CHAPTER 8

THE SYNTAX OF NUMBER MARKERS

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8.1 Introduction

The goal of this chapter is to explore the syntax of number markers. The traditional domain of investigation for number markers—at least for Indo-European languages—has been morphology. It thus stands to reason to ask why there should be a chapter on the syntax of number marking. In this chapter I address this question showing that plural marking is indeed syntactically significant. Because I take a cross-linguistic perspective, I begin this chapter with a brief overview of some typological observations and generalizations about the formal and interpretive properties of number marking (section 8.2). This will set the scene for a cross-linguistic exploration of the syntax of number in the remainder of this chapter. I start in section 8.3 with a discussion of the history of the study of number markers from a syntactic point of view, taking a generative perspective. Specifically, I introduce the hypothesis that number marking associates with a syntactic head Num(ber). In the remainder of the chapter, I discuss consequences and extensions of this analysis. Specifically, in section 8.4 I evaluate the NumP hypothesis relative to the empirical properties introduced in section 8.2. We will see that the NumP hypothesis can account for some but not all of the properties and parameters of variation. To account for the remainder of the properties, I introduce in section 8.5 extensions of the NumP hypothesis. Specifically, there is evidence for more than one functional category along the extended nominal projection that plays a role in the syntax of number marking: number marking can associate with different positions inside an articulated nominal structure and it can do so in different ways (as a head or as a modifier). This allows us to account for all of the parameters of variation of number marking reviewed in section 8.2. In section 8.6, I conclude with a summary and a brief field guide on how to investigate the syntax of number marking.

8.2 Typological observations and generalizations about number markers

The purpose of this section is to establish the empirical properties of number markers that any syntactic analysis will need to capture. And because at the heart of generative syntax is the assumption that languages share the same fundamental system with variation being limited to properties of lexical entries, I take a cross-linguistic perspective. This will serve as the baseline relative to which we will evaluate the success of syntactic analyses of number marking. Since many of the properties considered are treated in other chapters, this will be a very cursory overview. We start with the well-known properties of number markers in Indo-European languages, where it has the properties of an inflectional morpheme (section 8.2.1) and then move on to the kinds of variation we observe (section 8.2.2).

8.2.1 Inflectional plural marking

Much of the work on plural marking in the generative tradition is based on English or other languages with number marking that can be classified as *inflectional* in the sense of morphological typology—contrasting it with derivational morphology. In this subsection, I briefly introduce some of the core properties of inflectional number marking. This will serve as the empirical baseline against which number marking is compared to. Specifically, I will explore the distribution of plural marking (section 8.2.1.1), its formal properties (section 8.2.1.2), and its possible interpretations (section 8.2.1.3).

8.2.1.1 *Distribution of plural marking*

In English, as in many other inflectional languages, plural marking is obligatory on a well-defined set of nouns (mostly count nouns) whenever a plural interpretation is intended (though there are some well-defined exceptions to this generalization even in English, as we shall see). Roughly, I intend the term PLURAL to refer to interpretations where the cardinality of the referent is greater than 1. (For detailed discussion, see Chapter 7 in this volume.)

In contrast, number marking of the type found on nouns is not attested on verbs in English, even though events are compatible with a plural interpretation. Note, however, that this is not a linguistic universal as there are languages where markers of event plurality are available on verbs.

Even in languages where number marking is obligatory, number marking is not possible for all nouns. Specifically, number marking is typically sensitive to the mass–count distinction such that the mass interpretation of nominal referents is characterized

by the lack of number marking. To see this, consider the examples in (1). Even if the intended meaning is for there to be a large amount of sand, the mass noun *sand* cannot be pluralized though *sands* can be interpreted as kinds of sand, or individuated amounts of sand. That is, to pluralize a mass noun, English requires there to be an appropriate classifier (here in the form of a classifier that allows for a container reading (1b)).

(1) a. I played with sand. I played with lots of sand(*s).
b. I played with a bucket of sand. I played with lots of buckets of sand.

8.2.1.2 *Formal properties*

Turning now to the formal properties of number marking, in English, like in many other inflectional languages, number marking is affixal (suffixal in many Indo-European languages, prefixal in Bantu languages). There are however exceptions to the affixal character of number marking even in English. Specifically, some nouns have irregular plural marking, which can take all kinds of forms. But these morphological issues play no role for the syntactic analyses we are concerned with here. Similarly, plural pronouns are not marked by means of the regular plural marker (compare singular *he/she/it* to plural *they*).

In terms of its morphological type, number marking is inflectional and hence cannot occur inside of any derivational morphology (2) and cannot be used inside of a compound (3).[1] This is true even if the interpretation of the noun is intended to be plural. For example, a tattooist is someone who creates tattoos on a regular basis, and hence can safely be assumed to create more than one tattoo. Similarly, a toothbrush is a brush that is meant to brush more than one tooth, nevertheless, the non-head noun cannot be pluralized.

(2) a. dog-ish *dog-s-ish
b. tattoo-ist *tattoo-s-ist
c. brother-hood *brother-s-hood

(3) a. tooth-brush *teeth-brush
b. child-care *children-care
c. four-wheel-drive *four-wheel-s-drive

Another formal property of number marking in English and other inflectional languages has to do with the fact that it triggers agreement. There are two contexts to

[1] There are some well-known exceptions to this generalization (*admissions committee*, *records department*, *enemies list*, *injuries report*—see Pinker, 1999: 181), which we will return to in section 8.3. Similarly in German some compounds contain a marker that is formally parallel to plural marking: *Schwein-e-stall* 'pig-stable', *Frau-en-gefängnis* 'woman-prison', *Kind-er-garten* (child-garden). The status of these morphemes is unclear: they could be analysed as plural markers, but alternatively the have been analysed as being partly phonologically conditioned (Wegener, 2005).

consider: agreement inside a nominal phrase (4) and subject–verb agreement (5). In English, the former is attested with demonstrative determiners, which come in singular and plural forms. Crucially, plural nouns have to be preceded by a plural demonstrative, and singular nouns have to be preceded by a singular demonstrative. In the absence of number agreement, the phrase is ungrammatical. Similarly, verbs obligatorily agree in number with the subject (though crucially this has no interpretive effect on the verb itself).

(4) a. this apple *this apple-s
b. *these apple these apple-s

(5) a. The apple is tasty. *The apple are tasty.
b. *The apples is tasty The apples are tasty.

8.2.1.3 *Interpretive properties*

Finally, we briefly turn to the interpretive properties of number marking in English. This is not meant to be an exhaustive discussion but will merely serve as a baseline for the remainder of the discussion (see Chapters 3 and 7 in this volume for detailed discussion).

As a rough approximation, we observe that in English, singular marking is used to refer within the domain of atoms whereas plural marking is used—roughly—to refer within the domain of the collections of these atoms (i.e. sums—see Link, 1983). This assumption captures the complementarity of number marking observed thus far.

However, while in many cases plural-marked nouns do indeed exclude a singular interpretation, this is not always the case. For example, in the scope of questions, plural-marked nouns are compatible with a singular interpretation, hence the first answer in (6) is well formed, while the second one is not (van Eijck, 1983; Krifka, 1989).

(6) Q: Do you have children?
A1: Yes, one.
A2: #No I have only one.

However, the possibility for the inclusive interpretation is not observed in all languages and even within a given language, not all nouns behave alike in this respect (Farkas, 2006; Spector, 2007; Farkas and de Swart, 2010; Bale et al., 2011) as shown in (7). This inclusive interpretation of plural-marked nouns (plural marking *including* a singular interpretation) has led some to the conclusion, that plural is semantically unmarked while singular is viewed as the marked value of number marking (Krifka, 1989; Sauerland, 2003, 2008; Sauerland et al., 2005).

(7) Jack doesn't have a father/# fathers. (Spector, 2007: (42))

The conclusion that plural marking is semantically unmarked is surprising given that morphological considerations lead to a different conclusion: in English singular is morphologically unmarked while plural is consistently morphologically marked.

A different conclusion about semantic markedness is reached, however, if we consider the interpretation of morphologically unmarked forms inside of compounds as in (3). Here the unmarked form includes both the singular and the plural interpretation suggesting that the morphologically unmarked form is also semantically unmarked.

These observations point to the conclusion that the interpretation of a particular morphological marker (or the absence of that marking) is in part dependent on the system it is part of (Corbett, 2000), including different systems within a given language. That is, since plural marking is disallowed inside of compounds, the unmarked form is neither singular nor plural and hence is compatible with a plural interpretation (though markedness relations are not the same across languages).

The interaction between the interpretation of a particular form with the system it is part of can also be seen based on the fact that in languages with a contrast between singular and plural, plural marking can be used for contexts in which other languages would use duals (i.e. to refer to a collection of two individuals). Hence, the interpretation of a feature such as plural, depends on the contrast in which it participates (Corbett, 2000; Cowper, 2004).

The properties associated with inflectional number marking in English do not hold for number marking across all languages, as I will now show.

8.2.2 Variation in number marking

It is certainly useful for a language to be able to make a distinction between singular and plural individuals (i.e. atoms and collections) and this distinction can be made in many of the world's languages. However, number marking differs across languages across the three dimensions introduced above. We shall see that the distribution of number marking (i.e. what types of words can be marked as plural) differs across languages (section 8.2.2.1), as well as their formal and interpretive properties (sections 8.2.2.2 and 8.2.2.3).

8.2.2.1 *Variation in the distribution of plural marking*

In English, plural marking is restricted to a subset of nouns. Categories other than nouns cannot be plural marked; and the subset of nouns that allow for plural marking correlates with the distinction between mass and count nouns. Neither of these properties are universally associated with number marking. We consider each of them in turn.

Consider first number marking on categories other than nouns. There are languages where plural marking is not restricted to nouns but can also be used on verbs. This is usually referred to as *pluractional* marking. Though, there is a crucial distinction

between nominal and verbal plural marking. For example, according to Doetjes (2008), quantity is expressed in the verbal domain, while cardinality is not. The present discussion is pre-theoretical and is not intended to argue that plural marking in the two domains is qualitatively identical. However, in some languages, the same form is used for both nominal and verbal plurality. For example, in Halkomelem Salish the same allomorphs that are used to mark plural on nouns are also used to mark pluractionality. Specifically, both *-l* infixation and reduplication can be used to mark nominal (8) and verbal plural (9).

(8) Halkomelem

a.	méle	mámele	reduplication	
	child	children		
b.	q'ámi	q'álemi	*-l*-infixation	
	girl	girls		(Galloway, 1980: 14; 1993: 379f.)

(9) Halkomelem

a.	xáqlhel-em	xáqxeqlhál-em	
	sigh-INTRANS	sigh.PL-INTRANS	
	'sighing'	'sighing over and over'	
b.	qw'óqw-et	qw'óleqw-et	
	whip-TRANS	whip.PL-TRANS	
	'whip something'	'whip something several times'	(Galloway, 1993: 325f.)

In this respect, Halkomelem number marking is less restricted than its English counterpart. Similarly, number marking in Halkomelem is also less restricted on nouns. Specifically, plural marking is not restricted to count nouns, but instead is compatible with nouns that—in English—would be classified as mass nouns. This is illustrated in (10) where we observe that the same plural allomorphs found on count nouns and on verbs can also be used on nouns denoting substance. In the latter case, the plural marking is compatible with an interpretation of *abundance* (lots of gravel) as well as an interpretation of kinds (several types of gravel).

(10) Halkomelem

a.	th'exet	th'exth'exet	reduplication	
	gravel	gravel.PL		
b.	speháls	spelháls	*-l*-infixation	
	wind	wind.PL		(Wiltschko, 2010: 153, (26))

This establishes that plural marking in Halkomelem has a much broader distribution than in English: it can combine with verbs and all kinds of nouns (for more detailed discussion, see Wiltschko, 2008).

There are however also languages in which the distribution of plural marking is more restricted than it is in English. For example, in some languages the subcategory of nouns that allows for plural marking is not determined by the mass–count distinction but instead by a distinction between humans and non-humans. Thus, plural marking can be sensitive to the animacy hierarchy (see the discussion in Chapter 7 in this volume).

Finally, there are languages that lack plural marking altogether: of the 1,066 languages surveyed for WALS, 98 are classified as lacking plural marking (Dryer, 2013).

8.2.2.2 *Differences in formal properties of number marking*

Turning now to the formal properties of number marking, here too we observe variation. While suffixation of plural marking appears to be the most common strategy (of the 1,066 languages surveyed for WALS, 513 have suffixal plural markers) it is not the only strategy. There are other morphological strategies such as prefixation (126), stem change (6), tonal change (4), and complete reduplication (8). In addition, some languages also utilize plural words (170) or plural clitics (81). Chalcatongo Mixtec and Hawaiian exemplify languages which utilize plural words, as shown in (11) and (12); while Ktunaxa plural marking behaves as a clitic (Morgan, 1991).

(11) Chalcatongo Mixtec
Ni-xáá́=rí kʷaʔà žúʔa káni **xináʔa**
Comp-buy=1 many rope long pl
'I bought many long ropes.' (Macaulay, 1996: 113)

(12) Hawaiian
'elua a'u **mau** i'a
two my pl fish
'my two fish' (Elbert and Pukui, 1979: 159)

Similarly, we find variation in the type of morphology a given plural marker instantiates (inflectional or derivational, for example). As we have seen above, English plural marking is inflectional. But not all instances of plural markers are inflectional. For example, in Halkomelem, plural marking does not have any of the properties of an inflectional morpheme: it is optional (13), can occur inside derivational morphology (14) as well as inside of compounds (15).

(13) Halkomelem
a. te lhíxw swíweles
DET three boy
'the three boys.'
b. te lhíxw swóweles
DET three boy.PL
'the three boys.' (Wiltschko, 2008: (3))

(14) Halkomelem

a.	p'eq'	s-p'eq'	s-p'eq'p'eq'
	white	NOM-white	NOM-white.PL
	'white'	'white spot on skin'	'white spots on skin'
b.	th'ekw'	sth'eth'ikw'	s-th'ekw'th'ékw'
	be.sore	NOM-CONT.sore	NOM-sore.PL
	'be sore'	'sore'	'lots of sores'

(Galloway, 1993: 379)

(15)

a.	sxexep'-í:tsel	sxep
	stripe.pl-back	'stripe'
	'chipmunk'	
b.	sqwelqwél-xel	sqwel
	hair.pl-leg	'hair'
	'tuft(s) of hair on a horses legs'	
c.	tem-weléxes	wéxes
	time-frog.pl	'frog'
	'time of frogs' (='March')	

(Galloway, 1980: 63)

Moreover, Halkomelem plural marking (unlike its English counterpart) does not trigger agreement.

(16)

a.	t'ílém	**ye$_{pl}$**	**sí:wí:qe$_{pl}$**
b.	t'ílém	te	sí:wí:qe$_{pl}$
c.	t'ílém	ye$_{pl}$	swíyeqe
d.	t'ílém	te	swíyeqe
	sing	*det*	*man*

But even though Halkomelem plural marking doesn't behave like an inflectional morpheme, it also does not behave like a typical derivational morpheme: it is productively available on all nouns and hence Hukari (1978: 162f.) concludes that 'there are no clear-cut reasons for considering them [plural markers] to be either inflectional or derivational'. Again, this suggests that the classical categories for morphological classification are not sufficient to cover the typological space.

As we will see, taking syntactic differences into account is insightful in understanding differences between different types of plural marking.

8.2.2.3 *Differences in the interpretive properties of number marking*

Recall that in some contexts it is possible for English plural-marked nouns to have an inclusive interpretation (it includes the interpretation of its opposing feature). A similar phenomenon is found in some languages with unmarked nouns as well. For example, in Hindi (17) and in Hungarian (18) the interpretation of unmarked

indefinite count nouns in object position is such that it can be used in contexts where more than a single book is intended. Hence it appears to be 'plural-like'.

(17) Hindi
Mâîne kitaab padhii
I.erg book read.past.fem
'I read a book./I read some books.'
(SSWL, http://sswl.railsplayground.net/browse/properties/578)

(18) Hungarian
Egész délután könyvet olvastam
Whole afternoon book.ACC read.1SG
'I read a book all afternoon./I read books all afternoon long.'
(SSWL, http://sswl.railsplayground.net/browse/properties/578)

This phenomenon is typically referred to as *number neutrality* or *general number*.[2] What it has in common with inclusive plural marking is the fact that it includes the meaning of the opposing feature. However, the phenomenon of general number also differs from inclusive plurals in that singular nouns are pervasively morphologically unmarked (see Farkas and de Swart, 2010 for relevant discussion).

As briefly mentioned above, the singular–plural contrast in number is not the only number system found in the languages of the world. Other features found in number systems include dual, trial, and paucal (Corbett, 2000). The existence of these features is interesting from a semantic point of view as they go beyond the contrast between atoms and sums, but instead reference to the cardinality of the sums must be included in their denotation.

8.2.3 Interim conclusion

We have now seen that number marking is not a unified phenomenon: it differs across languages in many respects including distribution (what words it combines with), purely formal properties, as well as in terms of its interpretation. While number marking in English is typically classified as an inflectional category it is not immediately clear how to classify the plural markers that differ in ways that suggest that they are not inflectional. Specifically, the properties of non-inflectional number markers

[2] Corbett (2000) uses the term general number to refer to a third (number-neutral) form in addition to singular and plural and is thus a morphological term. In contrast, Rullmann and You (2006) use the term in a semantic way.

across languages suggest that we are not dealing with a natural class and hence we need to find ways to classify non-inflectional number markers. As we shall see, a syntactic approach towards number marking will allow us to develop a fine-grained typological space for variation in number marking.

8.3 The syntax of number marking: an overview

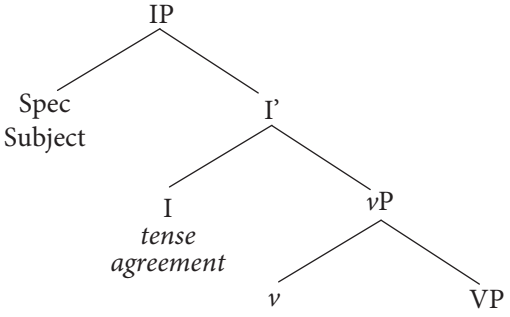
In this section, I give a brief overview of the history of analysing number marking as a syntactic phenomenon. We shall see that the syntacticization of morphological number marking is not only motivated by typological considerations. It is also consistent with the assumption that phenomena that have traditionally been ascribed to the domain of morphology can be analysed within the domain of syntax (section 8.3.1). Moreover, there are a number of ways in which number marking is syntactically significant (section 8.3.2): it can enter into syntactically conditioned relations (such as agreement), it displays form–meaning mismatches characteristic of syntactically conditioned phenomena, and number-marked nouns may display a different syntactic distribution from unmarked nouns (section 8.3.3). The syntactic significance of number marking has led some scholars to postulate a syntactic head dedicated to hosting number (section 8.3.4).

8.3.1 From morphology to syntax

We have seen in section 8.2 that number marking is often realized by means of purely morphological processes. So, if plural marking is a matter of morphological composition, then why do we need to think about the syntax of plural marking? There are at least two reasons to assume that the syntax of plural marking is indeed worth exploring. One is theoretical, and the other is empirical.

Theoretically, the fact that plural marking is expressed by morphological composition does not automatically suggest that plural marking is syntactically inert. Many seemingly morphological phenomena have long received a syntactic analysis within the generative tradition. For example, tense inflection on verbs in English has been argued to be associated with a syntactic head Infl (Travis, 1984; Chomsky, 1986) or Tense (Pollock, 1989). Whether the assumption is that the morphological expression itself is hosted by Infl or else that an abstract feature is responsible for triggering the morphological expression on the verb, the conclusion is the same: inflection is syntactically conditioned. The syntactic representation of verbal inflectional marking is schematized in (19).

(19) Syntactic structure for verbal inflection



The postulation of syntactic heads hosting inflectional features has further led some to assume that perhaps the divide between syntax and morphology is not as clear-cut as it may appear: words may be created in syntax. And over the years this view has not only been held for inflectional morphology, but also for noun-incorporation (Baker, 1988), derivational morphology (Marantz, 1991; Borer, 2005), reduplication (Travis, 2001), and suppletion (Bobaljik, 2012). Hence, there are theoretical reasons to assume that plural marking is not necessarily a matter of morphology. It may well be syntactically significant.

This conclusion is supported by the fact that plural marking is not universally realized by means of a morphological process. Rather, there are languages where plural marking is realized as a free-standing word (as in (20)) or a clitic whose distribution is syntactically conditioned (as in (21)).[3]

(20) Chalcatongo Mixtec
Ni-xa̋a̋=rí k^{w}aʔ žúʔá káni **xináʔa**
comp-buy=1 many rope long pl
'I bought many long ropes.' (Macaulay, 1996: 113)

(21) Sinaugoro
Belema bara=**ria** taulatoitoi
Python big=pl six
'six big pythons' (Kolia, 1975: 124)

This suggests that number marking at least can be syntactically significant.

[3] Of course, it remains to be seen whether in these languages the free-standing plural has the distributional properties expected of a syntactic head occupying the number head. But see below for the general conclusion that plural marking is not a natural class.

8.3.2 The syntactic significance of number marking

If number marking is syntactically significant, we expect to find some syntactic reflexes of plural marking. And indeed, there are such reflexes. In what follows I show that plural marking may indeed have the hallmark characteristics of a syntactic phenomenon: it enters into syntactic agreement relations, it shows form–meaning mismatches, and its presence on a noun affects the syntactic distribution of that noun. I discuss each of these properties in turn.

8.3.2.1 *Number marking can trigger syntactic agreement*

It is often assumed, at least within the generative tradition, that agreement is syntactically conditioned: it can be viewed as a syntactic dependency relation between person, number, and gender (see Bejar, 2003; den Dikken, 2011).[4] In English, there are two ways in which number agreement plays a role. On the one hand, we observe number agreement within a noun phrase such that a demonstrative determiner differs in form depending on whether the noun it precedes is singular or plural as we saw in (4). In languages with richer morphological paradigms, we also observe number agreement between the noun and an adjectival modifier as in Spanish, illustrated in (22).

(22) Spanish

a.	la	manzana	roja
	the	red	apple
b.	*la	manzana-s	roja
	the	red- PL	apple
c.	*la-s	manzana	roja-s
	the-PL	red	apple- PL
d.	la-s	manzana-s	roja-s
	the- PL	red- PL	apple- PL

Moreover, number agreement is also observed between a predicate and its arguments. For example, in English 3rd-person singular but not plural subjects trigger *-s* suffixation on the finite verb in present tense, as in (23).

[4] The assumption that agreement is syntactic, while pervasive, is not shared by everyone. Some argue that number agreement is semantically conditioned (Reid, 1991). See also Chung (2013) for arguments that morphological agreement cannot be collapsed with the syntactic AGREE relation. Furthermore, there are clear cases of semantically conditioned agreement whereby a given form agrees with properties of the referent rather than the antecedent as in (i) where the feminine pronoun *ihre* agrees with features of the female referent rather than the neuter antecedent (*das Mädchen*).

(i) *Das* Mädchen, *das* ich gesehen habe hat mir *ihre* Adresse gegeben.
The$_{neut}$ girl that$_{neut}$ I seen have has me her$_{fem}$ address given
'The girl I saw gave me her address.'

In what follows I restrict the discussion to syntactic agreement.

(23) a. The apple taste-s good. *The apple taste good.
b. The apples taste good. *The apples taste-s good.

Assuming that agreement is a syntactic phenomenon, we have to conclude that plural can be a syntactically active feature.

8.3.2.2 *Number marking changes the syntactic distribution of nouns*

It is typically assumed that the syntactic distribution of words and phrases is eternined by their categorical identity: elements that differ in distribution are assumed to differ in their categorical properties and hence we can conclude that these categorical properties are syntactically significant. This correctly predicts that plural-marked nouns have a different syntactic distribution than unmarked nouns. For example, English arguments have to be introduced by a determiner, but only if they are singular (24a). Plural-marked nouns (24b) as well as mass nouns (24c) do not require the presence of a determiner in argument position.

(24) a. *I ate apple. I ate the apple.
b. I ate apples. I ate the apples.
c. I ate apple pie. I ate the apple pie.

In addition, some quantifiers are sensitive to number marking on the nouns they precede suggesting that they may select for a particular number feature, as shown in (25). *Every* selects a singular count complement, whereas *all* selects for a plural one.

(25) a. I ate every apple_{sg} *I ate every $\text{apples}_{\text{pl}}$
b. *I ate all apple_{sg} I ate all $\text{apples}_{\text{pl}}$

Assuming that selection is a syntactic relation, we have to conclude that number marking is syntactically significant, otherwise selection should not be sensitive to it.

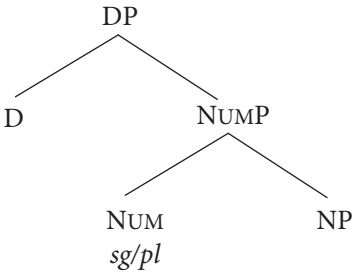
We have now seen evidence that number marking is syntactically significant corroborating the conclusion that a syntactic analysis of number marking is desirable. It will allow us to understand the distributional properties of number-marked nouns, and it will allow us to define a typological space for number marking. In particular, I show that syntactic differences can be used to explain the variation between different types of number markers.

8.3.3 NUM(BER) as a syntactic head

In this subsection, I introduce the assumption that (inflectional) number marking is hosted by a dedicated functional head NUM. This assumption is inspired by the more general assumption (reviewed above) that inflectional morphology is best understood as being associated with a syntactic head (INFL in the verbal domain; see section 8.3.1).

Hence, it is not surprising, that inflectional morphology in the nominal domain, too, is associated with a dedicated syntactic head, as illustrated in (26).[5]

(26) Syntactic structure of number marking



The NUMP hypothesis is independently supported by a number of facts, which I briefly review here.

First, it is well documented that nominal and verbal projections are largely parallel and this parallelism has informed linguistic theorizing at least since Chomsky (1970). Inspired by the introduction of functional categories in the verbal domain leading to generalized X'-theory (Chomsky, 1986) the way towards introducing functional categories in the nominal domain was paved. The first step towards this was Abney's (1987) DP-hypothesis: just like INFL was assumed to be the head of a finite clause, Abney proposes that D is the head of nominal arguments introduced by determiners. Based on the languages Abney (1987) explores, he concludes that D is the nominal equivalent of INFL. This contrasts with another version of the DP-hypothesis according to which DP is the nominal equivalent of CP (Szabolcsi, 1987). Depending on which version of the DP-hypothesis one adopts, NUMP will have to be likened to different categories: if DP parallels CP, then NUMP might be viewed as the nominal instantiation of IP; if DP parallels IP, then NUMP might be viewed as the nominal instantiation of AspP (see Travis, 1992; Megerdoomian, 2008 for this view). Independent of the status of NUMP relative to its verbal counterpart, the assumption remains that there are theoretical reasons to expect there to be a functional category in the extended projection of the noun.

There are also empirical reasons to assume such a category. Specifically, based on evidence from genitive constructions, pronominal systems, quantifiers, and number marking Ritter (1988, 1991) concludes that there must be a functional category between NP and DP. Consider for example the evidence from possessive constructions in Hebrew. First, in the so-called *construct state*, the head noun is followed by its possessor and cannot be introduced by a determiner (27). Despite the lack of an overt determiner, the head noun is definite.

[5] Whether this association is a matter of assuming an actual morphological exponent in NUM or an abstract feature, the conclusion is still that plural marking is syntactically significant.

(27) a. beyt ha-mora
house the-teacher
'the teacher's house'

b. *ha-beyt ha-mora
the-house the-teacher (Ritter, 1988, 1991)

This contrasts with the so-called *free state* possessive construction in (28) where the head noun is followed by its possessor and a determiner is possible. Specifically, in the absence of the definite determiner *ha* the noun phrase is indefinite, in its presence it is definite. Furthermore, free state genitive constructions differ from construct states in that the possessor has to be introduced by ʃel, which serves to assign genitive case.

(28) a. bayit ʃel ha- mora
house of the-teacher
'a house of the teacher's'

b. ha- bayit ʃel ha- mora
the-house of the-teacher
'the teacher's house' (Ritter, 1988, 1991)

The difference between construct and free state constructions is illustrated in (29):

(29) *construct state:* (*det) N-Poss → definite
free state det N ʃel Poss → definite
N ʃel Poss → indefinite

This pattern suggests that there is a functional projection (NumP) between NP and DP. Specifically, the definite interpretation of the construct state suggests that there is a definite determiner even though we don't see it. Hence D must be occupied. Ritter (1988, 1991) assumes that D is occupied by a silent determiner whose function is to assign genitive case. At the same time the genitive has to be assigned locally and hence the possessor argument has to occupy the specifier of the complement of D. But if NP was the complement of D, then this would leave no position for the head noun. Hence Ritter assumes that there is an intermediate projection, which she identifies as NUM and which serves as a landing site for N-movement.

The free state possessive construction differs in that the determiner position is occupied by an overt determiner (*ha*), which does not assign genitive case. Hence ʃel must be inserted.

Thus, the properties of construct and free-state possessive constructions suggests the presence of a functional category in between DP and NP. Evidence that this position is number, stems from the following considerations. First, assuming a parallelism between nominal and clausal projections, we expect this position to be related to agreement features. Since *gender* features are—according to Ritter (1991) inherent to the noun, she concludes that it must be number.

Crucially, Ritter's evidence is not restricted to finding a syntactic host for number marking, rather it relies on evidence for a head position (Num) as well as a phrasal position (SpecNumP) and both can serve as hosts for movement.[6]

Ever since Ritter's seminal work on the syntax of NumP, this analysis has been successfully applied to a variety of languages and a variety of phenomena, both directly or indirectly related to the syntax of plural marking (see Bernstein, 1993 for Romance; Fassi-Fehri, 1993 and Zabbal, 2002 for Arabic; Rouveret, 1994 for Welsh; Embick and Noyer, 2007 for English; Li, 1999 for Chinese; Harbour, 2007 for Kiowa).

8.4 Evaluating the NumP hypothesis

In this subsection, I turn to evaluating the empirical coverage of the NumP hypothesis. I start with a discussion of the NumP hypothesis relative to number marking in English (section 8.4.1) and then turn to evaluating how it fares in light of language variation.

8.4.1 NumP meets inflectional number marking

Even though it was not explicitly developed to account for plural marking in English, it does a good job accounting for the properties we surveyed in section 8.2, and summarized in (32).

(30) Properties of number marking in English
  a. Distribution
    (i) Obligatory (relative to (iii))
    (ii) Nouns only
    (iii) Restricted to count nouns

[6] Sauerland (2003) argues, based on properties of number marking in coordination constructions, that number has to be interpreted above DP. This is because when the subject consists of coordinated singular DP, the verb still agrees for plural, as shown in (i)–(ii).

(i) *Peter and Mary like kangaroos.*
(ii) **Peter and Mary likes kangaroos.*

If indeed this type of agreement is syntactically conditioned, we need a plural feature that is accessible to the verb, hence above the coordinated DP. Alternatively, we might argue that this is an instance of semantic agreement (see Rullmann, 2003).

b. Formal
  (i) suffixal (with some suppletion)
  (ii) inflectional
  (iii) triggers agreement

c. Interpretive
  (i) sums vs atoms
  (ii) inclusive interpretation of plural
  (iii) interpretation depends on the system

Assuming that number marking is hosted by a syntactic head, this predicts that it will display all of the properties of syntactic heads. This accounts for the distribution of number marking in English.

The obligatoriness of number marking is predicted on the assumption that D c-selects NumP.[7] That is, in the context of a DP, NumP must be projected and as a consequence its head must be specified for its features (singular or plural, respectively). The same assumption also accounts for the fact that number marking is restricted to nouns: since the selecting head (D) is part of the nominal extended projection, it follows that NumP, too, is restricted to nouns. Note that the selectability of NumP predicts that a particular feature specification (singular or plural) can also be selected. This is indeed so: as we have seen above, certain quantifiers are restricted to either singular or plural nouns, respectively (see (25)). Thus, the assumption that NP is dominated by NumP accounts for the fact that number marking has the potential to change the distribution of nouns: this follows from the NumP hypothesis because number-marked nouns are different syntactic entities: they are NumPs rather than just nouns.

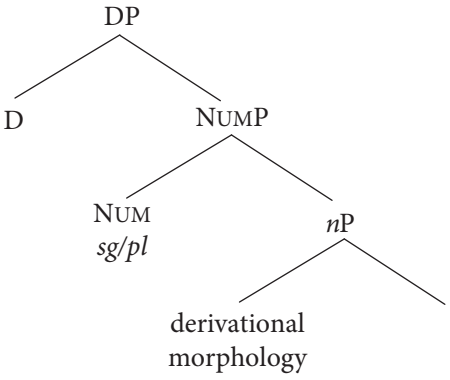
Another property of syntactic heads is the ability to enter into relations with other heads. This relation can be realized as agreement and indeed, as we have seen, number marking participates in syntactic agreement, one of the formal properties of number marking.

As for the inflectional characteristics of number marking, the NumP hypothesis can elegantly capture all of the properties that come with this characteristic. Specifically, the fact that number marking cannot occur inside of derivational morphology falls out from the fact that number-marked nouns are no longer analysed as nouns, but are instead NumPs. This straightforwardly accounts for the impossibility of number marking to occur inside of derivational morphology. And for this property to be derived, it doesn't matter whether we assume that derivational morphology is part of a different module (i.e. the lexicon or a separate morphological component) or that it associates with little *n* in the syntactic component (assuming a 'syntax-all-the way down' approach; Marantz, 1997). Under neither assumption would we expect derivational morphemes to combine with NumP. Under the lexicalist approach, it follows

[7] It is not crucial that this property be implemented via c-selection. It may also be understood as a result of the property of extended projections in the sense of Grimshaw (2005).

because NumP is a syntactic unit and hence cannot be part of lexical derivations; under the syntactic approach it follows because NumP is above *n*P as schematized in (33).

(31) Plural marking is outside of derivational morphology



Similar considerations hold for the fact that plural marking cannot occur inside of compounds. Specifically, compounding is typically a matter of combining lexical nouns rather than syntactic phrases. Since under the NumP hypothesis, number-marked nouns are syntactic phrases, this property of plural marking is derived. Furthermore, the exceptions to the ban on number marking inside of compounds can also be accounted for: they can be analysed as phrasal compounds like those in (34).[8]

(32) Slept-all-day look
Over-the-fence gossip (Wiese, 1996: 184, (2a))

As for the property that plural marking in English is suffixal, the NumP hypothesis is certainly consistent with it, but it is not specifically predicted by it. In general, there is nothing intrinsic about functional categories that would predict the morphological type of the elements that associate with them. This may be seen as a virtue of this analysis, in light of the type of cross-linguistic variation we observe.

Turning now to the interpretive properties of number marking, unsurprisingly, the NumP hypothesis does not predict the kinds of interpretations we expect since it is concerned with the formal properties of number marking. However, there are certain aspects of the interpretation that relate to its syntax. Specifically, since syntax mediates between form and interpretation, the syntacticization of number marking via the postulation of a dedicated syntactic head for number marking predicts the potential existence of mismatches between form and interpretation as well as the fact that the interpretation of a particular form depends on the system it is part of. This property of

[8] Phrasal compounds, however, are marked and are typically used to create temporary concepts, i.e. concepts that are not so established that they warrant lexicalization. The markedness of phrasal compounds extends to plural marking inside compounds.

number marking, and how it might be derived under the NumP hypothesis is best observed on the basis of cross-linguistic variation.

8.4.2 NumP meets non-inflectional number marking

In section 8.2.2, we have seen that the properties of number marking differ across all dimensions: distribution, formal and interpretive properties. The differences are summarized in (35).

(33) Variation in the properties of number marking
  a. Distribution
    (i) Obligatory, optional vs absent
    (ii) Nouns only, nouns and verbs
    (iii) Restricted to different types of nouns (mass–count vs animacy)
  b. Formal
    (i) suffixal, prefixal, free word, clitic
    (ii) inflectional, non-inflectional
    (iii) may or may not trigger agreement
  c. Interpretive
    (i) sums vs atoms
    (ii) inclusive interpretation of plural or singular (aka *general number*)
    (iii) interpretation depends on the system

In this subsection, I evaluate the NumP hypothesis in light of this variation. Everything else being equal, the NumP hypothesis does not straightforwardly predict differences in the obligatoriness of number marking. In fact, the postulation of the functional category Infl (which in part serves as the model for the postulation of NumP), was designed to capture the obligatoriness of inflectional marking. Specifically, the generalization of X'-theory to functional categories (Chomsky, 1986) was in part driven by the observation that inflectional morphology fits the bill of being the head of a phrase: there is an obligatory one-to-one relation between heads and phrases known as *endocentricity*. Assuming that inflection acts as a syntactic head made it possible to generalize what was known for lexical phrases (NP, VP, and AP) to the sentence (which up until this point was considered 'headless').

On this assumption then, the NumP hypothesis has nothing to say about the differences between languages with obligatory and optional plural marking. If we assume, as is common practice, that number marking will always associate with Num we cannot adequately account for the distributional differences we observe across languages: why would a language like Halkomelem have optional plural marking. Without losing the empirical coverage for inflectional plural marking discussed in

the previous subsection, there is no straightforward way to account for optional plural marking. As for languages without number marking, under the NumP hypothesis we might conclude that such languages lack NumP and hence this source of variation can be accounted for. Moreover, I show below that to account for some types of non-inflectional plural markers we need to assume that plural markers can modify other categories as well.

Turning now to the scope of number marking, the NumP hypothesis is mute about the difference between languages with and without number marking on verbs. Specifically, everything else being equal, we would expect number marking to be restricted to nouns. However, everything else need not be equal. There is nothing intrinsic in the NumP hypothesis that would predict a particular typological space in this respect. As for differences between the types of nouns for which plural marking is available (count nouns versus nouns denoting humans), the NumP hypothesis makes available a possible analysis such that we can model the difference in terms of selectional restrictions: in some languages number marking would select for count nouns, whereas in others it would select for animate or human nouns. This does however not straightforwardly predict a particular typological space.

In terms of the differences in formal features, the NumP hypothesis is mute about the morphological type realizing number marking. But, as mentioned above, this is a virtue of the analysis in that it is intrinsically compatible with all kinds of forms, including affixes, clitics, and free-standing words. At the same time however, the NumP hypothesis does not make any predictions about properties we might expect to correlate with a particular morphological type. For example, is there a correlation between morphological type and agreement or distribution? Whether such correlations exist or not has, to my knowledge, not been explored and is therefore an open empirical question.

As for the properties of non-inflectional number marking, the NumP hypothesis has nothing to say about those. In fact, if we assume that any type of number marking associates with NumP then the existence of (at least a certain type of) non-inflectional plural marking is unexpected. And, similarly, if number marking is invariantly a syntactic head, then it is not clear as to why languages should differ as to whether number marking triggers agreement.

And, finally, turning to the differences in interpretive properties, given that the NumP hypothesis concerns itself with the syntax of number marking, we do not expect it to account for variation in interpretive properties.

In sum, the NumP hypothesis, can only account for some of the variation we observe for plural marking. Though at the same time the existence of the variation we do observe is not inconsistent with the NumP hypothesis itself. Specifically, even though it is common practice to assume that any type of number marking associates with Num this is not in fact an assumption intrinsic to the NumP hypothesis. In fact, if we assume the possibility for number markers to associate with positions other than Num, then we open up the possibility for a broader typological space. And this is one of the virtues of the syntacticization of number marking generally and the NumP hypothesis

specifically: it makes it possible to explore properties of the syntactic category NUM independent of the properties of number marking. We can explore properties of the syntactic head NUM and we might expect there to be elements other than number markers that may associate with it. The existence of a restricted set of numberless nouns (i.e. mass nouns) is a potential example of a constellation where something other than number marking associates with NUM. Conversely, we may expect that there are number markers that associate with positions other than NUM. And finally, we might expect that NUM, like INFL, might be decomposed into a series of functional projections. All of these approaches are currently entertained in the literature on the syntax of number thereby extending the predicted typological space in empirically adequate ways, as I show next.

8.5 Towards a comprehensive syntactic typology for number marking

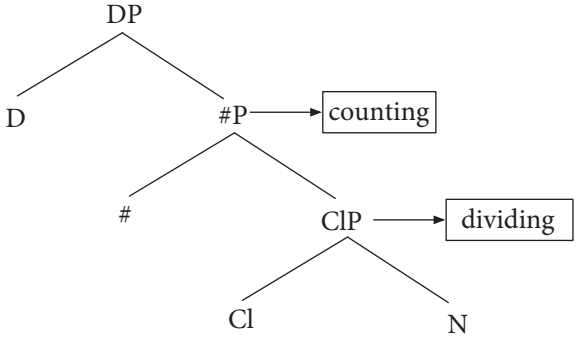
We have seen thus far that the syntacticization of number marking is empirically well supported. Ever since Ritter's (1991) seminal work it is standardly assumed that number marking is best viewed as associating with a functional category in the nominal structure NUMP. More than twenty-five years later, her proposal has stood the test of time, though it has been refined in a number of ways, mostly to accommodate the cross-linguistic variation. There are two core insights that have driven the advancement of the NUMP hypothesis: (1) based on the fact that (at least in English) plural marking seems to perform two distinct functions (dividing and counting) the functional category NUMP is now often perceived of as consisting of two separate categories; (2) based on the fact that some plural markers do not have the distribution expected for elements associating with NUMP, it is sometimes assumed that plural markers can associate with different categories (including D) but also in different ways (i.e. as modifiers). I turn to each of these modifications of the NUMP hypothesis in turn.

8.5.1 Decomposing NUMP: divide and count

Borer (2005) introduces the idea that all grammatical properties of lexical categories (nouns, verbs, adjectives) are syntactically derived. This includes among other things, their categorial identity (nounhood, verbhood, etc.; cf. also Marantz, 1997) as well as their subcategorical properties (e.g., transitivity for verbs). What is relevant for our purpose here, is the assumption that the subcategories of nouns (e.g., the difference between mass and count nouns) is also assumed to be syntactically conditioned.

Specifically, Borer (2005) assumes that all nouns in all languages denote 'stuff'. That is, they 'do not have any formal properties, and are, in this sense, tantamount to raw material, "stuff" which is poured into the structural mould to be assigned grammatical properties' (Borer, 2005: 108). In the absence of the relevant functional architecture for division and counting, such nouns are (by default) interpreted as mass nouns. All count nouns need to be associated with functional structure that serves to divide stuff into the appropriate countable unit. Specifically, on her influential approach, number marking in English serves this function: it is used to divide stuff into countable units. Only nouns that are divided can interact with the count system. These two functions are conceived of as functional categories dominating nouns: CL(ASSIFIER)P and #P, as in (36). On this view, then, NUMP is split into two separate categories. I will refer to this proposal as the 'split-NUMP hypothesis'.[9,10]

(34) Split NumP hypothesis



One of the arguments put forth for the Split NUMP hypothesis has to do with the pervasive complementarity of number marking and classifiers. Specifically, assuming that plural marking in English serves the dividing function it is taken to serve the same function as classifiers in classifier languages. The complementarity between plural marking and classifiers has long been observed (Greenberg, 1972; Sanches and Slobin, 1973) both across languages and within a given language. An example of cross-linguistic comparison presents itself when we compare English, a number-marking language, with Mandarin, a classifier language.[11] An example of language-internal non-complementarity between number and classifier marking comes from Armenian, where nouns—when they are

[9] This is in analogy with the Split-INFL hypothesis. That is, just like INFL was divided into two categories, TENSE and AGREEMENT, each associated with its own function so too is NUM.

[10] According to Ott (2011), CLP further splits into UNITP and NUMP/SORTP, adding to the proposed proliferation of functional categories in the nominal domain.

[11] An alternative to account for the difference between number-marking languages and classifier languages is developed by Chierchia (1998a), who argues that the difference is in the semantics of the noun, rather than in the syntax of the functors dominating nouns.

counted—are either preceded by a classifier (37a) or plural marked (37b); but crucially the classifier cannot co-occur with plural marking (37c).[12]

(35) Armenian

a. yergu had hovanoc uni-m
two cl umbrella have-1s
'I have 2 umbrellas.'

b. yergu hovanoc-ner uni-m
two umbrella-pl have-1s
'I have 2 umbrellas.'

c. *yergu had hovanoc-ner uni-m
two cl umbrella-pl have-1s
'I have 2 umbrellas.' (Borer, 2005: (39))

According to classic structuralist reasoning complementarity is the hallmark of identity; hence Borer (2005) concludes that classifiers and number markers are in some sense identical: they compete for the same functional category (CL) where they both function as dividers, which in turn is a prerequisite for interaction with the counting system.

If division is not restricted to one particular type of expression but instead can be fulfilled by either classifiers or number markers, the question arises as to whether there are any other means that fulfil this function. Mathieu (2012) argues that the answer is positive: the *singulative* instantiates another flavour of division. Specifically, the singulative is used to turn a mass noun or a collective noun into a unit. In many languages, it is marked by means of a shift in grammatical gender. For example, in Breton, the use of the feminine suffix derives singulative from collective nouns or mass nouns (38) and (39), respectively.

(36) Breton

a. buzhug 'worms' buzhug-enn 'a worm'
b. kraon 'walnuts' kraon-enn 'a walnut'
c. per 'pears' per-enn 'a pear'
d. logod 'mice' logod-enn 'a mouse'
e. gwez 'trees' gwez-enn 'a tree'

(Mathieu, 2012: (2), from Stump, 2005: 62)

(37) Breton

a. geot 'grass' geot-enn 'blade of grass'
b. plouz 'straw' plouz-enn 'wisp of straw'
c. ed 'wheat' ed-enn 'stick of wheat'
d. louzou 'weeds' louzou-enn 'blade of weed'

(Mathieu, 2012a: (2), from Trépos, 1980)

[12] See also Kwon and Zribi-Hertz (2004) for evidence that Korean uses both classifiers, and plural marking.

Assuming that the singulative does indeed serve the dividing function, this raises an interesting question in light of the fact that singulative nouns can be pluralized, as shown in (40).

(38) Breton

a. buzhug-enn 'a worm'	buzhug-enn-où 'worms'
b. kraon-enn 'a walnut'	kraon-enn-où 'walnuts'
c. per-enn 'a pear'	per-enn-où 'pears'
d. logod-enn 'a mouse'	logod-enn-où 'mice'
e. gwez-enn 'a tree'	gwez-enn-où 'trees'

The possibility for singulative marking (a divider, just like classifiers) to co-occur with plural marking suggests that plural marking can be a pure counter (Mathieu, 2012a; pace Borer, 2005). And if this is so, then we expect that other classifiers too can in principle co-occur with plural markers. This is indeed the case: there are languages in which classifiers and plural marking are not in complementary distribution (see Dékány, 2011 for a list of over twenty languages in which they co-occur). This in turn means that the complementarity between plural and classifier marking is a tendency at best: whether or not plural and classifier marking are in complementary distribution, depends on the way number marking is constructed. For analyses that account for the non-complementarity of plural and classifier marking, see among others Svenonius, 2008; Wiltschko, 2008; Borer and Ouwayda, 2010; Butler, 2012b; Ott 2011 (see Dékány, 2011 for detailed discussion).

To see this, consider the typology that emerges under the split NumP hypothesis: plural marking can be simultaneously associated with both # and Cl (41a); but it can also be associated with # only (41b), or with Cl only (41c).[13] Finally, if plural marking can but need not associate with either of these categories, we further predict that there are languages where plural marking does not associate with either Cl or #, as in (41d). This is instantiated in languages without plural marking.

(39)
a. [$_{\#}$ **pl** [$_{Cl}$ **pl** [N]]]]
b. [$_{\#}$ **pl** [$_{Cl}$ [N]]]]
c. [$_{\#}$ [$_{Cl}$ **pl** [N]]]]
d. [$_{\#}$ [$_{Cl}$ [N]]]]

The split NumP hypothesis increases the typological space we expect to find in the syntax of number marking. In particular, it allows us to dissociate the content of the exponent

[13] If indeed plural marking can be associated with different positions, we expect that they will be interpreted differently. Whether or not this prediction is borne out remains to be determined. While it is clear that there plural marking is interpreted differently depending on its distributional properties (see the discussion below on n-plurals for example), it is not yet clear how many different interpretations we have to recognize and whether they correlate with the syntactic positions that have been postulated.

(plural marking) from the functional category it associates with. This is because the functional categories that may host plural marking are no longer perceived of as being dedicated to NUMBER. Instead, they are characterized by a more abstract function: dividing and counting. These functions may but need not be instantiated by plural marking. This analysis then allows for a new way to approach the syntax of number. On the one hand, we can investigate properties of the functional categories that host plural marking (CL and #), and on the other hand we can explore properties of the exponents that are used to mark number. This has opened an interesting avenue of research, which has not been fully exhausted. Particularly, we do not yet know the full range of exponents that may associate with CL and #, respectively. Moreover, it is not clear if the semantics of plural marking differs depending on its syntactic position: do plural markers associated with CL have a different interpretation than those associated with #? The same questions can be asked for the classifiers. And are there any implicational relations between the type of marking associated with CL and the type of marking associated with #?

Finally, the assumption that number marking is not always associated with the same category (as in the NUMP hypothesis) raises the question as to whether number marking can associate with functional categories other than NUM. I turn to this question in the next subsection.

8.5.2 Number marking in positions other than NUM

According to Ghomeshi (2003), number marking in Persian associates with D (see also Butler, 2012b; Chapter 23 in this volume for Yucatec Maya). Specifically, Ghomeshi argues that Persian lacks NUMP, and instead that plural marking is dependent on the presence of DP. As a result, Persian plural marking is restricted to definite nominals, which are suffixed with the object marker *-ro*.

(40) Persian

a. sæg did-æm
dog see.PAST-1SG
'I saw dogs.' [lit.: I saw dog.]

b. sæg-a-ro did-æm
dog-PL-OM see.PAST-1SG
'I saw the dogs.' (Ghomeshi, 2003: 48, (1a, b))

Similar patterns are reported in WALS for Bambara and Gungbe where plural marking is restricted to definite noun phrases but is not found in indefinites.[14]

[14] There is some debate in the literature regarding the validity of this generalization: Aboh and DeGraff (2014) claim that Gungbe plural marking may be construed as indefinite.

(41) Bambara
a. misi fila bè ne fè
cow two is I with
I have two cows
b. misi fila w
cows two PL
the two cows

(42) Gungbe
a. Wémà ènè lé (lɔ́) kò wá
letter four PL (Det) already come
'The four letters have already arrived.'
b. Kpɔ́n! vì àwè tò àlìò jí
look child two LOC road on
'Look! There are two children on the road.'
(WALS: example attributed to Enoch Aboh)

The restriction of plural marking to definite noun phrases follows straightforwardly if we assume that plural marking associates with D, as illustrated in (45).

(43) $[_{D}$ **pl** $[_{\#}$ $[_{Cl}$ [N]]]]

Other languages where number markers bundle with definite features include Khmer and Maori (Ehrman, 1970: 43; Bauer, 1993: 110; cf. Dryer, 2013).

Just as there are number markers that have been argued to reside above the categories that were originally taken to host number marking, there are also some that associate with the (semi-) functional category below Cl, namely *n* (Lecarme, 2002; Acquaviva, 2008; Kramer, 2009 for Amharic; Gillon, 2015 for Innu-Aimun). *n*-plurals are characterized by a set of distinct properties that set them apart from plural in any of the other functional categories. In particular, *n*-plurals (given their local relation to roots) can select for specific roots and hence are not found with all roots.[15]

Selectional restrictions on roots are not found with plurals associated with NumP. While they too can select for their complement, the type of selection we observe here targets subcategories of nouns rather than idiosyncratic roots. The selection for subcategories such as count nouns or human nouns is a matter of selecting features in the functional architecture above the nominal root.

[15] The situation is more complicated. German, for example, is a language with inflectional plural marking, however there are some irregular plurals which, at least morphologically, look like *n*-plurals as they select for particular roots. This may be understood as a historical relic. One will have to assume an abstract feature in Num which is associated with multiple exponents.

Associating with *n* further predicts that number will bundle with nominal classification features. This is indeed the case in Kisi and Sanuma plural marking where plural bundles with noun class marking (Borgman, 1990: 144–8; Childs, 1995: 148; cf. Dryer, 2013).

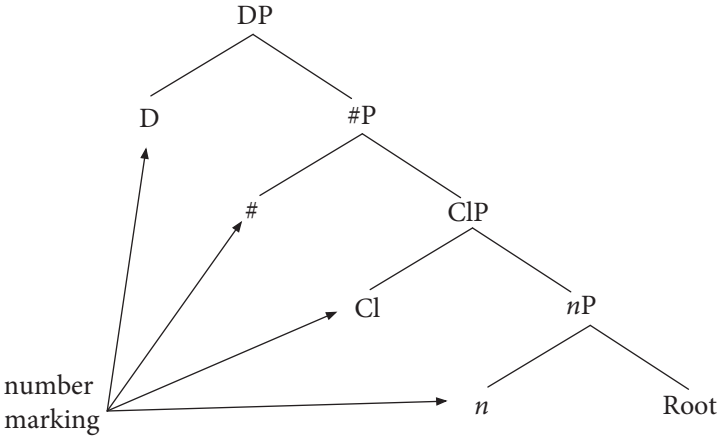
Further evidence that lexical plurals associate with *n* stems come from the fact that they can co-occur with regular plurals, which, according to Kramer (2009), associate with NUM in Amharic. This is illustrated in (46).

(44) Amharic

root	irregular plural	regular plural	translation
mämhɬr	mämhɬr-an	mämhɬr-an-otʃtʃ	'teacher'
kahɬn	kahɬn-at	kahɬn-at-otʃtʃ	'priest'
k'al	k'al-at	k'al-at-otʃtʃ	'word'

We have now seen that number marking is not always associated with NUM but instead can be distributed across all functional categories along the nominal spine as illustrated in (47).[16]

(45) NUMBER marking across the spine



This allows us to account for much of the variation we observe in the distributional properties of number marking, while still capturing all of the properties that are explained under the NUMP hypothesis. At the same time, it accounts for variation in distribution of number marking because depending on their place of association with the spine, number markers will have different selectional properties. It further correctly predicts that different number markers may bundle with different features depending

[16] The claim here is that plural morphology can be associated with different heads not only as a matter of agreement (as for example in languages where plural marking triggers agreement on adjectives and determiners). Instead, we find cases where plural marking will have to be categorized as a genuine instance of D.

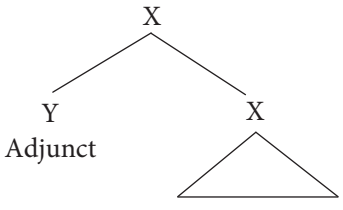
on their distribution along the spine (i.e. definiteness or classifying features). And it also accounts for the possibility for several number markers to co-occur, a property which is unexpected under the NumP hypothesis.

In this way, then, the assumption that plural marking can be distributed across the spine accounts for a number of properties of number marking which may be classified as 'non-inflectional'. However, despite the wide empirical coverage of the hypothesis that number marking can be distributed across the spine, there are still two properties of plural marking surveyed in section 8.2 that remain unexplained: its optionality, and the possibility to combine with verbs. Both properties can be explained if we assume that plural marking need not associate with a syntactic head, as I show in the next subsection.

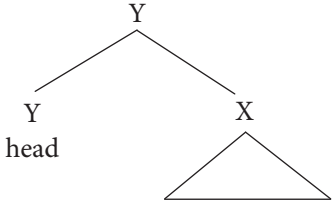
8.5.3 Modifying plural markers

Ever since the emergence of X'-theory it is standard practice to distinguish between elements that combine as heads, and elements that combine as adjuncts (Jackendoff, 1977).[17] There are two crucial properties that set apart heads from adjuncts. First, adjuncts are optional. Second, elements that combine via adjunction do not change the categorical properties of the adjoined structure as schematized in (48). Combining an adjunct Y to a structure X does not change the categorical identity of X: the adjoined structure is still a kind of X (48a). This contrasts with elements that combine as heads. In this case, the categorical identity of the head determines the categorical identity of the complex structure, which turns into a kind of Y (48b).

(46) a. merging as adjunct



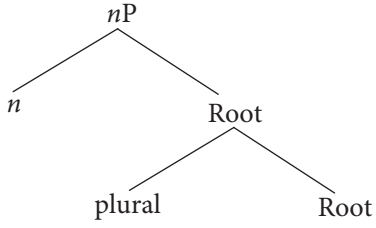
b. merging as a head



The difference between heads and adjuncts is exploited in Wiltschko (2008) to come to terms with the empirical properties of plural marking in Halkomelem Salish. Specifically, according to Wiltschko (2008), plural markers in Halkomelem adjoin to roots, as illustrated in (47).

[17] Other possible relations within X'-theory include complements and specifiers. See, however, Kayne (1994) for the assumption that adjuncts are structurally identical to specifiers and hence are not to be distinguished as a special structural relation.

(47) Halkomelem plural markers adjoin to roots



The assumption plural modifies roots before they get categorized accounts for the fact that it can also pluralize verbs, and adjectives. This category-neutral behaviour can be understood if we assume that it modifies roots before they get categorized. Further evidence that Halkomelem plural marking modifies roots comes from the fact that it can occur inside derivational morphology and inside of compounds (see Wiltschko, 2008 for detailed discussion).

Assuming that number markers may combine via adjunction, amounts to saying that they can serve as modifiers.[18] And, given that modifiers are typically optional, the optionality of plural marking in Halkomelem follows. If plural is not combined as a head it follows that it cannot enter into a significant contrast with its complement feature (singular). Hence, the absence of plural marking in Halkomelem is not interpreted as singular but rather it behaves as general number (i.e. it is compatible with a singular and a plural interpretation). When plural marking combines as a head the situation is different. In the absence of plural marking, the structure will still be interpreted as containing NumP, at least in the context of a determiner. The presence of an unpronounced Num head can thus be interpreted. In other words, the syntax of heads makes it possible for silent forms (such as singular marking) to be recovered. In contrast the absence of a modifier does not correlate with a dedicated interpretation. Just like the absence of the modifier *tall* in (48a) does not imply that *the boy* will refer to a short boy. The expression is simply unspecified for the height of the boy, just like a general number noun is unspecified for plurality.

(48) a. the boy
b. the tall boy

Other properties that correlate with the modificational character of Halkomelem plural markers are as follows. Since plural marking does not change the categorical identity of the expression it combines with, plural-marked forms are correctly predicted to have the same distributional properties as the unmodified ones. Furthermore, since modifiers are never selected it is correctly predicted that there are no determiners or quantifiers that require a plural-marked noun. And, finally, since modifiers never

[18] This does not imply that the semantic denotation of head plurals vs modifying plurals differs. In fact Kim et al. (2018) argue that head and modifying plural markers have the same semantics.

trigger agreement, it is correctly predicted that Halkomelem plural markers do not participate in agreement.

According to Wiltschko (2008), Halkomelem plural marking modifies roots. This correctly predicts that plural marking is not sensitive to the categorical status of the root. As a consequence, Halkomelem plural markers are compatible with any root, independent of its final destination as a noun, verb, or adjective. Similarly, Halkomelem plural marking is predicted not to be sensitive to any kind of subcategories such as mass vs count or human/animate vs inanimate. This prediction is indeed borne out (see section 8.2.2.1). Finally, the assumption that plural marking combines with roots before they are categorized correctly predicts that it can be productively used inside of derivational morphology as well as inside of compounds (see section 8.2.2.2).

Thus, the possibility for plural marking to combine as a modifier opens up another parameter of variation. That is, the syntax of plural marking differs according to where on the nominal spine plural marking associates (in *n*, CL, #, or D) and how it associates (as a head or as a modifier). I have reviewed here empirical evidence for plural markers that modify roots. However, we also expect that the difference between head plurals and modifying plurals is found across all areas in the spine (i.e. we expect plural modifiers to *n*, CL, #, and, D).

8.6 Conclusion

The goal of this conclusion is twofold. First, I provide a brief summary of the discussion in this chapter (section 8.6.1). I then move on to lay out a practical field guide for exploring the syntax of number marking (section 8.6.2).

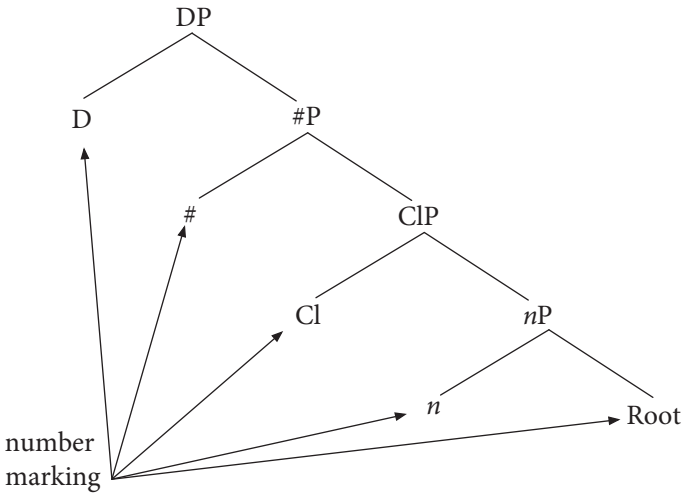
8.6.1 Summary

The goal of this chapter was to explore the syntax of number marking. We started with an overview of why number marking is syntactically significant rather than merely being a morphological feature. Furthermore, I presented a brief survey of the kinds of variation we observe with number markers across languages. This served as the baseline for evaluating several hypotheses that have been developed to account for the syntax of number marking. Specifically, we first introduced the NUMP hypothesis according to which number marking is associated with a functional category in the extended projection of the noun, i.e. the nominal spine. The postulation of such a projection allows us to capture several of the properties of number marking including some of the parameters of variation. Specifically, assuming that number marking is a syntactic head predicts that it has all of the properties of syntactic heads: it changes the category of the noun with which it associates, it can select, it can be selected, and it comes with a phrasal position that can serve as the landing site for movement. We have further discussed some empirical facts that lead researchers to assume that NUMP is

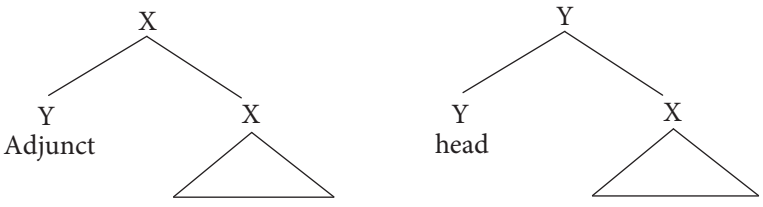
best viewed as split into two separate categories: ClP and #P. Each of these categories is associated with a dedicated function, namely dividing and counting, respectively. This allows for a much richer typology than the one made available by classical morphological typology. Furthermore, the assumption that number markers are not uniformly associated with the same functional category (some are in Cl, others are in #) opens up the possibility that they can be associated with other functional categories along the nominal spine (i.e. D, *n*, or Roots). Finally, we have discussed evidence for the existence of plural markers that do not behave as syntactic heads but instead serve to modify the category they associate with. The proposed difference between number markers that behave as syntactic heads and those that are modifiers goes beyond other ways of classifying differences in plural marking, including the difference between inflectional versus derivational plural marking, or lexical versus grammatical number. We have thus seen that, from a cross-linguistic perspective, there is a rich syntax of number marking that provides the necessary typological space to account for the extensive variation we observe. Specifically, number marking can differ in terms of the place of association: they can associate with all functional categories along the spine. Furthermore, they can associate in terms of the manner of association: they can act as heads or as modifiers. This is summarized in (49).

(49) Variation in syntactic integration of number marking

a. syntactic position of number marking



b. syntactic position of number marking



8.6.2 A field guide for exploring the syntax of number marking

One of the key advantages of the NumP hypothesis and its subsequent developments is the idea that the syntactic positions that can host number markers are not to be identified with the morphological exponents that express them. This makes it possible to explore the syntax of number markers from various angles: from the point of view of the number markers, or from the point of view of the functional categories that host them. I discuss each of these approaches in turn.

We can take as a starting point the (exponents of the) number markers themselves. This approach is driven by meaning in that the elements that are to be explored are strictly defined by the meaning they have, namely to express a value for number: singular, plural, dual, and paucal. For each of these expressions we will have to explore where and how they are syntactically integrated.

Regarding the question of how they are merged, Wiltschko (2008) develops the diagnostics in Table 8.1 to distinguish between number heads and number modifiers.

Table 8.1 Differences between heads and modifiers

	f-head	modifier
obligatory	yes	no
can trigger agreement	yes	no
absence is associated with meaning	yes	no
can be selected for	yes	no
allows for form–meaning mismatches	yes	no

Source: Wiltschko (2008: table 7).

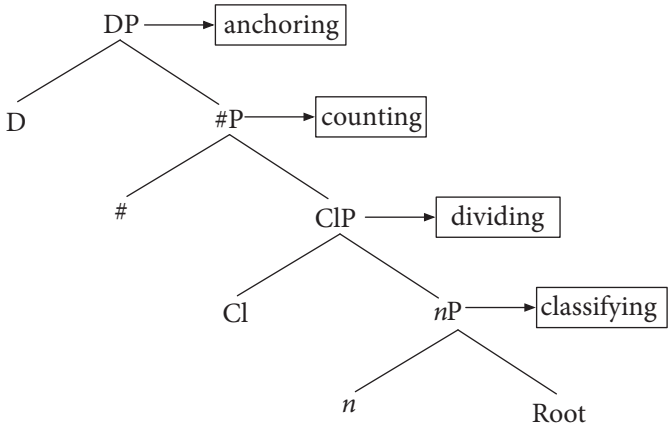
Regarding the question as to where they are merged, we have several types of diagnostics at our disposal. First, we have to determine the (grammatical) function of the number marker. The categories we have explored here lend themselves to the typology schematized in (50).

D serves to anchor the referent to the utterance situation (Wiltschko, 2014) and hence plays an important role in reference tracking and marking definiteness (among other things). Thus, for number markers associated with D, we expect that they interact with definiteness marking. # serves as the counting system and hence we expect that number markers associated with # are pure counters (Mathieu, 2012a). For number markers in this domain we expect that they interact with the counting system more generally (e.g., with the numeral system for example). Cl serves to divide the nominal denotation from stuff into individuated entities (Borer, 2005). Thus, for number markers associated with Cl, we expect that the interact with the system of division as it manifests for example in the mass–count division. The semi-functional category *n* is not only used to nominalize roots, it may also serve to *classify* different nominals (e.g., encoding gender or animacy restrictions). This amounts to saying that nominal

classification is at least in part independent of properties of the roots. Since roots are by hypothesis linguistic element consisting of sound and meaning only, the only way they could be classified is based on either their sound or their meaning. While nominal classification is sometimes based on the meaning of a given root, there are mismatches. For example, in German, the gender of a nouns is not predictable based on the meaning or the sound of a given word. Similarly in languages which use animacy to classify nouns (e.g., Blackfoot), there are mismatches such that a semantically inanimate noun is grammatically classified as animate.

For number markers associated with *n* we expect that they interact with the nominal classification system. As for roots, they are not associated with any particular grammatical function and hence number markers that modify roots are not expected to serve a particular function.

(50) The functions of nominal categories



A final angle from which we can explore the syntax of number is to take as a starting point the syntactic heads that may host number markers. Specifically, within the generative tradition, syntactic heads are never just utilized to host morphological marking. Instead they are typically also associated with other functions including the ability to host specifiers. Moreover, according to Wiltschko (2014), a particular functional category is not intrinsically (i.e. via Universal Grammar) associated with a particular substantive content. Instead, the layers of the spine are universally endowed with a core function, which can in turn be substantiated with different content (Ritter and Wiltschko, 2014). This approach allows us to explore the properties of syntactic heads independently of the number markers that associate with them. This in turn allows for a new avenue of research for languages that lack number marking altogether as well as for languages where number marking does not associate with positions where we typically assume them (i.e. # and Cl). Specifically, we expect that other elements may occupy these positions giving rise to further typological variation.