Numerals and the theory of number[1]

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Comments welcome!

Abstract. I begin by discussing empirical and theoretical shortcomings of Bale, Gagnon and Khanjian's (2011a) account of grammatical number in the numeral+noun construction in Turkish, Western Armenian and English. I then show that Scontras' (2014) account of the data, while a substantial improvement, can be improved further by deriving his *ad hoc* semantics for the Turkish and Western Armenian singular feature from Harbour's (2011, 2014) [±minimal]. Following Martí (2017a, b), this requires rethinking the role of Sauerland's (2003) plural feature in Scontras' account. I propose a Scontras-based system that accounts for the data with a uniform semantics for numerals, an empirically justified semantics for Turkish or Western Armenian nouns, and an adequate understanding of exclusive and inclusive plurality within Harbour's theory. The number marking on nouns in this construction is viewed as 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 compositional semantics. The account uncovers a new domain where the effects of [±minimal] can be detected (cf. Harbour 2011), and demonstrates that a Sauerland-style view of plurality is not necessary in the account of the data.

Keywords: numeral semantics, noun semantics, numeral+noun construction, number features

1 Introduction

This paper is concerned with the morphology and compositional semantics of the numeral[2]+noun construction in plural-marking languages, that is, languages which in principle have the morphological and semantic means to express plurality. At least three types of languages must be recognized, depending on the number marking that appears on the noun accompanying the numeral. The first type is exemplified by languages such as Spanish, English or German, as in (1) and (2):[3]

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

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[2] By 'numeral', in this paper I mean 'cardinal numeral'.

[3] Abbreviations in glosses are as follows: 1 = first person; 2 = second person; 3 = third person; ABL = ablative case; ABSOLUTIVE = absolutive case; ACC = accusative case; AOR = aorist; 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.

(3)   *Spanish*
      Un   **niño/* niño-s**
      One   boy.SG/boy-PL
      'One boy'

(4)   *Spanish*
      Tres   **niño-s/*niño**
      three   boy-PL/boy.SG
      'Three boys'

In this type of language, the numeral *one* obligatorily combines with morphologically singular nouns, and any numeral greater than 1 obligatorily combines with morphologically plural nouns[4]. In the second type, exemplified by Turkish (Bale, Gagnon and Khanjian 2011a), Finnish (Nelson and Toivonen 2000), or Hungarian (Farkas and de Swart 2010), on the other hand, all numerals combine with morphologically singular nouns, even numerals greater than 1. (5) and (6) illustrate for Turkish (Bale, Gagnon and Khanjian 2011a) and (7) and (8) illustrate for Hungarian (Farkas and de Swart 2010):[5]

(5)   *Turkish*
      Bir **çocuk/*çocuk-lar**
      one boy.SG/boy-PL
      'One boy'

(6)   *Turkish*
      Iki   **çocuk/*çocuk-lar**
      two   boy.SG/*boy-PL
      'Two boys'

(7)   *Hungarian*
      Egy   **gyerek/*gyerek-ek**
      one   child.SG/*child-PL
      'One child'

(8)   *Hungarian*
      Három **gyerek/*gyerek-ek**
      three   child.SG/*child-PL
      'Three children'

In a third type of language, illustrated by Western Armenian (Bale, Gagnon and Khanjian 2011a, Donabédian 1993, Sigler 1997) and Miya (for its inanimate nouns, as discussed

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[4] 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*. Martí (2017c), based on Bylinina and Nouwen (2017), shows that the account presented in this paper can account for the number marking of nouns in *zero*+noun combinations in different languages. I put aside decimal numbers and fractions in what follows.
[5] The plural marker in Turkish is the suffix *–lAr*, subject to vowel harmony (see Kornfilt 1997: 268). In Hungarian, it is the suffix *–(V)k* (see Farkas and de Swart 2003).

in Schuh 1989, 1998), there is optionality of plural marking on the noun for numerals greater than 1:[6]

(9) *Western Armenian*
     Meg **dəgha/*dəgha-ner**
     one boy.SG/boy-PL
     'One boy'

(10) *Western Armenian*
     Yergu **dəgha/dəgha-ner**
     two   boy.SG/boy-PL
     'Two boys'

(11) *Miya*
     Kàm/*kàmàmáw   wútə
     house.SG/house.PL   one
     'One house'

(12) *Miya*
     Kàmàmáw/kàm   máahà
     house.PL/house.SG   six
     'Six houses'

The patterns that this paper aims to account for are summarized in Table 1:[7]

	Type 1	**Type 2**	**Type 3**
One N	morphologically singular N	morphologically singular N	morphologically singular N
Two, etc. N	morphologically plural N	morphologically singular N	morphologically singular or plural N
Example languages	English, Spanish,German	Hungarian, Turkish, Finnish	Western Armenian, Miya

Table 1 The three language types

Bale, Gagnon and Khanjian (2011a) argue for an account of this variation (more precisely, of the contrast between English, Turkish and Western Armenian) where both the semantics of numerals and the semantics of nouns may vary from one language type

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[6] The most productive strategy for pluralization in Miya adds *–a-C-aw* 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 (10), see section 3.

[7] 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). Martí and Abels (in preparation) show how some of these more complex patterns are accounted for within the current system. 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 Matushanksy's view of complex numerals as syntactically complex.

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 nouns 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, singular semantics for morphologically singular nouns—in his account, the observed variation results from a different semantics for the feature [SINGULAR] in different languages.[8]

In this paper I argue, first, that the assumptions Bale, Gagnon and Khanjian (2011a) make concerning the semantics of morphologically singular nouns in the Turkish and Western Armenian numeral+noun construction are not empirically justified—these nouns are (at least in this construction) semantically singular (cf. Martí 2017b, Sağ 2016, 2017). I develop my empirical arguments on the basis of Turkish and Western Armenian, but hypothesize that morphologically singular nouns in this construction are semantically singular in the languages of all three types. 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 entirely on a stipulative claim, namely, that languages of the second and third type make use of a singular feature that is sensitive to elements without minimal parts, not, as in standard, to 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]. This is an improvement because the compositional semantics of the number features that are needed in Scontras' explanation are now justified independently of the data at hand.

Embedding Scontras' account within Harbour's theory of number, however, cannot be done without further changes, in particular, with respect to Scontras' assumptions about plurality. Scontras builds his account on Sauerland's (2003) account of number features, where singular features are presuppositional and plural features are semantically empty. Martí (2017a, b), however, demonstrates that this approach to plurality is not compatible with Harbour's theory of number, but that an ambiguity account of plurality, similar to that in Farkas and de Swart (2010), on the other hand, is. My proposal has three key ingredients: Martí's account of plurality, Harbour's features, and Scontras' idea about the interaction between the compositional semantics of number features and numerals. With these ingredients, I derive the three possibilities in (1)-(10) in principled grounds. I thus demonstrate that neither presuppositions nor a semantically vacuous plural feature are necessary in Scontras' account. Like its predecessors, the analysis proposed here derives the morphological and the semantic facts from the same set of principles, so the proposal can be viewed as an alternative to accounts that take the distribution of singular and plural nouns in (1)-(10) to be the result of morphological agreement independently of semantics.

The organization of the paper is as follows. In section 2, I present Bale, Gagnon and Khanjian's (2011a) analysis of the data. In section 3, I discuss its empirical shortcomings

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[8] A third type of account of the contrast between languages of the first and the second type 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 an account couched within a more standard, compositional semantics framework can do the work. Note that a different part of Farkas and de Swart's (2010) analysis, having to do with the distribution of exclusive and inclusive plurality, is, on the other hand, used in the account I propose in section 6.

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for Turkish and Western Armenian in detail. In section 4, I present Scontras' (2014) analysis. I then show in section 5 how Harbour's (2011, 2014) minimality can help to make Scontras' account less stipulative, but that in order to do so, Sauerland (2003) must be abandoned. Section 6 presents my proposal. Section 7 is the conclusion.

2   Bale, Gagnon and Khanjian (2011a): the semantics of numerals and morphologically singular nouns

For Bale, Gagnon and Khanjian (2011a), numerals may have either a subsective semantics, such as that in (13), or an intersective semantics, as in (14), and no other interpretation:[9]

(13) $[[two_S]] = \lambda P_{pl}.\lambda x. x \in P_{pl}$ & $|\{y: y<x$ & atom$(y)\}| = 2$
(14) $[[two_I]] = \lambda x. |\{y: y<x$ & atom$(y)\}| = 2$

In (13), a constraint is imposed on the input argument to the numeral, to the effect that only sets containing both atoms and non-atoms can serve as arguments, which makes the numeral subsective. In an intersective semantics like (14), the numeral does not impose any constraints on the noun it composes with, and is merely a cardinality predicate[10]. 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* in (15) imposes on its argument is that it be a set of atoms (P_{sg}):[11]

(15) $[[one_S]] = \lambda P_{sg}.\lambda x. x \in P_{sg}$ & $|\{y: y<x$ & atom$(y)\}| = 1$
(16) $[[one_I]] = \lambda x. |\{y: y<x$ & atom$(y)\}| = 1$

For the first type of language above, such as English, in which morphologically singular nouns are singular, numerals are uniformly subsective, with the following results:

(17) $[[boy]] = \lambda x. boy(x)$ & atom(x)
(18) $[[boys]] = \lambda x. boy(x)$

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[9] A predicate Q is of type P_{pl} iff $\forall x, y \in Q$ $(x+y \in Q)$; it is of type P_{sg} iff $\forall x, y \in Q$ $(x+y \notin Q)$.
[10] (13) and (14) are simplified versions of Bale, Gagnon and Khanjian's proposed 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) $[[two_S]] = \lambda P_{pl}.\{x: x \in P_{pl}$ & $\exists Y (Y \in PART(x)$ & $|Y| = 2$ and $\forall z(z \in Y \rightarrow z \in MIN(P_{pl})))\}$
(ii) $[[two_I]] = \{x : \exists Y(Y \in PART(x)$ & $|Y|=2$ & $\forall z(z \in Y \rightarrow ATOM(z)))\}$
(iii) MIN(P) is defined iff $\forall x,y((x,y \in P$ & $\neg \exists z(z \in P$ & $(z<y \lor z<x))) \rightarrow x \land y = 0)$. When defined MIN(P) = $\{x : x \in P$ & $\neg \exists z(z<x)\}$
(iv) ATOM(x) = 1 iff $x \in D$ & $\neg \exists z(z \in D$ & $z<x)$

MIN and ATOM foreshadow the notions of minimality and atomicity that are crucial in Scontras' and my account of the data, though in the case at hand they are part of the semantics of numerals, not of number features, and as such they don't produce the same effects. E.g., (i), which uses MIN, is the semantics for numerals in Turkish and English, but not in Western Armenian, in this account, whereas in the other accounts, Turkish and Western Armenian make use of a feature that is very similar to MIN in (iii).
[11] 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, remain unchallenged. An ambiguity approach like that in Geurts (2006) is also compatible with the proposal here. Cf. Kennedy (2015) and references cited there.

(19)

    a. $[[two_S \text{ boys}]] = \lambda x.\ x \in [[*boy]]\ \&\ |\{y: y<x\ \&\ atom(y)\}| = 2$ → *two boys*

    b. $\#[[two_S \text{ boy}]]$ → **two boy*

    c. $[[one_S \text{ boy}]] = \lambda x.\ x \in [[boy]]\ \&\ |\{y: y<x\ \&\ atom(y)\}| = 1$ → *one boy*

    d. $\#[[one_S \text{ boys}]]$ → **one boys*

Two$_S$ cannot combine with *boy* in English because it requires its input to denote a set of atoms and non-atoms, and *boy* does not denote such a set ((17)). In turn, *one$_S$* cannot combine with *boys* because it requires its input to denote a set of atoms, and *boys* does not denote such a set ((18)). (19) gives rise to the correct number marking on the nouns and the correct semantics for English. Turkish, a language of the second type, uses a subsective semantics for 2 and any numeral greater than 2, but it needs to use an intersective semantics for 1:

(20) $[[\text{çocuk}]] = \lambda x.\ boy\ (x)$

(21) $[[\text{çocuklar}]] = \lambda x.\ boy\ (x)\ \&\ \neg atom$

(22)

    a. $[[iki_S \text{ çocuk}]] = \lambda x.\ x \in [[\text{çocuk}]]\ \&\ |\{y: y<x\ \&\ atom(y)\}|=2$ → *iki çocuk*

    b. $\#[[iki_S \text{ çocuklar}]]$ → ** iki çocuklar*

    c. $[[bir_I \text{ çocuk}]] = \lambda x.\ |\{y: y<x\ \&\ atom(y)\}| = 1\ \&\ [[\text{çocuk}]](x)$ → *bir çocuk*

    d. $\#[[bir_I \text{ çocuklar}]]$ → **bir çocuklar*

Given (20), a subsective semantics for numerals greater than 1 will give a different result from English. The combination of such numerals with morphologically singular nouns will be grammatical, and with the desired semantics, as in (22)a. Their combination with morphologically plural nouns, (22)b, will be correctly predicted to be ungrammatical—such numerals require their input to denote a set of atoms and non-atoms, and (21) does not denote such a set. Using *one$_S$* in Turkish, however, would wrongly predict that this numeral cannot combine with morphologically singular nouns, as (20) does not denote a set of atoms. Thus, *bir$_I$* 'one$_I$' is used instead, and the rest of the Turkish pattern is predicted, (22)c/(22)d. As for Western Armenian, a language of the third type, its noun semantics is like that in Turkish, but its numerals are always intersective. Thus, we have:

(23) $[[\text{dəgha}]] = \lambda x.\ boy\ (x)$

(24) $[[\text{dəghaner}]] = \lambda x.\ boy\ (x)\ \&\ \neg atom$

(25)

    a. $[[yergu_I \text{ dəgha}]] = \lambda x.|\{y: y<x\ \&\ atom(y)\}|=2\ \&\ [[\text{dəgha}]](x)$ → *yergu dəgha*

    b. $[[yergu_I \text{ dəghaner}]] = \lambda x.|\{y: y<x\ \&\ atom(y)\}|=2\ \&\ [[\text{dəghaner}]](x)$

    → *yergu dəghaner*

    c. $[[meg_I \text{ dəgha}]] = \lambda x.|\{y: y<x\ \&\ atom(y)\}|=1\ \&\ [[\text{dəgha}]](x)$ → *meg dəgha*

    d. $\#[[meg_I \text{ dəghaner}]]$ → **meg dəghaner*

An intersective numeral semantics does not impose constraints on the denotation of the noun the numeral combines with, so both (25)a and (25)b give rise to grammatical

results with the desired semantics[12]. However, *one₁* 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—thus, the only constraint we observe in Western Armenian is that *meg* cannot combine with plural nouns, (25)c-(25)d.

Thus, according to Bale, Gagnon and Khanjian, morphologically singular nouns can vary in their denotation from one language to another (English vs. Turkish/Western Armenian)[13], as can the semantics of numerals (subsective in English/Turkish, intersective in Western Armenian) and the semantics of numerals within the same language (numerals greater than 1 vs. *bir* 'one' in Turkish). This state of affairs is in itself not desirable, as one would want these different choices to follow on more principled grounds, as Scontras (2014) argues. However, there is an important empirical problem with Bale, Gagnon and Khanjian's proposal, discussed in the next section.

3   The semantics of nouns in Turkish and Western Armenian

As we've seen, one of the basic assumptions in the analysis of Bale, Gagnon and Khanjian (2011a) is that the semantics of nouns can vary from one language to another. The question now is whether this assumption is empirically justified, both for the concrete languages that Bale, Gagnon and Khanjian consider, and for languages of types 2 and 3 more generally. My argument below shows that Turkish morphologically singular nouns are semantically number-neutral only in non-argument position; otherwise, they are semantically singular. Morphologically singular nouns are naturally atomic mass nouns in Western Armenian, but I argue that this kind of denotation cannot be the one that the noun has in the numeral+noun construction—for that, a count denotation is required. I suspect that it is possible to arrive at similar conclusions for the other languages belonging to types 2 and 3 (but see Acquaviva 2005 and Farkas and de Swart 2003 for Hungarian), but I will not be able to show that here. In Scontras' and my analysis of the data, in sections 4-6, it is assumed that morphologically singular nouns in argument position, and in the numeral+noun construction, are semantically singular throughout.

Examples such as the following are usually used in the literature (Acquaviva 2005, Bale, Gagnon and Khanjian 2011a, Bliss 2004, Corbett 2000, Göksel and Kerslake 2005, Görgülü 2012, Walter 2014) to show that morphologically singular nouns in Turkish are number neutral:

(26) *Turkish*
   Kitap   al-dı-m
   book   buy-PAST-1SG
   'I bought a book/books'

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[12] See below for more on the semantics of *yergu dagha* vs. *yergu daghaner*.

[13] The semantics of morphologically plural nouns can also vary, as can be seen from (18) vs. (21)/(24). This is due to the fact that, whereas English has inclusive plurals (that is, plurals that denote sets of atoms and non-atoms), Turkish and Western Armenian morphological plurals are only exclusive (that is, they denote sets of non-atoms only), as Bale and Khanjian (2008, 2014), Bale, Gagnon and Khanjian (2011a, b), Görgülü (2012) and Martí (2017b) show (exclusive and inclusive plurality shouldn't be confused with exclusive and inclusive first person). The issue of plurality, and of the distribution of inclusive and exclusive plurality, takes an important role in sections 5-6. Variation in the semantics of plural forms is not part of the analysis of the pattern in Table 1.

(27) *Turkish*

    Ağaç-ta   **kuş**   öt-üyor.
    Tree-LOC   bird   sing-PROG
    'A bird/birds is/are singing in the tree'

(28) *Turkish*

    Ali-yi   **arı**   sok-tu
    Ali-ACC   bee   sting-PAST
    'Bees stung Ali'/'Ali got bee-stung'

(29) *Turkish*

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

In all of (26)-(29), the highlighted nouns receive a number neutral interpretation. One reason why that might be is that, as in (20), the nouns in these sentences themselves have a number neutral denotation. However, it is well known, as discussed in Cabredo Hofherr (to appear a, and references cited there), that number neutrality can have sources other than a number-neutral noun semantics. In particular, Martí (2017b) and Sağ (2016, 2017) show that the number neutrality of Turkish morphologically singular nouns is attested only in pseudo-incorporation contexts, when morphologically singular nouns appear in non-argument position. This being so, it is likely that the source of the number neutrality we observe in (26)-(29) is due to the semantics of pseudo-incorporation (see Carlson 2006 and Dayal 2015 for overviews on the semantics of (pseudo-)incorporation). In turn, this calls into question a number-neutral semantics for nouns 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. Öztürk (2009), on the basis of developments in Massam (2001) (for Niauean; for Hindi pseudo-incorporation, see Dayal 2011), argues that the more appropriate description is that Turkish has noun pseudo-incorporation (given the fact that the relationship between the noun and the verb is less constrained in Turkish than in languages traditionally considered to have incorporation), of both themes and agents. Lack of pseudo-incorporation in Turkish is recognizable from Case marking, syntactic position and intonation, as argued for Öztürk (2009) (see also Kan 2010). Importantly, when pseudo-incorporation does not occur, that is, when the nouns in question are forced into argument positions, morphologically singular nouns in Turkish are semantically singular. For example, consider (30), a minimal pair for (26) (notice that Turkish has no definite article):

(30) *Turkish*

    Kitab-ı   al-dı-m
    book-ACC   buy-PAST-1SG
    'I bought the book'

Accusative Case marking in Turkish induces definiteness effects, as is well known (see Enç 1991, von Heusinger and Kornfilt 2005, among others). Adding it to (26), as in (30), has two effects, however: one is the expected definiteness of the noun; the other is that the noun is now unambiguously interpreted as singular. The latter effect is fully

expected if nouns in Turkish can undergo pseudo-incorporation with the verb, but not when Case marked. Lack of adjacency between the noun and the verb also prevents pseudo-incorporation, and, again, a semantically singular interpretation is the only possible interpretation in that case, as the minimal pairs in (27)/(31) and (27)/(32) show:

(31) *Turkish*
    Kuş   ağaç-ta   öt-üyor.
    bird   tree-LOC   sing-PROG
    'The bird is singing in the tree'

(32) *Turkish*
    Arı   Ali-yi   sok-tu
    bee   Ali-ACC   sting-PAST
    'The bee stung Ali'

If the noun-verb connection is disrupted by other means, such as a pause introduced between the noun and the verb ((33)), or stress on the verb ((34)), the singular interpretation arises again (cf. (28) and (29), where stress is on *çocuk*, respectively):

(33) *Turkish*
    Ali-yi   **arı** [ ] sok-tu
    Ali-ACC bee   sting-PAST
    'The bee stung Ali'

(34) *Turkish*
    Çocuk <u>gel-miş</u>
    child   come-EVID
    'The child came'

Finally, if a second noun is the one that undergoes pseudo-incorporation, then the first noun can only be interpreted as semantically singular (cf. (26)):

(35) *Turkish*
    Çocuk kitap oku-du
    child   book read-PAST
    'The child did book-reading'/'The child read one or more books'

Thus, when the conditions for pseudo-incorporation are not met, as in (30)-(35), semantically singular (definite) interpretations arise in Turkish, which suggests that the number neutrality of examples in (26)-(29) is not due to the semantics of the nouns, but to the semantics of (pseudo-)incorporation.[14]

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[14] As expected, these nouns can only take narrow scope. See Öztürk (2009) for other arguments for pseudo-incorporation in Turkish.

Notice that the above singular interpretations cannot be blamed on Case, the syntactic position of the noun or intonation, because plural forms get semantically plural readings in these cases, as shown for example in (36), with Accusative Case marking on the noun and with stress on the verb, from Ketrez (2003). (36) is interpreted as plural, not singular:

(36)   *Turkish*
        Ayşe **kitap-lar-ı**   oku-du
        Ayşe book-PL-ACC   read-PAST
        'Ayşe read the books'

Martí (2017b) suggests an analysis of these facts in which Turkish morphologically singular nouns are semantically singular and morphologically plural nouns as in (36) are semantically plural. She assumes that a ι-operator/type-shift (cf. Sharvy 1980, Link 1983, Partee 1987) operates in Turkish, which takes a set of individuals and returns the maximal individual that satisfies the predicate. When the set of individuals that this operator/type shift operates on is just a set of atoms, a well-formed result is obtained only if that set is a singleton. When the set of individuals contains only non-atoms, a well-formed result obtains only when there is a maximal non-atom entity that satisfies the input predicate. This gives the desired results in (30)-(36). There is no reason to think that there are two versions of the ι-operator/type-shift in Turkish, one singular, one plural, which would be responsible for semantic singularity and semantic plurality, respectively. That is, the number interpretation of the definite noun phrases in these examples plausibly comes from the semantics of the noun. Consider also that, as Martí (2017b) observes, even if the number neutral interpretation is the only pragmatically felicitous interpretation, as in (37) and (38), definite interpretations derived from a number-neutral semantics are impossible (cf. (31) and (32)), something which can be understood only if morphologically singular nouns in Turkish are not semantically number neutral, but singular:

(37)   *Turkish*
        [We've been talking about the birds in my garden:]
        #Kuş   ağaç-ta   öt-üyor.
          bird   tree-LOC   sing-PROG
        (#'The bird is singing in the tree')

(38)   *Turkish*
        [We've been talking about the bees in my garden:]
        #Arı Ali-yi   sok-tu
          bee Ali-ACC   sting-PAST
        (#'The bee stung Ali')

If *kuş* 'bird' and *arı* 'bee' were number neutral in these examples, we'd expect the sentences to be felicitous. Combined with the ι-operator/type-shift assumed above, a number neutral predicate would give rise to a definite plural interpretation when the maximal plural individual is the one that satisfies maximality, or to definite singular interpretation when a single atomic individual is the one that satisfies maximality. Nothing would prevent the definite plural interpretation in these cases; in fact, those interpretations are pragmatically favored. But only a definite singular interpretation is

possible in these examples, hence their infelicity (which also obtains for their English counterparts, as shown in the translation).

A few words about plurality in Turkish are in order. In addition to its function as a marker of standard plurality, exemplified in (36), –*lAr* can give rise to plurality of events and plurality of kinds readings (Ketrez 2003). These interpretations arise in examples such as (39), where there is no Case marker and where stress is on –*lAr* (cf. (36)):

(39) *Turkish*
    Ayşe **kitap-lar**   oku-du
    Ayşe book-PL   read-PAST
    'Ayşe engaged in multiple events of book-reading', or
    'Ayşe read different types of books'

For the plurality of events reading, Martí suggests that –*lAr* is similar to pluractional markers in other languages (see Cabredo Hofherr, to appear b and references cited there, Lasersohn 1995, and others)[15]. For the plurality of types reading, Ketrez assumes that there is no number projection associated with –*lAr*-marked noun phrases[16]. That the plural marker can give rise to these different kinds of readings might call into question the idea that the Turkish number system is a singular-plural number system. In particular, it might raise the question whether –*lAr* is comparable at all to English –*s* or Western Armenian –*(n)er*, given the differences (for more on –*(n)er*, see below). It's important to note that plurality of events or plurality of types readings cannot be the source of plurality of individual readings in Turkish, since the plurality of individuals reading is available in (36), but the plurality of events and plurality of types readings we observe in (39) 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 the distribution of these readings in subject to a number of constraints. In particular, only Case marking/definiteness can bring about the plurality of individuals reading. A standard account of semantic plurality is necessary, even when Turkish –*lAr* is capable of doing more than its counterparts in other languages.[17]

The discussion so far establishes that there is a distinction in Turkish between the semantic number of morphologically singular nouns in argument positions vs. non-argument positions. The next question to ask is whether nouns in the numeral+noun construction in Turkish are pseudo-incorporated or not. To maintain Bale, Gagnon and Khanjian's hypothesis that nouns in this construction are number neutral, and in view of the evidence provided above, it would have to be the case that such nouns pseudo-incorporate into the numeral. The main problem that this proposal has is that, as it currently stands, it would serve no purpose other than to facilitate the analysis of Turkish in terms of a number-neutral semantics for its nouns. We know that numerals may be syntactic heads, taking the noun (or a projection of the noun) as complement

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[15] Ketrez (2003) treats these cases as complex-predicate formation, but does not provide an explicit semantics.

[16] Though she doesn't discuss what mechanism would generate sub-kind readings. Chierchia's (1998) kind-forming ∩-operator does not give rise to sub-kind-readings, only to kind readings.

[17] In addition to being a marker of what Görgülü (2011) calls additive plurality, exemplified in (36) and (39), Turkish –*lAr* can also be a marker of associative plurality (Lewis 1967, Sebüktekin 1971, Göksel and Kerslake 2005, Görgülü 2011), and a marker of verbal agreement and distributivity (Ketrez 2003). Associative plurality has been argued to be a separate phenomenon from regular plurality in other languages, such as Japanese (see Nakanishi and Tomioka 2004), and Görgülü (2011) argues that in Turkish there is a separate associative plurality morpheme –*lAr*, with different syntax and semantics.

(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 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 a pseudo-incorporation relationship between numerals and nouns.[18]

   If Turkish morphologically singular nouns are in fact semantically singular, and not number neutral, the account of Turkish defended in Bale, Gagnon and Khanjian is no longer justified. 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 *çocuk* ((40), not (20)), since it is no longer the case that the denotation of its input argument contains both atoms and non-atoms:

(40) $[[çocuk]] = \lambda x.$ boy (x) & atom(x)

An intersective semantics also would not work, since (14) does not felicitously combine with (40). What would be 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 (41), with auxiliary definitions in (42) and (43) (cf. Higginbotham 1981: 110; Gillon 1984; Verkuyl & van der Does 1991; Schwarzschild 1994):

(41) $[[two_P]] = \lambda P_{et}.\lambda x. \exists S_{et} \prod(S)(x)$ & $|S|=2$ & $\forall s \in S$ $P(s)$

(42) $\prod(S)(x) = 1$ iff S is a cover of x, and $\forall z, y \in S$ $[z=y \lor \neg \exists a [a \leq z$ & $a \leq y]]$

(43) A set of individuals C is a cover of a plural individual X iff X is the sum of all members of C $(X = \sqcup C)$

S is a partition ($\prod$) 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 on 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 within 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. 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.

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[18] The only remaining facts which still point to a number neutral semantics for morphologically singular nouns 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 1980 and much subsequent literature). Given the evidence in the text, an analysis involving predicate distribution seems more plausible, an analysis that Bale, Gagnon and Khankian do not exclude (p. 588, ft. 5).

This is enough to call into question Bale, Gagnon and Khanjian's account of the cross-linguistic pattern of interest here. As for Western Armenian, I argue that, while it is plausible to assume that morphologically singular nouns are naturally atomic mass nouns in examples such as (44)-(46), which would directly give rise to a number neutral interpretation, this cannot be the interpretation of the noun in numeral+noun constructions in this language (and, possibly not the only interpretation of these nouns generally in Western Armenian)(examples from Sigler 1997):

(44) *Western Armenian*
    Maro-n   **tuz**   g-ude
    Maro-DEF   fig   IMP-eat.3SG
    'Maro eats one or more figs'

(45) *Western Armenian*
    Seʁan-e-n   **ʃiʃ**   ing-av
    table-ABL-DEF   bottle fall.AOR-3SG
    'From the table one or more bottles fell'

(46) *Western Armenian*
    Sud   badmə-v-ec-av
    lie   tell-PASS-AOR-3SG
    'One or more lies were told'

Despite the limited distribution that Sigler shows bare morphologically singular nouns have in Western Armenian, she argues that this language does not have noun (pseudo-)incorporation. Mohanan (1995), in her discussion of Hindi incorporation (which Dayal 2011 argues is actually pseudo-incorporation), shows that incorporated objects in Hindi are interpreted differently from their non-incorporated counterparts. Consider first (47), which Mohanan (1995: 91) argues to be ambiguous:

(47) *Hindi*
    Mohan   cʰuṭṭiyõ-me   **vækyum**   **kliinar**   bectaa   tʰaa
    Mohan.NOM   holidays-in   vacuum   cleaner.NOM sell.HAB   be.PAST
    'Mohan was selling vacuum cleaners during the holidays' or
    'Mohan was doing vacuum-cleaner-selling during the holidays'

The first reading in (47) arises from a structure in which the object *vækyum kliinar* 'vacuum cleaner' is not incorporated and is a regular syntactic object. The second reading arises from (pseudo-)incorporation of the noun into the verb. Truth-conditionally, the two readings are distinct, as can be seen from the fact that only the latter is compatible with the continuation in (48):

(48) *Hindi*
    Usne   do   mahine-me   ek   bʰii   vækyum   kliinar   nahĩĩ becii
    He.ERG   two   month-in   one   even   vacuum   cleaner.NOM NEG   sell
    'He didn't even sell one vacuum cleaner in two months'

(48) can be used as a continuation for (47), so this means that the interpretation that arises from (pseudo-)incorporation is available in (47). Similar examples in Western

Armenian, however, show that the bare nouns of interest here do not (pseudo-)incorporate. (50), for example, is not a possible continuation for (49):

(49)   *Western Armenian*
  Yerp Ani-n   Beirut gə-pənage-r   **kork** gə-dᶻaxe-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'

(50)   *Western Armenian*
  …# payc ayn yerek dar-va   əntack.i.n nuynisg meg had
    but that three year-GEN during   not.even one class
  kork čə-dᶻaxe-c
  carpet NEG-sell-AOR.3SG
  'But she didn't sell a single carpet in those three years'

Example (50) sounds like a contradiction when it follows (49). Notice that the equivalent examples from Turkish behave like those in Hindi, as expected. (52) is a possible and non-contradictory continuation for (51):

(51)   *Turkish*
  Anu Beyrut-ta yaşa-r-ken   **halı** sat-ar-dı.
  Anu Beirut-LOC live-AOR-when carpet sell-AOR-PAST
  'When Anu lived in Beirut, she did carpet-selling'

(52)   *Turkish*
  Fakat Anu o üç yıl boyunca tek bir halı sat-ma-dı.
  But Anu it three year during single one carpet even
  'But she didn't sell a single carpet in those three years.'

Other evidence for the lack of (pseudo-)incorporation offered by Sigler, not shown here, is that bare nouns can be part of coordinations in Western Armenian, but not in Hindi, as shown by Mohanan (1995).
  A more plausible explanation for the number-neutral interpretations in (44)-(46) is that morphologically singular nouns like *ʃiʃ* 'bottle' or *tuz* 'fig' are interpreted as mass nouns, 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 (see Bale and Barner 2009, Landman 2011, Rothstein 2010a, b, among others; for Sigler, they are typical mass nouns like *water* in English). If the bare nouns in (44)-(46) can be interpreted as naturally atomic mass, then what looks like a number neutral interpretation can actually be the same type of interpretation the nouns *furniture* or *luggage* have in the following examples:

(53) I bought **furniture** for the living room
(54) I carried **luggage** up the stairs

According to (53), I bought one or more pieces of furniture, and according to (54), I carried one or more pieces of luggage upstairs. Morphologically singular nouns of this kind 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):

(55) Maro-n   **ator**   kənets,   jes   **ator**   kənets-i,   menk
      Maro-DEF   chair   buy.PAST,   I   chair   buy.PAST-1SG, we
      ator   kənets-ink
      chair   buy.PAST-1PL
      'Maro bought a chair, I bought a chair, we bought a chair'

It seems quite plausible that the number neutral semantics we observe in examples (44)-(46) is due to the systematic availability of naturally atomic mass denotations for morphologically singular nouns in Western Armenian.[19] The next question is whether

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[19] For some (Khanjian 2012), but not all (Sigler 1997: 156) speakers, both typical mass nouns and morphologically singular nouns pattern together to the exclusion of morphologically plural nouns in that the former, but not the latter, require the presence of the definite article as subjects of kind or generic predications:

(i)   *Western Armenian*
      a. ***Vosgi**   suɣ   e
          gold   expensive   be.3SG
      b. **Vosgi-n** suɣ   e
          gold-DEF expensive   be.3SG
      'Gold is expensive'

(ii) *Western Armenian*
      a. ***Ahramoʁez**   votʃəntʃatsadz/pənatʃəntʃəvadz e
          dinosaur   annilated/extinct   be.3SG
      b. **Ahramoʁez-ə**   votʃəntʃatsadz /pənatʃəntʃəvadz e
          dinosaur-DEF   annilated/extinct   be.3SG
      'Dinosaurs are extinct.'

(iii) *Western Armenian*
      a. **Ahramoʁez-ner** votʃəntʃatsadz /pənatʃəntʃəvadz e-n
          dinosaur-PL   annilated/extinct   be-3PL
      b. **Ahramoʁez-ner-ə** votʃəntʃatsadz /pənatʃəntʃəvadz e-n
          dinosaur-PL-DEF   annilated/extinct   be-3PL
      'Dinosaurs are extinct'

Pires de Oliveira and Rothstein (2011) show that this contrast obtains in a good number of contexts in Brazilian Portuguese, where morphologically singular nouns mirror the distribution of typical mass nouns very closely. With regard to Bale and Barner's (2009) comparative construction test, it is difficult to see what the results mean. Bale and Barner argue that the comparative construction in (iv) can help tease apart the mass vs. count status of the noun involved:

(iv) Seymour has more **water/apples/luggage** than Esme

With typical mass nouns like *water*, the assessment of the comparison in (iv) necessarily takes place along a scale other than numerosity (volume in this case, but it can also be weight, length, etc.). With typical count nouns in their plural form, such as *apples*, and with naturally atomic mass nouns (Bale and Barner call them 'object-mass', and other labels are also used elsewhere), the comparison takes place only along the numerosity scale (i.e., (iv) is true if the number of apples or pieces of luggage that Seymour has is greater than Esme's, independently of their weight or volume), never along other scales. The problem is that Western Armenian *xəntsor* 'apple' can participate only in a non-numerosity comparison in (v):

the noun in the Western Armenian numeral+noun construction is a naturally atomic mass noun. Recall that Western Armenian allows both options in (56) for numerals greater than 1:

(56) *Western Armenian*
      Yergu   **dəgha/dəgha-ner**
      two   boy.SG/boy-PL
      'Two boys'

Relevant here is that Donabédian (1993) and Sigler (1997) argue that there is a difference in interpretation between the singular form and the plural form in such constructions. In the case of *yergu dəgha*, "the speaker is not interested in the individual [boys], but in the number and type of person", whereas in the case of *yergu dəghaner*, "the speaker is interested in the [boys] individually" (Sigler 1997: 41, 146-150). Consider the following examples (cf. Sigler's 1997: 148-50 own examples):

(57) *Western Armenian*

John:	Ajsor	ʃad	martig	gə	kal-en	gor	ajs	poɣots-i-n
	today	many	people	INDIC	walk-3PL.PRES	PROG	this	street-DAT-DEF
	metʃ							
	in							
	'A lot of people are walking on this street today'							
Bill:	Ajo	dʒiʃd	es	ajsor	yergu	**aɣtʃig**	ants-av	
	yes	right	be.2SG	today	two	girl	pass.by-PAST.3SG	
	'Yes, that's true. Two girls passed by today'							
Bill:	Ajo	dʒiʃd	es	ajsor	yergu	**aɣtʃig-ner**	ants-an	
	yes	right	be.2SG	today	two	girl-PL	pass.by-PAST.3PL	
	'Yes, that's true. Two girls passed by today'							

(v) *Western Armenian*
    Maro-n   indzme aveli   **xəntsor/xəntsorner/tʃur**   uni
    maro-DEF   me.ABL more   apple/apple.PL/water   has.3SG
    'Maro has more apple/apples/water than me'

The non-numerosity comparison is the only possible interpretation for the typical mass noun *tʃur* 'water', but also for the morphologically singular *xəntsor* 'apple' (only a numerosity comparison is possible for the plural noun, as expected). It is unclear what this tells us about the mass vs. count status of *xəntsor*. Compare this with the behavior of morphologically singular noun *pedra* 'stone' in Brazilian Portuguese in (vi), from Pires de Oliveira and Rothstein (2011: 2173). The comparison between the two gardens can be along the numerosity scale or the volume scale, an ambiguity which disappears in favor of the numerosity scale with the plural *pedras*:

(vi) *Brazilian Portuguese*
Esse	jardim	tem	mais	**pedra/pedras**	do	que	aquele
This	garden	have.3SG.PRES	more	stone/stone.PL	of.the	that	that
'This garden has more stone than the other one'							

(58) *Western Armenian*
   Teacher: Aʃagerd-ner,   ov   koɣtsa-v   xəntsor-əs
             student-PL   who   steal.PAST-3SG   apple-1SG.POSS
             'Students, who stole my apple?'
   Student: #Jes   desa   ov   ərav   yergu   **aɣtʃig**   xəntsor-ə   koɣts-av
             I   see.PAST   who   did   two   girl   apple-DEF   steal-PAST.3SG
             'I saw who did it. Two girls stole the apple'
   Student: Jes   desa   ov   ərav   yergu   **aɣtʃig-ner**   xəntsor-ə
             I   see.PAST   who   did   two   girl-PL   apple-DEF
             koɣts-an
             steal-PAST.3PL
             'I saw who did it. Two girls stole the apple'

When in the context number is relevant, as in (57), either numeral expression is appropriate. When in the context it is identity that is relevant, not number, as in (58), the numeral expression with the singular form of the noun is infelicitous, whereas the one with the plural form is felicitous. The plural form of nouns in this construction is thus compatible with both types of context, whereas the singular form of nouns is compatible only with the counting context. Notice that this difference between the morphologically singular and plural forms is not associated *per se* with the plural suffix, as no such effect obtains in (59) or (60):

(59) *Western Armenian*
   Yereg   kiʃer   **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'

(60) *Western Armenian*
   ʒoʁov-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 (57) and (58) follows from morphologically singular nouns being (typical) mass in the numeral+noun construction, and from the morphologically plural noun being count. According to Sigler, *dəgha* in (56), being (typical) mass, does not allow differentiation among different subparts of the boy-mass. Being count, *dəghaner* does allow such differentiation, which then 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 *menino* in Brazilian Portuguese. *Dəgha* in (56), 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 nouns 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 *luggage* or *mail* in Western Armenian, but typical mass nouns in the language do not combine directly with

numerals, as shown in (61) (cf. (62)) (see Khanjian 2012):

(61) *Western Armenian*
    *Jerek   **kini/vosgi/alujr**
     three   wine/gold/flour

(62) *Western Armenian*
    Hisun   gram   **alujr**
    fifty   gram flour
    'Fifty grams of flour'

We must then assume that Western Armenian morphologically singular nouns in (56) appear there in a second, count denotation, and that the difference illustrated in (57)/(58) is due to something other than a potential mass/non-mass contrast. The first idea is indeed part of Scontras' account, as shown in the next section, and of the developments I introduce to it in later sections. 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 denotation arises:

(63) *Western Armenian*
    Maro-n   **tuz-ə** g-ude
    Maro-DEF   fig-DEF IMP-eat.3SG
    'Maro eats the fig'

(64) *Western Armenian*
    Seʁan-e-n   **ʃiʃ-ə**   ing-av
    table-ABL-DEF   bottle-DEF   fall.AOR-3SG
    'From the table the bottle fell'

(65) *Western Armenian*
    Sud-ə   badmə-v-ec-av
    lie-DEF   tell-PASS-AOR-3SG
    'The lie was told'

This semantically singular interpretation is not due to the definite article, since the definite article gives rise to definite plural interpretations with plural marked nouns, as in (66) or (67):

(66) *Western Armenian*
    Piʁ-er-ə   pax-a-n
    Elephant-PL-DEF   escape-AOR-3PL
    'The elephants escaped'

(67) *Western Armenian*
    Maro-n   **tuz-er-ə**   g-ude
    Maro-DEF   fig-PL-DEF   IMP-eat.3SG
    'Maro eats the figs'

Notice that it is unlikely that this semantically singular interpretation is derived from the naturally atomic mass interpretation. Consider (68), where, despite the pragmatic pressure, only the singular interpretation arises—the Western Armenian example is as infelicitous as its English counterpart:

(68) *Western Armenian*
[We've been talking about the very many bottles on the table:]
#seʁan-e-n   ʃiʃ-ə   ing-av
  table-ABL-DEF bottle-DEF   fall.AOR-3SG
(#'From the table the bottle fell')

If it was possible to derive a singular interpretation from the mass interpretation, there'd be no reason why a plural interpretation couldn't be derived as well, specially given the context in (68)—yet, this doesn't occur. This is different from naturally atomic mass nouns which, I hypothesize, do not have a second, count interpretation available, as in the case of English (and this would be the reason why they cannot appear in the numeral+noun construction, cf. *three luggage*):

(69) [We've been talking about the very many pieces of luggage that need to be taken to the airport:]
We can now bring the **luggage** to the car

As for the contrast between (57)/(58), a possibility worth pursuing 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; see Martí and Ionin 2017 and references cited there).[20]

Bale, Gagnon and Khanjian (2011a) assume that the denotation of both numerals and nouns can vary from one language to another. In particular, the differences in Table 1 follow from morphologically singular nouns in English being semantically singular while semantically number neutral in Turkish and Western Armenian, and, for numerals greater then 1, from numerals having a subsective denotation in English and Turkish and an intersective denotation in Western Armenian. I have shown, however, that morphologically singular nouns with a number-neutral semantics do not appear in argument positions in Turkish. In Western Armenian, morphologically singular nouns are naturally atomic mass nouns, but such nouns cannot be counted, so that cannot be the interpretation of nouns in the numeral+noun construction. Thus, the amount of variation in noun and numeral denotations that Bale, Gagnon and Khanjian (2011a) need is undesirable theoretically and unjustified empirically.

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[20] 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 (56):

(i) *Western Armenian*
    Yergu (had) dəgha/dəgha-ner
    two   CLASS boy.SG/boy-PL
    'Two boys'

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).

4 Scontras (2014) and the semantics of number features

Scontras (2014), on the other hand, proposes a single semantics for all numerals, including *one*, and a single semantics for morphologically singular nouns across the three language types in Table 1. For Scontras, and for the developments I introduce to it later in the paper, morphologically singular nouns in the three types of languages are taken to be semantically singular, but the semantics of the feature [SINGULAR] can vary from one language to another.

For the semantics for nouns, he assumes the following, where '*' is Link's (1983) *-operator:

(70) $[[boy]] = \lambda x. boy(x) \& atom(x)$
        $[[*boy]] = \lambda x. boy (x)$

Like Link (1983) and many others, Scontras draws a distinction between semantic plurality and morphological plurality; in particular, denotations such as $[[*boy]]$ can be appealed to in the absence of morphological plurality. This plays an important role below in his explanation of the facts. A second ingredient in Scontras' account are the two number features [SG], which triggers singular form (even if null) and agreement, and [PL], which triggers plural form and agreement. Regarding the semantics of these features, Sauerland's (2003) presuppositional approach is assumed. This means that whereas [SG] comes with a singularity presupposition, [PL] is presupposition-less:

(71) $[[SG]] = \lambda P: \forall x \in P [\#x=1].P$
        $[[PL]] = \lambda P.P$

Given Heim's (1991) Maximize Presupposition, which Sauerland and Scontras assume, it follows that, if the presuppositions of [SG] are met, then [SG] is used; otherwise, [PL] is used. The syntax of noun phrases that have no numeral is as in (72), with further structure above NumberP possible but not necessary[21]:

(72)   …
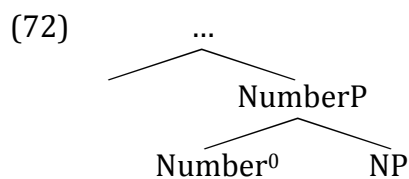
We now consider the four possible combinations of noun semantics and number features in a language of type 1:

(73)
     a. $[[SG\ boy]] = [[boy]] = \lambda x. boy(x) \& atom(x)$ $\rightarrow$ *boy*
     b. $\#[[SG\ *boy]]$ $\rightarrow$ **boy*
     c. $\#[[PL\ boy]] = [[boy]] = \lambda x. boy(x) \& atom(x)$ $\rightarrow$ * *boys*
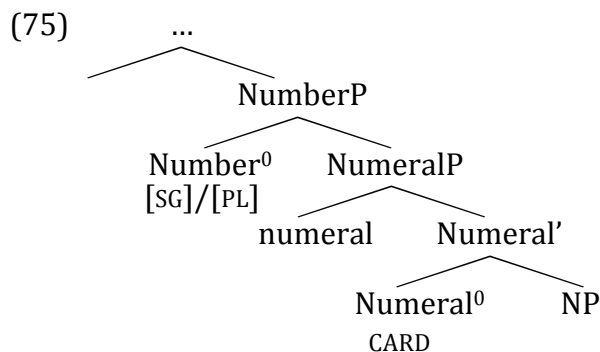   d. $[[PL\ *boy]] = [[*boy]]$ $\rightarrow$ *boys*

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[21] Given the varied ways in which authors designate the head that hosts number features, I've decided to call it Number^0. It is '#' in Scontras (2014), 'ɸ' in Sauerland (2003), and 'Num^0' in Harbour (2014). As for NP in (72), it is 'nP' for Harbour (2014). The term 'noun phrase' as used in this paper is merely descriptive and applies to whatever the final projection in (72) and related structures is.

When combined with [SG], only [[boy]], (73)a, and not [[*boy]], (73)b, gives rise to a well-formed meaning. In the case of (73)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 [[boy]], thus giving rise to the correct semantics. In the case of (73)b, on the other hand, [[*boy]] 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 (73)b would have yielded the form *boy*, it does not yield a well-formed meaning, but (73)a does, which also yields the form *boy*. The feature [PL], being presupposition-less, gives a well-formed result whether it combines with [[boy]] or [[*boy]], as shown in (73)c and (73)d, but (73)c is disfavored by Maximize Presupposition, as (73)a delivers the same result but uses an item with a presupposition, the feature [SG]. Thus, (73)a is realized morphologically as *boy*, with the corresponding (atomic) semantics of [[boy]] in (70), and (73)d is realized morphologically as *boys*, with the corresponding (inclusive) semantics of [[*boy]].

As for numerals, all numerals denote numbers (or degrees), of type <n>, in this system (cf. (13), (14)), following Hackl (2001), Krifka (1995), Rothstein (2011) and many others. Thus:

(74) [[one]] = 1
      [[two]] = 2

Numerals occupy the specifier position of NumeralP in (75) ('NumP' for Scontras), a projection headed by Numeral[0], which in our case is occupied by the cardinality predicate CARD, and with NP as its syntactic argument:[22]

(75)   ...
         _____
              NumberP
          _____
    Number[0]   NumeralP
    [SG]/[PL]   _____
            numeral   Numeral'
                    _____
                 Numeral[0]   NP
                   CARD

Crucial is the work of CARD, whose semantics is as follows, also as in Hackl (2001) and others[23]:

(76)   [[CARD]] = λPλnλx. P(x) & #x = n

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. Given these assumptions, the reason why in a

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[22] Scontras argues that NumeralP 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).
[23] Though (76) does not include existential quantification over individuals, which the cardinality predicate is assumed to do in many accounts. The assumption here is that existential quantification is effected by a (silent) quantifier higher in the structure.

language of the first type, like English, *two boys* is possible but *two boy* isn't is as follows. First, CARD may combine with either [[boy]] or [[*boy]]:

(77)

    a. [[CARD boy]] = λnλx. [[boy]](x) & card(x) = n

    b. [[CARD *boy]] = λnλx. [[*boy]](x) & card(x) = n

Either (77)a or (77)b may then combine with the numeral, though the result of that is not well-formed for (77)a (there are no members in [[boy]] constituted of exactly 2 atoms):

(78)

    a. #[[two CARD boy]]

    b. [[two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2

There are then two possibilities to consider for NumberP: either (78)b combines with [SG], as in (79)a, or it combines with [PL], as in (79)b:

(79)

    a. #[[SG two CARD *boy]]   →*two boy

    b. [[PL two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → *two boys*

(79)a is a presupposition failure, and hence so is *two boy*, because there are no members in the denotation of its input (in (78)b) constituted of exactly 1 atom. Only (79)b is then well-formed, which correctly gives rise to *two boys* and to its correct semantics. For *one*, we have the following, where Scontras needs to appeal to an additional Economy Principle, in (80):

(80) Economy Principle: given two expressions that are denotationally equivalent and where one expression is more complex than the other, choose the simpler expression

(81) provides the two possibilities we have for NumeralP at this point:

(81)

    a. [[one CARD boy]] = λx. [[boy]](x) & card(x) = 1

    b. [[one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1

We then have the following four possibilities for NumberP:

(82)

    a. [[SG one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → *one boy*

    b. #[[SG one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → * *one boy*

    c. #[[PL one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → * *one boys*

    d. #[[PL one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → * *one boys*

In (82)a, the presuppositions of [SG] are satisfied by the denotation of its input, a set of atoms. This means that it, and not (82)c, is chosen, and *one boy* results (with the correct semantics), not *one boys*. (82)b and (82)d are ruled out by the Economy Principle in

(80), since they are denotationally equivalent to (82)a but are more complex (since [[*boy]] is used, and [[*boy]] is more complex than [[boy]]).

This is the account for languages of type 1. For languages of type 2, such as Turkish, Scontras also assumes (70), and the same syntax for phrases with and without numerals. There is a 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 P—for any P, the relative atoms of P are those members of P which have no parts in P:

(83) $card_{P\text{-}atom}$ (x) is defined only when P(x)=1.
When defined, $card_{P\text{-}atom}$ (x) = |{y∈P: y≤x & ¬∃z∈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 (84), with [SG_T] being the singular number feature for Turkish, and with [PL] still presupposition-less:

(84) [[SG_T]] = λP:∀x∈P [$card_{P\text{-}atom}$ (x)=1].P
[[PL]] = λP.P

For numeral-less phrases, this system gives rise, correctly, to the following relationship between morphology and semantics:

(85)
a. [[SG_T çocuk]] = λx. boy(x) & atom(x) → *çocuk*
b. #[[SG_T *çocuk]] → * *çocuk*
c. #[[PL çocuk]] → * *çocuklar*
d. [[PL *çocuk]] = λx. boy(x) → *çocuklar*

In (85)a, the presupposition of [SG_T] is satisfied, since [[çocuk]] denotes a set of individuals that have no parts that are also in [[çocuk]]. This is not true in the case of (85)b, which is thus a presupposition failure—it is not the case that all members of its sister are P-atoms, since the set contains plural individuals and their parts. (85)a is correctly realized as *çocuk* and gives rise to the desired semantics. Both (85)c and (85)d satisfy the requirements of [PL], since this feature imposes no requirements. (85)c, however, expresses the same meaning as (85)a, and (85)a is presuppositional while (85)c is not, so (85)c is not selected. (85)d is morphologically realized as *çocuklar* 'boys' and gives rise to the desired semantics. For phrases with a numeral, we have:

(86)
a. [[CARD boy]] = λnλx. [[boy]](x) & card(x) = n
b. [[CARD *boy]] = λnλx. [[*boy]](x) & card(x) = n

(87)
a. #[[two CARD boy]]
b. [[two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2

Maximize Presupposition chooses (88)a over (88)b, giving rise to *iki çocuk* 'two boys' with the correct semantics:

(88)
   a. [[SG_T two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → *iki çocuk*
   b. [[PL two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → * *iki çocuklar*

Maximize Presupposition chooses (89)a over (89)c; (89)b and (89)d are not selected because there is a less complex expression for each one, (89)a and (89)c, respectively, as per the Economy Principle in (80). The correct morphological realization and meaning result:

(89)
   a. [[SG_T one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → *bir çocuk*
   b. #[[SG_T one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → * *bir çocuk*
   c. #[[PL one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → **bir çocuklar*
   d. #[[PL one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → **bir çocuklar*

The account of Turkish *bir* 'one' combinations and English *one* combinations is the same, even if [[SG_T]]≠[[SG]]; that's because with respect to a set of atoms, absolute atomicity and relative atomicity yield the same result (see (82) and (89)). Given SG_T, twosomes count as atomic for Turkish *iki* 'two' (and threesomes for *üç* 'three', etc.), so nouns are morphologically singular with all numerals ((88)). These do not count as atomic for [[SG_E]] ((79)).

   The account for languages of type 3, such as Western Armenian, is simply that the singular feature in this language is ambiguous between [SG_T] and [SG_E]. *Meg* 'one' surfaces with morphologically singular nouns because both (82) and (89) yield the same result. When [SG_T] is used with *yergu* 'two', etc., a morphologically singular noun surfaces ((88)). When, instead, [SG_E] is used, a morphologically plural noun surfaces ((79)). [SG_T] and [SG_E] do not compete with each other in Western Armenian, since they are both equally presuppositional. The correct semantics is produced.

5 Scontras' [SG_T] = Harbour's [+minimal]

While Scontras manages to account for the cross-linguistic patterns in Table 1 with a single semantics for numerals (including *one* and its equivalents in Turkish and Western Armenian) and without claiming that morphologically singular nouns in Turkish or Western Armenian are number neutral, the sensitivity of [SG_T] to relative atomicity serves no purpose other than to derive the Turkish and Western Armenian patterns. This is a stipulation that should be derived from independently needed principles, with the hope that doing so would constrain the possible range of meanings that the singular feature can have. I argue that Harbour's (2011, 2014) [+minimal] feature, which he shows to be part of a compositional theory of number values, and thus motivated independently, is [SG_T]. Seeing [SG_T] as Harbour's [+minimal], we can derive the language type 1 vs. language type 2 pattern in precisely the principled way we were after. That is, according to the proposal made here, numeral+noun constructions in languages of type 2 use the form of the noun that they do because the theory of grammar assigns those languages a [±minimal] number system. After introducing some of the basics in Harbour (2014), I go on to argue, with the help of Martí (2017a, b), that deriving Scontras' stipulation for languages of type 2 requires us to abandon Saulerland's (2003) theory of plurality, on which Scontras' system is built, as we saw in section 4.

Harbour (2014; see also 2011) derives all possible number values (singular, plural, minimal, paucal, etc.) from a compositional theory of number features. Two of the three features he postulates are [±atomic] and [±minimal]:[24]

(90) $[[+\text{atomic}]] = \lambda P\lambda x.\ P(x)\ \&\ \text{atom}(x)$
     $[[-\text{atomic}]] = \lambda P\lambda x.\ P(x)\ \&\ \neg\text{atom}(x)$

(91) $[[+\text{minimal}]] = \lambda P\lambda x.\ P(x)\ \&\ \neg\exists y\ P(y)\ \&\ y<x$
     $[[-\text{minimal}]] = \lambda P\lambda x.\ P(x)\ \&\ \exists y\ P(y)\ \&\ y<x$

[±Atomic] is sensitive to atoms, like [SG$_E$], whereas [±minimal] is sensitive to minimal parts, just like [SG$_T$]. The number system of a given language may choose one or more features. If it just chooses [±atomic], a straightforward singular-plural system like that of English, Spanish or German results. Languages may choose [±minimal] instead, or both [±minimal] and [±atomic] (see below). These features may combine with a third feature, [±additive], not discussed here, with well-formed feature combinations giving rise to the attested number values in the number systems of the languages of the world. Importantly, the full cross-linguistic typology of number system is derived from the same small set of principles.

In many cases, as shown in Harbour (2011), it is impossible to tell whether a system is [±atomic] or [±minimal]. That's because, in the basic case, $[[+\text{atomic}]](P) = [[+\text{minimal}]](P)$, and $[[-\text{atomic}]](P) = [[-\text{minimal}]](P)$. Justification for [±minimal] comes from cases where the two features come apart. One such case is presented by languages that distinguish inclusive from inclusive first person pronouns or agreement markers, such as Winnebago (Lipkind 1945), as shown in Table 2:

	minimal	**augmented**
1st person exclusive	ha-	ha- -wi
1st person inclusive	hin-	hin- -wi
2nd person	ra-	ra- -wi
3rd person	Ø-	Ø- -ire

Table 2 Winnebago agreement

Since the speaker-hearer dyad is the minimal unit of the 1st person inclusive, it counts as [+minimal] ((91)), but not as [+atomic] ((90)). All of the augmented forms are [−minimal] instead of [−atomic]: that's more than 1 for all persons except for the 1st person inclusive, for which it is more than 2 (i.e., more than the speaker-hearer dyad).

Another case in which the difference between [±atomic] and [±minimal] can be appreciated is in systems that have both (see Noyer 1992). These are singular-dual-plural systems, found in many languages (e.g., Slovenian, see Marušič and Žaucer, to appear and references cited there). Suppose the feature value [−atomic] applied first to a predicate, and then [+minimal] applied:

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[24] I deviate from Harbour in that I treat the contribution of the number features to be entirely made up of entailments, whereas for him some of their content is presupposed. (i) is Harbour's semantics for

(i) $[[+\text{minimal}]] = \lambda P\lambda x:\ P(x).\ \neg\exists y\ P(y)\ \&\ y<x$
   $[[-\text{minimal}]] = \lambda P\lambda x:\ P(x).\ \exists y\ P(y)\ \&\ y<x$

Nothing of what I say here depends on this. [±Atomic] is of type <e,t>, not <et, et>, in his proposal, but, again, the difference is not important here.

(92) [[+minimal]]([[−atomic]](P))

[−Atomic] yields the subset of P, call it Q, that contains all and only the non-atoms in P. Q is then the input for [+minimal], which delivers the subset of Q that contains all and only those individuals in Q which have no subparts in Q. This is the set containing all the plural P-individuals each of which is constituted of exactly 2 atoms. Thus, (92) gives rise to dual number, morphologically and semantically. (93) shows what the three possible number values in a [±atomic, ±minimal] system are:

(93) [+minimal]([+atomic](P)) → singular
      [−minimal]([+atomic](P)) → #
      [+minimal]([−atomic](P)) → dual
      [−minimal]([−atomic](P)) → plural

Harbour derives the cross-linguistic typology of number systems from these assumptions. Impossible number systems cannot be derived in his account. E.g., a number system with dual but no plural cannot be derived because [−atomic] is a building block of both dual and plural, so dual cannot exist without plural. Plural can exist without dual because dual also necessitates [+minimal], whereas plural doesn't.

Importantly, [+minimal] achieves the same result as Scontras' [SG_T]. To see this, consider (88)a again, repeated as (94)b, where [SG_T] applies to (87)a, repeated as (94)a, and compare it to the result of applying [+minimal] to (87)a, in (94)c:

(94)
      a. [[two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2
      b. [[SG_T two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2
      c. [[[+minimal] two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2

[SG_T] 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 (94)a, which indeed satisfies [SG_T]. Thus, NumberP in (94)a, which uses Scontras' [SG_T], 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, [SG_T] = [+minimal]. This is important because the cost of Scontras' analysis diminishes substantially once this is accepted: 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 predict is now principally constrained.

This can only be achieved if languages of type 2 are [±minimal] systems—in Harbour's system, if [+minimal] can be the value of Number^0, then so can [−minimal]. But then questions arise. What happens then 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 plurals, and numeral+noun combinations, are derived if languages of type 2 are [±minimal] systems.

As it turns out, however, there is a basic incompatibility between Sauerland's (2003) proposal (and hence Scontras') and Harbour (2014): Martí (2017a, b) argues that embedding a view of plurality like Sauerland's in Harbour's system makes the wrong predictions about the cross-linguistic typology of plurality. In fact, so far we've ignored the proper treatment of plurality, in particular, the distinction between inclusive and exclusive plurals (see ft. 13). Plural noun forms in English are well-known for giving rise to either exclusive or inclusive readings (see Farkas and de Swart 2010, Grimm 2012, Kiparsky and Tonhauser 2012, Krifka 1989, 1995, Lasersohn 1995, 2011, 2011, Martí 2017a,b, Sauerland 2003, Sauerland, Anderssen and Yatsushiro 2005, Spector 2007, Yatsushiro, Sauerland and Alexiadou 2017, Zweig 2009). The plural forms in (95) are interpreted inclusively: e.g., according to (95)a, Lina harvested neither one nor more tomatoes. Denotationally, this means that [[tomatoes]] should include both singular and plural tomato individuals:

(95)
 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 forms are usually interpreted exclusively. If (96)a is true, for example, Lina needs to have harvested more than one tomato:

(96)
 a. Lina harvested **tomatoes**
 b. **Students** came to the party
 c. I have **children**

Not all languages have inclusive plurals. For example, plural forms in Turkish (Görgülü 2012) and Western Armenian (Bale, Gagnon and Khanjian 2011a, b, Bale and Khanjian 2008, 2014)) are only exclusive:

(97) *Turkish*
  Çocuk-lar-ın var mı?
  child-PL-GEN exist Q
  'Do you have two or more children?'

(98) *Western Armenian*
 a. **Bəzdig-ner** unis?
   child-PL   have.2SG
   'Do you have two or more children?'
 b. Amen mar   vor **bəzdig-ner** uner vodk-i   gajne-tsav
   all   person that child-PL had foot-GEN/DAT stand-up
   'Everyone who had two or more children stood up'

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 forms are ambiguous between exclusive and inclusive readings (Farkas and de Swart 2010, Grimm 2012,

Martí 2017a, b). According to the second type, plural forms 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 and as discussed in section 4; note that these principles are sensitive to the monotonic properties of the environment the plural form finds itself in). I refer to the second type of account as the Sauerland-style view of plurality—for our purposes, exactly how this approach is implemented is not so important, as all of these systems are [+atomic]-only systems. In either type of account, the semantics of [PL] in languages with only exclusive plurals can be treated as unambiguously exclusive.

Importantly for us, Martí (2017a, b) argues that the Sauerland-style view of plurality is incompatible with Harbour's account. Her argument is as follows. First, note that Sauerland-style accounts of plurality amount, in Harbour's terms, to the postulation of number systems that deploy [+atomic] (or a presuppositional version of it) to the exclusion of [−atomic]. [+Atomic]-only languages are languages with singulars and with inclusive plurals in downward-entailing questions and questions, like English. However, if languages can deploy [+atomic] without also deploying [−atomic], then it follows that such languages cannot use [−atomic] elsewhere. But Harbour (2011) and others argue that [−atomic] is used to derive dual number, as we saw earlier in this section. Thus, the Sauerland-style 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, such as Slovenian. Either the Sauerland-style view of plurality, or Harbour's theory of number, has to be abandoned. As argued above, we must keep Harbour's theory of number if we are to derive the cross-linguistic pattern in Table 1 on more principled grounds.

Martí proposes to embed the 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 plurals. The availability of inclusive plurals is due in her account to general number, a number distinction not previously detected for English, which involves, syntactically, not projecting NumberP (that is, having no number features operating on NP). Additionally, she assumes that languages like English associate noun phrases where NumberP is not projected with plural forms (more on this assumption in section 6). This then derives the number neutrality associated with inclusive plurals in the right contexts. The availability of exclusive plurals is due to [−atomic].[25]

Martí's analysis of plural forms being the only one that is compatible with the derivation of Scontras' [SGT] from Harbour's theory, a language like English must be a [±atomic] language (with the possibility of not generating NumberP, more on which in section 6). But then this means that [PL] in English cannot be Scontras' [PL]. Thus, an alternative account of the cross-linguistic pattern in Table 1 is necessary if we want to be able to properly constrain the contribution of singular features across languages.

Note that simply adding a [−atomic] feature to Scontras' system does not work. Suppose that we added the feature [EX-PL] to Scontras' system, with the following contribution ([IN-PL] is Scontras' previous [PL]):

---

[25] Plural forms in the other languages of types 2 and 3 remain to be explored. Given Martí (2017a, b), they may or may not have inclusive plurals, depending on whether they allow NumberP not to project. Even if they do, they may choose a different form to spell out the resulting structures (e.g., the morphologically singular form), which would make them languages with exclusive plurals but inclusive and exclusive singulars.

(99)   [[SG]] = λP:∀x∈P [card(x)=1].P
       [[IN-PL]] = λP.P
       [[EX-PL]] = λP:∀x∈P [card(x)>1].P

We also need to add a third possible denotation for nouns, else [EX-PL] is useless:

(100) [[boy]] = λx. boy(x) and atom(x)
       [[*boy]] = λx. boy(x)
       [[⁺boy]] = λx. boy(x) and ¬atom(x)

(99) is compatible with Harbour's, and thus Martí's, proposal, or, at least, it can be made compatible with it, as [SG] is very close to [+atomic], and [EX-PL], to [−atomic]. Both [EX-PL] and [IN-PL] are spelled out by *–s*. No wrong prediction concerning languages with dual number and inclusive plurals are made, as we can hypothesize that [EX-PL], or something very close to it, is one of building blocks of the dual. But, while this gives the desired results for languages of type 1, it does not work for languages of type 2. Consider first noun phrases without numerals in English:

(101)
    a. [[SG boy]] = λx. boy(x) and atom(x)   → *boy*
    b. #[[SG *boy]]   → * *boy*
    c. #[[SG ⁺boy]]   → * *boy*
    d. #[[IN-PL boy]] = λx. boy(x) and atom(x)   → * *boys*
    e. [[IN-PL *boy]] = λx. boy(x)   → *boys*
    f. #[[IN-PL ⁺boy]] = λx. boy(x) and ¬atom(x)   → * *boys*
    g. #[[EX-PL boy]]   → * *boys*
    h. #[[EX-PL *boy]]   → * *boys*
    i. [[EX-PL ⁺boy]] = λx. boy(x) and ¬atom(x)   → *boys*

(101)d and (101)f are ruled out by Maximize Presupposition (against (101)a and (101)i, respectively). (101)e gives rise to *boys* with an inclusive semantics, and (101)i, to *boys* with an inclusive semantics. For the case of numerals, we consider, as usual, the case of numerals greater than 1, in (102), and the case of *one*, in (103):

(102)
    a. [[CARD boy]] = λnλx. [[boy]](x) & card(x) = n
    b. [[CARD *boy]] = λnλx. [[*boy]](x) & card(x) = n
    c. [[CARD ⁺boy]] = λnλx. [[⁺boy]](x) & card(x) = n
    d. #[[two CARD boy]] = λx. [[boy]](x) & card(x) = 2
    e. [[two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2
    f. [[two CARD ⁺boy]] = λx. [[⁺boy]](x) & card(x) = 2
    g. #[[SG two CARD *boy]]   → *two boy*
    h. #[[SG two CARD ⁺boy]]   → *two boy*
    i. #[[IN-PL two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → *two boys*
    j. #[[IN-PL two CARD ⁺boy]] = λx. [[⁺boy]](x) & card(x) = 2   → *two boys*
    k. [[EX-PL two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → *two boys*
    l. [[EX-PL two CARD ⁺boy]] = λx. [[⁺boy]](x) & card(x) = 2   → *two boys*

(102)g and (102)h are presupposition failures, but they are the only sources of *two boy*, so *two boy* is ungrammatical. (102)i and (102)j lose out on the basis of Maximize Presupposition to (102)k and (102)l, respectively. *Two boys* thus has two sources, (102)k and (102)l, but they give rise to the same, correct meaning for it, so they co-exist. Both Maximize Presupposition and the Economy Principle of section 4 get put to use in the case of *one*:

(103)

    a. [[one CARD boy]] = λx. [[boy]](x) & card(x) = 1

    b. [[one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1

    c. #[[one CARD ⁺boy]]

    d. [[SG one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → *one boy*

    e. #[[SG one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → **one boy*

    f. #[[IN-PL one CARD boy]] = λx. [[boy]](x) & card(x) = 1   → **one boys*

    g. #[[IN-PL one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → **one boys*

    h. #[[EX-PL one CARD boy]]   → **one boys*

    i. #[[EX-PL one CARD *boy]]   → **one boys*

(103)d gives rise to *one boy* with the correct semantics. (103)e loses against it on the basis of Scontras' economy principle. (103)f is less presuppositional than (103)d, so Maximize Presupposition rules it out as a source for *one boys*. (103)g loses out against it on the basis of economy, so the only other source for *one boys* ((103)h and (103)i are presupposition failures) is also ruled out, and *one boys* is predicted to be ungrammatical.

    Thus, the English pattern is still predicted when we add the feature [EX-PL] to Scontras' system. This, however, is not true for Turkish. The Turkish number system makes no use of [IN-PL], since its plurals are never inclusive. We thus have the following for Turkish (the same results obtain if the features were [±minimal]):

(104)   [[SGᴛ]] = λP:∀x∈P [card_{P-atom} (x)=1].P

        [[EX-PL]] = λP:∀x∈P [card(x)>1].P

This creates a problem because it is no longer predicted that numerals greater than 2 in Turkish do not combine with plural-marked nouns, as both features in (104) are presuppositional and thus one cannot be picked over the other on the basis of Maximize Presupposition. To see this, consider the following:

(105)   [[çocuk]] = λx. boy(x) and atom(x)

        [[⁺çocuk]] = λx. boy(x) and ¬atom(x)

The derivation of bare nouns, whether morphologically singular or plural, is unproblematic and gives rise to the correct semantics:

(106)

    a. [[SGᴛ çocuk]] = λx. boy(x) and atom(x)   → *çocuk*

    b. #[[SGᴛ ⁺çocuk]]   → * *çocuk*

    c. #[[EX-PL çocuk]]   → * *çocuklar*

    d. [[EX-PL ⁺çocuk]] = λx. boy(x) and ¬atom(x)   → *çocuklar*

The problem arises from the impossibility of choosing (107)e over (107)f:

(107)
      a. [[CARD çocuk]] = $\lambda n\lambda x$. [[boy]](x) & card(x) = n
      b. [[CARD $^+$ çocuk]] = $\lambda n\lambda x$. [[$^+$boy]](x) & card(x) = n
      c. #[[iki CARD çocuk]]
      d. [[iki CARD $^+$çocuk]] = λx. [[$^+$boy]](x) & card(x) = 2
      e. [[SG$_T$ iki CARD $^+$çocuk]] = λx. [[$^+$boy]](x) & card(x) = 2   → *iki çocuk*
      f. [[EX-PL iki CARD $^+$çocuk]] = λx. [[$^+$boy]](x) & card(x) = 2   → *iki çocuklar*

Note that the problem arises only with numerals greater than 1—(108)d is ruled out as a presupposition failure, so (108)c is the only possible source for *bir N*, and *bir çocuk* results, with the correct semantics:

(108)
      a. [[bir CARD çocuk]] = λx. [[boy]](x) & card(x) = 1
      b. #[[bir CARD $^+$çocuk]]
      c. [[SG$_T$ bir CARD çocuk]] = λx. [[boy]](x) & card(x) = 1   → *bir çocuk*
      d. #[[EX-PL bir CARD çocuk]]   → * *bir çocuklar*

In fact, the account just sketched is what we would want for Western Armenian, since (106), (107) and (108) gives rise to the Western Armenian pattern. The problem is that, if this is how the Western Armenian pattern is derived, we then have no account of Turkish. Assuming an additional denotation for nouns in Turkish, as in (109), doesn't help, as numerals greater than 2 are still predicted to be able to combine either with singular or with plural nouns:

(109) [[çocuk]] = λx. boy(x) and atom(x)
       [[$^+$çocuk]] = λx. boy(x) and ¬atom(x)
       [[*çocuk]] = λx. boy(x)

The impossibility of choosing (110)m/(110)n over (110)o/(110)p is what causes the problem, as (110)o and (110)p are well formed:
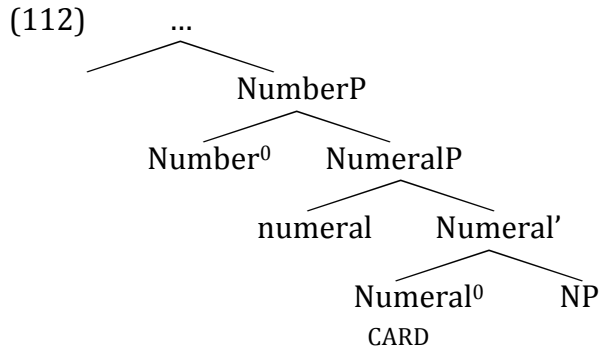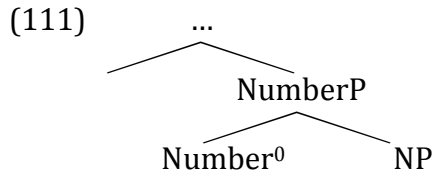
(110)
      a. [[SG$_T$ çocuk]] = λx. boy(x) and atom(x)   → *çocuk*
      b. #[[SG$_T$ *çocuk]]   → * *çocuk*
      c. #[[SG$_T$ $^+$çocuk]]   → * *çocuk*
      d. #[[EX-PL çocuk]]   → * *çocuklar*
      e. #[[EX-PL *çocuk]]   → * *çocuklar*
      f. [[EX-PL $^+$çocuk]] = λx. boy(x) and ¬atom(x)   → *çocuklar*
      g. [[CARD çocuk]] = $\lambda n\lambda x$. [[boy]](x) & card(x) = n
      h. [[CARD *çocuk]] = $\lambda n\lambda x$. [[*boy]](x) & card(x) = n
      i. [[CARD $^+$çocuk]] = $\lambda n\lambda x$. [[$^+$boy]](x) & card(x) = n
      j. #[[iki CARD çocuk]] = λx. [[boy]](x) & card(x) = 2
      k. [[iki CARD *çocuk]] = λx. [[*boy]](x) & card(x) = 2
      l. [[iki CARD $^+$çocuk]] = λx. [[$^+$boy]](x) & card(x) = 2
      m. [[SG$_T$ iki CARD $^+$çocuk]] λx. [[$^+$boy]](x) & card(x) = 2   → *iki çocuk*

n. [[SG_T iki CARD *çocuk]] = λx. [[*boy]](x) & card(x) = 2   → *iki çocuk*
o. [[EX-PL iki CARD *çocuk]] = λx. [[*boy]](x) & card(x) = 2   → *iki çocuklar*
p. [[EX-PL iki CARD +çocuk]] = λx. [[+boy]](x) & card(x) = 2   → *iki çocuklar*
q. [[bir CARD çocuk]] = λx. [[boy]](x) & card(x) = 1
r. #[[bir CARD *çocuk]] = λx. [[*boy]](x) & card(x) = 1
s. #[[bir CARD +çocuk]]
t. [[SG_T bir CARD çocuk]] = λx. [[boy]](x) & card(x) = 1   → *bir çocuk*
u. #[[EX-PL bir CARD çocuk]]   → * *bir çocuklar*

6   A new account

Having shown that adding [EX-PL] to Scontras' original system, maintaining the Sauerland-style view of plurality, does not work, I propose the following analysis. First, the assumptions I make about the syntax of noun phrases with and without numerals are as before:

(111)

```
        ...
       /  \
      NumberP
     /      \
 Number⁰     NP
```

(112)

```
        ...
       /  \
      NumberP
     /       \
 Number⁰   NumeralP
          /      \
     numeral   Numeral'
              /      \
         Numeral⁰     NP
           CARD
```

Second, I assume Harbour's (2014) compositional theory of number features, in particular, Harbour's [±atomic] and [±minimal], repeated here:

(113) [[+atomic]] = λPλx. P(x) & atom(x)
       [[−atomic]] = λPλx. P(x) & ¬atom(x)

(114) [[+minimal]] = λPλx. P(x) & ¬∃y P(y) & y<x
       [[−minimal]] = λPλx. P(x) & ∃y P(y) & y<x

As in Scontras (and others), numerals denote numbers. CARD has the same semantics it had in his system too, repeated here:

(115) [[CARD]] = λPλnλx. P(x) & #(x) = n

The first difference with Scontras' proposal is a simplification: like Harbour does, I assume that any given count noun N in a language is assigned one denotation, namely,

[[*N]] (=[[NP]]). That is, count nouns denote join-semilattices and their denotation contains both atoms and non-atoms, and that is the only option for them. Since English has inclusive plurals, it allows NumberP in (111) not to be projected (see below for more on the relation between this and (112)). In Turkish and Western Armenian, on the other hand, NumberP is always there (recall (97), (98)). I propose that English is a [±atomic] system, Turkish is a [±minimal] system, and Western Armenian can use either feature, though not at the same time. I don't appeal to Maximize Presupposition or to the Economy Principle in (80).

In what follows, I first show that the pattern in Table 1 is derived from these assumptions straightforwardly once Martí's statement about the spell out of NumberP-less noun phrases and its relation to (112) is properly understood. I then comment on the plausibility of Turkish being a [±minimal] system instead of a [±atomic] system, and on the idea that a language may have two number features at its disposal, but deploy only one of them at any one time.

For languages of type 1 like English, we have that [+atomic] spells out as $\emptyset$, and [−atomic] as –*s*. Noun phrases with the syntax in (116), where (neither) NumberP (nor NumeralP) is projected, spell out as –*s*, as per Martí (2017a, b):

(116)   …
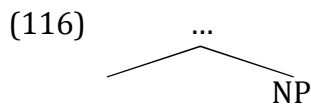
We thus have the following:

(117)

a. [[[+atomic] *boy]] = λx. [[*boy]](x) and atom(x)   → *boy*
b. [[[−atomic] *boy]] = λx. [[*boy]](x) and ¬atom(x)   → *boys*
c. [[*boy]] = λx. [[*boy]](x)   → *boys*
d. #[[[+atomic] two CARD *boy]]   → **two boy*
e. [[[−atomic] two CARD *boy]] = λx. [[*boy]](x) & card(x) = 2   → *two boys*
f. [[[+atomic] one CARD *boy]] = λx. [[*boy]](x) & card(x) = 1   → *one boy*
g. #[[[−atomic] one CARD *boy]]   → **one boys*

(117)a is the only source for *boy*, and it gives rise to the correct semantics for this noun phrase. (117)b gives rise to the form *boys* and assigns it an exclusive semantics, and (117)c results from (116), giving rise to an inclusive semantics. The Strongest Meaning Hypothesis then constrains their distribution, as per Farkas and de Swart (2010). (117)d is ill-formed, and the only source of *two boy*, so *two boy* is ungrammatical in English. (117)e, which generates [−atomic] in Number^0, is the only source for *two boys* and gives rise to the desired semantics. (117)f is the only well-formed source for *one boy*, and it gives rise to the correct semantics. (117)h is ill-formed, and the only source for *one boys*, which is thus predicted to be ungrammatical.

It is important to understand Martí's statement that the lack of NumberP is spelled out with plural forms in English properly for the account in (117) to work. There are, in particular, at least two ways of understanding it. One is that absence of NumberP is spelled out with plural forms in English. Another one is that the syntax in (116) is spelled out with plural forms in English. Either way gives the correct result for bare nouns, but only the second way gives the correct result for noun phrases with numerals. If the claim is specifically about the syntax in (116), then no further possibilities need be

considered for noun phrases with numerals in (117). If, on the other hand, it is the mere absence of NumberP that prompts the choice of plural forms in this language, the wrong predictions are made for *one boys*: this combination produces ungrammaticality, but it is predicted to be grammatical under this assumption—[[one CARD *boy]] 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 this way does not affect her analysis, so her account stays as is—this is the case even when further projections are added to (116), e.g., for quantified noun phrases, or noun phrases with a determiner. Note that the issue affects only languages like English, not Turkish or Western Armenian, since these languages have no inclusive plurals—(116) is never an option for them.

Languages of type 2 are [±minimal] systems in this account. In Turkish, [+minimal] spells out as $\emptyset$ and [−minimal] spells out as *–lAr*. We thus have:

(118)

    a. [[[+minimal] *çocuk]] = λx. [[*boy]](x) & ¬∃y [[*boy]](y) & y<x   → *çocuk*

    b. [[[−minimal] *çocuk]] = λx. [[*boy]](x) & ∃y [[*boy]](y) & y<x   → *çocuklar*

    c. [[iki CARD *çocuk]] = λx. [[*boy]](x) & card(x) = 2

    d. [[[+minimal] iki CARD *çocuk]] = λx. [[iki CARD *çocuk]](x) &
                             ¬∃y [[iki CARD *çocuk]](y) & y<x   → *iki çocuk*

    e. #[[[−minimal] iki CARD *çocuk]]   → * *iki çocuklar*

    f. [[bir CARD *boy]] = λx. [[*boy]](x) & card(x) = 1

    g. [[[+minimal] bir CARD *çocuk]] = λx. [[bir CARD *çocuk]](x) &
                             ¬∃y [[bir CARD *çocuk]](y) & y<x   → *bir çocuk*

    h. #[[[−minimal] bir CARD * çocuk]]   → * *bir çocuklar*

(118)d and (118)g give the same result that [SGT] gave in Scontras' system. (118)d denotes a set of boy individuals composed of exactly two atoms, these two-atom, plural boy individuals having no proper subparts in [[iki CARD *çocuk]] (which contains only plural boy individuals composed of exactly two atoms). (118)g denotes a set of boy individuals composed of exactly one atom, these atomic boy individuals having no proper subparts in [[bir CARD *çocuk]] (which contains only boy atoms). These are the only sources for the grammatical *iki çocuk* 'two boys' and *bir çocuk* 'one boy', respectively, which also result in the correct semantics. Crucially, no matter what numeral is present in the phrase, [−minimal], which spells out as *–lAr*, never gives rise to a well-formed result ((118)e, (118)h)—that is because [−minimal] selects from its input P those individuals that have proper subparts in P, and there are no such subparts in [[iki CARD *çocuk]], [[bir CARD *çocuk]], etc. Thus, the correct pattern is generated for Turkish from the assumptions made.

Finally, in this system languages of type 3 have at their disposal both [±minimal] and [±atomic] as features for Number⁰. In Western Armenian, [+minimal]/[+atomic] spells out as $\emptyset$, and [−minimal]/[−atomic] spells out as *–(n)er*. These features, however, cannot appear at the same time. This ensures that Western Armenian is correctly predicted not to have a dual (cf. discussion in section 5), but to have the language type 2 ((118)) and the language type 1 ((117)) patterns with numerals (in the latter case, minus any derivation in which NumberP is not present, since Western Armenian has no inclusive plurals). When [±atomic] is chosen for Number⁰, the English pattern follows. Notice, in particular, that [+atomic] cannot be the feature involved in the generation of *yergu dəgha* 'two boys', since (117)d is ill-formed. However, Western Armenian in this

account may choose to use [±minimal] in Number^0 instead, and (118)d, which uses [+minimal], results in the correct form and meaning for *yergu dəgha*. Likewise, [−minimal] cannot be the feature involved in the derivation of *yergu dəghaner* 'two boys', since (118)e uses this feature and is ill-formed. However, (117)e is also allowed in Western Armenian, and the correct form and meaning for *yergu dəghaner* results. Since both (117)g and (118)h are ill-formed, and since there is no other source for *meg dəghaner* 'one boys', *meg dəghaner* is predicted to be ungrammatical. *Meg dəgha* 'one boy' has two sources, (117)f and (118)g, both of which give rise to the correct semantics.

If this analysis is correct, then languages of type 2 are, against common assumption, not [±atomic] systems, but [±minimal] systems. The next question to ask is whether there are other parts of the grammar of these languages where we can detect that [±minimal], and not [±atomic], is at work. One place to look, given the discussion in section 4, is in their pronoun system—if these languages distinguished exclusive from inclusive first person, then it would be possible to tell whether [±atomic], or, on the contrary, [±minimal], is being used. 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 is thus compatible with Turkish being either a [±atomic] system or a [±minimal] system. The other languages that I hypothesize to belong to type 2, such as Finnish (Karlsson 1982: 74), Hungarian (Tompa 1968: 61) do not distinguish exclusive vs. inclusive first person (and neither do Western Armenian or Miya, Schuh 1998: 187). However, it is compatible with the analysis defended here that other languages belonging to type 2 (or 3), not discussed here, make it.

If the analysis presented here is correct, one new place in the grammar of a language were we might be able to tell whether [±atomic] or [±minimal] is at work is numeral+noun combinations. From the perspective of Harbour (2011, 2014), this result entails that it is possible to tell whether a system is [±atomic] or [±minimal] outside of the pronoun system of a language.

The final issue to address is the idea that a language would be either a [±atomic] system or a [±minimal] system, necessary in the account of languages of type 3. This is distinct from the claim that a language is a [±atomic, ±minimal] system. With the latter, as we saw in section 5, a singular-dual-plural system is generated:

(119)   [+minimal]([+atomic](P)) → singular
        [−minimal]([+atomic](P)) → #
        [+minimal]([−atomic](P)) → dual
        [−minimal]([−atomic](P)) → plural

In Harbour's theory, if a language has a [±atomic, ±minimal] number system, number values such as plain [+atomic], plain [+minimal], etc. are not possible. The claim for Western Armenian, and, more generally, languages of type 3, is, on the contrary, that none of the complex values in (119) are possible, but each of [+atomic], [+minimal], etc. is. The question is whether this claim is sensible within Harbour's theory. There two aspects of it to consider: (a) whether a language's number system could, in principle, be either [±atomic] or [±minimal], and (b) if so, how these features would be deployed in such a language. 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), exist. Consider Sursurunga, a language with a sophisticated number system on its emphatic pronouns (Corbett 2000: 26-30, Hutchisson 1986):

	singular	dual	lesser paucal	greater paucal	plural
1st exclusive	iau	giur	gimtul	gimhat	gim
1st inclusive		gitar	gittul	githat	git
2nd	iáu	gaur	gamtul	gamhat	gam
3rd	-i/on/ái	diar	gitul	dihat	di

Table 3 Sursurunga emphatic pronouns

Sursurunga has different forms of its emphatic pronouns depending on whether the number of referents is 1 (singular), 2 (dual), a very small number (lesser paucal), a slightly bigger number than that (greater paucal), or more than that (plural). Despite this level of sophistication on its emphatic pronouns, Sursurunga nouns are invariant and make no number distinctions at all (Don Hutchisson, p.c.). Independently of how Sursurunga is accounted for (for Harbour, it is a [±atomic, ±minimal, ±additive*][26] system), a basic distinction has to be made between the pronominal number system and the nominal number system.[27] 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 and no distinctions are made in other domains, but for the language type 3 account above to work, two separate sets of distinctions apply in the same domain (nouns).

This state of affairs might be less problematic than it seems at first sight. Going back to Miya, briefly 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 4:

singular form	plural form	translation
kúnkul	kúnkulálàw	*cap*
tùwàtúiw	tuwàtúwáwàw	*body*
dèrwétlí	dèrwátlyátlyàw	*leopard*
kàm	kàmàmáw	*house*
dəm	dəmàmàw	*tree*
dlərkiy	dlərkaw	*chicken*
'ám	təvàm	*woman*
áfúw	cùw	*goat*

Table 4 Miya pluralization

Other nouns, such as *dlərkiy* 'chicken' follow a separate pattern, and nouns such as *'ám* 'woman' and *áfúw* 'goat' have irregular plurals. When combined with numerals greater than 1, animate nouns, a class which includes all humans, most domestic animals and fowl, and some large wild animals, cannot be morphologically singular. Thus, we have:

(120) *Miya*
    a. təvàm/*'ám   tsər   (cf. *'ám wútə* 'one woman')
       woman.pl/woman.sg   two
       'Two women'

---

[26] In Harbour (2011, 2014), features are allowed to repeat; when that is the case, it is indicated with an asterisk. Thus, in Sursurunga, [±additive] repeats. See Harbour (2011, 2014) for more details.
[27] Sursurunga is not the only language to do this. Mele-Fila (Clark 2002) is another example of a language that displays (complex) number distinctions in one domain but not on another.

    b. dlərkaw/*dlərkiy   fəɗə
       chicken.pl/chicken.sg   four
    'Four chickens'
    c. cùwàwáw/*áfuw   dəɓítím
       goat.pl/goat.sg   ten
    'Ten goats'

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

(121) *Miya*
    a. zəkìyáyàw/zəkìy   vàatlə
       stone.pl/stone.sg   five
    'Five stones'
    b. kàmàmáw/kàm   máahà
        house.pl/house.sg six
    'Six houses'
    c. kusàmámàw/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 for one subset of nouns, the animate ones, whereas for another subset of nouns, the inanimate ones, either [±atomic] or [±minimal] is generated. 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.[28]

7 Conclusion

In this paper I have argued for an analysis of the cross-linguistic pattern in Table 1 based on the system in Scontras (2014), but with the following developments: (a) a single, number-neutral semantics for NP ([[*N]]) for all languages, as in Harbour (2011, 2014), (b) a non-arbitrary appeal to [SG$_T$] 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 in the three types of languages, facilitated by the adoption of Martí's (2017a, b) proposal. The proposal achieves this while maintaining the appeal of Scontras' system, including his uniform interpretation for all numerals across languages, and the correct treatment of bare nouns in Turkish and Western Armenian, which was shown to be a problem for Bale, Gagnon and Khanjian (2011a). I hypothesized English to be a [±atomic] number system, Turkish to be a [±minimal] number system, not [±atomic], and Western Armenian to be either [±atomic] or [±minimal], though both languages still surface as to what appear to be singular-plural languages:

---

[28] As Martí and Abels (in preparation) show, the system makes the prediction that languages that have the language type 3 pattern should not have dual number. This is because number systems such as (119), which give rise to the dual, when combined with numerals, produce different patterns of number marking on nouns than is the case for this language type. This prediction is not explored here.

	[±atomic]	**[±minimal]**	**[±atomic] or [±minimal]**
One N	morphologically singular N	morphologically singular N	morphologically singular N
Two, etc. N	morphologically plural N	morphologically singular N	morphologically singular or plural N
Example languages	English, Spanish, German	Hungarian, Turkish, Finnish	Western Armenian, Miya

Table 5 The three language types, according to their number system

Thus, the only element of variation in this system is the type of number system each language type has. In the account presented here, numerals greater than 1 combine with morphologically plural nouns in English because the individuals 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 combine, on the other hand, with morphologically singular nouns in Turkish because individuals in a set of non-atoms can also count as having no subparts in the set, and such a set can thus be characterized by [+minimal] (which spells out as ∅ 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), however, the paper demonstrates that the numeral+noun construction is another domain, in addition to inclusive first person pronouns, where the difference between [±atomic] and [±minimal] can be detected. From the perspective of Scontras (2014), the paper demonstrates that the structure of his explanation of the patterns in Table 1 does not require a Sauerland-style view of plurality. Consequences of these ideas for the number marking of nouns when combined with *zero* in different languages, and for more complex number marking systems, are discussed in Martí (2017c) and in Martí and Abels (in preparation), respectively.

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