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A syntactic account for the parametric variation of the Number feature

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Abstract

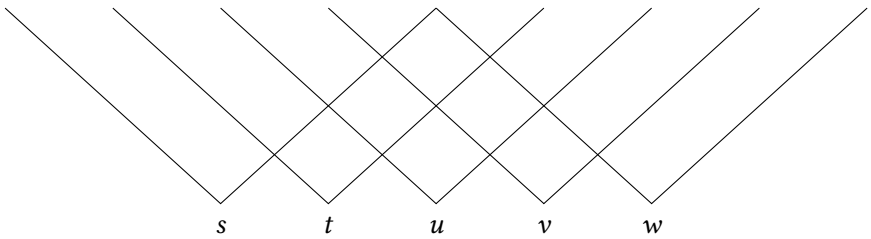
In this paper, I attempt to provide a syntactic account for the parametric variation displayed in the marking of Number crosslinguistically. The Number feature is analysed and compared with similar work conducted on the Person feature. Criteria for a language with a grammaticalised Number feature are presented, and applied to a number of languages. This analysis considers both the number marking that occurs on the noun, and its interpretation. Based on these observations, a number of points of parametric variation are suggested that form a parameter hierarchy.

1 Introduction

This paper finds its basis in the proposals of Ritter (1991), who calls for a functional projection within the nominal phrase that is the locus of the phrase's number specification (singular, plural, etc.). This functional head is labelled Num and hosts the Number feature. Ritter also follows the assumption, as will this paper, that the head of a functional projection may host an inflectional element that becomes an affix on the lexical stem through movement.

As a starting point, general lattice-theoretic semantics (Link 1983) will be adopted, whereby a bare noun denotes a set containing both atomic entities and pluralities. This is often represented as a semi-lattice:

(1)



Atomic entities occupy the lowest row of nodes — therefore the nodes *s* to *w* in the diagram above correspond to atoms. Higher nodes, at the points where the lines originating from the atoms intersect, represent sets of these atoms, for example, the point between *u* and *v* represents {*u*, *v*}. The denotation of a bare noun is all the nodes in the semi-lattice. I propose that the task of the nominal extended projection

is to restrict the denotation from complete semi-lattice to an individual atom or plurality.

2 The Person feature

This proposal aligns with Longobardi's (2008) work on reference to individuals, in which the Denotation Hypothesis states "individuals are denoted through the Person feature". 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. To remain consistent with Longobardi's approach to Person, the term *denotation* will be used for any type of relation that holds between an expression and the entity or entities it stands for.

Longobardi (2008) also proposes a "Core Generalization" to explain why bare common nouns do not undergo N-to-D movement like proper names in Italian and other Romance languages. Languages like Italian refer to individuals (where the class of individuals includes constants, variables or kinds) 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, which do not exhibit this movement and link N to D through a CHAIN (a kind of "covert" connection), are "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 exhibited in languages of the other types. This could mean that Person is not grammaticalised in these languages 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.

Given that the Person feature denotes an individual, is it possible that the Number feature restricts the denotation to a set based on the cardinality of its subsets, from which this individual can be chosen? For example, a Number feature valued as singular would restrict the denotation to the set of singularities, or the lowest row of the semi-lattice, whilst a plural value would select only the set of pluralities — all nodes except the atoms. The Person feature would then denote an individual from one of these sets.

Longobardi (2008) presents the following criteria for a language with no grammaticalised Person:

(2)
a. It will have no head Person (= D) in its syntactic representation of nominal arguments
b. Proper names will have the same surface distribution as common nouns
c. Bare nouns will be able to achieve kind-referential interpretation
d. Expressions translating Indo-European pronouns will have the same distribution as nouns
e. No person agreement will ever appear on verbs
f. No person agreement will ever appear on anaphors

As an attempt to make these criteria relevant to grammaticalised Number, the following set is suggested:

(3) a. It will have no head Number (= Num) in its syntactic representation of nominal arguments
b. Absence of plural marking is not associated with a consistent number-related interpretation
c. No number agreement will ever appear on verbs
d. No number agreement will ever appear on anaphors

A number of languages have been argued to lack grammaticalised Person — is there also evidence of a language without grammaticalised Number?

3 Grammaticalised Number

3.1 English and Halkomelem

Wiltschko (2008) compared how two different 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. Differences in a number of formal and interpretational properties are found between the two languages (Wiltschko 2008: 687), as shown in Table 1.

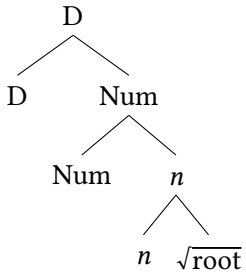
	English	Halkomelem
Absence of plural marking = singular	Yes	No
Obligatory agreement (within DP)	Yes	No
Plural can be selected for	Yes	No
Form-meaning mismatches (pluralia tantum)	Yes	No
Complementarity with classifiers	Yes	No
Restricted to nouns	Yes	No
Can occur inside compounds	No	Yes

Table 1 Properties of Number in English and Halkomelem

Note that a number of these criteria match those suggested in (3) as corresponding to Longobardi's criteria for grammaticalised Person.

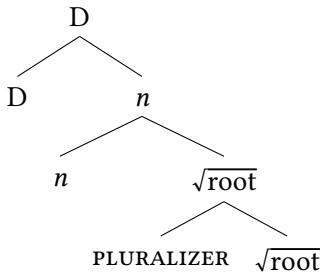
The contrasts with regard to these properties suggest a syntactic difference between the two plural markers and provide evidence that plural marking is subject to systematic crosslinguistic variation. Wiltschko concludes that the difference in plural marking between English and Halkomelem is in their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

(4)



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

(5)



In an attempt to align Number with Longobardi's approach to Person, Wiltschko's analysis for Halkomelem plural marking can be adapted. Just as Japanese was proposed as a language without grammaticalised Person, Halkomelem is suggested as a language without grammaticalised Number.

However, where does that leave English? Wiltschko shows that English has grammaticalised Number through the inflectional marking of plurals. Following Ritter's (1991) assumption that the head of a functional projection may host an inflectional element, the plural marker in English could become an affix on the lexical stem through movement of N to Num. In order to refer to pluralities in languages like English, the lexical content of the noun must be overtly associated with Number. This continues to align with the theory for Person, in which NtoD raising was characteristic of "strong Person" languages, and suggests that English is a "strong Number" language with N-to-Num raising. To further test this hypothesis, let us consider a wider range of Number marking phenomena.

3.2 Italian

In a number of languages, both the singular and plural are marked. Swahili (and many more Bantu languages) and Italian provide examples of this, as shown in Table 2.

The difference in the Number marking of these languages and the plural marking of languages like English is likely to also be based in their syntax. Italian will now be subjected to the criteria for grammaticalised Number as proposed by Wiltschko (2008).

	Singular		Plural	
Swahili	*m*toto	child	*wa*toto	children
Italian	bambin*o*		bambin*i*	

Table 2 Expression of number in Swahili and Italian

Firstly, does the absence of plural marking in Italian result in a singular interpretation? Superficially, this is not the case. In Italian, an unmarked noun is not compatible with a plural interpretation, but neither is it compatible with a singular interpretation:

(6) a. *bambin
b. bambino
'child'
c. bambini
'children'

This stands in contrast with both English and Halkomelem. In English, an unmarked noun is interpreted as singular, whereas in Halkomelem, the unmarked noun receives a number-neutral or general number interpretation (Corbett 2000), allowing compatibility with both singular and plural interpretations.

In this respect, Italian seems closer to English in that the marking of the noun determines the interpretations for Number available to it. In English, a Num head with its Number feature valued as plural can host a range of morphologically and phonologically conditioned allomorphs but, when its Number feature is valued as singular, the Num head is not associated with any phonetic content. This contrasts with Italian, in which it seems that an overt linguistic object expresses both the singular and plural values of Num.

However, the singular affixes in Italian are more usually analysed as markers of Gender. Italian, unlike English, is a stem-based language that requires nouns to always bear some gender marking. Do these markers encode both Gender and singular Number, or is singular Number not marked at all? The latter possibility is not unfeasible. The typical markers of inherent Gender on a noun are *-o* for masculine and *-a* for feminine. Nouns with these markers are interpreted as singular, but it does not necessarily follow that these markers instantiate the Num head. Plurals are then marked using two plural affixes that are sensitive to Gender, typically *-i* for masculine and *-e* for feminine. Gender is structurally lower than Number (Picallo 1991), and thus the nouns would still be able to raise to Num for plural marking.

Such an analysis suggests that nouns interpreted as singular in Italian are only marked for Gender, not Number. A noun with no Number marking denotes an individual from the domain of atomic entities, while a noun marked for plural has a non-atomic denotation. This aligns Italian singular nouns with English singular nouns, as neither are overtly marked for Number.

In Halkomelem, bare nouns have a general number interpretation, including both atomic and non-atomic entities in their denotation. However, bare nouns with a general number interpretation can surface in English in the form of compounds. The first nouns in each of the following compound words can receive a plural interpretation as well as a singular one (Wiltschko 2008):

(7) a. toothbrush
b. childcare
c. stamp collection
d. four wheel drive

Similarly, it is impossible in English for a plural marked noun to appear within a compound, e.g. *teethbrush*. This contrasts with Italian, in which plural forms can be used to create a compound:

(8) a. *porta+chiavi*
bring+keys
'keychain'
b. *apri+scatole*
open+cans
'can opener'
c. *lava+piatti*
wash+dishes
'dishwasher'

It is also possible to form compounds with a noun unmarked for Number:

(9) a. *asciuga+mano*
dry+hand
'towel'
b. *caccia+vite*
chase+screw
'screwdriver'

The property of allowing plural forms to occur inside compounds is one that Italian shares with Halkomelem and is a criterion of "no Number" languages. However, the ability for plural forms to occur inside compounds in Italian does not affect the denotation of the noun. Regardless of the form used within the compound, its interpretation remains consistent with the general number reading given to those in English compounds.

Form-meaning mismatches, another criterion for grammaticalised Number, are demonstrated by a number of *pluralia tantum* nouns:

(10) 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 version of a classifier must be used to determine the interpretation:

(11) a. questo paio di occhiali
'this pair of glasses'
b. queste paia di occhiali
'these pairs of glasses'

Italian is closer to English once again in this respect.

A further criterion of grammaticalised Number is obligatory agreement within the DP and, as is shown in (12), this holds for Italian:

(12) 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
d. **questi bambino*
these.PL child.SG

Here, the mechanics of agreement as put forward by Chomsky (2000, 2001) provide support for a grammaticalised Number feature in Italian. The demonstratives in (12) 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. English exhibits this in its quantifiers, which can select for a specific value of Num, and Wiltschko (2008) finds that all quantifier-like elements in Halkomelem can combine with both plural and unmarked nouns. In Italian, some quantifiers are sensitive to the feature value of Num, for example (from Chierchia 1998: 76):

(13) a. *Qualche* 'some' — takes singular only
Qualche uomo 'some man'/**qualche uomini* 'some men'
b. *Nessun(o)* 'no' — takes singular only
Nessun uomo 'no man'/**nessun uomini* 'no men'
c. *Alcuni* 'some' — takes plural only
Alcuni uomini 'some men'/**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* cannot combine with *nessun*, which only combines with a singular noun.

To summarize, Italian exhibits the behaviour shown in Table 3.

	English	Halkomelem	Italian
Absence of plural marking = singular	Yes	No	Yes
Obligatory agreement (within DP)	Yes	No	Yes
Plural can be selected for	Yes	No	Yes
Form-meaning mismatches (pluralia tantum)	Yes	No	Yes
Complementarity with classifiers	Yes	No	Yes
Restricted to nouns	Yes	No	Yes
Can occur inside compounds	No	Yes	Yes

Table 3 Properties of Number in English, Halkomelem, and Italian

This shows that Number in Italian shares many more characteristics with Number in English than in Halkomelem. In both English and Italian, plural number is marked. In English, nouns receiving a singular interpretation appear unmarked, whilst in Italian, nouns receiving a singular interpretation are only marked for Gender. The evidence here strongly suggests that Number is grammaticalised in Italian, and the Number marking on plural nouns provides evidence that N-to-Num raising is taking place.

4 The status of the singular and "covert" connections

So far, we have looked at Halkomelem, which does not have grammaticalised Number, and English and Italian, both of which have plural marking. However, an important question that must be addressed concerns the status of the singular in English and Italian: is the denotation of a singular noun reached via N-to-Num movement, at which point the noun receives a phonetically empty affix, or does the noun remain *in situ* and receive Number in a different way?

4.1 Fouta Jalon

In answering this question, let us first consider the Fouta Jalon dialect of Fula (in Guinea). Corbett (2000) found that, in this dialect, nouns not specified for singular or plural express general number, setting up a system of number with three distinctions (see Table 4).

Fouta Jalon clearly demonstrates how the value of the Number feature restricts the denotation of the noun to either the set of atoms or the set of pluralities, as the

language also has an unmarked form that can denote either an atom or a plurality, expressing general number. All nouns with a restricted denotation must be formally specified for Number, with the Num head hosting an inflectional element for both singular and plural values that becomes an affix through N-to-Num raising.

This contrasts with English and Italian forms that are not marked for number, given that they receive a singular interpretation. English and Italian have a binary distinction between singular and plural, and all nouns must be specified for Number, even if only plural forms are marked. Given that the nouns without Number marking in English and Italian do not receive a general number interpretation, there must be a connection between the value of singular on the Number feature of the Num head and the noun *in situ*. This connection is "covert", like Longobardi's (2008) CHAIN, and links the Number features on Num and the noun. This explains the interpretative differences between unmarked nouns in English and Italian, and bare nouns in Fouta Jalon.

The number system of Fouta Jalon means that an adjustment must be made to Wiltschko's (2008) first criterion of grammaticalised Number, which claims that a noun unmarked for plural is interpreted as singular in a language with grammaticalised Number. We now know that the situation is much less clear-cut than this statement suggests. A truly unmarked noun receives a general number interpretation, such that it can denote an atomic entity or a plurality. To restrict the denotation of a noun in terms of Number, a link must be made between the noun and the Num head. In Fouta Jalon, this link is the same for both singular and plural specifications, and the noun must undergo N-to-Num raising for both values to be marked. In English and Italian, the connection between Num and N differs depending on whether Number is valued as singular or plural. A Number feature valued as plural triggers raising of the noun to Num, where the noun receives plural marking. A Number feature valued as singular triggers a covert connection between Num and the noun, such that the Number feature of the noun is valued *in situ*.

4.2 Interim summary

Table 5 summarizes the findings thus far. "Denoted?" signifies that the language restricts the denotation of the noun in line with the Number specification of that

General		Singular		Plural	
toti	'toad(s)'	totii-ru	'toad'	totii-je	'toads'
nyaari	'cat(s)'	nyaarii-ru	'cat'	nyaarii-je	'cats'
boofo	'egg(s)'	woofoo-nde	'egg'	boofoo-de	'eggs'
biini	'bottle(s)'	biinii-ri	'bottle'	biinii-je	'bottles'

Table 4 Number specification in Fouta Jalon (from Corbett 2000: 12)

column. "Marked?" signifies that the language demonstrates a linguistically overt instantiation for the Number specification of that column.

Language	Number?	General number?	Plural number		Singular number	
			Denoted?	Marked?	Denoted?	Marked?
English	Yes	No	Yes	On Noun	Yes	No
Halkomelem	No	Yes	No	No	No	No
Italian	Yes	No	Yes	On Noun	Yes	No
Fouta Jalon	Yes	Yes	Yes	On Noun	Yes	On Noun

Table 5 Properties of Number in English, Halkomelem, Italian, and Fouta Jalon

All languages like Halkomelem that do not have grammaticalised Number are likely to express general number, as this is the denotation of bare nouns and there is no systematic restriction of this denotation.

English and Italian do not express general number, which means that all nouns must be linked to a grammaticalised Number feature. Both languages have an unmarked form that receives a singular, and not a general number, interpretation, suggesting that a Num head with a Number feature valued as singular in English and Italian can value the Number feature of the noun *in situ*.

Fouta Jalon has a grammaticalised Number feature also, which is necessary for expressing and marking both singular and plural nouns. However, it also has a bare form of the noun that is able to express general number. A noun expressing general number has no connection to a Number feature, as the denotation of the noun is not restricted to any particular Number specification. This leads to two possible options for expressing general number in a language with grammaticalised Number, either (a) the Num head is present in every construction, and in expressions of general number there is no Number feature on the Num head, or (b) the Num head is omitted altogether from the extended projection in expressions of general number. Before attempting an analysis, let us first consider another language that expresses general number.

5 Number in a classifier language

5.1 Mandarin Chinese

Many numeral classifier languages express general number, including Mandarin Chinese, in which bare nouns can denote either atomic entities or pluralities (from Zhang 2014):

(14) *Zhuo-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 are piles of watermelon on the table.'

Here, we can see a bare noun can denote an atom and a plurality, as well as denoting notions like (pseudo-)partitives and collectives.

First, let us consider the relationship between numeral classifiers and plural markers. The Sanches-Greenberg Generalization (SGG) states that:

(15) Numeral classifier languages generally do not have compulsory expression of nominal plurality, but at most facultative expression.
(Greenberg 1974: 25)

The SGG is borne out by Japanese, Korean and Thai, all numeral classifier languages, in which markers of plurality are not compulsory and do not appear to have regular distribution. Chierchia (1998) extends the SGG to a complementary distribution relation between numeral classifiers and plural markers, such that a language has either one or the other. For languages with both systems, either a numeral classifier or a plural marker can be used in the same construction, not both (Borer 2005).

This means that if a language expresses general number, there is no need to mark the meaning of plurality. Corbett (2000: 2) claims that "the distinction is made 'when it matters'". A plural marker will only be used when a direct contrast with singularity is required.

It is 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 similar to that of Fouta Jalon, with a ternary distinction between general number, singular number, and plural number. Bare nouns, as we would expect, 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 acts as a marker of singularity 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 (16a), "three instances of one unit of book" are bought. In (16b), 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 reduplicated, expressing unit plurality. This can be seen in the following examples, where the individual classifier *duo* and the collective classifier *dui* are reduplicated:

(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 (17a) there are multiple individual lotuses, and in (17b) there are multiple collectives (piles) of lotuses. Nominals with an RUW cannot receive a singular reading, thus Zhang analyses RUWs as markers of plurality.

Importantly, the examples in (17) raise two additional points to consider about Mandarin Chinese. 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 by another numeral, suggesting that it is not acting as a numeral in this instance, but 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 particular type of plurality called "abundant plurality". 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 abundant plurality and does not as easily allow an interpretation where there is 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. Abundant plurality strongly contrasts with singularity.

In summary, Zhang presents the following 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

Some of these characteristics of number marking in Mandarin Chinese neatly align with the already discussed properties of languages with grammaticalised Number.

(20d) mirrors Wiltschko's (2008) criterion of complementarity by claiming that number marking cannot co-occur with a numeral, as a numeral requires a numeral classifier. Although the Mandarin Chinese number markers 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.

(20e) reflects the criterion of being able to select for a plural. In English, certain quantifiers can only combine with a noun marked as plural; these quantifiers include *many*, *all*, *most*, and *some*. Such quantifiers select for a specific value of Number. 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 licensers. These other quantifiers, which include *henduo* 'many' and *suoyoude* 'all', are sensitive to the value of Number and cannot combine with a Number feature valued as plural and realized as an RUW. The existential *yi* quantifier, however, can license an RUW:

(21) *Zhuo-shang bai-zhe *henduo / *suoyoude / yi ben-ben xin shu.*
table-on put-DUR *many *all one CL-RUW new book
'There are many new books on the table.'

SUWs, on the other hand, can combine freely with various quantifiers:

(22) *mei ben shu*
every CL book
'every book'

In reference to Wiltschko's other criteria, Mandarin Chinese exhibits no Number agreement — obligatory or otherwise. Huang, Li & Li (2009: Section 8.4.1) claim that the lack of inflectional morphology in the language means that nouns are not inflected for Number.

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.

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 *cì*, 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 compatible as SUWs or RUWs.

Number marking also, as expected, does not occur on nouns inside compounds. It is possible, however, for classifiers to occur inside compounds, as can be seen in the following noun-classifier compounds, which express a collective or plural noun (Li & Thompson 1981: 82):

(23) a. *mǎ-pī* horse-classifier = 'horses'
b. *shū-běn* book-classifier = 'books'
c. *chuán-zhī* boat-classifier = 'boats'
d. *dēng-zhǎn* lamp-classifier = 'lamps'

In (23b), *ben*, our 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 (23) are, a postnominal classifier is claimed to be the realization of a functional head of dimensionality, not of a counting unit or Num head. According to Zhang (2011), nouns in Mandarin Chinese differ with respect to dimensionality such that [+dimension] nouns "denote elements showing natural atomicity" and [dimension] nouns "denote massive objects and immaterial notions". Following this proposal, nominal classifiers in Mandarin Chinese can fulfil three functions: numeral classifier, Number marker and dimensionality marker. At this point, we are only concerned with their role as Number 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 the postnominal position results in a dimensionality marking function, whilst inserting it in the Num head position results in a Number marking function.

The result of adding Mandarin Chinese to our findings for other languages is shown in Table 6.

These observations suggest that Mandarin Chinese is more similar to Halkomelem than it is to English or Italian in terms of Number. However, it is becoming increasingly apparent that the matter of Number grammaticalisation is not clear-cut. After the basic decisions as to the presence or absence of the Number feature in the system are made, the characteristics of Number vary greatly.

As well as using the above as properties of a language with grammaticalised Number, the specific properties of Number in these languages should also be compared. The results are shown in Table 7.

Table 7 shows that Mandarin Chinese is in fact more like Fouta Jalon than Halkomelem, in that it has grammaticalised Number, expresses general, singular and plural number, and marks both singular and plural.

We now return to the question of whether, in a language with grammaticalised Number that can also express general number, the Num head must still form part of the nominal structure when general number is being expressed. Recall the two

	Halkomelem	English	Italian	Mandarin Chinese
Absence of plural marking = singular	No	Yes	Yes	No
Obligatory agreement (within DP)	No	Yes	Yes	No
Plural can be selected for	No	Yes	Yes	Yes
Form-meaning mismatches (pluralia tantum)	No	Yes	Yes	No
Complementarity with classifiers	No	Yes	Yes	Yes
Restricted to nouns	No	Yes	Yes	Yes
Can occur inside compounds	Yes	No	Yes	No

Table 6 Properties of Number in English, Halkomelem, Italian, and Mandarin Chinese

Language	Number?	General number?	Plural number		Singular number	
			Denoted?	Marked?	Denoted?	Marked?
English	Yes	No	Yes	On Noun	Yes	No
Halkomelem	No	Yes	No	No	No	No
Italian	Yes	No	Yes	On Noun	Yes	No
Fouta Jalon	Yes	Yes	Yes	On Noun	Yes	On Noun
Mandarin Chinese	Yes	Yes	Yes	As CL	Yes	As CL

Table 7 Properties of Number in English, Halkomelem, Italian, Fouta Jalon, and Mandarin Chinese

options: (a) the Num head is present in every construction, and in expressions of general number there is no Number feature present on the Num head, or (b) the Num head is omitted altogether from the extended projection. It is certain that the noun receives no value for Number, as the denotation of the noun is not restricted in any way, but this could be for either of the above reasons. Just as there was no marking of nouns expressing general number in Fouta Jalon, a noun without an SUW or an RUW in Mandarin Chinese also expresses general number. This is perhaps an indicator of an absent Num head, but provides weak evidence for that claim. Let us again temporarily put aside the hypothesis that nouns expressing general number do not project a Num head and consider a different type of language with general number.

So far there has been discussion of a language without grammaticalised Number and of languages with number systems in which both singular and plural are specified. A further logical possibility predicts a language that expresses general

number and then specifies either singular or plural, but not both. Turkish could provide an example of such a language.

6 A language with no singular?

6.1 Turkish

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

(24) *çocuk*
boy
'boy' or 'boys'

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

(25) *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 English, which have a binary distinction between singular number and plural number. Corbett (2000) notes several languages that have a general number/plural number contrast like Turkish.

As has been discussed, general number is characteristic of a noun *in situ*, without a value for its Number feature and without a connection between the noun and the Num head. In Turkish, only when the Number feature on the Num head is valued as plural will the noun be linked to Num and raising be triggered. This raising causes the plural marker to become an affix on the noun, as in English.

A similarity between English and Turkish is that a noun receiving a singular interpretation in both languages appears to be unmarked. Variation in the Number feature can now explain this. In Turkish, the Number feature cannot be valued as singular; the contrast is between general number and plural number. This means that it is impossible to restrict the denotation of a noun to the set of singularities, unless it is modified by a numeral expressing a cardinality of 'one' (modification of this type will be discussed later). In English, there is no general number, but Number can be valued as singular. For the denotation of a noun to be restricted to the set of singularities, the Num head is linked to the noun covertly and the Number feature on the noun is valued as singular *in situ*. This variation in terms of the Number feature can explain the interpretative difference between the unmarked forms of singular nouns in English and Turkish. In Turkish, the absence of plural marking does not result in a singular interpretation, but a general number reading.

This analysis has implications for a diachronic theory of Number grammaticalisation. In a language like Turkish that lacks the singular Number feature, the only way to express a singular interpretation is through the numeral *one*. This suggests that languages with indefinite articles expressing a meaning similar to *one*

might all have had bare nouns denoting general number at some point, before the grammaticalisation introduced the singular value of Number to represent the interpretation. This would have to represent a covert association of the Num head and the noun, as no marking occurs. If this were the case, there could be interesting consequences for the diachronic analysis of Number and the grammaticalisation of formal features.

Turkish will now be examined against the remainder of the criteria for grammaticalised Number from Wiltschko (2008).

Number agreement within the DP in Turkish is not observed and thus not obligatory. The head noun of the DP is the sole location for any inflectional suffixes that relate to the DP as a whole (Göksel & Kerslake 2005: 145):

(26) *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 demonstrative adjectives, do not exhibit agreement in number with the noun.

There are a number of quantifiers that are sensitive to the feature value of Num, meaning that plural can be selected for. Libert (2008: 4), drawing on data from Lewis (1988) and Göksel & Kerslake (2005), summarizes the standard number requirements of some quantifiers as in Table 8.

Quantifier	Translation	Number requirement
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

Table 8 Number requirements of Turkish quantifiers

This mirrors the selectional requirements of quantifiers in English and Italian.

Given that Turkish maintains a general number/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.

Turkish can optionally use classifiers with nouns, but Her & Chen (2013) note that classifiers and plural marking are mutually exclusive, they cannot both co-occur with the noun.

In Halkomelem, the same plural markers that occur with nouns can also occur with verbs and adjectives. A plural-marked verb has the interpretation of a repeated event or action (pluractionality), whilst plural marking on an adjective intensifies or increases the property or quality being denoted. In Turkish, the plural marker can only modify the denotation of nouns, unlike in Halkomelem. It is important to note the difference between a plural marker on a verb "pluralizing" an event, as in Halkomelem, 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* can appear inside compounds, but only when the compound noun itself is marked as plural. This is because certain nominal compounds in Turkish have a compound marker attached to the end of the compound, after the plural marker:

(28) a. *kadın şapka-sı*
woman hat-CM
'women's hat'
b. *kadın şapka-lar-ı*
woman hat-PL-CM
'women's hats'

A case marker can also follow the compound marker. 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 pluralized. This aligns with English, which also does not allow plural marking internal to a compound.

We are now in a position to add Turkish to the existing findings for grammaticalised Number, according to Wiltschko's (2008) criteria. This is shown in Table 9.

Table 9 shows that Turkish has the same properties as Mandarin Chinese in terms of grammaticalised Number. However, the same problems arise in terms of plural marking and form-meaning mismatches when a language expresses general number.

7 An alternative criterion for grammaticalised Number

For this reason, the primary criterion for a language with grammaticalised Number will now be whether the language can restrict the denotation of a noun from general number to a particular specification. As has been discussed, the value of the

	English	Halkomelem	Italian	Mandarin Chinese	Turkish
Absence of plural marking = singular	Yes	No	Yes	No	No
Oblig. agreement (within DP)	Yes	No	Yes	No	No
Plural can be selected for	Yes	No	Yes	Yes	Yes
Form-meaning mismatches (pluralia tantum)	Yes	No	Yes	No	No
Complementarity with classifiers	Yes	No	Yes	Yes	Yes
Restricted to nouns	Yes	No	Yes	Yes	Yes
Can occur inside compounds	No	Yes	Yes	No	No

Table 9 Properties of Number in English, Halkomelem, Italian, Mandarin Chinese, and Turkish

Number feature is what determines whether the noun denotes an atomic entity or a plurality, and the connection between the Num head and the noun is either made overtly, through raising of the noun to Num, or covertly, by the Num head valuing the Number feature of the noun *in situ*. By approaching grammaticalised Number in terms of interpretative differences, it is clear to see how the nominal extended projection serves to restrict the denotation of a noun.

With this shift of emphasis, Turkish is added to the languages already analysed in Table 10. 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 in fact there is 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 (abundant) pluralities. SUWs and RUWs, therefore, must instantiate the Num head and have feature values of singular and plural respectively. These values are shared with the noun *in situ*, creating a CHAIN and providing the restricted interpretations.

Fouta Jalon perhaps has the simplest number system here discussed. General number is expressed by a bare noun, which means that the noun is not valued for Number and that there is no connection formed between the noun and a Num head.

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

Table 10 Properties of number in English, Halkomelem, Italian, Fouta Jalon, Mandarin Chinese, and Turkish

A valued Number feature on the Num head triggers raising of the noun to Num, and the inflectional element hosted by Num becomes an affix on the noun.

In English and Italian, all nouns must obligatorily receive a value for their Number feature, meaning that general number cannot be expressed. Only a Number feature valued as plural triggers raising of the noun to Num, which is why only the plural is marked in English and Italian. A Number feature valued as singular values the Number feature of the noun *in situ* via a CHAIN.

Turkish has a binary distinction in its number system, like Italian and English, but instead of a singular/plural contrast, it has a general/plural contrast. 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.

8 The role of grammaticalised Number and parametric variation

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:

(29) The denotation of a noun is restricted into a set of singularities or a set of pluralities by the Number feature.

The Number feature is hosted on the functional Num head. In some languages, like Halkomelem, the lack of a grammaticalised Number feature means that the denotation of a noun cannot be systematically restricted and therefore nouns usually express general number. In other languages, such as Mandarin Chinese, Fouta Jalon, and Turkish, the Number feature on the noun can be left unvalued and as such the denotation of the noun is not restricted, expressing general number. In

languages like English and Italian, the Number feature on the noun must always be valued, making a general number interpretation impossible.

There is also variation in whether the Number feature triggers N-to-Num raising in order to mark the noun with an inflectional element. In Mandarin Chinese, the Number feature of the noun is valued *in situ* and no raising occurs, but the Num head is pronounced as an SUW or RUW before the unmarked noun. In Fouta Jalon, a Number feature of any value will trigger N-to-Num movement and, as a result, both the singular and plural forms are marked. In English and Italian, only a Number feature that is valued as plural will trigger N-to-Num raising, resulting in the plural being marked. A Number feature valued as singular will value the Number feature of the noun *in situ* and thus the singular is not marked. In Turkish, if the value of the Number feature is valued, it must be valued plural. When this is the case, N-to-Num raising occurs and the noun is marked.

8.1 Points of variation and parameter settings

With Longobardi's (2008) claims for the Person feature still in mind, it can be proposed that the lack of N-to-Num movement in Mandarin Chinese marks the language as a "Weak Number" language. Similarly, Fouta Jalon and Turkish can be labelled "Strong Number" languages, given that they have obligatory N-to-Num movement (with a valued Number feature). Halkomelem, without a grammaticalised Number feature, is transparently a "No Number" language. English and Italian, though, remain somewhere in between "Strong Number" and "Weak Number", given that N-to-Num raising only occurs with plural number.

Some points of variation between the languages can now be put forward. These are shown in Table 11. Table 11 shows how the variation in the interpretation and marking of number across these six languages can be said to result from variation in the properties of the Number feature, or rather: the Number feature is the locus of parametric variation in the number system.

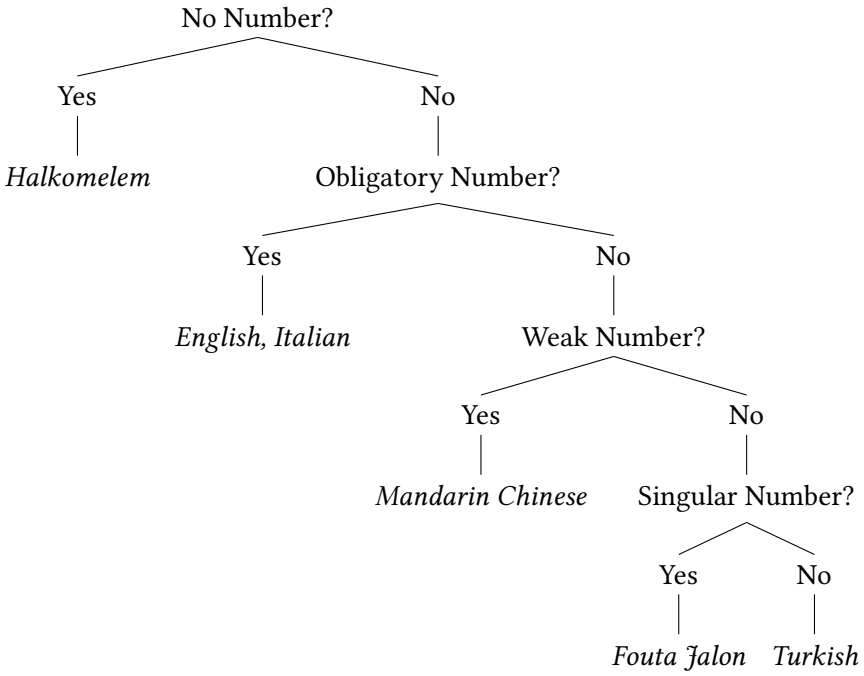
Point of variation	Language					
	Eng	Hal	Ita	FJ	MC	Tur
Is Number grammaticalised?	+	−	+	+	+	+
Is Number obligatory?	+	0	+	−	−	−
Is Number always strong?	−	0	−	+	−	+
Can Number be valued singular?	+	0	+	+	+	−

Table 11 Variation in properties of Number in English, Halkomelem, Italian, Fouta Jalon, Mandarin Chinese, and Turkish

8.2 A parameter hierarchy

Given these "points of variation", it is now possible to tentatively propose a decision tree, or parameter hierarchy, to show the typological variation between the languages so far discussed:

(30)



The first parameter "No Number?" divides languages into those with grammaticalised Number and those without. Halkomelem is an example of a No Number language. The next decision is whether the presence of the Number feature is always required. This has the effect of separating the languages that can express general number from those that cannot. English and Italian cannot express general number as the Number feature is always obligatory and always restricts the denotation of a noun to either singular or plural. The "No" option here leaves the languages that can express general number. The next parameter "Weak Number?" categorizes languages into those that consistently have a covert connection between Num and the noun, such as Mandarin Chinese, and those with overt N-to-Num raising. This also divides the languages with no number marking on the noun, like canonical classifier languages, from those that mark Number through inflectional affixes. The final decision separates Fouta Jalon from Turkish by delving further into the possible values of the Number feature. The Number feature can take a singular value in Fouta Jalon, but not in Turkish.

8.3 The hierarchy in acquisition terms

The sequencing of the first two parameters 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 Generalization. Feature Economy requires that as few features as possible be postulated to account for the input (Roberts & Roussou 2003), whilst Input Generalization forces available features to be maximized (Roberts 2007). Biberauer (2011) combines these two biases into one, namely "make maximal use of minimum means", which reflects the efficiency observed in acquisition.

In the next stage, the acquirer tends to "overgeneralize" and posits that the Number feature is obligatory in all constructions. This respects Input Generalization, as the available features are maximized, 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 categorize further, both Feature Economy and Input Generalization will be violated, as a new feature is required. Here, the "strength" of the Number feature is used.

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

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 affix. The acquirer can link the morphological marking of the noun to its denotation and, as a result, postulates a Number feature with values corresponding to singular and plural.

Turkish also 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.

Herein lies the crucial difference between Turkish on the one hand, and English and Italian on the other. In all three 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 and Italian having a distinction between general number and plural number, as in Turkish. Crucially, nouns that are unmarked for Number in English and Italian receive singular, and not general number, interpretations. Therefore in these languages, 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 and Italian, leads to the postulation of the singular feature in the latter two languages, despite it not being represented overtly in the morphology.

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.

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.

9 The Num head and general number

We are now in a position to fully address the question of whether, in languages with grammaticalised Number that also express general number, the Num head is always projected. Given the above discussion, the Num head is omitted from the extended projection entirely when the denotation of the noun is not restricted in terms of Number, i.e. 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:

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

10 Conclusion

In summary, the Number feature has been compared to Longobardi's (2008) proposals regarding the Person feature, and a number of similarities were observed. Based on criteria for a grammaticalised Number feature, the patterns of number marking and semantic interpretation in a number of languages were analysed and some points of crosslinguistic variation came to light. These could be placed in a parameter hierarchy, supported by theories of acquisition. The findings here suggest that the Number feature is responsible for restricting the denotation of a noun

to sets of either atomic elements or pluralities, and that Number is employed differently in different languages to fulfil this purpose.

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