issues of syntax as well as semantics in a comprehensive way. It is also the most articulated theory of variation in the mapping from the nominal structure to interpretation in natural language and for this reason has had tremendous impact on research in this domain.

5. Theories of Variation: Number, Definiteness and Lexicalization

In this section I summarize my own work on the topic of bare NPs and genericity, which highlights the role of number in kind formation and explicates the relation between definite determiners and kind forming operations.

5.1. Modifications based on Languages with Number but no Determiners

The starting point of the account is an observation in Dayal (1992) that Hindi bare plurals behave more or less like English bare plurals, but that Hindi bare singulars display substantively different properties. The basic idea proposed there was that the semantics of singular morphology clashes with the conceptual notion of a kind (see also Chierchia 1998a), ruling out NOM as a potential covert type shift for singular nouns. In Dayal (1999, 2004), this initial position is developed on the basis of further data from Hindi and Russian.

Bare singulars and bare plurals readily allow for kind as well as anaphoric and deictic readings in these languages, as shown by the Hindi examples below:

- 31a. *kuttaa* aam jaanvar hai
dog common animal is
"The dog is a common animal."
b. *kutte* yahaaN aam haiN
dogs here common are
"Dogs are common here."

- 32a. *ek baccaa* andar aayaa. *bacca* khush lagaa
one child in came child happy seemed
"A child came in. The child seemed happy."
b. *kucch bacce* andar aaye. *bacce* khush lage
some children in came children happy seemed
"Some children came in. The children seemed happy."

The existential reading of bare NPs, however, is distinct from that of regular indefinites. Both singular and plural NPs take obligatory narrow scope. Furthermore, in sentences like (32b), the bare plural in the second sentence cannot refer to a subset of the children mentioned in the first sentence nor could a bare singular be used there to pick out one of the children from the previously mentioned set. That is, bare NPs differ from indefinites in enforcing maximality. Clearly, even though the language lacks both the definite and the indefinite determiner, only readings associated with the first are available. Languages

like Hindi (and Russian) thus show that the ranking of covert type shifts is constrained, as proposed by Chierchia (1998a), but that the correct ranking is $\{\text{NOM}, \iota\} > \exists$ not $\text{NOM} > \{\iota, \exists\}$.

The second set of issues raised by such languages has to do with the status of the bare singular kind. Though (31) shows that bare singulars are kind terms, they are not a trivial variant of the bare plural:

- 33a. #caaro taraf *bacca* khel rahaa thaa
 four ways child play PROG PAST
 “The (same) child was playing everywhere.”
 b. caaro taraf *bacce* khel rahe the
 four ways children play PROG PAST
 “(Different) children were playing everywhere.”

These data are interesting because the only locus of difference is the number marking on the bare nominal. Neither of the two approaches to bare nominals taps into this difference to explain the facts. In the neo-Carlsonian approach, for example, (34a) would be the logical representation for (33), which is incorrect for (33a). The ambiguity approach would result in representations such as (34b)-(34c), depending on where existential closure applies. (33b) is incorrect the singular case, (33c) for the plural case:

- 34a. $\forall x [\text{place}(x) \rightarrow \exists y [\overset{\cup}{\sim} \text{kid/kids}(y) \wedge \text{play-in-x}(y)]]$
 b. $\forall x [\text{place}(x) \rightarrow \exists y [\text{kid/kids}(y) \wedge \text{play-in-x}(y)]]$
 c. $\exists y [\text{kid/kids}(y) \wedge \forall x [\text{place}(x) \rightarrow \text{play-in-x}(y)]]$

Clearly, singular kind terms do not relate to an instantiation set in the same way that plural kind terms do. An analogy can be drawn with ordinary sum individuals *the players* whose atomic parts are available for predication and collective nouns or groups like *the team* which are closed in this respect: *The players live in different cities* vs. **the team lives in different cities* (Barker 1992, Schwarzschild 1996). The plural kind forming operator NOM yields a kind term that allows semantic access to its instantiations and is analogous to sums, a singular kind term restricts such access and is analogous to collective nouns.

Similarly telling contrasts between plural and singular kind terms are also evident in English:

- 35a. *Airports* are busy places / *The airport* is a busy place.
 b. Due to the weather, *airports* are closed today/ *the airport* is closed today.

While both the singular and plural in (35a) are equally good as generic statements, only the plural in (35b) can be about airports in general. The singular refers to the salient airport in the context. Since English kind terms differ in definiteness and number,

evidence from languages that do not have determiners underscores the importance of number in differentiating plural and singular kind formation.

The proposal that NOM is undefined for singular terms, then, begs the question of how to characterize singular kind formation. It is argued that in these cases, the common noun denotation can shift to its taxonomic reading and denote a set of taxonomic kinds, here indicated for expository purposes with a superscripted *tk*. It can then combine with any determiner and yield the relevant reading:

- 36a. *Every dinosaur^{tk}* is extinct.
- b. *The dinosaurs^{tk}* are extinct.
- c. *The dinosaur^{tk}* is extinct.

The presupposition that *every* range over a plural domain or that *the* denote a maximal plural individual can be satisfied in (36a) and (36b) because the quantificational domain is the set of sub-kinds of dinosaurs. The uniqueness requirement of *the* with a singular noun in (36c) can be satisfied if the quantificational domain is the set of sub-kinds of mammals. In other words, singular kind formation is argued to require an adjustment of our view of common noun denotations, not of the type-shift operations. Depending on whether the language does or does not have definite determiners, the operation *iota* will be either overt or covert, and singular kind formation will result in definite or bare singular kind terms.

Although the evidence that bare NPs are not true indefinites in languages like Hindi and Russian is strong, there remains a residue of cases for which the most natural translation into English would suggest the use of an indefinite:

- 37. lagtaa hai kamre meN *cuhaa* hai
 seems room in mouse is
 “There seems to be a mouse in the room.”

The explanation for this rests on the view that covert and overt type shifts agree on semantic operations but not on presuppositions. English *the* encodes lexically the same operation that Hindi bare NPs use to shift to type <e> covertly, namely *iota*. Therefore both versions entail maximality/uniqueness. In addition, however, English *the* has a familiarity requirement that Hindi bare NPs are not subject to. It is this non-familiar maximal reading that can be confused with a bona fide existential reading in the case of the Hindi bare singular.

The conclusions in Dayal (2004), summarized above, with regard to the unavailability of \exists as a type shift also applies to languages without determiners or number morphology, such as Chinese or Japanese. The conclusions with regard to singular kind formation obviously do not extend to them. All nouns in such languages are expected to undergo plural kind formation via NOM.

5.2. Predicting Cross-linguistic Patterns

Dayal (2004) also deals with cross-linguistic generalizations about the correlation between kind denoting terms and their syntactic form. A prediction made by the account of singular kinds given above, for example, is that deictic or anaphoric nouns and singular kind terms will agree in lexicalization. In a given language they will either both be bare or both definite, depending on whether *iota* is lexicalized or not. This prediction seems to be borne out across a wide range of languages. There are further cross-linguistic patterns that, I argue, a theory of variation should address. It had been observed in the literature on generics, at least by implication, that natural languages have no dedicated kind determiner. Plural kind terms are either bare, as in English, Hindi or Chinese, or definite, as in Italian or Spanish. This generalization, though quite robust, had never been adequately addressed. There is, it turns out, a rather simple explanation for it. There are no dedicated kind determiners because NOM is merely the intensional counterpart of *iota* (cf. 24) and languages do not lexically differentiate extensional/intensional distinctions. This way of looking at NOM, however, opens up an interesting alternative way of looking at the definite plural kind term, familiar from the discussion of Romance languages.

Recall that Longobardi treated the definite determiner in Italian counterparts of English kind terms as expletives and Chierchia argued that they were similar, but not identical, to NOM. The claim in Dayal (2004) is that they are, in fact, the lexicalized version of NOM (see Zamparelli 2002 for very relevant discussion). One advantage of this approach to the definite plural generic is that it does not predict complete identity of meaning between bare plural kind terms and definite plural kind terms, given that only lexical items are taken to be triggers for presuppositions. This plays out in cases such as the following from Italian:

- 38a. *I cani* stanno abbaiano
 the dogs are barking
 “The dogs are barking.” not “(Some) dogs are barking”
- b. *I gatti* corrono sul mio prato ogni giorno
 the cats run across my garden every day
 “The cats run across my garden every day” NOT “Cats run across my garden everyday.”
- c. * $\forall s$ [day(s)] $\exists x$ [\cup cats(x) & run-across-my-garden-in-s(x)]

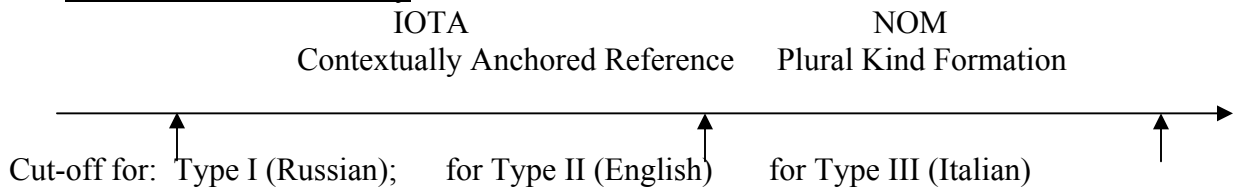
The bare plural counterpart of (38a) in English, we know, readily allows for an existential reading but kind-derived existential readings are unavailable to the Italian plural definite. The reason for this is that the definite retains a weak presupposition of existence, which prevents it from occurring in contexts where existence has to be asserted. The resistance to existential interpretations also holds for more complex cases such as (38b), based on Carlson (1989), where the sentence is generic but a bare plural would most plausibly map into the nuclear scope (38c). (38b), however, only has a reading where the same group of cats habitually runs across the garden. Bare plurals or bare partitives must be used in contexts where existence has to be asserted (see Chierchia 1997, Dobrovie-Sorin and Laca 1996, Dobrovie-Sorin 2004, Robinson 2005 among others).

We have taken some pains to discuss definites in an article on bare NPs because of the fact that variation in kind terms across languages ranges between bare NPs and

definites. Even within this range of possibilities there are unexpected restrictions that call for an explanation. If a given language uses bare nominals for contextually anchored/anaphoric readings, then it also uses them for plural kind formation. If a language uses definites for plural kind formation it also uses them for contextually anchored/anaphoric readings. If the choice between bare and definite forms were arbitrary, we would expect to see languages in which bare plurals were used to refer deictically/anaphorically (as in Hindi or Chinese) and definite plurals to refer to kinds (as in Italian). Such languages are not attested.

These patterns are claimed to follow from a universal principle of lexicalization in which *iota* and NOM are mapped along a scale of diminishing identifiability:

39. The Scale of Identifiability



Languages choose distinct points on the scale for lexicalization, proceeding from most to least referential. Determiner-less languages are those whose cut-off point is at the extreme left, with both NOM and *iota* functioning as covert type-shifts. Mixed languages are those whose cut-off point is in the middle, with *iota* lexicalized and NOM a covert type-shift. Fully determined languages are those in which the cut-off is at the extreme right, encoding both *iota* and NOM lexically. For a language to have a lexical determiner for plural kind formation, its cut-off point would have to be at the extreme right. This would mean that *iota* could not be covert. That is, the unattested language type would be one where lexicalization would not conform to the proposed direction of lexicalization.

That *iota* is the first target of lexicalization is motivated by the fact that NOM is defined in terms of IOTA. It is also motivated by the fact that there are two distinct modes of reference to individuals, identity-oriented and property-oriented modes. A definite description is an apt vehicle for identity-oriented ways of reference. A kind term denotes in property-oriented ways, without regard to the identity of individual members. Although definite descriptions are readily used for identity oriented modes of reference, they also have attributive uses, where the identity of the individual is not particularly relevant (Donnellan 1966). This leads to the overlap observed in (5) and (40):

- 40a. *The ground hogs/Groundhogs* are eating up my lettuce.
 b. eating-up-my-lettuce($\iota x[\text{groundhogs}_s(x)]$)
 c. $\exists x [\cup \text{groundhogs}_s(x) \ \& \ \text{eating-up-my-lettuce}(x)]$

The existence of groundhogs can be easily accommodated in a context about gardening. This satisfies the presupposition of *iota*, which picks out the maximal entity in the set of groundhogs. Under the group reading of plural definites, it is not required that predication distribute down to all individual groundhogs. Consider *the reporters asked the president questions*, which does not require all reporters to ask questions in order to be true (see Brisson 1998 and references cited there). NOM allows for existential

quantification over the instances of groundhogs in the situation. The semantic requirements of the two overlap, leading to a situation where either the bare plural or the definite can be used. To sum up, NOM cannot be used referentially and *iota* cannot be used to assert existence. The semantics of each is such that it predicts a situation of overlap along a continuum for expressions associated with them, rather than complementary distribution.

The approach to kind terms sketched here stresses the importance of number morphology in kind formation, arguing for a fundamental distinction between singular and plural kind terms. It also establishes that languages without determiners do not freely allow indefinite readings for bare NPs. And it accounts for cross-linguistic variation between bare and definite NPs used to refer to contextually salient entities and kinds, without appealing to the notion of expletive determiners. But it does not address the problem of non-kind denoting bare NP's in languages like Italian which nevertheless display the narrow scope readings typical of kind denoting NP's. Neither does it address the fact that languages in which all nouns occur with classifiers tend not to have definite determiners. As such, it does not address the issue of whether languages are subject to the semantic parameterization claimed by Chierchia.

6. Challenges for Theories of Variation

In sections 3, 4 and 5 I have laid out what I take to be some of the essential aspects of current theories of variation. In this section I turn to some problems that remain open, using data from Brazilian Portuguese as illustrative.

6.1. Brazilian Portuguese

As mentioned earlier, *The Nominal Mapping Parameter* of Chierchia (1998a) was enormously successful in provoking interest in the meaning and form of NPs. It prompted, almost immediately, papers on Brazilian Portuguese by Munn and Schmitt (1999, 2005), who challenged its validity. This was followed by work by Müller (2001, 2002) and more recently by Dobrovie-Sorin and Pires de Oliveira (2008). I begin by presenting the basic facts before drawing out their theoretical implications.

Brazilian Portuguese, like other Romance languages, has definite singular and definite plural kind terms:

- 41a. *O panda* logo estará extinto
the-SG panda soon will-be extinct
“The panda will soon become extinct.”
b. *Os pandas* logo estarão extintos
the-PL pandas soon will-be extinct
“Pandas will soon become extinct.”

It differs from other Romance languages in admitting bare singulars as well as bare plurals, both of which are acceptable in generic contexts:

- 42a. (*O*) *brasileiro* é trabalhador
 the brazilian is hardworking
 “The brazilian is hardworking.”
 b. (*Os*) *brasileiros* são trabalhadores
 the Brazilians are hardworking
 “Brazilians are hardworking.”

Both allow for existential readings in episodic contexts, and take narrow scope with respect to other operators:

- 43a. Chegou *crianca*
 arrived child
 “A child/children arrived.”
 b. Chegaram *criancas*.
 arrived children
 “Children arrived.”
- 44a. João não viu *mancha/manchas* no chão
 J not see spot /spots on the floor
 “J saw no spots on the floor.”
 b. Pedro quer encontrar *policia/policiais*
 P want to meet policeman/policemen
 “P wants to meet policemen.”

Bare singulars, however, have some unexpected properties. They are morphologically singular but number neutral in interpretation, as indicated in the translations above. There is some disagreement about their status as true kind terms. Müller argues that they are not, citing the fact that they are not acceptable as arguments of kind-level predicates like *invent*. Munn and Schmitt and Dobrovie-Sorin and Pires de Oliveira, on the other hand, take bare singulars to be kind denoting. Finally, the distribution of bare singulars is worth taking note of. Unlike other Romance languages, Brazilian Portuguese does allow bare plural subjects. However, bare singulars are not always acceptable subjects of episodic statements. (43) with a post-verbal subject is acceptable in the singular and the plural but its pre-verbal subject counterpart is only good in the plural.

Munn and Schmitt claim that Brazilian Portuguese shows the *Nominal Mapping Parameter* to be either incorrect or irrelevant. That bare NPs are possible as subjects shows, according to them, that there is no null determiner in need of licensing, and a [-arg, +pred] setting is ruled out. Since there are definite plural kind terms in the language, a [+arg, +pred] setting is not possible. The presence of determiners and the absence of a generalized classifier system rules out the possibility of a [+arg, -pred] setting. Similar criticisms against the parameter have been leveled on the basis of data from Creole languages (Baptista and Guéron 2007). It seems to me, however, that Chierchia’s theory may allow for languages in which number is not visible on the noun but there is no generalized classifier system, depending on what lies behind the absence of number. One theoretical possibility is that a language of this kind has null plural morphology, for

example. Instead of exploring the place of languages like Brazilian Portuguese in Chierchia's system, however, I will focus on three issues that have a general relevance to theories of variation and remain open questions in the literature on bare nominals: optionality, number neutrality, scope.

6.2. Optionality

The Brazilian Portuguese data call into question the empirical basis of the *Blocking Principle* (Chierchia 1998a) but before one can account for these facts, some care is needed in establishing the nature of the optionality at issue. Independent diagnostics are needed for NOM, *iota* and \exists , the three operations that are relevant in conducting cross-linguistic investigations into the semantics of bare NPs. For NOM, we can take as definitive the ability to serve as arguments of true kind predicates like *be extinct*, *be endangered* or *evolve*, or indeed any predicate that cannot apply to an ordinary individual. This test dates back to Carlson (1977) and has held up to scrutiny.

A determiner in any language can be taken to encode *iota* if it leads to a contradiction when the noun phrase it is the head of is an argument to a predicate in its affirmative and negative (Löbner 1985). This maximality/uniqueness effect distinguishes a true definite determiner from its close-kin demonstrative determiner. All languages have demonstratives but not all have definite determiners:

- 45a. #*The dogs* are sleeping and *the dogs* are not.
 b. *Those dogs* are sleeping and *those dogs* are not.

A determiner encodes \exists if it has the ability to function generically, in addition to showing variable scope possibilities (Chierchia 1998a). By this diagnostic, *a/an* qualifies as encoding \exists but not *some*:

- 46a. *A dog* barks if it is hungry.
 b. #*Some dog/dogs* barks if it is/theyare hungry. *under the intended \forall interpretation*

Again, every language can use the numeral *one* as an indefinite but that does not qualify the numeral as a lexical counterpart of \exists . In languages like Hindi, for example, such numerals do not have generic indefinite readings (at least in the basic cases), nor do they allow for neutral narrow scope readings with negation (Dayal 2004):

- 47 jaun-ne ek kitaab nahii khariidii
 John-ERG one book not bought
 "John didn't buy a particular book" or "John didn't buy even one book."
 NOT: "John didn't buy any book."

Turning back to Brazilian Portuguese we can ask if bare NPs are optional variants of definite plurals. Bare NPs, it turns out, can never be used deictically or anaphorically

(Schaal-O'Connor and Schwab 2008). Optionality is limited to generic and/or kind readings.

Optionality between generic bare plurals and definite plurals was noted previously by Krifka et al (1995) for some dialects of German. As pointed out in Dayal (2004), however, optionality does not hold across the board in those dialects. Bare NPs cannot be used to refer deictically or anaphorically. It is suggested there that such optionality calls for a distinction between canonical and non-canonical meanings. *iota*, as the canonical meaning of the definite determiner, in any language, delivers the effect of the *Blocking Principle* via the lexicalization principle. This leaves open the possibility of covert type shifts for non-canonical meanings of the definite determiner. Under this perspective, German has the same cut-off point as English, lexicalizing *iota* and effectively blocking it as a covert type shift but it differs from English in partially lexicalizing NOM, allowing for optionality. It also differs from Romance where the lexicalization of NOM is firmly entrenched, effectively blocking both *iota* and NOM as covert type shifts. This approach, it is worth emphasizing, still rules out a number of logically possible language types. For example, it rules out languages in which a lexical determiner would be needed for plural kind terms but not for contextually anchored readings. It rules out languages in which contextually anchored readings could be expressed optionally by bare or definite NPs but plural kind terms would be obligatorily definite. This is because a definite determiner in any language is expected to have at least the basic semantic operation *iota* as its canonical meaning. It does not appear, therefore, that optionality poses an insurmountable problem for restrictive and testable theories of variation but it is certainly a challenge that theories must contend with.

6.3. Number Neutrality

The Brazilian Portuguese bare singular, we have seen, is morphologically singular but it seems to be semantically plural. This suggests that it may be, in fact, a mass noun. However, Munn and Schmitt establish that this is not the case. It is not possible for predication to apply distributively to mass nouns but it is not possible for it to do so with bare singulars:

- 48a. * *Oura* pesa duas gramas
Gold weighs two grams
“Gold weighs two grams.”
b. *Crianca* pesa 20 quilos nesta idade
child weighs 20 kilos at-this-age
“Children weigh 20 kilos at this age.”

Another option is to think of the bare singular as a plural count noun. As suggested earlier, one might flesh out this idea by taking the NP to have a null plural morpheme. Or one might think of the bare NP as denoting a set of atoms, with a null determiner building in plurality. These ways of conceptualizing the mismatch between form and meaning is in keeping with various analyses that have been proposed. The obvious challenge in thinking of the singular as an underlyingly plural term is to account for differences between bare singulars and bare plurals in a principled way. As noted by

Munn and Schmitt bare singulars are ruled out from the preverbal position of episodic statements, but not bare plurals, for example. This would be unexpected if they were simply a variant of bare plurals.

There is a third option for treating number neutral bare singulars in the literature, though this option has not been explored specifically for Brazilian Portuguese. Recent work on (pseudo)-incorporation has shown that the semantics of incorporated NPs is very similar to that of kind terms. In fact, Van Geenhoven (1998) considers them to be the same but Farkas and de Swart (2003) and Dayal (1999 and forthcoming) provide strong arguments for distinguishing between them. One hallmark of incorporation is that its distribution is more restricted than that of kind terms. In Hindi, for example, number neutral interpretations for bare singulars are restricted to non case-marked direct objects. In fact, even English, which does not allow bare singular arguments, allows them in certain restricted positions which could presumably be analyzed as incorporation: *He is in prison/at school* (see Stvan 1998 for extensive discussion, see also de Swart and Zwarts in press).

The fact that there appear to be some syntactic restrictions on bare singulars in Brazilian Portuguese suggests that an incorporation analysis may be worth looking into. However, the existence of bare singular subjects in generic contexts goes counter to the description of Hungarian in Farkas and de Swart and suggests otherwise. The more general point is that languages seem to differ with regard to the conditions under which (pseudo) incorporation may take place and we do not as yet know what the range of possibilities for incorporation may be. The study of Brazilian Portuguese bare singulars may well play a role in this discussion.

6.4. Scope

In this final section I want to return to the issue of scope, which was one of the touchstones used by Carlson to define the problem of bare plurals and kinds. Carlson's idea that a kind term being a name takes narrowest scope and its existential readings are local has been articulated most explicitly in Chierchia (1998a), as given above in (24). Briefly, the existential force of a kind denoting term has a built-in locality while a true existential quantifier involving the type shift \exists can, and in some cases must, take wide scope.

Carlson not only showed that kind denoting terms differ from indefinites in enforcing narrowest scope, he also noted that this is not true of bare plurals that do not denote kinds. This is shown in (49). Chierchia explains this unexpected emergence of the wide scope reading for the bare plural in (49b) on the basis of ranking. Since NOM is undefined in this case and *iota* is lexically blocked, the bare plural is able to shift by \exists and take wide or narrow scope (see also Dayal 1999 and 2004, Van Geenhoven 1999 and Zucchi and White 2001 for relevant discussion):

49. a.* Parts of this machine are widespread.
b. John didn't see parts of this machine.

Brazilian Portuguese bare NPs (singular and plural) obligatorily take narrow scope, not surprising if they are in fact kind terms, as claimed by Munn and Schmitt or Dobrovie-Sorin and Pires de Oliveira. If they are not, as claimed by Müller, however,

their inability to take wide scope calls for an explanation. Independently of Brazilian Portuguese, the problem holds for Italian bare plurals that also have this propensity for narrow scope and have been argued not to be kind denoting by Longobardi and Zamparelli, among others.

The issue of obligatory narrow scope for non kind denoting, non incorporated NPs is an important one and needs to be settled before we can say that the semantics of bare NPs has been truly understood. The only conclusion that we can draw from these cases at this point is that the diagnostic of narrowest scope identifies not only kind denoting terms (in addition to incorporated NPs) but also concept denoting terms, in the sense of Krifka (1995). This, however, begs the question of the relation between concepts and kinds, something that remains to be articulated within a theory of variation.

In this section I took Brazilian Portuguese as an exemplar of the questions that I believe a theory of variation must address. I did not explicitly discuss other languages for which similar observations have been made in the belief that a focused discussion of issues raised by one language would be of relevance to other languages as well.

7. Conclusion:

Cross-linguistic work in the semantics of bare NPs, as would be clear from this survey, is a dynamic area of research that has produced many substantive results. As our knowledge of different languages and language types continues to grow, theories are faced with new challenges. A theory measures up to these challenges if it can be modified and adjusted to account for new and unexpected facts without losing predictive power. The requirement of empirical adequacy thus continues to sharpen theoretical insights, forcing us to ask deeper questions of languages we already know and languages we encounter for the first time.

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