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The Parameterisation of Number

Christopher Hicks

The interpretation and marking of number greatly varies crosslinguistically. This paper examines the connections between the marking and interpretation of number for count nouns, based on evidence found in a range of different languages. I argue that a consistent number interpretation depends on the presence of the grammatical feature Number, hosted on a functional Num head (as proposed by Ritter (1991)). If the Number feature and the Num head are present in the extended projection of the noun, then the denotation of that noun will be restricted accordingly in terms of number. I also argue that number marking results from a property of the Number feature, such that a language that marks number through an affix on the noun will have raising of N to the Num head and languages without such marking will be able to value the Number feature of the noun in situ. This leads to the proposal that the Number feature is the locus of parametric variation in the number system and predicts a new typology of number marking which accounts for languages that mark plural only, languages that also mark singular, languages that maintain a general number interpretation, and canonical classifier languages.

1 The Number feature

Ritter (1991), in her work on noun phrases in Modern Hebrew, argues for a functional projection within the nominal extended projection dedicated to the category Number. In addition to D, a second non-lexical category is proposed, with the head of this projection bearing the number specification of the whole noun phrase. Ritter assumes, as do I, that functional projections may be headed by inflectional elements which, through head movement, may be affixed onto the lexical stem in the syntax. Therefore, the functional head Num, which bears the specification for the grammatical feature Number, hosts the relevant inflectional elements that, through head movement, are affixed to the noun stem. The proposed extended projection is given in (1).

This gives an account of how number is marked morphologically, but can this be linked to the interpretation of number? To do this, we must look at proposals for how the Person feature achieves a similar goal.

1.1 The Person feature

In work by Longobardi (2008) on reference to individuals, he proposes the Denotation Hypothesis that states “individuals are denoted through the Person feature” — in other words: in order to refer to individuals, a language needs the Person feature (although Wiltschko (2014) proposes equivalents that can fulfil the same function). Longobardi claims that the functional head D minimally consists of the Person feature.

Longobardi (2008) also proposes a Core Generalization to explain why bare common nouns do not undergo N-to-D movement, as proper nouns do, in Italian and other Romance languages. Languages like Italian refer to individuals (where the class of individuals includes those with a constant interpretation: proper names and common nouns when used as kind-denoting names) by overtly associating the lexical content of nouns with the Person feature through N-to-D movement. These languages are “strong Person” languages. Languages like English do not exhibit this movement and have a covert link between N and D. These are termed “weak Person” languages. Japanese and other East Asian languages have been characterised as “no Person” languages, meaning that they are deprived of the syntactic effects of Person as exhibited in languages of other types. This could mean that Person is not grammaticalised at all, or that Person fulfils a different function in their nominal domain. It may be the case that different features are grammaticalised in the nominal extended projections of these languages, leading to topic-prominence or other typological characteristics.

1.2 My proposal

Longobardi (2008) claims that the Person feature denotes an individual. In accordance with this, I propose that the Number feature denotes a set that only contains sets with a specified number of members. If the Number feature is grammaticalised in a language, then it is possible to systematically restrict the denotation of a noun with regard to number. Just as the link between N and D was only concerned with individuals with constant interpretation/reference (proper names and kinds), the link between N and Num is only concerned with entities with a constant number interpretation. A link between N and Num means that the interpretation in terms of number is fixed. For example, a Number feature valued as singular would restrict the denotation of the noun to the set of singularities, whilst a plural valued Number feature selects the set of pluralities. More widely, the task of the nominal extended projection is to progressively restrict the denotation of the noun from that provided by the lexicon to the intended referent.

To illustrate how this works, consider the structure in (1) (which is assumed as the standard basic structure of the nominal phrase). N merges first, with the unrestricted denotation provided by the lexicon. The Num head then merges, with its Number feature, which restricts the denotation of the noun according to the value of Number - typically either singular or plural. The D head merges next, with its Person feature, which further restricts the denotation of the noun to an individual singularity or plurality. In this article, only count nouns and languages with Number values of singular and plural will be discussed, but it is expected that the proposals could be extended.

Combining the work of Longobardi (2008) and Wiltschko (2008), I will show how variation with regard to the Number feature can account for the differences in both the marking and interpretation of number in a variety of languages. First, I will consider a language that may lack the Number feature entirely.

2 Grammaticalised Number

2.1 English and Halkomelem

Wiltschko (2008) compared how two languages, English and Halkomelem, differ in their expression of singularities and pluralities. Halkomelem has plural markers, just as English does, but Wiltschko denies that their shared meaning indicates categorial identity. She claims that this should be based on distributional criteria

instead and finds the following differences between the distributions of the markers of plurality in Halkomelem and English, suggesting that they are categorially distinct (Wiltschko 2008:687):

(2)

	<i>Halkomelem</i>	<i>English</i>
a. Absence of plural marking = singular	No	Yes
b. Obligatory agreement (within DP)	No	Yes
c. Plural can be selected for	No	Yes
d. Form-meaning mismatches (<i>pluralia tantum</i>)	No	Yes
e. Complementarity with classifiers	No	Yes
f. Restricted to nouns	No	Yes
g. Cannot occur inside compounds	No	Yes

We can see here that the criteria relate to semantics, morphology and semantics. First, property (a) links the morphological marking of Number to its interpretation. In Halkomelem, a noun lacking plural marking may still receive a plural interpretation, but in English, a noun that is not marked as plural can only interpreted as singular.

In terms of syntactic operations, property (b) connects Number marking to agreement. In English, agreement for number is obligatory in the nominal phrase, e.g. *this boy* and *these boys*, rather than **this boys* and **these boy*. Agreement is optional in Halkomelem, as plural marking is not associated with a Num head. Property (c) similarly links the Number specification to other elements within the nominal phrase in terms of selection; selectional restrictions can only be established between syntactic heads.

Property (d) links semantics and morphology again, by drawing the distinction between grammatical Number and natural number. In Halkomelem, only natural number is instantiated - there are no mismatches. In English, nouns marked as plural in accordance with their grammatical Number specification may have a natural number interpretation of singular.

Property (e) is based on a structural position argument. Wiltschko (2008) asserts that plural markers and classifiers are in complementary distribution if and only if they associate with the same functional category. In Halkomelem, classifiers and Number marking can co-occur, demonstrating that they are not truly in complementary distribution, whereas this is not possible in English.

Property (f) relates to how, in Halkomelem, number markers are unrestricted in what they can modify and can appear on heads of any category, or even roots prior to categorisation. This is not possible in English, in which number marking only takes place in the nominal projection.

Property (g) uses a similarly morphological argument with regard to where number marking can appear. In English, number marking cannot occur in single word (N+N) compounds – this excludes what Wiltschko (2008) terms “phrasal compounds”, such as *admissions committee*, *records department*, etc., in which the non-head of the compound is taken not to be N, but to be a phrase. In phrasal compounds, the non-head accepts further modification, which is prohibited in N+N compounds. For example, *graduate school admissions committee*, understood as the committee for graduate school admissions, is acceptable, but *gold earring*, understood as a ring for a gold ear, is not. In Halkomelem, the fact that number markers are unrestricted in what they can modify means that there is no reason why a plural marked noun could not participate in compounding.

The contrasts with regard to these properties suggest a syntactic difference between the plural markers of the two languages and provide evidence that plural marking is subject to systematic cross-linguistic variation. Wiltschko concludes that the difference in plural marking between English and Halkomelem is in their syntax. In English, the plural marker instantiates the functional head Num, resulting in this structure (Wiltschko 2008:687):

In Halkomelem, the plural marker is not a head, but a modifier that adjoins to the nominal structure:

Wiltschko (2008) uses $\sqrt{root}$, not N, in Halkomelem as the lexical item is not categorised until the categorising head n is merged.

Following Wiltschko’s analysis, we have evidence for a language that does not have a grammaticalised Number feature, and therefore lacks a functional Num head. Halkomelem could therefore be proposed as a “no Number” language in which Number has no syntactic effect at all. This draws a strong parallelism with Longobardi’s approach to Person. Using Wiltschko’s criteria in (2), let us now analyse a range of other languages to determine whether they have grammaticalised Number, and whether we can extend the parallelism to find a distinction between strong Number and weak Number languages.

2.2 Italian

First, does the absence of plural marking result in a singular interpretation in Italian? Before answering this question, we need to determine what constitutes plural marking in Italian. Italian is a stem-based language that requires nouns to

always bear some gender and number marking, meaning that an unmarked noun is ungrammatical and unpronounceable and therefore cannot provide a singular interpretation:

- (5) **bambin*
 bambino ‘child’
 bambini ‘children’

This contrasts with English, in which an unmarked noun is interpreted as singular, and Halkomelem, in which the unmarked noun receives a number-neutral, or general number, interpretation (from Corbett (2000)).

However, Italian is also a “fusional” language, in which one morpheme may simultaneously code multiple features, i.e. Gender and Number. Following Picallo (1991), Gender is structurally lower than Number and nouns with Gender are able to raise to Num for number marking. Unlike English then, both singular and plural nouns in Italian are overtly marked for Number. In the examples above, *-o* encodes masculine and singular, and *-i* encodes masculine and plural.

The next criterion for grammaticalised Number is obligatory agreement within the DP and, as is shown in (6), this holds for Italian:

- (6) a. *questo bambino*
 this.SG child.SG
 ‘this child’
 b. *questi bambini*
 this.PL child.PL
 ‘these children’
 c. **questo bambini*
 this.SG child.PL
 *‘this children’
 d. **questi bambino*
 this.PL child.SG
 *‘these child’

Here, the mechanics of agreement as put forward by Chomsky (2000) provide support for a grammaticalised Number feature in Italian. The demonstratives in

(6) each bear an unvalued Number feature that can only be valued by a valued Number feature on another linguistic object. This object is the Num head.

Further evidence for grammaticalised Number comes from selectional restrictions. Higher DP-internal heads should be sensitive to the value of the Number feature. This can be seen in some quantifiers of Italian (from Chierchia 1998:76):

- (7)
- a. *qualche* ‘some’
takes singular only
e.g. *qualche uomo* ‘some man’ vs. **qualche uomini* ‘some men’
 - b. *nessun(o)* ‘no’
takes singular only
e.g. *nessun uomo* ‘no man’ vs. **nessun uomini* ‘no men’
 - c. *alcuni* ‘some’
takes plural only
e.g. *alcuni uomini* ‘some men’ vs. **alcuno uomo* ‘some man’

Evidence that this is syntactic selection and not semantic selection comes from the selection of *pluralia tantum* nouns. The semantically singular but morphologically plural form *occhiali*, ‘glasses’, cannot combine with *nessun*, which only combines with a singular noun.

Nouns such as *occhiali*, which exhibit a form-meaning mismatch, are another characteristic of a language with grammaticalised Number. In Italian, there are a number of *pluralia tantum* nouns:

- (8)
- a. *cesoie* ‘shears’
 - b. *forbici* ‘scissors’
 - c. *occhiali* ‘glasses’

Here, the plural marking does not match the singular interpretation. These nouns only exist in their plural form and are therefore ambiguous between a singular and plural interpretation. A higher noun must be used to determine the interpretation:

- (9)
- a. *questo paio di occhiali*
‘this pair of glasses’

- b. *queste paia di occhiali*
‘these pairs of glasses’

Complementarity between classifiers and Number marking is further evidence of grammaticalised Number. Italian has a small number of classifier-like expressions which are normally used to turn mass nouns into count nouns:

- (10) a. *cento capi di bestiame*
hundred heads of cattle
‘100 head of cattle’
- b. *molti capi di abbigliamento*
many heads of clothing
‘many items of clothing’
- c. *nove unità di personale*
nine units of personnel
‘nine units of personnel’

In constructions with classifiers such as those in (10), it is impossible for the noun to be marked for Number. This suggests that classifiers and number marking are in complementary distribution.

Another characteristic property of languages with grammaticalised Number is that the marking of Number is restricted to nouns. In Italian, only nominal number is marked. Tovenà and Kihm (2008) argue that verbal number, or pluractionality, exists in Italian in words such as:

- (11) a. *piangere* ‘to cry’ vs. *piagnucolare* ‘to whimper’
- b. *saltare* ‘to jump’ vs. *saltellare* ‘to hop’
- c. *mordere* ‘to bite’ vs. *mordicchiare* ‘to nibble’

The difference in interpretation between the two verbs is that the second in each example has a “pluractional-diminutive nuance”. However, Tovenà and Kihm (2008) propose that the morphological difference between the forms is not inflectional and that “they are autonomous word-forms realising simple stems” with a submorphemic contrast. In addition to this, it is clear that this is not Number

marking of the same kind exhibited on nouns.

The final criterion for grammaticalised Number is disallowing Number marking within compounds. In Italian, forms marked for Number can appear in compounds:

- (12) a. *portachiavi*
 bring+keys
 ‘keychain’
- b. *apriscatole*
 open+cans
 ‘can opener’
- c. *lavapiatti*
 wash+dishes
 ‘dishwasher’

Here, the plural marked “compound-internal” noun forces plural marking on the entire compound noun, even when the compound noun is in the singular, setting up a form-meaning mismatch. For example, *lavapiatti* in the singular in Italian superficially carries a plural ending *-i* due to the compound-internal, plural marked *piatti*. Also, it is important to note that the plural forms internal to the compound do not necessarily denote plural nouns, i.e. a *portachiavi* is still a *portachiavi* when it is only carrying one *chiave* (singular). This is the opposite to English, in which singular nouns appear in compounds but can have a plural denotation, i.e. a *dishwasher*, not a **disheswasher*, washes more than one dish. It seems that regardless of the form used within the compound, the interpretation of the noun is consistently that of general number.

We can now add Italian to our table of Number marking properties:

(13)

	<i>Halkomelem</i>	<i>Italian</i>	<i>English</i>
Absence of plural marking = singular	No	Yes	Yes
Obligatory agreement (within DP)	No	Yes	Yes
Plural can be selected for	No	Yes	Yes
Form-meaning mismatches (<i>pluralia tantum</i>)	No	Yes	Yes
Complementarity with classifiers	No	Yes	Yes
Restricted to nouns	No	Yes	Yes
Cannot occur inside compounds	No	No	Yes

This table demonstrates that the behaviour of Number in Italian is very similar to its behaviour in English. It is apparent that Italian has grammaticalised Number as there is a clear syntactic effect. Let us now consider a language which marks number in a different way, not through inflection on the noun but through classifiers, to assess whether this variation can also be accounted for by an explanation in terms of Number.

2.3 Mandarin Chinese

Mandarin Chinese is commonly referred to as a “numeral classifier” language and is usually taken as one of the canonical examples of this type of language. Bare nouns in Mandarin Chinese express general number and can denote atomic entities, pluralities and notions like (pseudo)partitives and collectives, as shown in the following example from Zhang (2014):

- (14) *Zhou-shang you xigua*
 table-on have watermelon
 ‘There is a watermelon on the table.’
 ‘There are watermelons on the table.’
 ‘There is a slice of watermelon on the table.’
 ‘There are slices of watermelon on the table.’
 ‘There is a pile of watermelon on the table.’
 ‘There is a pile of watermelons on the table.’

Returning to Wiltschko’s first criterion again, the examples in 2.3 demonstrate how, in Mandarin Chinese, the absence of plural marking does not (necessarily) lead to a singular interpretation. Greenberg (1974:25) proposes the Sanches-Greenberg Generalisation (SGG) for the relationship between numeral classifiers and plural markers in numeral classifier languages:

- (15) Numeral classifier languages generally do not have compulsory expression of nominal plurality, but at most facultative expression.

The SGG is borne out by Japanese, Korean and Thai, all numeral classifier languages, in which markers of plurality are not compulsory. Chierchia (1998) extends the SGG to a complementary distribution between numeral classifiers and plural markers, such that a language has either one or the other. For languages with both systems, either one of a numeral classifier or a plural marker can be used in the same construction, not both (Borer 2005). This relates back to Wiltschko’s fifth criterion - complementarity of plural marking with classifiers.

Therefore if a language expresses general number, there is no need to mark the meaning of plurality. Corbett (2000:14) claims that “the distinction is made ‘when it matters’”. A plural marker will only be used when it is necessary to explicitly exclude a singular interpretation.

2.3.1 Evidence for Number in Mandarin Chinese

It has been widely assumed that Mandarin Chinese does not have a true marker of plurality. Zhang (2014) argues against this assumption and proposes that the language does maintain a productive formal encoding of plurality and that Mandarin Chinese nominals do in fact have the property of Number. Zhang’s claims for Mandarin Chinese suggest a number system with a ternary distinction between general number, singular number, and plural number. Bare nouns, as expected, express general number.

Singular number is expressed via “simple unit words”, or SUWs, which are classifiers that do not occur with numerals and consistently express singularity. An example of an SUW is *ben*, which acts as a numeral classifier when following a numeral, but a singular marker in the absence of a numeral:

- (16) a. *Yani mai-le san ben shu*
 Yani buy-PRF three CL book
 ‘Yani bought three books.’
- b. *Yani mai-le ben shu*
 Yani buy-PRF CL book
 ‘Yani bought a book.’

As a numeral classifier language, a noun and a numeral cannot combine directly in Mandarin Chinese. The numeral classifier acts as a counting unit, such that in (16-a), “three instances of one unit of book” are bought. In (16-b), in the absence of a numeral, the meaning of “one unit of book” - or a single book - is expressed. On the basis of this evidence and more, Zhang argues that singularity in Mandarin Chinese is expressed through SUWs.

Plural number in Mandarin Chinese is expressed via “reduplicate unit words”, or RUWs. A word that denotes a unit, like a classifier, can be duplicated, expressing unit plurality. This can be seen in the following examples, where the individual classifier *duo* and the collective classifier *dui* are duplicated:

- (17) a. *He-li piao-zhe (yi) duo-duo lianhua*
 river-in float-DUR one CL-RUW lotus
 ‘There are many lotuses floating on the river.’
- b. *Di-shang you yi dui-dui lianhuan*
 ground-on have one CL-RUW lotus
 ‘There are piles of lotuses on the ground.’

The reduplicated classifier here marks the plurality of the unit word, such that in (17-a) there are multiple individual lotuses, and in (17-b) there are multiple collectives (piles) of lotuses. Nominals with an RUW cannot receive a singular reading, thus Zhang analyses RUWs as markers of plurality.

It is important to note here that neither SUWs nor RUWs can occur with numerals, drawing an important distinction between the property of Number and that of “countability”. Following Zhang (2012), only SUWs and RUWs represent Number

and are realisations of Num, whilst other classifiers, including those that combine with numerals, realise another functional head which she terms “Unit”. This division of Number from countability and combination with numerals reflects the observation that numeral-noun expressions lack overt number morphology in many languages, such as Hungarian, Turkish and Western Armenian and follows the claim of Borer (2005) that for languages with both numeral classifiers and plural markers, only one can be used in a single construction.

The examples in (17) raise two additional points to consider. Firstly, if RUWs mark plurality, then how can they combine with the numeral *yi* ‘one’? Steindl (2010:69) shows that *yi* with an RUW cannot be replaced with a different numeral, suggesting that it is not acting as a numeral in this instance, but as an existential quantifier. Existential *yi* is found in a number of other constructions, for example:

- (18) *Jiaoshi-li yi pian hunluan*
 Classroom-in one CL chaos
 ‘There is chaos in the classroom.’

Secondly, RUWs express a semantic type of plurality termed “plural of abundance”. This type of plurality is found in English also, where a bare plural unit word is followed by *of*, as in:

- (19) a. *She has stacks of old newspapers in the dining room.*
 b. *After months of waiting, ...*

In these examples, the bare plural denotes plural of abundance and does not easily allow an interpretation involving only a small number of *stacks* or *months*. In Mandarin Chinese, this can be understood in terms of the choice to use plural number over general number, the distinction is made to reinforce the contrast with singularity. Referring back to Corbett’s (2000:14) claim that “the distinction is made ‘when it matters’”, this facultative expression of plurality is made to exclude the singular and emphasise the plural of abundance.

Zhang presents the following summary of the properties of SUWs and RUWs as number markers in Mandarin Chinese:

- (20) a. The number feature denotes the number of units.
 b. The number feature is attested in all types of unit words.
 c. The number feature is underspecified with regard to definiteness.
 d. The number feature is not compatible with a numeral.

- e. Plural markers are structurally licensed by certain quantifiers.

2.3.2 Returning to Wiltschko’s criteria

As already discussed, it is clear that the absence of plural marking does not produce a necessarily singular interpretation in Mandarin Chinese.

In reference to Wiltschko’s second criterion, Mandarin Chinese exhibits no Number agreement - obligatory or otherwise. Huang et al. (2009:§8.4.1) claim that the lack of inflectional morphology in the language means that nouns are not inflected for number.

The criterion of being able to select for a plural is reflected in (20-e) above. In Mandarin Chinese, Zhang proposes that RUWs, as plural markers, require licensing by certain quantifiers and that they are incompatible with any quantifiers other than their licensors. These other quantifiers, which include *henduo* ‘many’ and *suoyoude* ‘all’, are sensitive to the value of the Number feature and cannot combine with the plural marker RUW and its plural-valued Number feature. The existential *yi* quantifier, however, can license an RUW, as seen in (17).

With regard to form-meaning mismatches, the noun itself is never marked for number and thus always maintains a general number interpretation. The Number specification, either singular or plural, determines the form of the number marker, either an SUW or an RUW respectively, which always provides a consistent interpretation.

Wiltschko’s (2008) criterion of complementarity is mirrored in (20-d) by claiming that number marking cannot co-occur with a numeral, as a numeral requires a numeral classifier. Although the number markers of Mandarin Chinese, SUWs and RUWs, share the same form and position as numeral classifiers, they cease to be markers of Number when they combine with a numeral. The fact that SUWs and RUWs cannot occur with a numeral, but share the same position as numeral classifiers, suggests that they are incompatible and must be in complementary distribution.

Similarly, given that nouns do not receive number marking, it is not the case that number marking is restricted to nouns. Although numeral classifiers usually occur with nouns, there exists a set of verbal numeral classifiers that specify the number of times an action or event occurs, rather than the number of units of an object. These classifiers include *ci* and *quàn*, both of which roughly translate as ‘times’ in the English sentence: ‘I went to London four times.’ (Zhang 2014:2). However, these verbal classifiers must occur with a numeral and are therefore not comparable

with SUWs and RUWs. This suggests that the criterion should be amended to account for classifier languages such that it should be any element that overtly marks the number interpretation, either inflection or classifier (without a numeral), that should be restricted to nouns in the case of languages with grammaticalised Number.

Given that nouns cannot be marked for Number without an accompanying SUW or RUW, a compound-internal noun cannot express plurality on its own. However, it is possible for a noun and a classifier to combine to form a compound. Examples of this can be seen in the following noun-classifier compounds, which express a collective or plural noun (Li and Thompson 1981:82):

- (21)
- a. *ma-pi*
horse-CL
'horses'
 - b. *shu-ben*
book-CL
'books'
 - c. *chuan-zhi*
boat-CL
'boats'

In (21-b), *ben*, the earlier example of an SUW, is used. However, Zhang (2011) shows that the syntactic status of a compound-internal classifier is context-dependent. Apart from kind classifiers, which none of the classifiers in (21) are, a postnominal classifier is claimed to be the realisation of a functional head of “dimensionality”, not of a counting unit or a Num head. According to Zhang (2011), nouns in Mandarin Chinese differ with respect to dimensionality such that nouns that are said to bear the feature [+dimension] “denote elements showing natural atomicity” and nouns that are [–dimension] “denote massive objects and immaterial notions”. Following this proposal, nominal classifiers in Mandarin Chinese can fulfil three functions: (a) numeral classifier, (b) Number marker, and (c) dimensionality marker.

This aligns with a proposal by Duffield (2013) regarding East Asian languages more generally. In these languages, underspecified lexical items can derive their interpretations from the positions in which they occur, allowing “multifunctional” items. In terms of Number, this means that the item *ben* is lexically underspecified - inserting it into a postnominal position results in a dimensionality marking func-

tion, whilst inserting it into the Num head position results in a Number marking function.¹

Adding Mandarin Chinese to our table of Wiltschko’s criteria gives:

(22)

	<i>Halkomelem</i>	<i>Mandarin Chinese</i>	<i>Italian</i>	<i>English</i>
Absence of plural marking = singular	No	No	Yes	Yes
Obligatory agreement (within DP)	No	No	Yes	Yes
Plural can be selected for	No	Yes	Yes	Yes
Form-meaning mismatches (<i>pluralia tantum</i>)	No	No	Yes	Yes
Complementarity with classifiers	No	Yes	Yes	Yes
Restricted to nouns	No	Yes	Yes	Yes
Cannot occur inside compounds	No	Yes	No	Yes

¹Thanks are offered to a reviewer who pointed out that classifiers can occur higher than (at least certain) modifiers. This higher position for Num in Mandarin Chinese would be problematic for the analysis of number marking through noun raising and affixation as put forward for languages like Italian, for which Num must be lower in the structure. Although not directly concerned with the distribution of modifiers, I offer two, potentially compatible, solutions. Firstly, Wiltschko (2008) presents two lines of crosslinguistic variation for number marking: (i) whether Number is a head or a modifier, and (ii) where in the nominal projection Number appears. I have provided evidence to support Num as a grammaticalised head in Mandarin Chinese, but it may be the case that when Num projects in this language, there are lower projections in the structure that can host certain adjectives. Secondly, Zhang (2012) proposes a functional projection for delimitability, DelP, which can project immediately above NP. DelP may license certain types of modifiers in its Specifier position which would allow particular delimitable adjectives to the right of classifiers.

As we can see, there is some syntactic effect of Number in Mandarin Chinese, but the variation between this language, Italian, and English suggests that there are further points of variation between those languages with grammaticalised Number; Mandarin Chinese exhibits some but not all of the characteristics put forward by Wiltschko (2008).

2.4 Turkish

In Turkish, bare nouns express general number, meaning that their denotation includes both atomic entities and pluralities:

- (23) *çocuk*
 boy
 ‘boy’ or ‘boys’

In addition to this, Turkish also has a productive plural morpheme *-lar*:

- (24) *çocuk-lar*
 boy-PL
 ‘boys’

This shows that the number system in Turkish has a binary distinction between general number and plural number, placing it in contrast with languages like Italian, which have a binary distinction between singular number and plural number. Corbett (2000) notes several languages that, like Turkish, have a general vs. plural number contrast. With regard to the first criterion of Wiltschko (2008) therefore, the absence of plural marking does not result in a singular interpretation. Bare nouns typically represent a categorial meaning rather than representing a member of that category. For example, *insan* refers to the category *human*, *bir insan* refers to a single member of the category *human*, and *insanlar* indicates an indefinite number of members of the category *human*.

There is no number agreement within the DP in Turkish, meaning that the language does not conform to Wiltschko’s second criterion of obligatory agreement. The head noun of the DP is the sole location for any inflectional suffixes that relate to the DP as a whole (Göksel and Kerslake 2005:145):

- (25) *(Bu kattakien güzel oda-lar-ımız)-ı size ayırdık*
 room-PL-1PL.POSS-ACC

‘We’ve given you (our best rooms on this floor).’

All other modifying elements within the DP, including adjectives and demonstratives, do not exhibit agreement in number with the noun.

There are a number of quantifiers that are sensitive to the feature value of Number, meaning that plural can be selected for. Libert (2008:4), drawing on data from Lewis (1988) and Göksel and Kerslake (2005), summarises the standard number requirements of some quantifiers as follows:

(26)

<i>Quantifier</i>	<i>Translation</i>	<i>Number requirement</i>
bazı, kimi	‘some’	plural
birtakım	‘some’, ‘a number of’	plural
bir kısım	‘some’	plural
birkaç	‘a few’, ‘several’	unmarked
kaç	‘how many’	unmarked
çok	‘a lot of’, ‘many’	plural or unmarked
birçok	‘a good deal of’, ‘many’	plural or unmarked

Given that Turkish maintains a general vs. plural number distinction, the only possible form-meaning mismatch would arise from a noun marked as plural with a singular interpretation - *pluralia tantum*. There is no evidence of Turkish having nouns of this type, given that unmarked nouns denote both atomic entities and pluralities and a noun is only marked as plural to highlight that singularities are excluded from the denotation.

Continuing to Wiltschko’s next criterion, Turkish can optionally use classifiers with nouns, but Her and Chen (2013) note that classifiers and plural marking are mutually exclusive and cannot co-occur within a noun phrase. This means that plural marking and classifiers are complementary.

In Turkish, the plural marker can only modify nouns. It is important to note the difference between a plural marker on a verb that marks pluractionality and the optional number agreement that can be marked on verbs in Turkish (from Sezer 1978:26):

- (27) *Öğrenci-ler gel-di-(ler).*
 student-PL come-PST-(3PL)
 ‘Students came.’

This marking of the verb does not at all affect the interpretation of the verb, but displays agreement with its subject.

The plural marker *-lar* cannot appear inside compounds. In indefinite compound nouns, the first noun acts as a modifier to describe the second noun, which is marked with the third person possessive suffix to show the connection between the two words. When the compound noun is marked as plural, the suffix changes to the third person plural possessive suffix:

- (28) a. *otobüs durağ-ı*
 bus stop-3SG.POSS
 ‘bus stop’
 b. *otobüs durak-ları*
 bus stop-3PL.POSS
 ‘bus stops’

Importantly, the first noun in the compound can never be marked as plural, and the plural marker only ever marks that the compound as a whole is pluralised.

We are now in a position to add Turkish to the existing findings for grammaticalised Number, according to Wiltschko’s (2008) criteria:

(29)

	<i>Halkomelem</i>	<i>Mandarin Chinese</i>	<i>Turkish</i>	<i>Italian</i>	<i>English</i>
Absence of plural marking = singular	No	No	No	Yes	Yes
Obligatory agreement (within DP)	No	No	No	Yes	Yes
Plural can be selected for	No	Yes	Yes	Yes	Yes
Form-meaning mismatches (<i>pluralia tantum</i>)	No	No	No	Yes	Yes
Complementarity with classifiers	No	Yes	Yes	Yes	Yes
Restricted to nouns	No	Yes	Yes	Yes	Yes
Cannot occur inside compounds	No	Yes	Yes	No	Yes

On adding Turkish to the table of criteria, we somewhat surprisingly find that it matches identically with the results from Mandarin Chinese. Given that these two languages differ greatly in their expression of Number, we must find another way to capture the variation exhibited with regard to Number that not only divides Turkish from Mandarin Chinese, but can also individuate the points of variation amongst each of the languages with grammaticalised Number.

3 Variation in grammaticalised Number

Given that each of the languages discussed except Halkomelem shows characteristics of grammaticalised Number, let us now approach Number in terms of interpretative differences. The table below compares how each language marks Number

and restricts the denotation of a noun:

(30)

<i>Language</i>	<i>Number?</i>	<i>General number?</i>	<i>Plural Number...</i>		<i>Singular Number...</i>	
			<i>Denoted?</i>	<i>Marked?</i>	<i>Denoted?</i>	<i>Marked?</i>
Halkomelem	No	Yes	No	No	No	No
English	Yes	No	Yes	On Noun	Yes	No
Italian	Yes	No	Yes	On Noun	Yes	On Noun
Mandarin Chinese	Yes	Yes	Yes	As CL	Yes	As CL
Turkish	Yes	Yes	Yes	On Noun	No	No

Halkomelem expresses general number and has no systematic way of restricting the denotation of a noun to either singularities or pluralities. This is taken as evidence that the noun does not receive a value for Number from a Num head and that there is in fact no grammaticalised Number feature to provide such a value.

In Mandarin Chinese, there is no morphological marking of nouns and, as such, these bare nouns standardly receive a general number interpretation. This interpretation is restricted through the use of classifiers as Number markers. Single unit words, when preceding a bare noun, result in the noun receiving a singular reading. Reduplicate unit words before a bare noun restrict the denotation of the noun to pluralities. This means that Mandarin Chinese has a ternary distinction for number: general vs singular vs plural. SUWs and RUWs instantiate the Num head and have feature values of singular and plural respectively. Given that Number is not marked directly on the noun, the noun does not raise to have its Number feature valued by that on Num. This lack of overt association (movement) between N and Num aligns with the proposals of Longobardi (2008) for Person and suggests that Mandarin Chinese is a “weak Number” language.

Turkish has a binary distinction in its number system: general vs plural. If the noun does not have its Number feature valued, then it expresses general number. The only available value for the Number feature is plural and, if the Number

feature on the noun is valued as such, the noun raises to Num and receives as an affix the inflectional element hosted by Num. The overt association of N and Num, through movement of N to Num, suggests that Turkish is a “strong Number” language.

In Italian and English, all nouns must obligatorily receive a value for their Number feature, meaning that general number cannot be expressed. In Italian, all nouns raise to Num and both the singular and plural are marked, making Italian a “strong Number” language. In English, only a Number feature valued as plural triggers raising of N to Num, which is why only the plural is marked. A Number feature valued as singular values the Number feature of the noun *in situ*. This suggests that English falls somewhere between Italian on the one hand and Mandarin Chinese on the other. Let us refer to English as a “mixed Number” language, in which the strength of the Number feature depends on its value.

From the languages observed so far, it seems that it is not possible to both express general number and mark singular Number inflectionally (i.e. not through a classifier). This language would have to meet three criteria: (i) it expresses general number, unlike Italian, (ii) it expresses singular Number, unlike Turkish, and (iii) is a “strong Number” language, unlike Mandarin Chinese. One such language is Fouta Jalon.

3.1 Fouta Jalon

Corbett (2000) finds, in the Fouta Jalon dialect of Fula (in Guinea), a language with Number marking on the noun and a ternary distinction for number:

(31) from Corbett (2000:12)

<i>General</i>		<i>Singular</i>		<i>Plural</i>	
toti	‘toad(s)’	totii-ru	‘toad’	totii-je	‘toads’
nyaari	‘cat(s)’	nyaarii-ru	‘cat’	nyaarii-je	‘cats’
boofu	‘egg(s)’	woofu-nde	‘egg’	boofu-de	‘eggs’
biini	‘bottle(s)’	biinii-ri	‘bottle’	biinii-je	‘bottles’

Fouta Jalon perhaps has the simplest number system discussed so far. General

number is expressed by a bare noun, which means that the noun is not valued for Number and there is no connection between the noun and a Num head. A valued Number feature on the Num head triggers raising of N to Num and the inflectional element hosted by Num becomes an affix on the noun. This shows that Fouta Jalon is a “strong Number” language.

Adding Fouta Jalon to our current classification gives:

(32)

<i>Language</i>	<i>Number?</i>	<i>General number?</i>	<i>Plural Number...</i>		<i>Singular Number...</i>	
			<i>Denoted?</i>	<i>Marked?</i>	<i>Denoted?</i>	<i>Marked?</i>
Halkomelem	No	Yes	No	No	No	No
English	Yes	No	Yes	On Noun	Yes	No
Italian	Yes	No	Yes	On Noun	Yes	On Noun
Mandarin Chinese	Yes	Yes	Yes	As CL	Yes	As CL
Turkish	Yes	Yes	Yes	On Noun	No	No
Fouta Jalon	Yes	Yes	Yes	On Noun	Yes	On Noun

4 Number as the locus of variation in number

In line with Longobardi’s (2008) Denotation Hypothesis, which proposed that the Person feature on D denotes individuals, the following is now put forward as a parallel proposal for Number:

- (33) The denotation of a noun is restricted to a set of singularities or a set of pluralities by the singular or plural value of a grammaticalised Number feature.

The first point of variation is whether Number is grammaticalised in a language at

all. This means that the language exhibits some syntactic effect of Number. This was found not to be the case in Halkomelem, which therefore must be termed a “no Number” language.

Amongst languages with grammaticalised Number, the second point of variation is whether Number, and therefore the Num head, is obligatory within the nominal phrase. In Mandarin Chinese, Fouta Jalon, and Turkish, the noun can be left unvalued in terms of Number, permitting a general number interpretation. This separates these languages from those like Italian and English, in which the noun must be valued for Number and general number cannot be expressed.

A third point of variation is whether Number is always strong when present. In such languages, a noun with a specified Number interpretation will always be inflectionally marked as such, and vice-versa. These are “strong Number” languages and include Italian, Turkish and Fouta Jalon. Conversely, Number is always weak when present in Mandarin Chinese, meaning a noun with a specified Number interpretation will always be marked via a classifier. Mandarin Chinese is a “weak Number” language.

One tentative universal arises such that all the languages discussed that were found to have grammaticalised Number could have that Number feature valued as plural. In Turkish this is the only possible value for Number, but all the other languages also had the value of singular.

The variation in the interpretation and marking of number across the languages discussed can therefore be said to result from variation in the properties of the Number feature, or rather:

- (34) The Number feature is the locus of parametric variation in the number system.

This is based on the following points of variation in the number system:

(35)

<i>Point of variation</i>	<i>Language</i>					
	<i>Hal</i>	<i>Ita</i>	<i>Eng</i>	<i>MC</i>	<i>FJ</i>	<i>Tur</i>
Is Number grammaticalised?	-	+	+	+	+	+
Is Number obligatory?	0	+	+	-	-	-
Is Number always strong?	0	+	-	-	+	+
Can Number be valued singular?	0	+	+	+	+	-

Of the logical possibilities among the languages with grammaticalised Number, three are not accounted for in this sample. The combination [+, +, -, -] is predicted not to exist as the language would have obligatory restriction in terms of number, i.e. general number cannot be expressed, but would also lack the ability to express singular number. This would force all forms to be interpreted as plural, either with or without marking, which, in turn, is more likely to be acquired as a lack of grammaticalised Number. The combination [+, +, +, -] makes the same prediction of a language with obligatory number restriction that lacks the ability to express the singular, the difference here being that Number must be marked as an affix. The final combination [+, -, -, -] predicts a language that can (i) express general number, (ii) cannot force a singular interpretation through the Number feature, like Turkish, and (iii) need not mark Number as an affix, like Mandarin Chinese. This combination is not impossible and, based on data from WALs, two languages that may fit this specification are Chalcatongo Mixtec and Tetun.

4.1 Parameters in acquisition terms

The sequencing of the first two parameters in (35) follows the general sequence of acquisition: No > All > Some (Biberauer 2013). The default setting prior to acquisition is that there is no Number feature, as the acquirer has received no systematic input to motivate its existence. This respects two separate learning biases, namely Feature Economy and Input Generalisation. Feature Economy requires that as few features as possible be postulated to account for the input (Roberts and Roussou 2003), whilst Input Generalisation forces available features

to be maximised (Roberts 2007). Biberauer (2011) combines these two biases into one, namely “make maximal use of minimal means”, which reflects the efficiency observed in acquisition.

In the next stage, the acquirer tends to “overgeneralise” and posits that the Number feature is obligatory in all constructions. This respects Input Generalisation, as the available features are maximised, but requires that the Number feature be postulated, which goes against Feature Economy.

This leaves the next parameter choice to determine the “some Number” languages. To categorise further, both Feature Economy and Input Generalisation will be violated, as a new feature is required. Here, the “strength” of the Number feature might be used.

It is perhaps easier to consider these parameter settings from the point of view of the acquirer, given the morphological and semantic cues available.

In Halkomelem, the acquirer will not receive any systematic input in relation to Number, as unmarked nouns can receive singular and plural interpretations. Given this input, no Number feature is postulated. A simplified structural representation of Halkomelem is provided in (36):

In Fouta Jalon, unmarked nouns can receive singular and plural interpretations. Nouns that can receive only plural interpretations are systematically marked with a particular affix, whereas nouns that can receive only singular interpretations are systematically marked with a different particular affix. The acquirer can link the morphological marking of the noun to its denotation and, as a result, postulate a Number feature with values corresponding to singular and plural. The possible structural representations in Fouta Jalon are given in (37):

(37) a. General

b. Singular and plural

Italian is similar to Fouta Jalon, except that Number is obligatory and general number cannot be expressed. Nouns that can receive only plural interpretations are systematically marked with a particular set of affixes and nouns that can receive only singular interpretations are systematically marked with a different set. The acquirer links the morphological marking to the denotation and postulates singular and plural values of an obligatory Number feature. The structural representation is the same as that in (37-b).

Turkish has unmarked nouns that express general number. A noun that can only denote a plurality is marked with a particular affix. The acquirer can link the interpretation to the marker by positing the Number feature with a value corresponding to plural. When this feature is present, it restricts the denotation to the set of pluralities. In contrast, when the feature is absent, the noun denotes the superset of all atomic and non-atomic entities. The structural representations are given in (38):

Herein lies the crucial difference between Turkish on the one hand, and English on the other. In both languages, nouns that receive plural interpretations are systematically marked morphologically and the acquirer posits a Number feature to link the plural marking to a denotation of pluralities. However, leaving the acquisition sequence here would result in English having a distinction between general number and plural number, as in Turkish. Crucially, nouns that are unmarked for Number in English receive singular, and not general number, interpretations. Therefore in English, lack of plural marking does not indicate a lack of number specification. The contrast lies between plural marking, which denotes the set of pluralities, and no marking, which instead denotes the absolute complement of the set of pluralities: the set of singularities. This interpretative difference between selecting a subset of the denotation from the whole, as plural marking does in Turkish, and dividing the denotation into two complementary subsets, as plural marking does in English, leads to the postulation of the singular feature in English, despite it not being represented overtly in the morphology. The structural representations for English are given in (39):

(39) a. Plural

b. Singular

In Mandarin Chinese, nouns without classifiers express general number. Nouns that consistently receive singular interpretations systematically link to the presence of a classifier being employed as a single unit word in the absence of a numeral. The acquirer therefore links the SUW with the denotation of singularities through a Number feature. Similarly, nouns that receive plural interpretations without numerals consistently align with the presence of a reduplicate unit word. The presence of an RUW is linked to the plural interpretation through the Number feature also. The structural representations for Mandarin Chinese are provided in (40):

(40) a. General

b. Singular and plural

In summary, if the morphological marking on a noun systematically aligns with its semantic interpretation in terms of Number, then the acquirer will postulate a Number feature that links the two. Only the presence of the Number feature can restrict the denotation of the noun, not its absence.

4.2 The Num head and general number

Given that some languages can have grammaticalised Number and express general number, it must be possible for the Num head to be omitted from the extended projection entirely when general number is expressed. The acquirer would have no motivation to posit a Number feature in constructions involving number-neutral nouns.

This finding has two consequences. Firstly, it must be possible for the Number feature on the noun either to remain unvalued and not cause a derivation crash, or to attain a default value when one is not provided from elsewhere. Whilst this is beyond the scope of the current discussion, Preminger (2014) has suggested that both of these are possibilities. Secondly, it is clear that the Number feature serves only to restrict the denotation of the noun and that the Num head is not present when there is no Number specification. This prompts the following hypothesis,

again mirroring Longobardi (2008) for Person:

- (41) Crosslinguistically, the category Num minimally consists of the Number feature.

5 Conclusion

The Number feature shows behaviour very similar to that proposed for the Person feature. It is a device responsible for the marking of nouns in terms of their number and for restricting the denotation of a noun, depending on the feature's value. Different properties of the Number feature are responsible for crosslinguistic variation, and these parameter settings can be supported by theories of acquisition.

The first parameter is whether the language has grammaticalised Number or not. A “No Number” language like Halkomelem has no links between the interpretation and any morphosyntactic head or feature properties, such as agreement. The second parameter determines whether Number is optional. A language which has non-obligatory Number is capable of expressing general number, as the Number feature that restricts the denotation of the noun is optional. The next parameter considers whether Number must be a strong feature that triggers raising of N to Num. If Number is always strong, there is an overt marker for each value of the Number feature in that language. This can be seen in Italian, Turkish and Fouta Jalon, in which the Number feature always triggers overt marking of the noun. In English, Number is only strong when valued plural, meaning only plural number is marked on the noun. In Mandarin Chinese, Number is never strong. This is a characteristic of canonical classifier languages in which Number marking on the noun does not occur. The final parameter separates Turkish from Fouta Jalon by identifying the number of possible values for the Number feature. Both are “strong Number” languages, so Number is marked when present, however Turkish only has one possible value for Number - plural, while Fouta Jalon has both plural and singular.

Unifying all facets of number into the behaviour of one functional head Num undoubtedly holds theoretic value, and further research on different canonical classifier languages and languages with more than singular and plural values of the Number feature will hopefully strengthen this proposal.

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