Numerals and the theory of number

Abstract. I argue for an account of the semantics and of the number marking of nouns in the numeral+noun construction in Turkish, Western Armenian and English that combines insights from Scontras’ (2014) approach to the same data with Martí’s (2017, 2019) treatment of grammatical number, based on Harbour (2014). Fundamental to my approach are two of Harbour’s number features, [±atomic] and [±minimal], their compositional semantics, and a syntax where these features take the phrase that contains the numeral, which I call NumeralP, as their sister, following Scontras. The number marking we find on noun phrases with numerals across languages is thus viewed as a result of the principled interplay of the spell out of number features, their place, and that of numerals, in the syntactic structure of noun phrases, and their semantic import. Numerals are provided with a uniform semantics, no matter the language, and the semantics assumed for Turkish and Western Armenian noun phrases is empirically justified. I compare my proposal to Scontras (2014) and to Bale, Gagnon and Khanjian (2011a), highlighting in particular the empirical and theoretical shortcomings of the latter. The account uncovers a new domain where the effects of [±minimal] can be detected (cf. Harbour 2011, 2016), and demonstrates that an inclusive-only approach to plurality is not necessary in the account of the data, this time contra Scontras (2014).

1 Introduction

This paper is concerned with the morphology and compositional semantics of the numeral+noun construction in plural-marking languages. At least three types of languages must be recognized, depending on the number marking that appears on the noun accompanying the numeral. In the first type of language, exemplified by English, Spanish or German, the numeral one obligatorily appears with morphologically singular nouns, and any numeral greater than 1, with morphologically plural nouns: 1

(1) One boy/*boys
(2) Two/three...etc. boys/*boy

In the second type, exemplified by Turkish (Bale, Gagnon and Khanjian 2011a), Finnish (Nelson and Toivonen 2000), or Hungarian (Farkas and de Swart 2010), all numerals combine with morphologically singular nouns, even numerals greater than 1: 2, 3, 4, 5, 6

1 Many thanks to Klaus Abels, Elias Boike, Gabi Danon, Hossep Dolatian, Emrah Görgülü, Nihan Ketrez, Hrayr Khanjian, Balkaz Öztürk, Cilene Rodrigues, Greg Scontras, Nilüfer Şener, Michele Sigler, Kriszta Szendrői, Bert Vaux and two anonymous reviewers for very helpful criticism, judgements, discussion and/or support.

2 By ‘numeral’, in this paper I mean ‘cardinal numeral’.

3 Actually, a more accurate description, as discussed for example in Krifka (1989) and Borer (2005), is that numerals other than morphologically singular one in English combine with morphologically plural nouns: *zero boy vs. zero boys, 1.0 boys vs. *1.0 boy. I put aside these cases in what follows.

4 Abbreviations in glosses are as follows: 1 = first person; 2 = second person; 3 = third person; abl = ablative case; ABSOLUTIVE = absolute case; acc = accusative case; aor = aorist; dat = dative case; class = classifier; def = definite determiner; erg = ergative case; evid = evidential; gen = genitive case; hab = habitual; imp = imperfective; indic = indicative; loc = locative case; neg = negation; nom = nominative case; pass = passive; past = past tense; pl = plural; pres = present; prog = progressive; sg = singular.

5 The plural marker in Turkish is the suffix –lür, subject to vowel harmony (see Kornfilt 1997: 268). In Hungarian, it is the suffix –tö(k) (see Farkas and de Swart 2003).
In the third type, exemplified by Western Armenian (Bale, Gagnon and Khanjian 2011a, Donabédian 1993, Sigler 1997) or Miya (for its inanimate nouns, as discussed in Schuh 1989, 1998), plural marking on the noun is optional for numerals greater than 1: 7, 8

Western Armenian
Meg dǝgha/*dǝgha-ner
one boy.SG/boy-PL
‘One boy’

Western Armenian
Yergu dǝgha/dǝgha-ner
two boy.SG/*boy-PL
‘Two boys’

These patterns are summarized in Table 1. 9

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>One N</td>
<td>morphologically singular N</td>
<td>morphologically singular N</td>
<td>morphologically singular N</td>
</tr>
<tr>
<td>Two, etc. N</td>
<td>morphologically plural N</td>
<td>morphologically singular N</td>
<td>morphologically singular or plural N</td>
</tr>
<tr>
<td>Example languages</td>
<td></td>
<td>Hungarian 10 ,</td>
<td>Western Armenian, Miya</td>
</tr>
<tr>
<td></td>
<td>English, Spanish, German</td>
<td>Turkish, Finnish</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 The three language types

---

6 Thanks to Emrah Görgülü, Nihan Ketrez, Balkız Öztürk and Nilüfer Şener for their judgements and help with Turkish.
7 The most productive strategy for pluralization in Miya adds –a-C-aow to the noun, where C is the final consonant of the noun stem. The plural marker in Western Armenian is the suffix –(n)er. For semantic differences between the two versions of (6), see section 4.2.2.
8 Thanks to Hossep Dolatian, Hrayr Khanjian, Michele Sigler and Bert Vaux for their judgements and/or help with Western Armenian.
9 Languages that have no inflectional plural marking to begin with, such as Japanese (cf. Nakanishi and Tomioka 2004 for the argument that –tati is not an inflectional plural marker but a marker of associativity), are not part of the current study. More complex patterns are attested in other languages (see, e.g., Corbett 2000: 210-6 and Franks 1995 on Slavic languages, Mittendorf and Sadler 2005 and Sadler 2000 on Welsh). I also do not consider the case of pluralized numerals (see Danon 2012 and references cited there), or of complex numerals (see Ionin and Matushansky 2006) in this paper, among other issues. I do think that the proposal developed in this paper is compatible with Ionin and Matushansky’s view of complex numerals as syntactically complex.
10 Thanks to Kriszta Szendrői for her judgements and help with Hungarian.
Bale, Gagnon and Khanjian (2011a) argue for an account of these patterns where both the semantics of numerals and the semantics of noun phrases may vary from one language type to another: numerals in different languages may have either subsective or intersective semantics, the numeral one may or may not have the same kind of denotation as other numerals within the same language, and morphologically singular noun phrases may also have a different semantics in different languages (singular in English, number neutral in Turkish or Western Armenian). On the other hand, Scontras (2014) assumes a single semantics for all numerals (including one) and a single semantics for morphologically singular noun phrases—in his account, the observed variation results from a different semantics for the feature [SINGULAR] in different languages.\footnote{A third type of account of the contrast between type 1 and type 2 languages can be found in Farkas and de Swart (2010). Theirs is an optimality-theoretic account that I don’t discuss in the text, since I’m interested in demonstrating that a compositional semantics account works for the data at hand. Note that a different part of Farkas and de Swart’s (2010) analysis, regarding the distribution of exclusive and inclusive plurality, is compatible with the account I propose in section 2.2. See Martí (2019) for more on this issue.}

I show in this paper that the assumptions Bale, Gagnon and Khanjian (2011a) make concerning the semantics of morphologically singular noun phrases in Turkish and Western Armenian are empirically flawed (cf. Martí 2017, Sağ 2016, 2017). Given that Bale, Gagnon and Khanjian also assume that numerals have different semantics in different languages, and, sometimes, as I show, within the same language, Scontras’ treatment is both empirically and theoretically superior to theirs.

However, Scontras’ explanation relies on the stipulative claim that languages of types 2 and 3 use a singular feature that is sensitive to elements without minimal parts in a certain domain, which may or may not be atoms. I improve Scontras’ account by appealing to Harbour’s (2011, 2014) theory of grammatical number, where the source of sensitivity to minimal parts is the feature [±minimal], different from [±atomic]. [±Minimal] is involved, according to Harbour, in the generation of a series of number distinctions across languages and its use goes well beyond its role in the numeral+noun construction; thus, it is independently motivated. Hence, the compositional semantics of the number features that are needed for Scontras’ explanation to work does not need to be stipulated in my analysis.

Embedding Scontras’ account within Harbour’s theory of number, however, cannot be done without changing Scontras’ assumptions about plurality. Scontras builds his account on Sauerland (2003), where singular features are semantically contentful but plural features are semantically empty. Martí (2017, 2019), however, demonstrates that this approach to plurality is not compatible with Harbour’s theory of number, but that an alternative, ambiguity account is. My proposal has, therefore, three key ingredients: Martí’s account of plurality, Harbour’s features, and Scontras’ idea about the interaction between the semantics of number features and numerals. With these ingredients, I derive the variation in Table 1 on principled grounds. I demonstrate that neither presuppositions nor semantically vacuous plurals are necessary in the account of the data. Like its predecessors, the syntactic and semantic proposal defended here can be viewed as an alternative to taking the variation in Table 1 to be the result of morphological agreement between numerals and nouns.

The organization of the paper is as follows. In section 2, I present my account of the data in Table 1, introducing first the basic assumptions of Harbour (2014) and Scontras (2014) that it relies on. In section 3, I compare my proposal to Scontras’ In

---

---
section 4, I compare it to Bale, Gagnon and Khanjian’s (2011a) account. Section 5 is the conclusion.

2 Semantics and number marking in the numeral+noun construction

In this section I present my account of the patterns in Table 1. Section 2.1 introduces the necessary background, and section 2.2 presents my proposal.

2.1 Background: Harbour (2011, 2014) and Scontras (2014)

There are two main ingredients of the account I will propose that need to be introduced now. The first ingredient is Harbour’s (2011, 2014) number features. The second is Scontras’ (2014) syntactic assumptions about the numeral-noun construction, as well as the crucial role that number features play in deriving not only the correct semantics for it, but the correct number marking on the noun that accompanies the numeral, as seen in Table 1.

Languages make grammatical number distinctions beyond the familiar singular and plural, such as dual, trial, minimal, augmented, paucal, or greater plural, among others (see Corbett 2000 for more). In addition, as we know at least since Greenberg (1966), there is a typology of grammatical number, so that not all possible number value combinations lead to attested linguistic systems; e.g., there are no attested number systems that distinguish singular from dual only, or paucal from plural only, or trial from plural only, etc. The full set of cross-linguistic generalizations is in (7) (from Harbour 2014: 186):

(7) Trial requires dual
   Dual requires singular
   Singular requires plural
   Plural requires singular or minimal
   Unit augmented requires augmented
   Minimal requires augmented or plural
   Augmented requires minimal
   Greater paucal requires (lesser) paucal
   Paucal requires plural
   Greater (and global) plural requires plural or augmented

The challenge for a theory of number is to explain why only a subset of the logically possible combinations of number values lead to attested number systems in the languages of the world. Harbour (2014) attempts one such theory, and it is this theory that I use in my proposal below.

Harbour (2014) postulates three different, semantically contentful features, [±additive], [±atomic], [±minimal]12, and, together with the following assumptions, derives the cross-linguistic typology implied in (7): (a) NumberP13 takes nP as complement, as in (8); (b) n0, the head of nP, assigns roots to the category of nouns and structures them into semilattices; (c) up to three features can appear in Number0, the

12 Harbour (2011) only had [±atomic] and [±minimal] and is the precursor of Harbour (2014).
13 Given the varied ways in which authors designate the head that hosts number features, I’ve decided to call it simply Number0. It is ‘#’ in Scontras (2014) (see section 3), ‘ϕ’ in Sauerland (2003), and ‘Num’ in Harbour (2014). The term ‘noun phrase’ as used in this paper is merely descriptive.
head of NumberP, either alone or in combination with each other: [+additive], [+atomic], [+minimal]; (d) these features operate on the lattices provided by nP; (e) the repetition of a particular feature in Number⁰ may or may not be allowed in a language; and (f) the semantic range of the [+additive] cut is subject to social convention. Not all of these assumptions are new to Harbour’s work; in particular, the structural assumptions and the function of n⁰ and nP are quite common in the literature (see Borer 2005 and much subsequent work based on that). We will consider only certain aspects of these assumptions here, as not all of them are relevant in what follows; for example, we will ignore the feature [+additive] (hence also (f)), since this feature is only involved in the generation of values, such as paucal, which do not concern us here.

Consider first the structure in (8), assumed to be part of the structure of noun phrases:

(8) $\text{NumberP} \xrightarrow{\text{Number}^0} nP \xrightarrow{n^0} \sqrt{\cdot}$

At the bottom of the projection is a root, $\sqrt{\cdot}$. After $n^0$ operates on it, we obtain a join semilattice, so, for three individuals a, b and c, we have¹⁴:

(9) $\llbracket nP \rrbracket = \{a, b, c, ab, ac, bc, abc\}$

The compositional semantics for the number features is as follows¹⁵:

(10) $\llbracket +\text{atomic} \rrbracket = \lambda P.\lambda x. P(x) \land \text{atom}(x)$
    $\llbracket -\text{atomic} \rrbracket = \lambda P.\lambda x. P(x) \land \neg \text{atom}(x)$

(11) $\llbracket +\text{minimal} \rrbracket = \lambda P.\lambda x. P(x) \land \neg \exists y \ P(y) \land y \sqsubseteq x$
    $\llbracket -\text{minimal} \rrbracket = \lambda P.\lambda x. P(x) \land \exists y \ P(y) \land y \sqsubseteq x$

¹⁴ Harbour (2014) is not explicit about what the exact denotations of roots should be—however, this issue is orthogonal to our purposes, as what matters to us is what the meaning of nP is, not how that meaning is arrived at.

¹⁵ Following Martí (2019), I treat the contribution of number features to be entirely made up of entailments, whereas for Harbour (2011, 2014) some of the content of some features is presupposed. For example, his actual semantics for [+minimal] is as in (i):

(i) $\llbracket +\text{minimal} \rrbracket = \lambda P.\lambda x. P(x) \land \neg \exists y \ P(y) \land y \sqsubseteq x$
    $\llbracket -\text{minimal} \rrbracket = \lambda P.\lambda x. P(x) \land \exists y \ P(y) \land y \sqsubseteq x$

Nothing of what I say here depends on this—this is because in (i) the main effect of the features is still an entailment.

For consistency with [+minimal], I assume that [+atomic] is also of type <et, et>, not <e, t> as in Harbour’s proposal, but, again, this difference has no consequences. If so desired, one can define [+atomic] in terms of numerosity, a notion I borrow from Scontras (2014) and others below:

(ii) $\llbracket +\text{atomic} \rrbracket = \lambda P.\lambda x. P(x) \land \#x = 1$
    $\llbracket -\text{atomic} \rrbracket = \lambda P.\lambda x. P(x) \land \#x \neq 1$

Q is a free variable, $\sqcup$ is the join operation, $\sqsubseteq$ is the proper subpart relation. Lower case variable names range over both atomic and non-atomic individuals.
(12) \[ [+\text{additive}] = \lambda P. \lambda x. Q(x) \land Q \subseteq P \land \forall y. Q(y) \rightarrow Q(x \sqcup y) \]
\[ [-\text{additive}] = \lambda P. \lambda x. Q(x) \land Q \not\subseteq P \land \forall y. Q(y) \rightarrow Q(x \sqcup y) \]

[±Additive] is concerned with whether the output set contains, for any two of its members, their join ([+additive]) or not ([−additive]). It is involved in deriving approximative number values such as paucal in Harbour’s system. Both [±atomic] and [±minimal] give rise to exact number values, which are what concerns us here. [±Atomic] is sensitive to atoms ([+atomic]) vs. non-atoms ([−atomic]).

Consider a singular-plural system, with trees as in (13) for singular and (14) for plural:

(13)  
\[
\text{NumberP} \\
\text{Number}^0 \\
[+\text{atomic}] \\
nP \\
n^0 \\
\sqrt{}
\]

(14)  
\[
\text{NumberP} \\
\text{Number}^0 \\
[-\text{atomic}] \\
nP \\
n^0 \\
\sqrt{}
\]

(13) is the representation in this system of what we descriptively call a singular noun, (14) of what we call a plural noun. It will be important to keep this in mind in what follows, as the assumption is that there is internal structure to singular and plural nouns (and pronouns), despite the fact that we may tend to think of them in terms of single words—I thus refer to them below as singular or plural noun phrases. We obtain (15) and (16) as the denotation of NumberP in (13) and (14), respectively:

(15) \[ \text{NumberP} = [+\text{atomic}](\text{[nP]}) = \lambda x. [\text{nP}](x) \land \text{atom}(x) = \{a, b, c\} \quad ((13)) \]
(16) \[ \text{NumberP} = [-\text{atomic}](\text{[nP]}) = \lambda x. [\text{nP}](x) \land \neg\text{atom}(x) = \{ab, bc, ac, abc\} \quad ((14)) \]

The structure that gives rise to (16), i.e., to exclusive plural interpretations, contains a [−atomic] feature. I will not question the resulting exclusive interpretation of the plural in (16) for now but will come back to it in section 3. In English, a [±atomic] number system, [+atomic] is not morphologically realized overtly, but [−atomic] is, as -s.

[±Minimal] is sensitive to elements with parts ([−minimal]) vs. elements without parts ([+minimal]) in its complement. Importantly, [±minimal] is a relative notion: whether an individual counts as [+minimal] or not depends on what else is in the set that [±minimal] operates on. This property of [±minimal] will play a crucial role in my account in section 2.2. For now, note that, in the case of (17), since the sister of Number\(^0\) is nP and nP is as in (9), the results will be indistinguishable from (13)/(15) and (14)/(16), respectively:

(17)  
\[
\text{NumberP} \\
\text{Number}^0 \\
[+\text{minimal}] \\
nP \\
n^0 \\
\sqrt{}
\]
The set of elements in \( [nP] \) for which there isn’t proper subparts in \( [nP] \) is equivalent to the set of atoms in \( [nP] \), and the set of elements in \( [nP] \) for which there are proper subparts in \( [nP] \) is equivalent to the set of non-atoms in \( [nP] \). Thus, (17) may also be associated with what descriptively we can call singular noun phrases, and (18), with plural noun phrases. That is, what are descriptively singular-plural number system may in principle be analyzed as in (13)/(14) or as in (17)/(18).

However, it is not the case that \([\pm\text{minimal}]\) gives the same result as \([\pm\text{atomic}]\) in all cases. The derivation of systems that have a dual number value in Harbour (2011, 2014), based on Noyer (1992), involves the feature \([\pm\text{minimal}]\) combining with \([\pm\text{atomic}]\). Consider the syntax in (21) (I have numbered the two NumberPs for convenience), which represents the internal syntax of singular, dual and plural noun phrases in languages with a singular-dual-plural system, and the feature values in (22):

(a. \([\pm\text{minimal}]\)(\([\pm\text{atomic}]\)(\([nP]\)))) = \(\lambda\)x. \([nP]\)(x) & atom(x) \& \neg\exists y atom(y) \& y\sqsubset x\)
(b. \([\pm\text{minimal}]\)(\([\pm\text{atomic}]\)(\([nP]\)))) = \(\lambda\)x. \([nP]\)(x) & \neg atom(x) \& \neg\exists y \neg atom(y) \& y\sqsubset x\)
(c. \([\pm\text{atomic}]\)(\([nP]\)))) = \(\lambda\)x. \([nP]\)(x) & \neg atom(x) \& \exists y \neg atom(y) \& y\sqsubset x\)
(d. \#\([\pm\text{minimal}]\)(\([\pm\text{atomic}]\)(\([nP]\)))) = \(\lambda\)x. \([nP]\)(x) & atom(x) \& \exists y atom(y) \& y\sqsubset x\)

The feature combination in (22)a gives rise to the singular, that in (22)b, to the dual, and that in (22)c, to the plural. Importantly, consider how the dual in (22)b is derived: \([\pm\text{atomic}]\) first eliminates the atoms from \(nP\), and \([\pm\text{minimal}]\) then chooses, from the set of non-atoms so provided by \(\text{NumberP}_2\), all of those constituted of two atoms, since these are the individuals with no proper subparts in \(\text{NumberP}_2\). In (22)c, for plural, of the set of non-atoms provided by \(\text{NumberP}_2\), \([\pm\text{minimal}]\) chooses all of those constituted of three or more atoms, since these are the individuals with at least one proper subpart in \(\text{NumberP}_2\), correctly for plurals in languages that have a dual (see Martí 2019 for ample discussion of this point). Since nothing can satisfy (22)d (atoms do not have
proper subparts), (22)d does not give rise to a well-formed meaning, and thus, by assumption, to any number value. Thus, singular-dual-plural number systems constitute evidence for the existence of both [+atomic] and [+minimal] as separate features (see Nevins 2011 for recent arguments for this decompositional account of dual number).

Another argument for the postulation of a [+minimal] feature is concerned with number systems with a first person inclusive/exclusive distinction. Consider the ergative enclitic pronominal forms of Ilocano, an Austronesian language spoken in the Philippines, in Table 2 (Corbett 2000: 168, Rubino 1997: 55-6):

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>dual</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ex</td>
<td>-ko</td>
<td>—</td>
<td>-mi</td>
</tr>
<tr>
<td>1in</td>
<td>—</td>
<td>-ta</td>
<td>-tayo</td>
</tr>
<tr>
<td>2</td>
<td>-mo</td>
<td>—</td>
<td>-yo</td>
</tr>
<tr>
<td>3</td>
<td>-na</td>
<td>—</td>
<td>-da</td>
</tr>
</tbody>
</table>

Table 2 Traditional analysis of Ilocano pronominal forms

Ilocano distinguishes two types of first person pronouns: exclusive (which exclude the addressee; ‘1ex’ in Table 2), and inclusive (which include the addressee; ‘1in’ in the table). That is, Ilocano is a language that has different types of we: for example, it uses -mi for cases where the addressee is excluded (‘we excluding you’), and -tayo, for those where it is included (‘we including you’). Interestingly, Ilocano has a third form -ta which is inclusive, so it includes the addressee, but it is only possible to use it to refer to the speaker-hearer dyad, that is, to a twosome—hence the label ‘dual’ in Table 2. However, the analysis in Table 2 misses an important generalization: if -ta is a dual form, it is a strange one, in that we expect a full paradigm, with dual versions of the pronoun system for first person exclusive, second person, and third person.Positing a traditional singular-dual-plural number system for Ilocano pronouns leaves the reason behind the empty cells in the table unexplained. However, positing a [+minimal] system for Ilocano (a minimal-augmented system in traditional terms), as in Table 3, obviates the need for such stipulative explanations:

<table>
<thead>
<tr>
<th></th>
<th>minimal</th>
<th>augmented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ex</td>
<td>-ko</td>
<td>-mi</td>
</tr>
<tr>
<td>1in</td>
<td>-ta</td>
<td>-tayo</td>
</tr>
<tr>
<td>2</td>
<td>-mo</td>
<td>-yo</td>
</tr>
<tr>
<td>3</td>
<td>-na</td>
<td>-da</td>
</tr>
</tbody>
</table>

Table 3 [+minimal] analysis of Ilocano pronominal forms

The minimal pronouns are the ones that are derived with the feature [+minimal]—that the referent of -ta is a twosome follows naturally from this, as the speaker-hearer dyad is the most “minimal” individual that satisfies the requirements of the first person inclusive (recall: the first person inclusive has to include the speaker, because it is first person, and the addressee, because it is inclusive). That is, of the set of all individuals that satisfy the first person inclusive requirements, which will include speaker+hearer+other₁, speaker+hearer+other₁+other₂ and so on, in addition to speaker+hearer, speaker+hearer is the only individual without proper subparts. This obviates the need to postulate a rare dual that only has a first person inclusive form in this analysis. The augmented pronouns are the ones derived with the feature [-minimal]. Notice that in the case of the first person inclusive, this has the effect that -tayo (‘we including you’) is concerned with triples (as it is predicted to pick, of those
individuals that satisfy the first person inclusive requirements, those which in addition have proper subparts, thus excluding the dyad speaker+hearer)—this is, in fact, empirically correct. Thus, there are languages for which an analysis as [±minimal] number systems, not as [±atomic] systems, is entirely justified.

At this point one might worry that, while there is evidence for the postulation of [±minimal], as we’ve seen, there isn’t actually evidence for [±atomic]. [±Minimal] is enough to derive minimal-augmented systems and singular-plural systems. And singular-dual-plural systems could be generated as long as [±minimal] can repeat, so there would be no need to appeal to [±atomic] to generate such systems:

(23) \[
\text{Number}^0_{\text{[±minimal]}} \xrightarrow{\text{Number}^0_{\text{[±minimal]}}} \text{nP} \xrightarrow{n^0} \sqrt{\text{unit augmented}}
\]

(24) a. [+minimal, +minimal] (singular)
    b. [+minimal, −minimal] (dual)
    c. [−minimal, −minimal] (plural)

Indeed, more complicated minimal-augmented number systems require [±minimal] to repeat. This is the case, for example, for the dative pronoun system of Rembarrnga, an Australian aboriginal language, in Table 4 (Corbett 2000: 166-167, McKay 1978, 1979). In Harbour’s (2011, 2014) analysis, Rembarrnga dative pronouns repeat [±minimal] to generate the number value unit augmented (“one more than minimal”, which is two for all persons except for first person inclusive, where it is three), as shown in (25):

\[
\begin{array}{ccc}
1 \text{ex} & \text{ng}u\text{u} & \text{yarrbbarrah} \\
1 \text{in} & \text{y}u\text{k}u & \text{ngakorrbarrah} \\
2 & \text{k}u & \text{nakorrbarrah} \\
3 & \text{nawu}, \text{ngadu} & \text{barrbbarrah}
\end{array}
\]

\text{Table 4 Rembarrnga dative pronouns}

(25) [+minimal] (minimal)
    [+minimal, −minimal] (unit augmented)
    [−minimal] (augmented)

Another example is number systems that include a trial number value, such as Larike, an Austronesian language of Indonesia (Corbett 2000: 21-22, Laidig and Laidig 1990), with the analysis in (26):

\[
\begin{array}{cccc}
1 \text{ex} & a\text{7u} & \text{arua} & \text{aridu} \\
1 \text{in} & – & \text{itua} & \text{itidu} \\
2 & \text{ane} & \text{irua} & \text{iridu} \\
3 & \text{mane} & \text{matua} & \text{matidu}
\end{array}
\]

\text{Table 5 Larike pronouns}
However, if we allow the plural in a system like that in (24) to be generated with a feature combination such as [+minimal, −minimal], or trial to be generated as [+minimal, −minimal, −minimal] as in (26), where the same value (negative) of the minimal feature repeats, nothing prevents the generation of many unattested exact number values, such as quadrals, quintals, sextals, and so on (see Corbett 2000: 26-30):

(27) [+minimal, −minimal, −minimal, −minimal] (cuadral)
    [+minimal, −minimal, −minimal, −minimal] (quinqual)
    [+minimal, −minimal, −minimal, −minimal] (sexal)

Such number values are unattested. To prevent them from being generated, feature repetition in Harbour’s account is constrained so that it can only apply if the value of the feature is not the same (e.g., [+minimal, −minimal] is allowed, but [−minimal, −minimal] isn’t). This entails that [±atomic] is necessary after all, since we’d lose an account of number systems with duals, or with duals and trials, without it. Returning to the main argument, then, both [±minimal] and [±atomic] are necessary.

My account of the patterns in Table 1 makes use of certain crucial assumptions from Scontras (2014) as well. Scontras assumes that number features in Number0 (in his case, [SG] and [PL]; see section 3) operate on constituents that contain the numeral, that is, on the NumeralP in (28) (NumP for Scontras; I’ve adapted his labels to Harbour’s and my account here, but see section 3):

(28) NumberP
    Number0 NumeralP
    numeral Numeral’
    Numeral0 nP
    CARD

Like Harbour, he assumes that these features are ultimately responsible for the number morphology we see on noun phrases. In fact, which features are assumed to operate in Number0 in different languages plays a crucial role in his account, as well as in mine, as we will see below, in deriving the patterns in Table 1. Scontras also assumes that numerals denote numbers, of type <n>, following Hackl (2001), Krifka (1995), Rothstein (2011) and many others. They occupy the specifier position of NumeralP, a projection headed by Numeral0, occupied by the cardinality predicate CARD, and with nP as its syntactic argument.16 The semantics of CARD is as follows, also as in Hackl (2001) and others17, for ‘#’ an atom-counting function:

16 Scontras argues that NumeralP (his NumP) is more generally MeasureP, and that units of measurement other than cardinality (e.g., for weight, volume, length...) are possible. He then provides a semantics for measure phrases (two kilos of apples). I put measure phrases aside here (cf. Acquaviva 2005, Rothstein 2017 for arguments that NumeralPs and MeasurePs are different). It is possible that my proposal in
CARD takes a predicate P and a number n and returns the set of individuals in P each of which is constituted of exactly n atoms.

2.2 Proposal

I propose that type 1 languages, such as English, are [±atomic] systems, that type 2 languages, such as Turkish, [±minimal] systems, and that type 3 languages, such as Western Armenian, have access to two number systems, a [±atomic] system and to a [±minimal] system. In what follows, I first show how the patterns in Table 1 are derived from the assumptions in section 2.1. I then comment on the plausibility of Turkish number being a [±minimal] system, and, finally, on the idea that a language may have two number systems at its disposal but deploy only one of them at any given time, which is a crucial aspect of my analysis of type 3 languages.

A type 1 language, such as English, is derived as follows. First, assume that [+atomic] spells out as ∅, and [−atomic], as –s\(^{18}\). We then have (30) for the NP boy, (31) for singular and plural noun phrases with the root boy, and (32) for phrases with a numeral and with the same root:

(30) \[\llbracket_{NP \text{ boy}}\rrbracket = \{a, b, c, ab, bc, ac, abc\}\]

(31) \[
\begin{array}{c}
\text{Number}^0 \\
[±\text{atomic}]
\end{array}
\quad NP
\quad n^0
\quad \sqrt{\text{boy}}
\]

These assumptions give rise to the following results:

(33)

a. \[\llbracket_{[+atomic] \text{ boy}}\rrbracket = \lambda x.\llbracket_{\text{boy}}\rrbracket(x) \text{ and atom}(x) \rightarrow \text{boy}\]

b. \[\llbracket_{[-atomic] \text{ boy}}\rrbracket = \lambda x.\llbracket_{\text{boy}}\rrbracket(x) \text{ and } \neg\text{atom}(x) \rightarrow \text{boys}\]

c. \[\#\llbracket_{[+atomic] \text{ two \#CARD \text{ boy}}}\rrbracket \rightarrow \text{two \#boy}\]

section 2.2 cannot maintain the generality regarding units of measurement that Scontras’ account accomplishes, a matter I leave for future research.

\(^{17}\)(29) does not existentially quantify over individuals, which CARD is assumed to do in many accounts. Existential quantification can be carried out by a (silent) quantifier higher in the structure.

\(^{18}\)My proposal is compatible with languages that may actually have an overt singular morphological marker, of course. The spell out of [−atomic] with irregular plurals (e.g., sheep, geese, etc.) may be accomplished via other morphological processes, such as null affixation, root change, etc.
(33)a is the only source for morphologically singular noun phrase boy and delivers the correct semantics for it. (33)b gives rise to the morphologically plural noun phrase boys and assigns it an exclusive plural semantics, which I return to in section 3. (33)c denotes the empty set and is thus, I assume, ill-formed (hence the hash tag). It is also the only source for two boys, so two boy is correctly predicted to be ungrammatical in English (hence the resulting phrase is crossed out in (33)c; what follows an arrow in (34), and (37) below, is always a phrase). (33)d, with [-atomic] in Number⁰, is the only source for two boys and gives rise to its desired (at least) semantics. (33)e is the only well-formed source for one boy, and it, again, gives rise to the correct semantics. (33)f is empty and ill-formed, and the only possible source for one boys, which is thus predicted to be ungrammatical. Thus, we derive that in type 1 languages, all numerals greater than one appear in morphologically plural noun phrases, and the numeral one appears in morphologically singular noun phrases. Phrases without a numeral, such as boy and boys, are morphologically and semantically singular or plural noun phrases, respectively. Notice that the root boy the nP boy are not numbered—nP is always number-neutral in this system ((30)). However, the noun phrase boy is numbered, as it contains a number feature, and thus a Number Phrase ((31), (33)a). It is because of the latter that we can say that in this analysis morphologically singular noun phrases like English boy are treated as semantically singular or [+atomic] (likewise, morphologically plural noun phrases like boys are treated as semantically plural or [-atomic]).

Languages of type 2 are, instead, [+minimal] systems. Assume that in Turkish, [+minimal] spells out as ∅ and [−minimal] spells out as −lAr. We thus have:

(34) \( [[nP \text{ çocuk}]] = \{a, b, c, ab, bc, ac, abc\} \)

(35)

\[
\begin{array}{c}
\text{NumberP} \\
\text{[±minimal]} \\
\text{nP} \\
\text{n⁰} \\
\sqrt{\text{çocuk}}
\end{array}
\]

(36)

\[
\begin{array}{c}
\text{NumberP} \\
\text{[±minimal]} \\
\text{NumeralP} \\
\text{numeral} \\
\text{Numeral'} \\
\text{Numeral⁰} \\
\text{nP} \\
\text{n⁰} \\
\sqrt{\text{çocuk}}
\end{array}
\]
Likewise, there are two sources for the morphologically plural noun phrase like 'boy.' The root çocuk (which contains only boy atoms) and the root çocuklar (which contains only plural boy individuals, these atomic boy individuals having no proper subparts in individuals composed of exactly two atoms) will only give rise to an exclusive plural semantics, which I return to in section 3. The only difference in this account between languages of type 2 and languages of type 2 is in the number feature that appears in Number—a feature that is [±minimal], as opposed to [±atomic], one and all numerals greater than one will only be able to appear in morphologically singular noun phrases. Notice, again, that the root, e.g., çocuk, and the nP, çocuk, are not numbered. However, the noun phrase çocuk is. Thus, in this analysis, morphologically singular noun phrases like Turkish çocuk are treated as semantically singular or [+minimal] (likewise, morphologically plural noun phrases like çocuklar are treated as semantically plural or [−minimal]).

Finally, languages of type 3 have at their disposal both a [±minimal] number system and a [±atomic] number system for Number. In Western Armenian, [+minimal] and [+atomic] spell out as ø, and [−minimal] and [−atomic] spell out as -(n)er. This entails, first of all, that there are two sources for a morphologically singular noun phrase like dagha, both of them resulting in semantic singularity: either (33)a or (37)a. Likewise, there are two sources for the morphologically plural noun phrase daghaner: either (33)b or (37)b—both of them give rise to an exclusive plural semantics.

±Minimal] and [±atomic], however, do not combine in this system—this ensures that Western Armenian is correctly predicted not to have a dual (cf. discussion in section 2.1), but to give rise to the language type 2 ((37)) and the language type 1 ((33)) patterns with numerals. When [±atomic] is chosen for Number, the type 1 pattern...
follows. Notice, in particular, that [+atomic] cannot be the feature involved in the generation of *yergu dagha* 'two boys', since (33)d is ill-formed. However, a language like Western Armenian in this account may choose to use [+minimal] in Number instead, and (37)d, which uses [+minimal], results in the correct form and meaning for *yergu dagha*. Likewise, [-minimal] cannot be the feature involved in the derivation of *yergu daghaner* 'two boys', since (37)e uses this feature and is ill-formed. However, (33)e is also allowed in Western Armenian, and the correct form and meaning for *yergu daghaner* results. Since both (33)g and (37)h are ill-formed, and since there is no other source for *meg daghaner* 'one boys', *meg daghaner* is predicted to be ungrammatical. *Meg dagha* 'one boy' has two sources, (33)f and (37)g, both of which give rise to the correct semantics. In this account, then, languages of type 3 are a mix between types 1 and 2.

If this analysis is correct, then languages of type 2 are not [+atomic] systems but [+minimal] systems. The next question is whether there are other parts of the grammar of these languages where we can detect that [+minimal] is at work. One place to look, recalling now section 2.1, is in their pronoun system—if exclusive first person is distinguished from inclusive first person, then [+minimal] is being used in the language. Unfortunately, Turkish does not distinguish exclusive vs. inclusive first person in its pronoun system (see Kornfilt 1997: 281), where a simple singular vs. plural distinction is made. The pronoun data on its own is thus compatible with Turkish being either a [+atomic] system or a [+minimal] system. Other languages that I hypothesize to be of type 2, such as Finnish (Karlsson 1982: 74) or Hungarian (Tompa 1968: 61) do not distinguish exclusive vs. inclusive first person either, and neither do Western Armenian or Miya (Schuh 1998: 187), languages of type 3.

However, type 2 or type 3 languages with an inclusive vs. exclusive first person distinction do exist. For example, Itzaj Maya (Hofling 2000) is a candidate for a type 3 language. Itzaj Maya makes a distinction on several of its pronoun series between inclusive and exclusive first person, which in Harbour’s system requires the feature [+minimal]. We thus have evidence for [+minimal] in Itzaj Maya that is independent of the numeral+noun construction. In addition, this language makes an obligatory singular-plural distinction on its nouns (Hofling 2000: 118). Importantly, when nouns combine with numerals, they may or may not take plural marking (Hofling 2000: 227), as in Western Armenian. In my approach, this is because the noun system of Itzaj Maya has access to either [+minimal] or to [+atomic], making it a type 3 language (and the singular-plural distinction on nouns, whether effected via [+minimal] or [+atomic], has the same surface realization, again, as in my (and Scontras’, below) analysis of Western Armenian). Thus, we find evidence outside of the noun system for the feature [+minimal] in this language.

---

19 Spanish-based numerals are directly followed by the noun in Itzaj Maya, without mediation of classifiers, but native, non-Spanish-based numerals must be followed by a numeral classifier (Hofling 2000: 141). I put constructions that use numeral classifiers aside here, though the treatment of numerals as part of a complex NumeralP assumed here is compatible with analyses of numeral classifiers such as those in Bale and Coon (2014), Kříňka (1995), Wilhelm (2008) and many others, where numeral classifiers introduce counting functions (cf. CARD).

20 Harbour (2016: 141) argues that hortatives (e.g., *Let us go*) in some languages also require [+minimal]. There are in fact languages of the Turkic language family, though not Turkish itself, where it is possible to find evidence of [+minimal] in hortatives (Nevskaya 2005): in these languages, the speaker-hearer dyad is treated differently from other first person inclusives (see also Onambélé 2012 for other languages). Thanks to an anonymous reviewer for pointing this out.
In type 2 and type 3 languages with a distinction between inclusive and exclusive first person pronouns, then, the pronominal and nominal number systems both have access to the same feature, [±minimal].

The final issue to address is the idea that a language would be able to use either [±atomic] or [±minimal], but not both at the same time. This is distinct from the claim that a language may be a [±atomic, ±minimal] system; with the latter, as we saw in section 2.1, a singular-dual-plural system is generated. The claim for languages of type 3 above is different: it is that each of [±atomic], [±minimal], [±atomic], and [±minimal], on their own, is a possible number value. The question is whether this claim is sensible within Harbour’s theory. There are two issues to consider: (a) whether a language’s number system could, in principle, have access to number features separately (e.g., [±atomic] and [±minimal]), and (b) if so, how these features would be deployed in such a language.

Addressing the first issue, let us notice that, in fact, Harbour’s theory already assumes (a), for good empirical reasons: languages with different number distinctions in different domains (e.g., pronouns vs. nouns) do exist.

For example, in Imere (see Biggs 1975, Clark 1975, 1998, 2002/2011 and Martí, to appear), pronouns, as well as nouns inflected with the affectionate prefix series, distinguish singular, dual and plural (these domains require, featurally, [±atomic] and [±minimal] in Harbour’s theory), but nouns inflected with a different prefix series distinguish singular, paucal and plural (featurally, this requires [±atomic] and [±additive]; paucal is a number value that expresses something similar to what English a few does). Thus, different classes (pronouns vs. nouns), and different subclasses within nouns, have access to different sets of number features.

This suggests that the innovation needed for languages of type 3 is concerned, then, only with (b), in that, in at least some of the languages we know of, distinctions are made in one domain that are different from distinctions made in another, but for the language type 3 account above to work, two separate sets of distinctions apply in the same domain (nouns).

Interestingly, going back to Miya, mentioned in the introduction, Schuh (1989: 175, 1998: 198) shows that Miya animate and inanimate nouns in numeral+noun combinations behave differently. Consider the plurals in Table 6:

<table>
<thead>
<tr>
<th>singular</th>
<th>plural</th>
<th>translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>kúnkul</td>
<td>kúnkulálàw</td>
<td>cap</td>
</tr>
<tr>
<td>kàm</td>
<td>kàmàmàw</td>
<td>house</td>
</tr>
<tr>
<td>dom</td>
<td>damàmàw</td>
<td>tree</td>
</tr>
<tr>
<td>dlarkiy</td>
<td>dlarkaw</td>
<td>chicken</td>
</tr>
<tr>
<td>‘ám</td>
<td>tavàm</td>
<td>woman</td>
</tr>
<tr>
<td>áfúw</td>
<td>cúw</td>
<td>goat</td>
</tr>
</tbody>
</table>

Table 6 Miya pluralization

Other nouns, such as dlarkiy ‘chicken’ follow a separate pattern, and nouns such as ‘ám ‘woman’ and áfúw ‘goat’ have irregular plurals. When combined with numerals greater

---

21 A prediction that my account makes and that remains to be confirmed is that there should be languages just like Western Armenian or Itzaj Maya but in which [±atomic] and [±minimal] (or [±atomic] and [±minimal]) are not spelled out via the same morpheme. On the surface, this would look like Western Armenian or Itzaj Maya except that the plural morpheme of nouns in the numeral+noun construction (which spells out [±atomic]) would be one of two plural morphemes (one for [±atomic], one for [±minimal]) that are used more generally in the language.
than 1, animate noun phrases, a class which includes all humans, most domestic animals and fowl, and some large wild animals, cannot be morphologically singular. Thus, we have:

(38)  
Miya
a. tovâm/*'ám  tsər  (cf. 'ám wúta 'one woman')
   woman.PL/woman.SG  two
   'Two women'

b. dlɔrkɔw/*dlɔrkiy  faɗɔ
   chicken.PL/chicken.SG  four
   'Four chickens'

c. cuwɔwɔw/*'áfuw  daɓítím
   goat.PL/goat.SG  ten
   'Ten goats'

This is the language type 1 pattern. For inanimate nouns, however, both morphologically singular and plural noun phrases are possible:

(39)  
Miya
a. zakiyàwà/waziy vàatlə
   stone.PL/stone.SG  five
   'Five stones'

b. kàmàmàw/kàm  màahà
   house.PL/house.SG six
   'Six houses'

c. kusàmàmàw/kùsàm  vàatlə
   mouse.PL/mouse.SG  five
   'Five mice'

Thus, for inanimate nouns, Miya follows the Western Armenian pattern. In our terms, this entails that only [±atomic] is generated in Number\(^0\) in animate noun phrases, whereas for another subset of nouns, the inanimate ones, either [±atomic] or [±minimal] is possible. Thus, we have a language where, overall, the number system has both [±atomic] and [±minimal] at its disposal, but these features are deployed differently for different nouns. According to this analysis, Miya is a mix of the patterns in language types 1 and 2, but a different mix for inanimate vs. animate nouns.

To summarize, I have proposed an analysis of the patterns in Table 1 which relies on two crucial assumptions: one is that Harbour’s [±atomic] and [±minimal] may be features in Number\(^0\) in the numeral+noun construction; the second is that, in that construction, number features operate on phrases that contain the numeral.

3 Scontras (2014)

The proposal I have made in section 2.2. is based in Scontras’ own account of the same data. However, by combining Scontras’ structure for the numeral+noun construction and his ideas about number features in English vs. Turkish with Harbour’s number features, as I have done above, a more principled account of the patterns in Table 1 ensues. I also show below that combining these ingredients from Harbour and Scontras
requires us to make certain assumptions about the proper analysis of inclusive plurals—in that, I follow Marti (2017, 2019).

Scontras proposes two number features for a language like English: [sg], which triggers singular form and agreement, and [pl], which triggers plural form and agreement. Whereas [sg] comes with a singularity presupposition, [pl] is presupposition-less (from Sauerland 2003); both are identity functions:

\[
\begin{align*}
\llbracket \text{sg} \rrbracket &= \lambda P: \forall x \in P \ [\#x=1]. P \\
\llbracket \text{pl} \rrbracket &= \lambda P. P
\end{align*}
\]

For Scontras, these features project a #P (NumberP in Harbour's and my system). For a numeral-less noun phrase, we have (NP is nP in Harbour's and my system):

\[
\llbracket \text{NP} \rrbracket = \{a, b, c\}
\]

Consider now the four possible combinations of noun semantics and number features in a language of type 1 that arise for Scontras:

\[
\begin{align*}
\text{a. } \llbracket \text{sg} \llbracket \text{NP } \text{boy} \rrbracket &= \llbracket \text{NP } \text{boy} \rrbracket = \{a, b, c\} & \rightarrow \text{boy} \\
\text{b. } \#\llbracket \text{sg} \llbracket \text{NP } \text{*boy} \rrbracket &= \llbracket \text{NP } \text{boy} \rrbracket = \{a, b, c\} & \rightarrow \text{boy} \\
\text{c. } \#\llbracket \text{pl} \llbracket \text{NP } \text{boy} \rrbracket &= \llbracket \text{NP } \text{boy} \rrbracket = \{a, b, c\} & \rightarrow \text{boys} \\
\text{d. } \llbracket \text{pl} \llbracket \text{NP } \text{*boy} \rrbracket &= \llbracket \text{NP } \text{*boy} \rrbracket = \{a, b, c, ab, bc, ac, abc\} & \rightarrow \text{boys}
\end{align*}
\]

When combined with [sg], only [np boy], (43)a, gives rise to a well-formed meaning for the noun phrase boy. In (43)a, the presupposition of [sg] that every member of the denotation of its input be individuals constituted of exactly one atom, or atomic, is satisfied and the meaning of the whole is the same as the meaning of [np boy], thus giving rise to the correct semantics. In (43)b, on the other hand, \[\llbracket \text{NP } \text{*boy} \rrbracket\] contains both atoms and non-atoms, and so the presupposition of the feature is not met and the result is a presupposition failure. Even though (43)b would have yielded the noun phrase boy, it does not yield a well-formed meaning for it. (43)a does, which also yields the noun phrase boy. The feature [pl], being presupposition-less, gives a well-formed result whether it combines with \[\llbracket \text{np boy} \rrbracket\] or \[\llbracket \text{np *boy} \rrbracket\], as shown in (43)c and (43)d, but (43)c is disfavored by Maximize Presupposition, as (43)a delivers the same result but uses an item with a presupposition, the feature [sg]. Thus, (43)a is realized as the noun phrase boy, because of [sg] and the (atomic) semantics of [np boy] in (42). (43)d is
realized as the noun phrase *boys*, because of [PL] and the (inclusive) semantics of [NP *boy].

Recall Scontras’ assumptions about numerals (section 2.1): they give rise to a syntax, in (44), in which number features scope above numerals, with CARD as in (45) (as before, see (29)):

(44) ![Diagram of syntactic structure]

(45) $[[\text{CARD}]] = \lambda P \lambda n \lambda x. P(x) \& \#x = n$

The reason why in Scontras’ system, *two boys* is possible but *two boy* isn’t in a type 1 language is as follows. First, CARD may combine with either $[[\text{NP} \text{boy}]]$ or $[[\text{NP} *\text{boy}]]$:

(46) a. $[[\text{CARD} [\text{NP} \text{boy}]]] = \lambda n \lambda x. [[[\text{NP} \text{boy}]]](x) \& \#x = n$
   b. $[[\text{CARD} [\text{NP} *\text{boy}]]] = \lambda n \lambda x. [[[\text{NP} *\text{boy}]]](x) \& \#x = n$

Either (46)a or (46)b may then combine with the numeral, though the result is not well-formed for (46)a (there are no members in $[[\text{NP} \text{boy}]]$ constituted of exactly 2 atoms, that is, (47)a denotes the empty set):

(47) a. $[[\text{two CARD [NP boy]}]]$
   b. $[[\text{two CARD [NP *boy]}]] = \lambda x. [[[\text{NP} *\text{boy}]]](x) \& \#x = 2$

There are then two possibilities to consider: either (47)b combines with [SG], as in (48)a, or it combines with [PL], as in (48)b:

(48) a. $[[\text{SG two CARD [NP *boy]}]] \rightarrow \textit{two boy}$
   b. $[[\text{PL two CARD [NP *boy]}]] = \lambda x. [[[\text{NP} *\text{boy}]]](x) \& \#x = 2 \rightarrow \textit{two boys}$

(48)a is a presupposition failure, and hence so is *two boy*, because there are no members in the denotation of its input (in (47)b) constituted of exactly 1 atom. Only (48)b is well-formed, which correctly gives rise to *two boys* and to its correct semantics. For *one*, Scontras appeals to an additional Economy Principle, in (49):

(49) Given two expressions that are denotationally equivalent and where one expression is more complex than the other, choose the simpler expression

(50) provides the two possibilities we have for NumP at this point:
We then have the following four possibilities for \( P \):

\[
\begin{align*}
\text{(51a)} & \quad \llbracket \text{one \ CARD} \{ \text{NP \ boy} \} \rrbracket = \lambda x. \llbracket \text{NP \ boy} \rrbracket (x) \land \# x = 1 & \rightarrow \text{one \ boy} \\
\text{(51b)} & \quad \# \llbracket \text{one \ CARD} \{ \text{NP \ boy} \} \rrbracket = \lambda x. \llbracket \text{NP \ *boy} \rrbracket (x) \land \# x = 1 & \rightarrow \text{one \ boy} \\
\text{(51c)} & \quad \# \llbracket \text{PL} \{ \text{one \ CARD} \{ \text{NP \ boy} \} \} \rrbracket = \lambda x. \llbracket \text{NP \ boy} \rrbracket (x) \land \# x = 1 & \rightarrow \text{one \ boy} \\
\text{(51d)} & \quad \# \llbracket \text{PL} \{ \text{one \ CARD} \{ \text{NP \ *boy} \} \} \rrbracket = \lambda x. \llbracket \text{NP \ *boy} \rrbracket (x) \land \# x = 1 & \rightarrow \text{one \ boys}
\end{align*}
\]

In (51a), the presuppositions of \([SG] \) are satisfied by the denotation of its input, a set of atoms. This means that it, and not (51c), is chosen, and \textit{one \ boy} results (with the correct semantics), not \textit{one \ boys}. (51b) and (51d) are ruled out by the Economy Principle in (49), since they are denotationally equivalent to (51a) but are more complex (since \([\text{NP \ *boy}] \) is used, and that is more complex than \([\text{NP \ boy}] \). Because there is at least one successful derivation for \textit{one \ boy} (51a), not (51b), \textit{one \ boy} is predicted to be grammatical in English, or, more generally, in languages of type 1, correctly.

For languages of type 2, such as Turkish, Scontras also assumes (42), and the same syntax as above. There is a crucial difference, however, in that in Turkish, \([SG] \) is stipulated to be sensitive to relative atomicity, as opposed to English \([SG] \). Being sensitive to relative atomicity, or \( P \)-atomicity, means that what counts as an atom for a predicate \( P \) is relative to what is in \( P \)—for any \( P \), the relative atoms of \( P \) are those members of \( P \) which have no parts in \( P \):

\[
\text{(52)} \quad \text{card}_{-\text{atom}} \{ x \} \text{ is defined only when } P(x)=1.
\]

When defined, \( \text{card}_{-\text{atom}} \{ x \} = |\{ y \in P : y \leq x \land \neg \exists z \in P z < y \}| \)

The cardinality of the set that contains those relative atoms is what Turkish \([SG] \) is sensitive to. The number features assumed for Turkish are in (53), with \([SG]\) being the singular number feature (I’ll speak of \([SGE]\) from now on for English \([SG]\)), and with \([PL] \) still presupposition-less:

\[
\llbracket \text{SG} \rrbracket = \lambda P. \forall x \in P \lfloor \text{card}_{-\text{atom}} \{ x \} = 1 \rfloor P \\
\llbracket \text{PL} \rrbracket = \lambda P. P
\]

For numeral-less phrases, this system gives rise to the following:

\[
\begin{align*}
\text{(54a)} & \quad \llbracket \text{SG} \{ \text{NP \ çocuk} \} \rrbracket = \llbracket \text{NP \ çocuk} \rrbracket = \{ a, b, c \} & \rightarrow \text{çocuk} \\
\text{(54b)} & \quad \# \llbracket \text{SG} \{ \text{NP \ *çocuk} \} \rrbracket & \rightarrow \text{çocuk} \\
\text{(54c)} & \quad \# \llbracket \text{PL} \{ \text{NP \ çocuk} \} \rrbracket & \rightarrow \text{çocuklar} \\
\text{(54d)} & \quad \llbracket \text{PL} \{ \text{NP \ *çocuk} \} \rrbracket = \llbracket \text{NP \ *çocuk} \rrbracket = \{ a, b, c, ab, bc, ac, abc \} & \rightarrow \text{çocuklar}
\end{align*}
\]

In (54a), the presupposition of \([SG] \) is satisfied, since \([\text{NP \ çocuk}] \) denotes a set of individuals that have no parts that are also in \([\text{NP \ çocuk}] \). This is not true in the case of (54b), which is thus a presupposition failure—it is not the case that all members of the sister of \([SG] \) are \( P \)-atoms, since the set contains plural individuals and their parts. (54a)
is correctly realized as the noun phrase çocuk and gives rise to the desired, singular semantics. Both (54)c and (54)d satisfy the requirements of [pl], since this feature imposes no requirements. (54)c, however, expresses the same meaning as (54)a, and (54)a is presuppositional while (54)c is not, so (54)c is not selected. (54)d is correctly realized as the noun phrase çocuklar ‘boys’ and gives rise to the desired, inclusive semantics. For phrases with a numeral, we have:

(55)
\[
\begin{align*}
&\text{a. } \boxed{\text{CARD } [NP \text{ çocuk}]} = \lambda n \lambda x. \boxed{[NP \text{ çocuk}]}(x) & \#x = n\\
&\text{b. } \boxed{\text{CARD } [NP ^*\text{çocuk}]} = \lambda n \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = n
\end{align*}
\]

(56)
\[
\begin{align*}
&\text{a. } \#[\text{iki CARD } [NP \text{ çocuk}]]\\
&\text{b. } [\text{iki CARD } [NP ^*\text{çocuk}]] = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 2
\end{align*}
\]

Maximize Presupposition chooses (57)a over (57)b, as (57)a is presuppositional and its presuppositions are satisfied, giving rise to iki çocuk ‘two boys’ with the correct semantics:

(57)
\[
\begin{align*}
&\text{a. } \boxed{\text{SGT } [\text{iki CARD } [NP ^*\text{çocuk}]]} = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 2 & \rightarrow \text{iki çocuk}\\
&\text{b. } \boxed{\text{PL } [\text{iki CARD } [NP ^*\text{çocuk}]]} = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 2 & \rightarrow \text{iki çocuklar}
\end{align*}
\]

Maximize Presupposition chooses (58)a over (58)c; (58)b and (58) d are not selected because there is a less complex expression for each one, (58)a and (58)c, respectively, as per the Economy Principle in (49). The correct realization and meaning result:

(58)
\[
\begin{align*}
&\text{a. } \boxed{\text{SGT } [\text{bir CARD } [NP \text{ çocuk}]]} = \lambda x. \boxed{[NP \text{ çocuk}]}(x) & \#x = 1 & \rightarrow \text{bir çocuk}\\
&\text{b. } \boxed{\text{SGT } [\text{bir CARD } [NP ^*\text{çocuk}]]} = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 1 & \rightarrow \text{bir çocuk}\\
&\text{c. } \boxed{\text{PL } [\text{bir CARD } [NP ^*\text{çocuk}]]} = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 1 & \rightarrow \text{bir çocuklar}\\
&\text{d. } \boxed{\text{PL } [\text{bir CARD } [NP ^*\text{çocuk}]]} = \lambda x. \boxed{[NP ^*\text{çocuk}]}(x) & \#x = 1 & \rightarrow \text{bir çocuklar}
\end{align*}
\]

The account of Turkish bir ‘one’ and English one combinations is the same, even if \[\boxed{\text{SGT}}\#^{\boxed{\text{SGE}}}\], since with respect to a set of atoms, absolute atomicity and relative atomicity yield the same result (cf. (51) and (58)). Given \[\boxed{\text{SGT}}\], twosomes count as atomic for Turkish iki ‘two’ (threesomes for üç ‘three’, etc.), so nouns are morphologically singular with all numerals ((57)). They do not count as atomic for \[\boxed{\text{SGE}}\].

It is obvious that Scontras’ account for languages of types 1 and 2 forms the basis of my analysis in section 2.2. The same is true for his account of language type 3: the singular feature in this language is ambiguous between \[\boxed{\text{SGT}}\] and \[\boxed{\text{SGE}}\]. Western Armenian meg ‘one’ surfaces in morphologically singular noun phrases because both (51) and (58) yield the same result. When \[\boxed{\text{SGT}}\] is used with yergu ‘two’, etc., a morphologically singular noun phrase results ((57)). When, instead, \[\boxed{\text{SGE}}\] is used, a morphologically plural noun phrase results ((48)). \[\boxed{\text{SGT}}\] and \[\boxed{\text{SGE}}\] do not compete with each other in Western Armenian, since they are both equally presuppositional. The correct semantics is produced.

To summarize, Scontras proposes a uniform syntax and semantics for all numerals, and for noun phrases, across the three language types. For Scontras, the crucial
difference arises in the semantics of the feature [SGT], which can vary from one language to another. This is what is responsible for the variation we observe in Table 1, both in his and in my account.

Notice that the sensitivity of [SGT] to relative atomicity serves no purpose in Scontras’ account other than to derive the Turkish and Western Armenian patterns—the feature [SGT] is thus stipulated in this analysis. Ideally, however, there would be independent reasons for adopting it. In the proposal in section 2.2, on the other hand, Harbour’s (2011, 2014) [+minimal] feature is motivated independently, in that it serves various purposes other than deriving the patterns in Table 1, and, as we saw in section 2.2, has the same effect as Scontras’ [SGT]. Seeing [SGT] as Harbour’s [+minimal], we derive the patterns in Table 1 in precisely the principled way that is lacking in Scontras’ account. Recall that in the proposal in section 2.2, numerals in type 2 languages appear in the noun phrases that they do because the theory of grammar assigns those languages a [±minimal] number system.

To see how [+minimal] achieves the same result as Scontras’ [SGT], consider (57)a again, in (59)b, where [SGT] applies to (56)a, in (59)a, and compare it to the result of applying [+minimal] to (56)a, in (59)c:

\[ \text{(59)} \]

\begin{align*}
\text{a. } \llbracket \text{iki CARD } [\text{NP } * \text{çocuk}] \rrbracket & = \lambda x. \llbracket \text{NP } * \text{çocuk} \rrbracket(x) & \# x = 2 \\
\text{b. } [\text{SGT} \text{ iki CARD } [\text{NP } * \text{çocuk}]] & = \lambda x. \llbracket \text{NP } * \text{çocuk} \rrbracket(x) & \# x = 2 \\
\text{c. } [\text{[+minimal]} \text{ iki CARD } [\text{NP } * \text{çocuk}]] & = \lambda x. \llbracket \text{NP } * \text{çocuk} \rrbracket(x) & \# x = 2
\end{align*}

[SGT] checks that the set P denoted by its argument contains only plural boy individuals with no subparts in P. P contains only plural boy individuals each of which is constituted of exactly 2 atoms, and nothing else, as in (59)a, which indeed satisfies [SGT]. Thus, NumberP in (59)a, with Scontras’ [SGT], is a set of plural boy individuals each of which is constituted of exactly 2 atoms. [+Minimal] is not presuppositional, but it still has the effect that NumberP denotes a set of plural boy individuals each of which is constituted of exactly 2 atoms. In other words, we can replace [SGT] with [+minimal]. Doing so diminishes the cost of Scontras’ analysis substantially: while we still have to state that Turkish uses [+minimal] where English uses [+atomic], the fact that [+minimal] is used simply follows from Harbour’s system. The amount of variation we expect on the numeral-noun construction is now principally constrained.

However, this result can only be achieved if languages of type 2 are [±minimal] systems—in Harbour’s system, if [+minimal] is active in a language, then so is [−minimal]. Important questions arise now. What happens with [−minimal] in Scontras’ analysis, given that there is no difference between [+minimal] and [−minimal] in presuppositional terms? And what about [pl]? More generally, the question is: how are plurals, and numeral+noun combinations, derived if languages of type 2 are [±minimal] systems?

As it turns out, there is a basic incompatibility between Sauerland’s (2003) view of plurality (and hence Scontras’) and Harbour (2011, 2014): Martí (2017, 2019) shows that embedding a view of plurality like Sauerland’s in Harbour’s system makes the wrong predictions about the cross-linguistic typology of plurality.

plural noun phrases in English give rise to either exclusive or inclusive readings. The plurals in (60) are interpreted inclusively: e.g., according to (60)a, Lina harvested neither one nor more tomatoes. Denotationally, this means that \[[\text{NumberP tomatoes}]\] should include both singular and plural tomato individuals:

(60)

a. Lina didn’t harvest **tomatoes**
b. No **students** came to the party
c. I don’t have **children**
d. Do you have **children**?

In upward-entailing (non-question) contexts, on the other hand, these same phrases are usually interpreted exclusively. If (61)a is true, for example, Lina needs to have harvested more than one tomato:

(61)

a. Lina harvested **tomatoes**
b. **Students** came to the party
c. I have **children**

Two main types of accounts of the distribution of exclusive and inclusive plurals in languages like English have been pursued. In the first type, plural noun phrases are ambiguous between exclusive and inclusive readings (Farkas and de Swart 2010, Grimm 2012, Martí 2017, 2019). According to the second type, plural noun phrases are unambiguously inclusive and exclusive readings arise only pragmatically (via implicature, as in Spector 2007, or via Maximize Presupposition, as in Sauerland 2003 and others; note that these principles are sensitive to the monotonic properties of the environment the plural noun phrase finds itself in). I refer to the second type of account as the inclusive-only view of plurality.

As Martí explains, inclusive-only accounts of plurality amount, in Harbour’s terms, to the postulation of number systems that deploy [+atomic] (or, if wanted, a presuppositional version of it) to the exclusion of [−atomic]. [+Atomic]-only languages are languages with singular noun phrases and with inclusive plural noun phrases in downward-entailing questions and questions, like English. Given Sauerland’s pragmatics, based on Maximize Presupposition, exclusive plurals arise via implicature, as explained above. However, if a number system can deploy [+atomic] without also deploying [−atomic], then it follows that such a number system cannot use [−atomic] elsewhere within the same system. But Harbour and others argue that [−atomic] is used to derive dual number, as we saw earlier. An inclusive-only view of plurality, combined with Harbour’s approach to number, predicts that languages with dual number should not have inclusive plurals. This is contrary to fact: Martí shows that languages with both duals and inclusive plurals exist. Either the inclusive-only view of plurality, or Harbour’s theory of number, has to be abandoned.

A solution considered by Martí consists in embedding an ambiguity account of plurality within Harbour’s system, using Farkas and de Swart’s (2010) Strongest Meaning Hypothesis to explain the distribution of exclusive and inclusive plural noun phrases. The availability of inclusive plural noun phrases is due in this proposal to the possibility of not projecting NumberP (that is, having no number features operating on nP). Languages like English realize noun phrases where NumberP is not projected as
morphologically plural noun phrases. This then derives the number neutrality associated with inclusive plural noun phrases in the right contexts. That is, the availability of exclusive plural noun phrases is due to [−atomic] ((62)), and the availability of inclusive plural noun phrases is due to the absence of NumberP ((63)):

(62) \[
\begin{array}{c}
\text{DP} \\
\text{D} \\
\text{NumberP} \\
\text{Number}^0 \\
[\text{−atomic}] \\
\text{nP} \\
\sqrt{n^0} \\
\end{array}
\]

(63) \[
\begin{array}{c}
\text{DP} \\
\text{D} \\
\text{nP} \\
\sqrt{n^0} \\
\end{array}
\]

The distribution of the two is regulated by the Strongest Meaning Hypothesis.

Such a solution being the only one that is compatible with Harbour's theory\(^\text{22}\), and hence with the reduction of Scontras' [SG\(_T\)] to Harbour's [+minimal] I proposed above, a language like English must be a [+atomic] language with the possibility of not projecting NumberP. But this means that [PL] in English cannot be Scontras' [PL]—we cannot maintain an account of plurality that doesn't contain something like [−atomic]. This is the main theoretical motivation for the alternative account of the cross-linguistic patterns in Table 1 I proposed in section 2.2.

In that account, whether a language has inclusive plural noun phrases or not is unrelated to which pattern the language chooses for the noun+numeral construction—since we have no evidence that these two sets of facts are related, the null hypothesis is that the account of the latter should not rely on the former. To integrate Martí's account of inclusive and exclusive plurality in the account in section 2.2., all we need to say is that, if a language has inclusive plural noun phrases, then it tolerates the absence of NumberP in numeral-less noun phrases and realizes them morphologically as plural.\(^\text{23}\) This will be the case for languages of type 2 as well—if they have inclusive plural noun phrases, then they tolerate the absence of NumberP in numeral-less noun phrases; when NumberP is present, exclusive plural noun phrases are generated thanks to [−minimal].\(^\text{24}\)

\(^{22}\) Martí considers other possibilities, but they come very close to postulating the [−atomic] feature.

\(^{23}\) Notice that if it is the mere absence of NumberP that prompts the choice of plural forms in these languages, the wrong predictions are made for numeral phrases such as one boys: this combination is ungrammatical, but it is predicted to be grammatical under this assumption—[[one CARD [or boy] ]], without NumberP but with NumeralP, would be assigned the spell out one boys, with the same meaning as one boy. Given that Martí is not concerned with the account of numerals, understanding her statement in such a way that it doesn’t apply to phrases with a numeral does not affect her analysis of inclusive plurals.

\(^{24}\) The question arises as to whether Turkish or Western Armenian have inclusive and exclusive plurals, like English. Görgülü (2012) argues that Turkish plural nouns do not give rise to inclusive readings. On the other hand, Sağ (2016: 10, 2017) and Renans et al. (2017) argue that they do. According to Bale et al. (2011), Bale and Khanjian (2014), Western Armenian only has exclusive plurals. I am not able to settle these matters at this point. However, as we've seen, my proposal in section 2.2 works whether type 2 or type 3 languages have inclusive plurals or not.
Thus, my account in section 2.2 takes from Scontras’ the crucial idea that number features operate on phrases that contain the numeral, and that this is responsible for the morphological number marking we see on noun phrases in the numeral+noun construction. Importantly, however, my account does not stipulate a special feature for languages of types 2 and 3: the feature that derives these patterns is Harbour’s [+minimal]. Because Harbour’s [+minimal] is justified independently, as it is the feature that derives, among others, minimal-augmented and singular-dual-plural number systems, the work that [+minimal] does here is costless. Whereas Scontras’ account relies on an inclusive-only semantics for plurals, with associated pragmatic principles like Maximize Presupposition to derive exclusive plurals, my account relies on the features [-minimal] and [-atomic] to derive exclusive plurals, and, following Martí (2017, 2019), on the absence of NumberP, plus a pragmatic principle like the Strongest Meaning Hypothesis, to derive inclusive plurals.

Both accounts postulate a uniform semantics for numerals (as numbers, type <n>), as well as a uniform semantics for the noun phrases involved in the numeral+noun construction, across languages. About the latter, note that the two accounts take the number of the noun phrase of Turkish numeral+noun phrases to be always singular ([sgT] in Scontras’ account, [+minimal] in mine; according to my account, they should thus be more appropriately called minimal, but I stick to the label ‘singular’ here). Thus, in my account, all Turkish numeral+noun phrases, and all Western Armenian numeral+noun phrases without -ner, contain the NumberP in (64):

(64) NumberP
    / \   /
   / \  /  
  /  \ /   
 Number^0  NumeralP
 [ +minimal ]  
  numeral  Numeral'
        /  \
       /   \   
      Numeral^0 nP
          CARD
        n^0 √

Western Armenian additionally allows the possibility in (65) for those cases where the numeral is meg ‘one’:

(65) NumberP
    / \   /
   / \  /  
  /  \ /   
 Number^0  NumeralP
 [ +atomic ]  
  numeral  Numeral'
        /  \
       /   \   
      Numeral^0 nP
          CARD
        n^0 √

This empirical point is worth making because in the first account proposed for the data in Table 1, that in Bale, Gagnon and Khanjian (2011a), these noun phrases are postulated to be number neutral, not singular. Bale, Gagnon and Khanjian also take the semantics of numerals not to be uniform cross-linguistically. I argue below that both of these assumptions are problematic.
4 Bale, Gagnon and Khanjian (2011a)

4.1 The account

For Bale, Gagnon and Khanjian (2011a), there are two possible denotations for numerals: the subsective semantics in (66), and the intersective semantics in (67):25

\[ (66) \; \llbracket \text{two}s \rrbracket = \lambda P_p . \lambda x. x \in P_p \land \{ y : y < x \land \text{atom}(y) \} = 2 \]
\[ (67) \; \llbracket \text{two} \rrbracket = \lambda x. \{ y : y < x \land \text{atom}(y) \} = 2 \]

In (66), the input argument to the numeral is constrained to be only sets containing both atoms and non-atoms. The numeral counts the atoms that constitute proper parts of the members of the input argument. In an intersective semantics like (67), the numeral is a cardinality predicate. Similar remarks can be made for the numeral one (though Bale, Gagnon and Khanjian do not discuss it), with the difference that the constraint subsective one imposes on its argument is that it be a set of atoms \( P_{sg} \):26

\[ (68) \; \llbracket \text{one}s \rrbracket = \lambda P_{sg} . \lambda x. x \in P_{sg} \land \{ y : y \leq x \land \text{atom}(y) \} = 1 \]
\[ (69) \; \llbracket \text{one} \rrbracket = \lambda x. \{ y : y \leq x \land \text{atom}(y) \} = 1 \]

For a language like English, morphologically singular noun phrases are assumed to denote sets of atoms and numerals are taken to be uniformly subsective. Assuming a universe with just three boys, we have:

\[ (70) \; \llbracket [N \text{ boy}] \rrbracket = \{ a, b, c \} \]
\[ (71) \; \llbracket [N \text{ boys}] \rrbracket = \{ a, b, c, ab, bc, ac, abc \} \]

Bale, Gagnon and Khanjian are not precise about the syntax that they assume for noun phrases or the numeral+noun construction, but what is crucial for us here is that numerals in their account directly combine with (70) and (71), and no number features are postulated. Structures that are compatible with these assumptions are in (73) and (73):

\[ A \; \text{predicate} \ P \; \text{is of type pl iff} \; \forall x, y \in P \; x + y \in P. \ (66) \; \text{and} \ (67) \; \text{are simplified versions of Bale, Gagnon and Khanjian's numeral semantics. Their official semantics is in (i) and (ii), with auxiliary definitions in (iii) and (iv) (though a definition for part is never provided):} \]

(i) \[ [\text{two}s] = \lambda P_p . \{ x : x \in P_p \land \exists Y (Y \in \text{part}(x) \land |Y| = 2 \land \forall z \in Y \to \text{atom}(z)) \} \]
(ii) \[ [\text{two}] = \lambda x. \{ y : y \leq x \land \text{atom}(y) \} \]
(iii) \[ \text{min}(P) \; \text{is defined iff} \; \forall x, y ((x, y) \in P \land \neg \exists z (z \in P \land (z < y \lor z < x))) \to x \land y = 0. \; \text{When defined} \; \text{min}(P) = \{ x : x \in P \land \neg \exists z (z < x) \} \]
(iv) \[ \text{atom}(x) = 1 \; \text{iff} \; x \in D \land \neg \exists z (z \in D \land z < x) \]

Their min and atom foreshadow the notions of minimality and atomicity that are crucial in Scontras’ and my account, though in their case they are part of the semantics of numerals, not of number features, and as such they don't produce the same effects.

25 A predicate \( P \) is of type pl iff \( \forall x, y \in P \; x + y \in P \). (66) and (67) are simplified versions of Bale, Gagnon and Khanjian’s numeral semantics. Their official semantics is in (i) and (ii), with auxiliary definitions in (iii) and (iv) (though a definition for part is never provided):\

(i) \[ [\text{two}s] = \lambda P_p . \{ x : x \in P_p \land \exists Y (Y \in \text{part}(x) \land |Y| = 2 \land \forall z \in Y \to \text{atom}(z)) \} \]
(ii) \[ [\text{two}] = \lambda x. \{ y : y \leq x \land \text{atom}(y) \} \]
(iii) \[ \text{min}(P) \; \text{is defined iff} \; \forall x, y ((x, y) \in P \land \neg \exists z (z \in P \land (z < y \lor z < x))) \to x \land y = 0. \; \text{When defined} \; \text{min}(P) = \{ x : x \in P \land \neg \exists z (z < x) \} \]
(iv) \[ \text{atom}(x) = 1 \; \text{iff} \; x \in D \land \neg \exists z (z \in D \land z < x) \]

Their min and atom foreshadow the notions of minimality and atomicity that are crucial in Scontras’ and my account, though in their case they are part of the semantics of numerals, not of number features, and as such they don't produce the same effects.

26 A predicate \( P \) is of type sg iff \( \forall x, y \in P \; x + y \in P \). All numeral denotations in this paper derive at least readings. I assume exactly readings are derived by implicature, as in Horn (1972) and much subsequent literature, an analysis which has not, of course, remained unchallenged. An ambiguity approach like that in Geurts (2006) is also compatible with the proposal here. Cf. Kennedy (2015) and references cited there.
Thus, we have, for English:

(74)

a. $\llbracket\text{two}_{S}[N \text{ boys}]\rrbracket = \lambda x. x \in \llbracket[N \text{ boys}]\rrbracket \land |\{y: y < x \land \text{atom}(y)\}| = 2 \rightarrow \text{two boys}$
b. $\#\llbracket\text{two}_{S}[N \text{ boy}]\rrbracket \rightarrow \text{two boy}$
c. $\llbracket\text{one}_{S}[N \text{ boy}]\rrbracket = \lambda x. x \in \llbracket[N \text{ boy}]\rrbracket \land |\{y: y \leq x \land \text{atom}(y)\}| = 1 \rightarrow \text{one boy}$
d. $\#\llbracket\text{one}_{S}[N \text{ boys}]\rrbracket \rightarrow \text{one boys}$

Two boy ((74)b) is predicted to be impossible in English because $\text{two}_{S}$ cannot combine with the $N \text{ boy}$: $\text{two}_{S}$ requires its input to denote a set of atoms and non-atoms, and the $N \text{ boy}$ does not denote such a set ((70)). $\text{two}_{S}$ on the other hand, can combine with a morphologically plural $N$ like $\text{boys}$ ((74)a) because the set of atoms and non-atoms that the $N \text{ boys}$ denotes ((71)) does satisfy that requirement. $\text{one}_{S}$ cannot combine with $\text{boys}$ ((74)d) because $\text{one}_{S}$ requires its input to denote a set of atoms, and $\text{boys}$ does not denote such a set. Boy does, however, which is why $\text{one boy}$ ((74)c) is grammatical. Turkish, on the other hand, uses a subsective semantics for any numeral greater than 1, an intersective semantics for 1, and a different semantics for morphologically singular and plural nouns:

(75) $\llbracket[N \text{ çocuk}]\rrbracket = \{a, b, c, ab, bc, ac, abc\}$
(76) $\llbracket[N \text{ çocuklar}]\rrbracket = \{ab, bc, ac, abc\}$

(77)

a. $\llbracket\text{iki}_{S}[N \text{ çocuk}]\rrbracket = \lambda x. x \in \llbracket[N \text{ çocuk}]\rrbracket \land |\{y: y < x \land \text{atom}(y)\}| = 2 \rightarrow \text{iki çocuk}$
b. $\#\llbracket\text{iki}_{S}[N \text{ çocuklar}]\rrbracket \rightarrow \text{iki çocuklar}$
c. $\llbracket\text{bir}_{S}[N \text{ çocuk}]\rrbracket = \lambda x. \{y: y \leq x \land \text{atom}(y)\} = 1 \land \llbracket[N \text{ çocuk}]\rrbracket(x) \rightarrow \text{bir çocuk}$
d. $\#\llbracket\text{bir}_{S}[N \text{ çocuklar}]\rrbracket \rightarrow \text{bir çocuklar}$

Given (75), a subsective semantics for numerals greater than 1 gives a different result from English. The combination of such numerals with morphologically singular nouns is predicted to be grammatical, and with the desired semantics, as in (77)a (for iki ‘two’). Their combination with morphologically plural nouns, (77)b, is correctly predicted to be ungrammatical—such numerals require their input to denote a set of atoms and non-atoms, and (75) does not denote such a set. Using $\text{bir}_{S}$ ‘one’$^\prime$, however, would wrongly predict that this numeral cannot combine with morphologically singular nouns, as (75) does not denote a set of atoms. Thus, $\text{bir}_{S}$ ‘one’$^\prime$ is used instead, and the rest of the Turkish pattern is predicted, (77)c/(77)d. As for Western Armenian, its noun semantics is proposed to be like that in Turkish, but its numerals are always intersective:
The intersective numeral semantics of *yergu*, 'two', does not impose constraints on the denotation of the noun it combines with, so both (78)a, *yergu dagha* 'two boy', and (78)b, *yergu daghaner* 'two boys', are grammatical and have the desired semantics. However, *meg*, 'one', cannot combine with a noun that denotes a set of non-atoms, as a set of non-atoms intersected with a set of individuals constituted exactly of 1 atom is empty. Hence, the only restriction we observe in Western Armenian is that *meg* cannot combine with morphologically plural nouns ((78)d).

Thus, according to Bale, Gagnon and Khanjian, N varies in its denotation from one language to another (English vs. Turkish/Western Armenian morphologically singular nouns, for example), as does the semantics of numerals (subjective in English/Turkish, intersective in Western Armenian) and the semantics of numerals within the same language (numerals greater than one vs. *bir* 'one' in Turkish).

However, there is no independent empirical evidence that the semantics of numerals should vary in this way across the three language types (or more generally)—the null hypothesis here is that it is the same across languages, which is what is assumed in both Scontras’ and my account. On this count, Bale, Gagnon and Khanjian’s proposal is quite unappealing.

Whether the semantics of N should vary from one language to another is also an empirical question, and here Bale, Gagnon and Khanjian do provide an empirical argument that morphologically singular Ns in Turkish and Western Armenian are number-neutral, based on their semantic behavior when used as bare noun phrases (i.e., without a numeral, a D, a quantifier, etc.). It is to this argument that we turn below. I show that Bale, Gagnon and Khanjian’s assumptions about Turkish and Western Armenian morphologically singular Ns are not empirically justified.

For comparison, recall that morphologically singular bare noun phrases in my and Scontras’ account are semantically singular in the three types of languages (because they use [[SG]/[SGT]] in Scontras’ account, [+atomic]/[+minimal] in mine). Recall numerals/CARD always combine with number-neutral nPs in my account, but in this account number is a property of full noun phrases, not of subparts of them, such as nPs—what is descriptively known as bare nouns or bare noun phrases are not nPs but at least NumberPs, and possibly DPs.

4.2 The semantics of morphologically singular noun phrases in Turkish and Western Armenian

Bale, Gagnon and Khanjian (2011a) assume that morphologically singular Ns in the numeral+noun construction in Turkish and Western Armenian are semantically number-neutral because they give rise to a number-neutral semantics when used as bare noun phrases, without the numeral. Following Sağ (2016, 2017) and Martí (2017), however, I argue that the latter assumption is wrong. I show below that Turkish morphologically singular bare nouns are number-neutral only when incorporated, that is, in non-argumental positions. Crucially, morphologically singular bare noun phrases

(78)

a. \[[yergu \,[N \,dǝgha]]= \lambda x.\{ y: y<x \& \text{atom}(y)\}=2 \& \[[N \,dǝgha]](x) \rightarrow yergu \,dǝgha\]

b. \[[yergu \,[N \,dǝghaner]]= \lambda x.\{ y: y<x \& \text{atom}(y)\}=2 \& \[[N \,dǝghaner]](x) \rightarrow yergu \,dǝghaner\]

c. \[[\text{meg} \,[N \,dǝgha]]= \lambda x.\{ y: y \leq x \& \text{atom}(y)\}=1 \& \[[N \,dǝgha]](x) \rightarrow \text{meg} \,dǝgha\]

d. \[[\text{meg} \,dǝghaner]\] \rightarrow \text{meg} \,dǝghaner


are semantically singular in non-incorporated, argumental positions—and there are no reasons to think that incorporation is involved in the numeral+noun construction. I also argue that in Western Armenian, morphologically singular bare noun phrases are either singular count noun phrases or naturally atomic mass noun phrases (in the sense of Bale and Barner 2009, Landman 2011, Rothstein 2010a, b, among others), but that, crucially, numerals appear in the former, not the latter. Thus, in addition to the theoretical shortcomings of this proposal, discussed above in section 4.1, there are empirical shortcomings in this account as well.

4.2.1 Turkish singular noun phrase semantics

Morphologically singular bare noun phrases in Turkish are usually taken to be number neutral semantically (Acquaviva 2005, Bale, Gagnon and Khanjian 2011a, Bliss 2004, Corbett 2000, Gökşel and Kerslake 2005, Gorgülü 2012, Walter 2014). Consider the following examples, often discussed in this literature:

(79) **Turkish**

Kitap  al-di-m
book   buy-PAST-1SG
‘I bought a book/books’

(80) **Turkish**

Ali-yi    arı   sok-tu
Ali-ACC bee sting-PAST
‘Bees stung Ali’/‘Ali got bee-stung’

(81) **Turkish**

Çocuk  gel-miş
child  come-EVID
‘There was one or more children coming’

In (79)-(81), the highlighted noun phrases receive a number neutral interpretation, as can be seen from the translations. One reason why that might be is that, as hypothesized in Bale, Gagnon and Khanjian, the noun phrases in these sentences have a number neutral denotation. However, as discussed in Cabredo Hofherr (to appear a, and references cited there), number neutrality can have sources other than noun phrase semantics. In particular, Sağ (2016, 2017), and Martí (2017) after her, shows that the number neutrality observed in (79)-(81) is attested only in incorporation contexts, when morphologically singular noun phrases appear in non-argument position. This being so, it is likely that the source of the number neutrality we observe in (79)-(81) is due to the semantics of incorporation (see Carlson 2006 and Dayal 2015 for overviews on the semantics of incorporation). In turn, this calls into question a number-neutral semantics for N in the numeral+noun construction in Turkish.

Let us go through the details of the argument. Knecht (1986), Kornfilt (1995, 2003) and Mithun (1984) argue that Turkish has noun incorporation.27 Lack of incorporation

---

27 Öztürk (2009), on the basis of developments in Massam (2001) (for Niauean; for Hindi, see Dayal 2011), argues that the more appropriate description is that Turkish has noun pseudo-incorporation (of both themes and agents), given that the relationship between the noun and the verb is less constrained in
in Turkish is recognizable from Case marking, syntactic position and intonation, as argued for Öztürk (2009) (also Kan 2010). Importantly, as Sağ and Martí note, when incorporation does not occur, i.e., when the noun phrases in question are forced into argument positions, morphologically singular bare noun phrases in Turkish are no longer number neutral. For example, consider (82), a minimal pair for (79) (note that Turkish has no definite article):

(82) *Turkish*

\[
\begin{align*}
\text{Kitab-ı} & \quad \text{al-di-m} \\
\text{book-ACC} & \quad \text{buy-PAST-1SG}
\end{align*}
\]

'I bought the book'

Accusative Case marking in Turkish induces definiteness effects, as is well known (Enç 1991, von Heusinger and Kornfilt 2005, among others). Adding it to (79), with the result in (82), has two effects, not one: the expected definiteness of the noun, and, more importantly for us, its unambiguous singular interpretation—the speaker bought one and only one book. The latter effect is fully expected if noun incorporation in Turkish is blocked when the noun is Case marked. Lack of adjacency between the noun and the verb also blocks incorporation, and, again, a singular interpretation is the only possible interpretation in that case, as the minimal pair (80)/(83) shows—in (83), one and only one bee stung Ali:

(83) *Turkish*

\[
\begin{align*}
\text{Ari} & \quad \text{Ali-yi} & \quad \text{sok-tu} \\
\text{bee} & \quad \text{Ali-ACC} & \quad \text{sting-PAST}
\end{align*}
\]

'The bee stung Ali'

If the noun-verb connection is disrupted by other means, such as by a pause ((84)), or via stress on the verb ((85)), the singular interpretation arises again (cf. (80) and (81), where stress is on çocuk, respectively):

(84) *Turkish*

\[
\begin{align*}
\text{Ali-yi} & \quad \text{ari [ ] sok-tu} \\
\text{Ali-ACC} & \quad \text{bee} & \quad \text{sting-PAST}
\end{align*}
\]

'The bee stung Ali'

(85) *Turkish*

\[
\begin{align*}
\text{Çocuk} & \quad \text{gel-mis} \\
\text{child} & \quad \text{come-EVID}
\end{align*}
\]

'The child came'

Thus, when the conditions for incorporation are not met, as in (82)-(85), singular (definite) interpretations arise in Turkish, which suggests that the number neutrality of examples in (79)-(81) is not due to the semantics of N, but to the semantics of incorporation.

---

Turkish than in languages traditionally considered to have incorporation. This difference doesn't play a role in my argument below, so I will continue speaking of Turkish incorporation.
Note that the above singular interpretations cannot be a direct effect of Case, the syntactic position of the noun phrase or intonation, since plural noun phrases, as shown by Ketrez (2003), get semantically plural readings in these cases. Consider (86), with Accusative Case marking on the noun and with stress on the verb. The noun phrase is interpreted as plural, not singular:

(86) **Turkish**

\[
\begin{align*}
\text{Ayşe } & \text{ kitap-lar-ı } \text{ oku-du} \\
\text{Ayşe } & \text{ book-PL-ACC } \text{ read-PAST} \\
\end{align*}
\]

'Ayşe read the books'

Regarding morphologically plural noun phrases in Turkish, Ketrez (2003) notes that, in addition to its function as a marker of standard plurality, exemplified in (86) and accounted for in the proposals above, –lAr can give rise to plurality of events and plurality of kinds readings. These interpretations arise in examples such as (87), where there is no Case marker and where stress is on –lAr (cf. (86)):

(87) **Turkish**

\[
\begin{align*}
\text{Ayşe } & \text{ kitap-lar } \text{ oku-du} \\
\text{Ayşe } & \text{ book-PL } \text{ read-PAST} \\
\end{align*}
\]

‘Ayşe engaged in multiple events of book-reading’, or

‘Ayşe read different types of books’

That the plural marker can give rise to these different readings might call into question the idea that the Turkish number system is a singular-plural (minimal/augmented in my analysis in section 2.2) number system. It’s important to note that plurality of events or plurality of types readings cannot be the source of plurality of individual readings, since the plurality of individuals reading is available in (86), but the other two aren’t. As matters stand, it is reasonable to think that –lAr can lead to a number of distinct readings, one of which is the plurality of individuals reading, and that only Case marking/definiteness can bring about that reading. In other words, an account of individual plurality is necessary that is independent of event and kind plurality.\(^{28}\)

The discussion above establishes that there is a semantic distinction in Turkish between morphologically singular bare noun phrases in argument positions vs. noun phrases in non-argument positions\(^{29}\). The next question is whether nouns in the numeral+noun construction in Turkish are incorporated or not. To maintain Bale, Gagnon and Khanjian’s hypothesis that numerals combine with number-neutral Ns in this construction, it would have to be the case that such nouns incorporate into the numeral. The main problem with this proposal is that, as it currently stands, it would serve no purpose other than to facilitate the analysis of Turkish envisaged by these authors. We know that numerals may be syntactic heads, taking the noun (or a projection of the noun) as complement (Borer 2005, Cardinaletti and Giusti 2006, Danon 2012, Giusti 1997, Ionin and Matushansky 2006, Longobardi 2001, Shlonsky 2004, Danon 2012), or phrases, which function as specifiers (Cinque 2005, Corver and Zwarts 2006, Danon 2012, Franks 1994, Giusti 1997, 2002, Kayne 2010, among others), and

\(^{28}\) Turkish –lAr can also be a marker of associative plurality (Lewis 1967, Sebüktakin 1971, Göksel and Kerslake 2005, Görgülü 2011). Görgülü (2011) argues that this is a separate use. Cf. also footnote 9.

\(^{29}\) One could think that, in addition, incorporated nouns don’t project as much syntactic structure as non-incorporated ones. I do not investigate this matter further here.
there are other distinctions and patterns that the rich literature on numerals and the numeral+noun construction recognizes, but there isn’t one that would independently justify an incorporation relationship between numerals and nouns.  

Importantly, if Turkish morphologically singular bare noun phrases are in fact not number neutral semantically, the account of Turkish defended in Bale, Gagnon and Khanjian is no longer empirically justified, a point made also in Sağ (2016, 2017). The analysis for bir çocuk/*çocuklar need not change: bir ‘one’ can still be intersective, and the desired pattern and semantics are derived. However, the subsective denotation of iki no longer combines with that of the N çocuk in (88), since it is no longer the case that the denotation of its input argument contains both atoms and non-atoms:

(88) ⟦[N çocuk]⟧ = {a, b, c}

An intersective semantics also would not work, since (67) does not felicitously combine with (88).

The evidence just presented suggests that the treatment of un-incorporated, morphologically singular bare noun phrases in my account in section 2.2 (and in Scontras’ account as well) is correct. To repeat that account: I’ve proposed that a noun phrase like kitab-i ‘book’ in (82) is analyzed as containing (89) as part of its structure, that is, as a semantically singular noun phrase (ignoring the precise location/analysis of Case and other matters irrelevant for our purposes):

![Diagram]

\[ \text{NumberP} \]
\[ \text{Number}^0 \]
\[ [+\text{minimal}] \]
\[ \text{nP} \]
\[ n^0 \]
\[ \sqrt{\text{kitab}} \]

\[ (89) \]

---

30 The only remaining facts which still point to a number neutral semantics for morphologically singular noun phrases in these languages is their predicative uses, which are possible in both Turkish and Western Armenian (see Bale, Gagnon and Khanjian 2011a). One question is, of course, whether predicative positions are argumental positions, an issue I cannot address here (see Williams 1983 and much subsequent literature). Given the evidence in the text, an analysis involving a distributivity operator seems more plausible, which Bale, Gagnon and Khanjian do not exclude (p. 588, ft. 5).

31 Sağ (2016, 2017) argues that what is needed is the privative numeral semantics of Ionin and Matushansky (2006), where numerals combine with noun denotations containing only atoms to return sets of plural individuals, as in (i), with auxiliary definitions in (ii) and (iii) (cf. Higginbotham 1981: 110; Gillon 1984; Verkuyl & van der Does 1991; Schwarzschild 1994):

(i) \[ \text{two}_P = \lambda P.\lambda x.\exists S.\forall s \in S P(s) \]
(ii) \[ \Pi(S)(x) = 1 \text{ iff } S \text{ is a cover of } x, \text{ and } \forall z, y \in S [z \neq y \lor \exists a [a \leq z \land a \leq y]] \]
(iii) A set of individuals C is a cover of a plural individual X iff X is the sum of all members of C (X = \bigcup C)

S is a partition (\[ \Pi \]) of an entity x if it is a cover of x and its cells don’t overlap (so that no element is counted more than once). Applying two\(_P\) to a set of atoms returns a set of twosomes each of which is composed of exactly two non-overlapping atoms. One could use such a privative interpretation for just numerals greater than 1, or for all numerals (the latter option would mean that all numerals in Turkish have a uniform interpretation). Either way, this undermines much of the motivation for Bale, Gagnon and Khanjian’s argument that numerals cannot have privative interpretations, which forms the basis of their attempt to provide an alternative semantics to Ionin and Matushanksy’s for Turkish numerals. But, more importantly, it is unclear what the range of variation in numeral meanings there can be, and, thus, ultimately, whether the typology in Table 1 can now be predicted in a principled way.
And I’ve proposed that [+minimal] is also present in noun phrases that contain a numeral (cf. (36), (37)d and (37)g):

(90)  
\[
\text{NumberP} \\
\text{Number}^0 \quad \text{NumeralP} \\
\quad \text{[+minimal]} \\
\quad \text{numeral} \quad \text{Numeral'} \\
\quad \quad \text{Numeral}^0 \quad \text{nP} \\
\quad \quad \quad \text{CARD} \\
\quad \quad \quad \quad n^9 \\
\quad \quad \quad \quad \sqrt{çocuk}
\]

4.2.2 Western Armenian singular noun semantics

Western Armenian morphologically singular bare noun phrases are plausibly analyzed as naturally atomic mass (in the sense of Bale and Barner 2009, Landman 2011, Rothstein 2010a, b, among others) in examples such as (91)-(92).

(91)  
\[
\text{Western Armenian} \\
\text{Maro-n tuz } \text{g-ude} \\
\text{Maro-DEF fig IMP-eat.3SG} \\
\text{'Maro eats one or more figs'}
\]

(92)  
\[
\text{Western Armenian} \\
\text{Señan-e-n ñif } \text{ing-av} \\
\text{table-ABL-DEF bottle fall.AOR-3SG} \\
\text{'From the table one or more bottles fell'}
\]

A naturally atomic mass interpretation is a number-neutral interpretation, as shown in more detail below, which would be compatible with Bale, Gagnon and Khanjian (2011a) and with the interpretation of these examples. However, I argue below that this cannot be how they are interpreted in the numeral+noun construction.

Given our discussion about noun incorporation in Turkish in the previous section, note first that Western Armenian does not have noun incorporation, following Sigler (1997), so that cannot be the source of the number-neutral interpretations of (91)-(92). Mohanan (1995), in her discussion of Hindi incorporation, shows that Hindi incorporated objects are interpreted differently from their non-incorporated counterparts. Consider the ambiguous (93) (Mohanan 1995: 91):

(93)  
\[
\text{Hindi} \\
\text{Mohan } \text{c\u{u}ttiyo-me vákyum kliinar becta } \text{t^9aa} \\
\text{Mohan.NOM holidays-in vacuum cleaner.NOM sell.HAB be.PAST} \\
\text{'Mohan was selling vacuum cleaners during the holidays' or} \\
\text{'Mohan was doing vacuum-cleaner-selling during the holidays'}
\]

In the first reading in (93), the object vákyum kliinar ‘vacuum cleaner’ is not incorporated and is a regular syntactic object. The second reading arises from

---

32 All Western Armenian examples are from Sigler (1997) and have been further corroborated by Hossep Dolatian.
incorporation of the noun into the verb. Only the latter is compatible with the continuation in (94):

(94) **Hindi**

Usne do mahine-me ek ḅii vãkyum kliinar nahïi beci
He.ERG two month-in one even vacuum cleaner.NOM NEG sell

‘He didn’t even sell one vacuum cleaner in two months’

Parallel examples in Western Armenian show that the bare noun phrases of interest here do not incorporate. (96) sounds contradictory as a continuation for (95):

(95) **Western Armenian**

Yerp Ani-n Beirut ga-pənæg-r kork ga-ḍi axe-r
when Ani-DEF Beirut IMP-live-PAST.3SG carpet IMP-sell-PAST.3SG

‘When Ani lived in Beirut she sold carpets’

#’When Ani lived in Beirut she did carpet-selling’

(96) **Western Armenian**

...# payc ayn yerek dar-va antack.i.n nuynisg meg had
but that three year-GEN during not.even one class
kork čo-ḍi axe-c
carpet NEG-sell-AOR.3SG

‘But she didn’t sell a single carpet in those three years’

A more plausible explanation for the number-neutral interpretations in (91)-(92) is that morphologically singular noun phrases like /bottle/ or /fig/ are mass, as argued by Bale and Khanjian (2008) and Sigler (1997), more specifically, as mass nouns with naturally atomic parts, like /luggage, furniture, or mail/ in English (Bale and Barner 2009, Landman 2011, Rothstein 2010a, b, among others; for Sigler, they are typical mass nouns like English /water/). If the bare noun phrases in (91)-(92) can be interpreted as naturally atomic mass, then their number-neutral interpretation can be the same type of interpretation of nouns like /furniture or luggage/:

(97) I bought **furniture** for the living room
(98) I carried **luggage** up the stairs

According to (97), I bought one or more pieces of furniture, and according to (98), I carried one or more pieces of luggage upstairs. These noun phrases indeed allow for a cumulative interpretation in Western Armenian, as suggested by the following example, which makes them compatible with a mass denotation (cf. Link 1983):

33 The equivalent examples from Turkish behave like those in Hindi, as expected. (i) is well-formed:

(i) **Turkish**

Anu Beyrut-ta yaša-r-ken hali sat-ar-di.
Anu Beirut-LOC live-AOR-when carpet sell-AOR-PAST
Fakat Anu o üç yıl boyunca tek bir hali satmadı.
But Anu it three year during single one carpet even

‘When Anu lived in Beirut, she did carpet-selling. But she didn’t sell a single carpet in those three years.’
It seems quite plausible, then, that the number neutral semantics we observe in examples (91)-(92) is due to the systematic availability of naturally atomic mass denotations for morphologically singular noun phrases in Western Armenian.

The important question for us is whether noun phrases with numerals in Western Armenian are also interpreted as naturally atomic mass—my account in section 2.2 (and Scontras’) takes them to be [+minimal]/[atomic] noun phrases, so semantically singular, which is not compatible with a naturally atomic mass interpretation.

Sigler (1997) argues that they indeed are mass nouns in the numeral+noun construction. Her argument, and my reasons for questioning it, are as follows. Recall that Western Armenian allows both options in (6), repeated as (100), for numerals greater than one:

\[(100) \text{Western Armenian}\]
\[
\begin{align*}
\text{Yergu dagha/dagha-ner} \\
\text{two boy.SG/boy-PL}
\end{align*}
\]
\[\text{‘Two boys’}\]

Donabédian (1993) and Sigler (1997) argue that there is a difference in interpretation between the singular form and the plural form in such constructions. With yergu dagha, “the speaker is not interested in the individual [boys], but in the number and type of person”, whereas with yergu daghaner, “the speaker is interested in the [boys] individually” (Sigler 1997: 41, 146-150). Consider the following examples (due to Hossep Dolatian, p.c.) (cf. Sigler’s 1997: 148-50 own examples):

\[(101) \text{Western Armenian}\]
\[
\begin{align*}
\text{John: Ajsor jad martiggo kal-en gor ajs poyots-i-n} \\
\text{today many people INDIC walk-3PL.PRES PROG this street-DAT-DEF} \\
\text{met} \\
\text{in} \\
\text{‘A lot of people are walking on this street today’}
\end{align*}
\]
\[
\begin{align*}
\text{Bill: Ajo džjd es ajsor yergu ayfig ants-av} \\
\text{yes right be.2SG today two girl pass.by-PAST.3SG} \\
\text{‘Yes, that’s true. Two girls passed by today’}
\end{align*}
\]
\[
\begin{align*}
\text{Bill: Ajo džjd es ajsor yergu ayfig-ner ants-an} \\
\text{yes right be.2SG today two girl-PL pass.by-PAST.3PL} \\
\text{‘Yes, that’s true. Two girls passed by today’}
\end{align*}
\]

\[(102) \text{Western Armenian}\]
\[
\begin{align*}
\text{Teacher: Ajagerd-ner, ov koytsa-v xantsor-as} \\
\text{student-PL who steal.PAST-3SG apple-1SG.Poss} \\
\text{‘Students, who stole my apple?’}
\end{align*}
\]
When in the context number is relevant, as in (101), either expression is appropriate. When in the context it is identity that is relevant, not number, as in (102), the singular form of the noun is infelicitous, whereas the plural form is felicitous. The plural form of the noun in this construction is thus compatible with both types of context, whereas the singular form is compatible only with the counting context. This difference between the morphologically singular and plural forms is not associated per se with the plural suffix, as no such effect obtains in (103) or (104):

(103) Western Armenian
Yereg  kijer  sarsur-ner  ga-i-n  xohanoc-i-n  meč
Yesterday night cockroach-pl exist.PAST.3PL kitchen-GEN-DEF under
‘Last night there were cockroaches in the kitchen’

(104) Western Armenian
30əv-i-n  lezvaked-ner  masnagce-c-an
meeting-DAT-DEF linguist-PL participate-AOR-3PL
‘Linguists participated in the meeting’

For Sigler (cf. Donabédian), the difference exemplified in (101) and (102) follows from morphologically singular nouns being (typical) mass in the numeral+noun construction, and from the morphologically plural noun being count. Dǝgha in (100), being (typical) mass, does not allow differentiation among different subparts of the boy-mass. Being count, dǝghaner does allow such differentiation, which entails identification.

Whatever its merits, we cannot maintain this analysis in the face of the contrast, commonly noted in the literature, between typical mass nouns like water and naturally atomic mass nouns like luggage in English, or nenino in Brazilian Portuguese. Dǝgha in (100), if mass, is naturally atomic mass, with clear differentiation between different subparts of the boy-mass, constituted by boy-atoms (cf. Bale and Barner 2009, Bale and Khanjian 2008, Rothstein 2010a, b, among others). But, more importantly, neither typical mass nor naturally atomic mass nouns can combine directly with numerals, in English or in other languages (cf. English *three water; *three luggage; Brazilian Portuguese *tres menino, tres meninos, Cilene Rodrigues, p.c.). I haven’t been able to find clear cases of naturally atomic mass nouns like English luggage in Western Armenian, but typical mass nouns do not combine directly with numerals (cf. (106)) (Khanjian 2012):

(105) Western Armenian
*Jerek  kini/vosgi/aluθ
three wine/gold/flour
(106) **Western Armenian**

Hisun gram alujr
fifty gram flour
'Fifty grams of flour'

We must then assume that the Western Armenian morphologically singular nouns in (100) appear there in a second, count denotation, and that the difference illustrated in (101)/(102) is due to something other than a potential mass/non-mass contrast. This second, count denotation is actually likely to be systematically available for morphologically singular nouns, as when a definite article, which Western Armenian does have, is added to our earlier examples, only a semantically singular interpretation arises:

(107) **Western Armenian**

Maro-n tuz-ǝ g-ude
Maro-DEF fig-DEF IMP-eat.3SG
'Maro eats the fig'

(108) **Western Armenian**

Sexan-e-n fif-ǝ ing-av
table-ABL-DEF bottle-DEF fall.AOR-3SG
'From the table the bottle fell'

It is possible to show that this interpretation is not due to the definite article itself, since the definite article gives rise to plural interpretations with plural marked nouns:

(109) **Western Armenian**

Piś-er-ǝ pax-a-n
Elephant-PL-DEF escape-AOR-3PL
'The elephants escaped'

(110) **Western Armenian**

Maro-n tuz-er-ǝ g-ude
Maro-DEF fig-PL-DEF IMP-eat.3SG
'Maro eats the figs'

A possibility worth pursuing for the contrast between (101)/(102) is one in which the introduction of an identifiability component is done by a different item within the noun phrase, such as a (silent) determiner or a quantifier. This would not be too surprising, as we know from other languages that quantifiers can indeed be sensitive to such distinctions (Russian uses koe-wh as an indefinite determiner to require the speaker to be able to identify the referent; cf. Martí and Ionin 2019 and references cited there).34

---

34 Western Armenian has a classifier, *had*, as shown in Bale and Khanjian (2008) and Sigler (2003) (cf. also Borer 2005, Khanjian 2012). This classifier can appear (and, for some speakers, is preferred) in (100):

(i) **Western Armenian**

Yergu (had) dagha/dagha-ner
two CLASS boy.sg/boy-pl
'Two boys'
Going back to my account in section 2.2, my proposal there is that Western Armenian uses either (111) or (112) as part of the structure of morphologically singular bare count noun phrases, and (113) or (114) as part of the structure for noun phrases with a numeral like *yergu* 'two' (recall that, since [-atomic] in Western Armenian is assumed to be spelled out as -ner, (114) gives rise to *yergu dǝgha-ner* 'two boys'):

\[
\text{(111) \\
\text{NumberP} \\
\text{Number}^0 \\
[+\text{atomic}] \\
\text{nP} \\
\text{n}^0 \\
\sqrt{\text{dǝgha}}}
\]

\[
\text{(112) \\
\text{NumberP} \\
\text{Number}^0 \\
[+\text{minimal}] \\
\text{nP} \\
\text{n}^0 \\
\sqrt{\text{dǝgha}}}
\]

\[
\text{(113) \\
\text{NumberP} \\
\text{Number}^0 \\
[+\text{minimal}] \\
\text{NumeralP} \\
\text{numeral} \\
\text{yergu} \\
\text{Numeral}^0 \\
\text{Numeral'} \\
\text{CARD} \\
\text{n}^0 \\
\sqrt{\text{dǝgha}}}
\]

\[
\text{(114) \\
\text{NumberP} \\
\text{Number}^0 \\
[−\text{atomic}] \\
\text{numeral} \\
\text{yergu} \\
\text{Numeral}^0 \\
\text{Numeral'} \\
\text{CARD} \\
\text{n}^0 \\
\sqrt{\text{dǝgha}}}
\]

These proposals are compatible with the evidence we have reviewed in this section.

Summarizing now the arguments in section 4.2, Bale, Gagnon and Khanjian (2011a) propose that the differences in Table 1 follow in part from morphologically singular bare noun phrases in English being semantically singular while semantically number neutral in Turkish and Western Armenian. I have argued, however, that morphologically singular bare noun phrases in argument position are interpreted as morphologically singular only, as assumed in my account in section 2.2. In Western Armenian, morphologically singular nouns may be naturally atomic mass nouns, but under such an interpretation nouns cannot be counted, so that interpretation cannot serve as an argument to a numeral. Bale, Gagnon and Khanjian’s assumptions are thus not only theoretically unappealing, but empirically unsubstantiated as well.

For some, but not all, speakers, *had* is impossible with morphologically plural nouns. *Had* cannot occur with mass nouns. Turkish is also claimed to have an optional classifier; see Sağ (2016, 2017).
5 Conclusion

In this paper I have argued for an analysis of the cross-linguistic patterns in Table 1 based on the system in Scontras (2014), but with the following developments: (a) a single, number-neutral semantics for nP for all languages, as in Harbour (2011, 2014), (b) a non-arbitrary appeal to [SGT] in the form of Harbour’s [+minimal], so that what was expressed as a stipulation before is now derived from the theory of number, and (c) a Harbour-compatible understanding of inclusive and exclusive plurality, facilitated by the adoption of Martí’s (2017, 2019) proposal. My account achieves this while maintaining the appeal of Scontras’ system, including his uniform interpretation for numerals across languages, and the correct treatment of bare noun phrases in Turkish and Western Armenian, which was shown to be problematic for Bale, Gagnon and Khanjian (2011a). I hypothesized type 1 languages to be [±atomic] number systems (what descriptively we call singular-plural systems), type 2 languages to be [±minimal] number systems (what descriptively we can call minimal-augmented systems), and type 3 languages to have both [±atomic] and [±minimal] number systems:

<table>
<thead>
<tr>
<th></th>
<th>[±atomic]</th>
<th>[±minimal]</th>
<th>[±atomic] or [±minimal]</th>
</tr>
</thead>
<tbody>
<tr>
<td>One N</td>
<td>morphologically singular noun phrase</td>
<td>morphologically singular noun phrase</td>
<td>morphologically singular noun phrase</td>
</tr>
<tr>
<td>Two, etc. N</td>
<td>morphologically plural noun phrase</td>
<td>morphologically singular noun phrase</td>
<td>morphologically singular or plural noun phrase</td>
</tr>
<tr>
<td>Example languages</td>
<td>English, Spanish, German</td>
<td>Hungarian, Turkish, Finnish</td>
<td>Western Armenian, Miya, Itzaj Maya</td>
</tr>
</tbody>
</table>

Table 7 The three language types, according to their number system

Thus, the only element of variation in this approach is the type(s) of grammatical number system each language type has access to—and grammatical number systems are regulated by the principles of Harbour’s theory of number. In the account presented here, numerals greater than one appear in morphologically plural noun phrases in English because the members of a set of non-atoms are not atoms, and such a set can thus be characterized by [−atomic] (which spells out as −s in English). Such numerals, on the other hand, appear in morphologically singular noun phrases in Turkish because individuals in a set of non-atoms also count as having no subparts in the set, and such a set can thus be characterized by [+minimal] (which spells out as ø in Turkish). The individuals in a set of atoms, on the other hand, are both atoms ([+atomic]) and have no subparts in the set ([+minimal]), so the difference between Turkish and English is obliterated in the single case of the numeral one, correctly, something which follows the logic of Harbour (2011, 2014). From the perspective of Harbour (2011, 2014, 2016), the paper demonstrates that the numeral+noun construction is another domain where [±atomic] and [±minimal] may be teased apart. From the perspective of Scontras (2014), the paper demonstrates that the structure of the explanation of the patterns in Table 1 requires neither an inclusive-only view of plurality nor the stipulation of a number feature like [SGT].
References
Bale, Alan, Michaël Gagnon and Hrayr Khanjian. 2011a. Cross-linguistic Representations of Numerals and Number Marking. SALT 20, 582-598
Cabredo Hofherr, Patricia. To appear a. Nominal Number Morphology. In Patricia Cabredo Hofherr and Jenny Doetjes (eds.) Handbook of Grammatical Number, Oxford University Press
Cabredo Hofherr, Patricia. To appear b. Verbal Number. In Patricia Cabredo Hofherr and Jenny Doetjes (eds.) Handbook of Grammatical Number, Oxford University Press
Corver, Norbert and Joost Zwarts. 2006. Prepositional Numerals. Lingua 116, 811-835
Dayal, Vaneeta. 2015. Incorporation: Morpho-Syntactic vs. Semantic Considerations, in Olga Borik and Berit Gehrke (eds.) The Syntax and Semantics of Incorporation, Syntax and Semantics 40
Franks, Steven. 1995. Parameters of Slavic Morphosyntax, Oxford University Press.
Grimm, Scott. 2012. Plurality is Distinct from Number-Neutrality. Proceedings of NELS 41
dissertation, University of California Los Angeles


Kan, Seda. 2010. Number Marking and Turkish Noun Phrases, ms., University of Massachusetts, Amherst


Kennedy, Chris. 2015. A de-Fregean Semantics (and neo-Gricean Pragmatics) for Modified and Unmodified Numerals. Semantics and Pragmatics 8, 1-44.


Knecht, Laura. 1986. Subject and Object in Turkish. Ph.D. dissertation, MIT.


Kriška, Manfred. 2004. Bare NPs: Kind-referring, Indefinites, Both or Neither? SALT 13


Lewis, Geoffrey. 1967. Turkish Grammar. OUP.


Onambélé, Christophe. 2012. Vers une grammaire minimaliste de certains aspects syntaxiques de la langue ewondo, Ph.D. dissertation, Université Paris 8


Pires de Oliveira, Roberta and Susan Rothstein. 2011. Bare Singular Noun Phrases are Mass in Brazilian Portuguese. Lingua 121: 2153-2175


Yearbook of Cognition, Logic and Communication, vol. 6. Formal Semantics and
Press
King (eds.) Argument Realization. Stanford: CSLI Publications. 73-110
Sağ, Yağmur 2016. On the Semantics of Classifiers: a New Perspective from an Optional
Classifier Language, Turkish. http://ling.auf.net/lingbuzz/002999
Sağ, Yağmur. 2017. The Semantics of Numeral Constructions in Turkish. Sinn und
Bedeutung 22.
Proceedings of the 13th Semantics and Linguistic Theory Conference, 258–275. Ithaca,
N.Y: Cornell University CLC-Publications.
Sauerland, Uli, Jan Anderssen and Kazuko Yatsushiro. 2005. The Plural is Semantically
Unmarked. In Stefan Kepser and Marga Reis (eds.), Linguistic Evidence, 409–30. de
Gruyter.
89, 607–624.
Progress in Chadic Linguistics: Proceedings of the International Symposium on
Chadic Linguistics, 171-181. Amsterdam: John Benjamins
Natural Language Semantics 2, 201-248
University
Sigler, Michele. 1997. Specificity and Agreement in Standard Western Armenian, PhD
dissertation, MIT.
Sigler, Michele. 2003. A Note on the Classifier in Western Armenian: had. Annual of
Armenian Linguistics 22-23, 41-53.
Spector, Benjamin. 2007. Aspects of the Pragmatics of Plural Morphology: on Higher-
Order Implicatures. In Uli Sauerland & Penka Stateva (eds.), Presuppositions and
Implicatures in Compositional Semantics, 243–281.
Philosophical Review 89: 607-624
Underhill, Robert. 1979. Turkish Grammar. MIT Press
der Does & J. van Eyck (eds.) Quantifiers, Logic, and Language. CSLI. Stanford. 337-
374.
Walter, Micah. 2014. Morphosyntax and Semantic Type of NPs in Turkish. BA
dissertation, Haverford College
Wilhelm, Andrea. 2008. Bare Nouns and Number in Dëne Sųłiné. Natural Language
Semantics 16, 39-68

