Variation in the morpho-syntactic expression of numerically-quantified nominals

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1 Intro: variation in number-marking with cardinal numerals

There are cross-linguistic differences in the realization of nominal number in noun phrases with cardinal numerals (C-Ns for "cardinal-noun" expressions).

- plural obligatory (e.g. English)
- unmarked/singular obligatory, plural not possible (e.g. Turkish, Hungarian)
- either unmarked/singular or plural (e.g. W. Armenian)

(1) a. four book-s.PL b. * four book.SG

(2) a. * öt hajó-k b. öt hajó *Hungarian*
five ship-PL five ship.SG (Ortmann 2000: (4))

(3) a. yergu dəgha-ner b. yergu dəgha *Western Armenian*
two boy-PL two boy.SG (Bale and Khanjian 2014: (10))

Studying this variation is important for understanding three related issues:

- the link between number morphology and its interpretation
- the syntactic position of number in the nominal phrase
- the lexical semantics of numerals

Approaches to variation in number marking:

- The variation is **semantic** in nature: all numerals (apart from 'one') need to combine with semantically plural predicates. The semantics of singular (and possibly plural) differs across languages, but there is no mismatch between nominal number and interpretation (Bale et al. 2011, Bale and Khanjian 2014, Scontras 2013a, 2022, Martí 2020)

- The variation is **morpho-syntactic** in nature. All numerals (apart from 'one') need to combine with semantically singular or plural predicates (theories differ as to which), and there may be a mismatch between the overt nominal number and its interpretation, e.g., plural marking is the result of agreement, it itself is not interpreted. (Krifka 1989, Landau 2016, Ionin and Matushansky 2006, 2018, Alexiadou 2019, Sağ 2018, 2019; Sağ 2024)

Variation in the syntactic position of number within C-Ns:

- below the numeral (Bale et al. 2011, Bale and Khanjian 2014, a.o.)
- above the numeral (Scontras 2013b, 2022, Martí 2020)
- both below and above the numeral (Danon 2012, Norris 2014)

Variation in the lexical semantics of numerals:

- Numerals are predicates (or predicate modifiers) (Link 1983, Partee 1987, Landman 2004, Chierchia 2010, Rothstein 2009, 2017, Ionin and Matushansky 2006, 2018, a.o.)
- Numerals are number denoting (Krifka 1989, Scontras 2013b, 2022, Solt 2015, Martí 2020, Sağ 2024, a.o.)

2 Ingredients of cardinality measures

2.1 Three necessary ingredients

- Roots denoting precise numbers

(4) $[\![\sqrt{two}]\!] = 2$ type: n

- Expressions encoding a cardinality measure function

(5) $[\![\mu_{card}]\!] = \lambda x.\, |x|$ type: $\langle e, n \rangle$  $\rightsquigarrow$ 2

- Semantically plural predicates

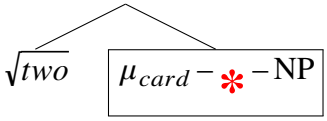
(6) a. $P \rightsquigarrow \{a, b, c, ...\}$
b. $^{*}P \rightsquigarrow \{a, b, c, ..., ab, bc, ac, ..., abc, ...\}$ (Link 1983's pluralizing operator)

A grammatical constraint on pseudo-partitives – structures with cardinal numerals and measure phrases (e.g., *two kilograms of raspberries*): the dimension of measurement needs to be monotonic on the part-whole relation in the domain given by the noun phrase, i.e., cardinality and the dimensions provided by pseudo-partitive measure phrases are *extensive* measures (Krifka 1989, Schwarzschild 2006), a.o.

2.2 Ways of putting the ingredients together

- Number-denoting numerals as arguments of the noun (Krifka 1989)

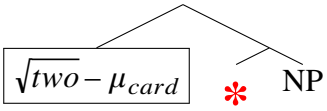
(7)



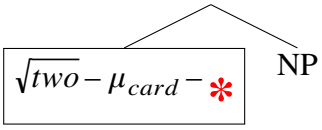
- Modifier numerals

  – numerals combine with semantically plural predicates
  (Link 1983, Partee 1987, Landman 2004, Chierchia 2010, Bale and Khanjian 2014, Rothstein 2009, 2017, a.o.)
  – numerals combine with semantically singular predicates (Ionin and Matushansky 2006, 2018)

(8) a.



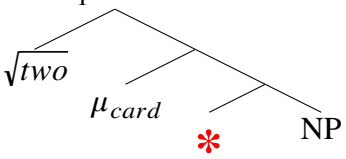
b.



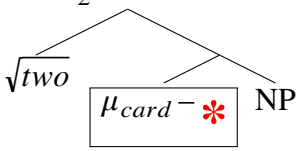
- Number-denoting numerals as arguments of a MEAS head, which encodes the cardinality measure function

  – MEAS_1: (Scontras 2013b, 2022, Solt 2015, Martí 2020, Pancheva 2023, a.o.);
  – MEAS_2 (Pancheva 2023; Pancheva and Cao 2024, Sağ 2024)

(9) a. MEAS_1



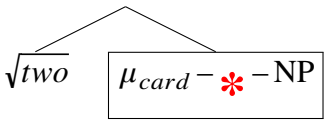
b. MEAS_2



3 A closer look at the various accounts

3.1 Number-denoting numerals as arguments of the noun

(10)



(Krifka 1989)

(11) $[\![two]\!] = [\![\sqrt{two}]\!] = 2$ type: n

(12) $[\![cat(s)]\!] = \lambda n \lambda x.\ x$ is a cat or cats and $|x| = n$ type: $\langle n, \langle e, t \rangle \rangle$

There is nothing inherent to the structure in (10) that requires a mismatch between number marking and interpretation, as in (12), but this is what is proposed:

> "Count nouns usually come in two morphological forms, singular and plural. But in examples like [... (RP/LTP: "two cats")], the plural is triggered syntactically and has no semantic effect at all." (Krifka 1989: 85)

(13) a. zero {cats/*cat}
b. one point zero {cats/*cat}
c. one {*cats/cat}

> "[... (RP/LTP: (13a), (13b))] have nothing to do with the semantic concept of plurality, but are easily explained if one assumes that the numerals 0 and 1.0 trigger syntactic plurality." (Krifka 1989: 85)

This conflates the semantic plurality of the C-N and that of the NP; (13a) and (13b)) present no problem for restricting the semantics of (12) to just plural-marked NPs, preserving a match between number morphology and number semantics.

The only problem for a straightforward mapping between morphological number and semantic number is (13c): **one cats* is semantically well-formed yet unacceptable.

In any event, this account denies the need to have a match between morphological number and semantic number. It could then say that in C-Ns the unmarked form is always used, and all numerals in English, except *one* trigger plural agreement, ruling out **one cats*.

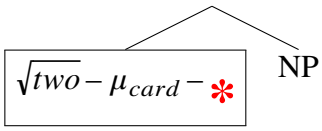
Outside of C-Ns, the *n* argument is existentially quantified. There is a pragmatic competition between bare plural *cats* and *a cat*.

(14) $[\![cat(s)]\!] = \lambda x \exists n.\ x$ is a cat or cats and $|x| = n$

On this account, cross-linguistic variation, as in (1)/(2)/(3), is due to whether morpho-syntactic agreement with the numeral is obligatory/not possible/optional.

3.2 Modifier numerals combining with semantically singular predicates

(15)



(Ionin and Matushansky 2006, 2018)

The account proposing (15) has to deny that there is a match between morphological and semantic number, unlike Krifka's account which doesn't have to (although it does). Whether singular- or plural-marked, NPs here denote semantically singular predicates, which are then pluralized by the numerals.

(16) $[\![cat(s)]\!] = \lambda x.\ x$ is a cat

(17) $[\![\textit{two}]\!] = \lambda P\, \lambda x\, \exists S.\ \Pi(S)(x)\ \wedge\ |S| = 2\ \&\ \forall s.\ s \in S \rightarrow P(s)$

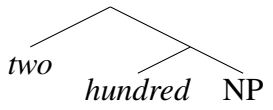
A set of individuals S is a partition Π of a plural individual x iff x is the sum of all members of S and the members of S do not overlap.

(18) a. $x = abcd$
b. $S_1 = \{a, b, c, d\}$ S_1 is a partition of x and its every member is a singular individual
c. $S_2 = \{ab, c, d\}$ S_2 is a partition of x but not every member of of S_2 is a singular individual
d. $S_3 = \{ab, cd\}$ S_3 is a partition of x but not every member of S_3 is a singular individual
e. $S_4 = \{ab, a, c, d\}$ S_4 is not a partition of x

The *lexical* NP complement must be semantically singular: Both S_2 and S_3 are partitions of x, but their cardinalities differ, from each other and from x.

However, the need for semantic singularity cannot be encoded in the lexical meaning of numerals, because of the structure assumed for complex numerals.

(19)



This structure is necessary because of the assumed semantics of numerals as predicate modifiers, and the same would hold if numerals are assumed to be predicates.

(20) a. $[\![\textit{two}]\!] = \lambda x_e\,.\,|x| = 2$
b. $[\![\textit{hundred}]\!] = \lambda x_e\,.\,|x| = 100$
c. $\#\,[\![\textit{two hundred}]\!] = \lambda x_e\,.\,|x| = 2 \wedge |x| = 100$

Numerals need to be able to combine both with semantically singular lexical NPs (e.g., *cats*) and semantically plural C-Ns (e.g., *hundred cats*)

(21) a. $[\![\textit{hundred}]\!] = \lambda P\, \lambda x\, \exists S.\ \ (S)(x)\ \wedge\ |S| = \textit{100}\ \&\ \forall s.\ s \in S \rightarrow P(s)$

after combining with a predicate of individuals, returns a predicate of plural individuals x such that x has a partition (a set) whose cardinality is 100 and whose members do not overlap

b. $[\![\textit{hundred cats}]\!] = \lambda x\ \exists S.\ \Pi(S)(x)\ \ \wedge\ \ |S| = 100\ \wedge\ \forall s.\ s \in S \rightarrow s$ is a cat

a predicate of plural individuals x such that x has a partition (a set) whose cardinality is 100 and whose members do not overlap and each member of the partition is a cat.

c. $[\![\textit{two hundred cats}]\!] = \lambda x\ \exists S.\ \Pi(S)(x)\ \ \wedge\ \ |S| = 2\ \wedge\ \forall s.\ s \in S \rightarrow Q(s)$

where $Q = \lambda x\ \exists S.\ \Pi(S)(x)\ \wedge\ |S| = 100\ \&\ \forall s.\ s \in S \rightarrow s$ is a cat]

a predicate of plural individuals x s.t. x has a partition whose cardinality is 2 and each member of the partition is itself a plural individual y s.t. y has a partition with a cardinality of 100 and each member of this partition is a cat – in other words, a plural individual with 200 atomic parts s.t. each atom is a cat.

- Ionin and Matushansky (2006, 2018): a definedness condition on counting blocks semantically plural lexical NPs:

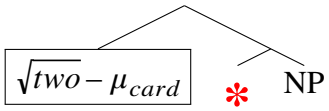
(22) ⟦'n'⟧(P)(x) is defined iff $\exists n\, \forall z\, [P(z) \rightarrow |z| = n]$
'only individuals of the same (known) cardinality can be counted.'

Coming back to the issue of semantic vs. morphological plurality, this account posits, like Krifka's, that all numerals in English, except *one*, trigger plural agreement. Cross-linguistic variation, as in (1)/(2)/(3), is due to whether morpho-syntactic agreement with the numeral is obligatory/not possible/optional.

Outside of C-Ns, plural marking does correspond to semantic plurality. In effect, there are two plural markers, one interpretable, and the other one not interpretable.

3.3 Modifier numerals combining with semantically plural predicates

(23)



(Link 1983, Partee 1987, Landman 2004, Chierchia 2010, Bale and Khanjian 2014, Rothstein 2009, 2017, a.o.)

The accounts in (23) maintain a match between morphological and semantic number.

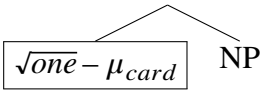
(24) a. ⟦ *cat* ⟧ = $\lambda x.\, x$ is a cat
b. ⟦ *cats* ⟧ = *⟦ *cat* ⟧ = $\lambda x.\, x$ is a cat or cats

(25) ⟦ *two* ⟧ = $\lambda P_{\langle e,t\rangle}\ \lambda x_e\, .\, P(x)\ \wedge\ |x| = 2$ type: $\langle\langle e,t\rangle, \langle e,t\rangle\rangle$

(26) a. ⟦ *two cat* ⟧ = $\lambda x_e\, .x$ is a cat $\wedge\ |x| = 2$ unacceptability predicted
b. ⟦ *two cats* ⟧ = $\lambda x_e\, .x$ is a cat or cats $\wedge\ |x| = 2$ acceptability predicted

One is the only numeral not to combine with a plural predicate, see (27), (28a). However, here too **one cats* presents a problem, as the general structure in (23) should be available in addition to (27), and it is interpretable. Perhaps competition can rule it out.

(27)



(28) a. ⟦ *one cat* ⟧ = $\lambda x_e\, .x$ is a cat $\wedge\ |x| = 1$ acceptability predicted
b. ⟦ *one cats* ⟧ = $\lambda x_e\, .x$ is a cat or cats $\wedge\ |x| = 1$ unacceptability not predicted

Some of these accounts address the cross-linguistic variation as well: the unmarked Ns in languages like Turkish and Armenian are semantically number-neutral (Bale et al. 2011; Bale and Khanjian 2014).

(29) a. ⟦ *dəgha* ⟧ = $\lambda x.\, x$ is a boy or boys *W. Armenian*
b. ⟦ *dəgha-ner* ⟧ = ⊛⟦ *boy* ⟧ = $\lambda x.\, x$ is boys

(30) a. $P \rightsquigarrow \{a, b, c, ...\}$

b. $^{*}P \rightsquigarrow \{a, b, c, ..., ab, bc, ac, ..., abc, ...\}$ (Link 1983's pluralizing operator)

c. $^{\circledast}P \rightsquigarrow \{ab, bc, ac, ..., abc, ...\}$ (Link 1983's strongly pluralizing operator)

(31) a. * $[\![two]\!](\{a, b, c, ...\}) = \{ab, bc, ac, ...\}$
English unmarked NPs

b. ✓ $[\![two]\!](\{a, b, c, ..., ab, bc, ac, ..., abc, ...\}) = \{ab, bc, ac, ...\}$
English plural-marked, W. Armenian unmarked NPs

c. ✓ $[\![two]\!](\{ab, bc, ac, ..., abc, ...\}) = \{ab, bc, ac, ...\}$
W. Armenian plural-marked NPs

These accounts further motivate the need for semantically plural predicates in C-Ns by positing the 'Strong Thesis' (a proposed semantic universal): numeral modification is restrictive, because modification in language is restrictive (Bale et al. 2011)

(32) a. * $[\![two]\!](\{a, b, c, ...\}) = \{ab, bc, ac, ...\}$
non-restrictive modification

b. ✓ $[\![two]\!](\{a, b, c, ..., ab, bc, ac, ..., abc, ...\}) = \{ab, bc, ac, ...\}$
restrictive modification

c. ✓ $[\![two]\!](\{ab, bc, ac, ..., abc, ...\}) = \{ab, bc, ac, ...\}$
restrictive modification

This account of number variation in C-Ns faces empirical challenges. NPs in Finnish, Estonian do not have number-neutral interpretations. The same has been argued for Turkish, outside of contexts of pseudo-incorporation.

(33) a. dəgha vaze-ts *W. Armenian*
boy run-PAST.**SG** (Bale and Khanjian 2014: (3), (7))
'One or more boys ran.'

b. dəgha-ner vaze-ts-in
boy-**PL** run-PAST-**PL**
'Two or more boys ran.'

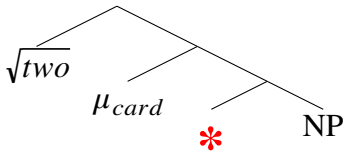
(34) Çocuk ev-e koş-tu. *Turkish*
child home-DAT run-PAST (Sağ 2022: (2a))
'The child ran home.' (undefined if more than one child ran home)

(35) John-ə yev Brad-ə { dəgha / dəgha-ner } en *W. Armenian*
John-def and Brad-def boy boy-**PL** **are**
'John and Brad are boys.' (Bale and Khanjian 2014: (4b),(6a))

(36) Matti ja Antti ovat { poikia / *poikaa }. *Finnish*
Matti and Antti are boy.**PL**.PART boy.**SG**.PART
'Matti and Antti are boys.'

3.4 Number-denoting numerals as arguments of MEAS which combines with semantically plural predicates

(37)



(Scontras 2013b, 2022, Solt 2015, Martí 2020, Pancheva 2023, a.o.)

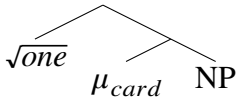
MEAS_1 encodes μ_{card}.

(38) $[\![\text{MEAS}_1]\!] = \lambda P\, \lambda n\, \lambda x.\, P(x) \;\wedge\; |x| = n$

This approach accounts for C-Ns in languages like English, while maintaining a match between morphological number and semantic number.

To derive *one cat*, and maintain the match between number morphology and interpretation, a structure without the pluralizing operator is needed, as in (39). To account for the unacceptability of **one cats*, given the availability of the structure in (37), one could restrict the number argument and the P argument of MEAS, as in (40).

(39)



(40) $[\![\text{MEAS}_1]\!] = \lambda P : \exists y\, [P(y) \;\wedge\; \neg\, atom(y)]\; \lambda n\; \lambda x.\, P(x) \;\wedge\; |x| = n$

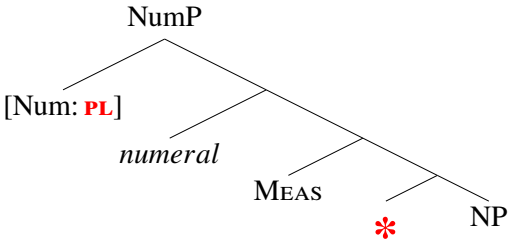
Scontras (2022) and Martí (2020) account for variation in number marking by proposing that:

- morphological number is encoded higher than the numeral
- semantic plurality is encoded below the numeral
- there is variation in the semantics of singular marking (and plural marking)

Martí (2020) implements this idea in terms of the features [± atomic] and [± minimal].

- In English, singular number is precluded because it encodes atomicity.

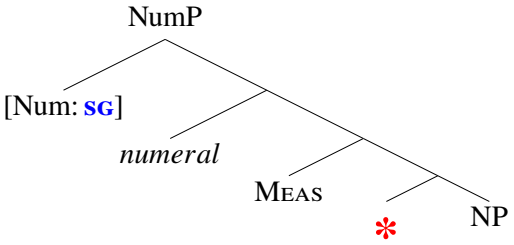
(41) *English*



$[\![\text{sg}]\!] = \lambda P \lambda x.\, P(x) \;\wedge\; atom(x)$
$[\![\text{pl}]\!] = \lambda P \lambda x.\, P(x) \;\wedge\; \neg\, atom(x)$

- In Turkish, singular is allowed, because it encodes minimality. Plural is prohibited for the same reason.

(42) *Turkish*



$[\![\text{sg}]\!] = \lambda P \lambda x.\, P(x) \ \wedge \ \neg \exists y.\, P(y) \ \wedge \ y \sqsubset x$
$[\![\text{pl}]\!] = \lambda P \lambda x.\, P(x) \ \wedge \ \exists y.\, P(y) \ \wedge \ y \sqsubset x$

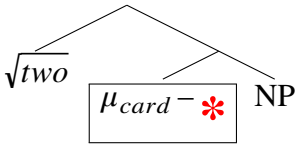
- In W. Armenian, where plural marking is optional, there is variation between an English-type grammar and a Turkish-type grammar, i.e., [± atomic] and [± minimal] systems co-exist.

This account cannot be extended to languages like Finnish or Estonian, which show evidence for high plural number, yet the NP has to be marked singular.

(43) *in nominative case contexts*
ne viimeiset kaksi pien-tä auto-a *Finnish*
this-NOM.PL last.NOM.PL two.SG small-PART.SG car-PART.SG
'these last two small cars' (Brattico 2010: (14) modified)

3.5 Number-denoting numerals as arguments of MEAS which combines with semantically singular predicates

(44)



(Pancheva 2023; Pancheva and Cao 2024, Sağ 2024)

MEAS_2 encodes μ_{card}. It selects semantically singular predicates and pluralizes them.

(45) $[\![\text{MEAS}_2]\!] = \lambda P : \forall y\, [P(y) \ \rightarrow \ atom(y)] \ \lambda n \ \lambda x.\, {}^{*}P(x) \ \& \ |x| = n$

Unlike all previous accounts, which claim that the structures for C-Ns that they posit are universal, with cross-linguistic differences restricted to syntactic agreement or the value of a high number feature, this account is meant to apply only to languages like Estonian, Finnish, Turkish, whose unmarked NPs are not generally number neutral, and which prohibit plural marking in C-Ns.

Further evidence from Alasha Mongolian (Toquero-Pérez 2024):

- In C-Ns, NPs are not overtly marked for number. This includes animates, which denote predicates of singular individuals (see handout 2). (Numerals appear with the ATTR morpheme, which is absent when the numeral is in predicative position.)

(46) a. { nigV-n/ ghorovV-n/ dulu-n} almort
one-ATTR three-ATTR seven-ATTR apple
'{one/ three/ seven} apples'

b. { nigV-n/ ghorovV-n/ dulu-n} xüch
one-ATTR three-ATTR seven-ATTR boy
'{one/ three/ seven} boys'

(47) a. almort bol { ghorovV(*-n)/ dulu(*-n) }
apple COP three-ATTR seven-ATTR
'The apples are {three/ seven}

b. xüch bol { ghorovV(*-n)/ dulu(*-n) }
boy COP three-ATTR seven-ATTR
'The boys are {three/ seven}

- In C-Ns, the NP cannot be PL-marked, regardless of animacy.

(48) a. * dulu-n nom-o:d
seven-ATTR book-**PL**
'seven books'

b. * dulu-n xüch-üd
seven-ATTR boy-**PL**
'seven boys'

- Numerals are compatible with unmarked inanimates modified by non-classificatory APs, which denote predicates of sinular individuals (see handout 2): (49).

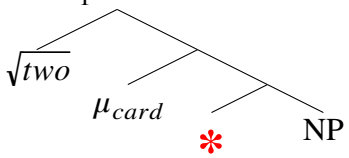
(49) dulu-n unte-n nom
seven-ATTR expensive-ATTR book
'seven expensive books'

- In sum:
  - numerals are incompatible with PL-marking;
  - numerals are compatible with unmarked animate nouns, which denote predicates of singular individuals
  - numerals are compatible with unmarked inanimates modified by non-classificatory APs, which denote predicates of singular individuals

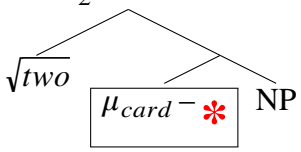
3.6 Number-denoting numerals as arguments of two types of MEAS

Two general structures for C-Ns, with languages having one or both, and possibly placing further restrictions on the NP and numeral arguments of MEAS. (Pancheva 2023; Pancheva and Cao 2024)

(50) a. MEAS$_1$



b. MEAS$_2$



(51) a. $[\![\text{MEAS}_1]\!] = \lambda P : \exists y\,[P(y) \wedge \neg\, atom(y)]\ \lambda n\ \lambda x.\ P(x) \wedge |x| = n$

b. $[\![\text{MEAS}_2]\!] = \lambda P : \forall y\,[P(y) \rightarrow atom(y)]\ \lambda n\ \lambda x.\ {}^{*}P(x)\ \&\ |x| = n$

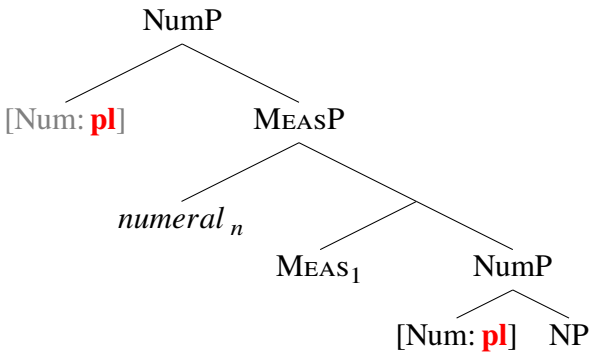
Two Number heads, as in (Danon 2012, Norris 2014)

- a low number head – the source of the number feature on N – provides the pluralizing operator * when marked plural; if it is missing from the structure, the NP is number neutral
- a high number head – seen on determiners and in external agreement – is marked plural, reflecting the semantic plurality of C-Ns; if it is not (independently) plural marked, it is valued by the lower number value.

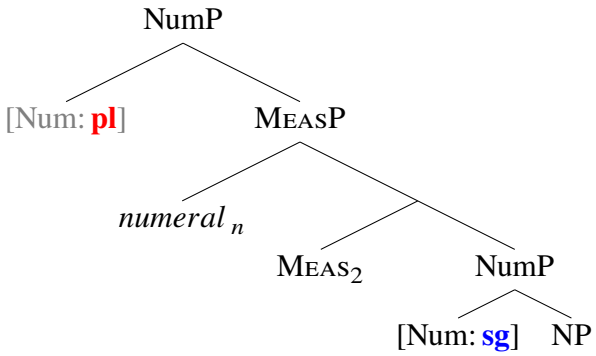
Accounting for cross-linguistic variation:

- English-type languages use MEAS$_1$, and have plural NPs in C-Ns
- Finnish, Estonian, Turkish, Mongolian, etc. use MEAS$_2$, and have singular NPs in C-Ns
- in all languages there is a match between number marking and number interpretation

(52) English



(53) Turkish, Finnish, Estonian



(54) Kolme lintu-a istu-i / istu-ivat oksa-lla. *Finnish*
three bird.NOM.**SG** sit-PAST.3**SG** sit-PAST.3**PL** branch-ADE (Kaiser 2022: (6))
'Birds sat on a branch.'

(55) Lintu-ja istu-i oksa-lla. *Finnish*
bird.PART.**PL** sit-PAST.3**SG** branch-ADE (Kaiser 2022: (4))
'Three birds sat on a branch.'

4 Further cross-linguistic variation

In addition to differences among languages, there is also variation within languages.

- Noun-class splits: nominal number and animacy

(56) a. cùwàwáw dəɓítím
goat.PL ten

b. * áfuw dəɓítím
goat.SG ten

Miya (Chadic, Nigeria)
(Martí 2020: (37c), (38b))

c. kàmàmáw máahá
house.PL six

d. kàm máahà
house.SG six

- Numeral splits: nominal number and adjective-like vs. determiner-like (high/low) syntax

(57) a. m?allm-eh waHd-eh
teacher-F.SG one-F.SG

b. m?allm-t-ein tn-t-ein
teacher-F-DU two-F-DU

Lebanese Arabic
(Ouwadaya 2014: 1.3.3)

c. arba? m?allm-eet
four teacher-F.PL

d. arb?iin m?allm-eh
forty teacher-F.SG

The analyses that consider variation in number to be a morpho-syntactic fact – whether numerals are predicates/predicate modifiers (Ionin and Matushansky 2006, 2018), or arguments of the noun (Krifka 1989) – can describe these facts, but not in an explanatory way:

- animate nouns in Miya trigger obligatory agreement; with inanimate nouns the agreement is optional.
- transdecimal numerals in Arabic prohibit agreement, numerals *one-nine* require agreement, numerals *one-two* have the syntax of adjectives

The analyses that consider singular/unmarked nouns to be number neutral (Bale and Khanjian 2014) cannot account for numeral splits as in Arabic, since it is the nouns that vary in form with the variation in numerals.

The analysis that proposes that singular number encodes minimality vs. atomicity (Martí 2020) would posit that languages with numeral splits and number splits have both [± atomic] and [± minimal] systems, like W. Armenian, but the specifics of the splits need to be stipulated:

- [± atomic] must be used with animate nouns in Miya
- [± atomic] must be used with lower numerals in Arabic, whereas [± minimal] must be used with transdecimal numerals

The analysis proposing two MEAS heads linking number-denoting numerals to nouns (Pancheva 2023; Pancheva and Cao 2024) can account for the noun class and numeral splits the same way it accounts for variation among languages.

- MEAS_1 in Arabic selects for numerals *three-nine*; MEAS_2 is the elsewhere case and so is restricted to transdecimal numerals via competition.

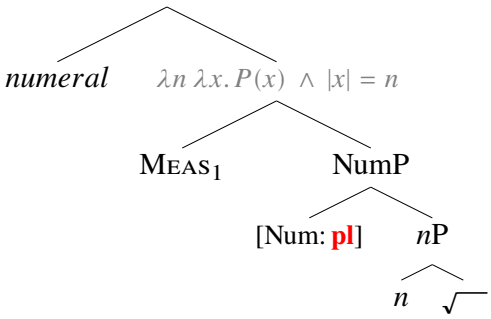
(58) $[\![\text{MEAS}_1]\!] = \lambda P : \exists y\,[P(y)\ \&\ \neg\, atom(y)]\ \ \lambda n :\ 3 \leq n \leq 10\ \ \lambda x.\ P(x)\ \&\ |x| = n$

- inanimate nouns in Miya are number neutral and they can combine directly with MEAS_1, though they may also first combine with plural; animate nouns are not number neutral and thus need to combine with plural before they can combine with MEAS_1.

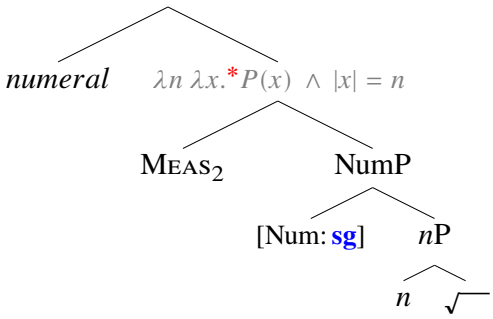
5 Determiner vs. modifier adjectives

MEAS$_1$ and MEAS$_2$ yield semantically plural predicates, satisfying the Monotonicity constraint.

(59) a.



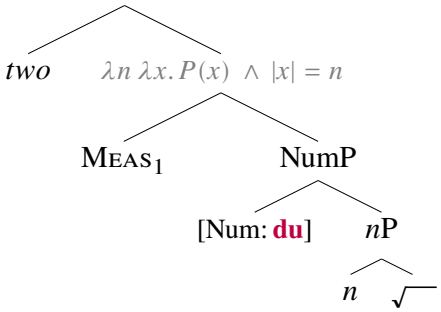
b.



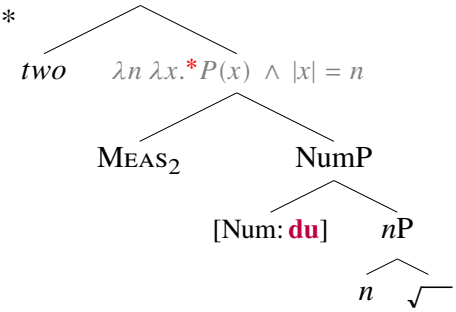
Numeral 'two' is compatible with both of these structures, and we see both, cross-linguistically. We also see a third structure, where 'two' has the syntax of an adjective, and combines with dual number.

Dual number is incompatible with MEAS$_2$, which requires a semantically singular predicate. If combined with MEAS$_1$ it would not satisfy the Monotonicity constraint, see (62).

(60) a.



b. *



(61) a. $[\![\,\text{MEAS}_1\,]\!] = \lambda P : \exists y\,[P(y) \wedge \neg\, atom(y)]\ \lambda n\ \lambda x.\ P(x) \wedge |x| = n$

b. $[\![\,\text{MEAS}_2\,]\!] = \lambda P : \forall y\,[P(y) \rightarrow atom(y)]\ \lambda n\ \lambda x.\ {}^{*}P(x)\ \&\ |x| = n$

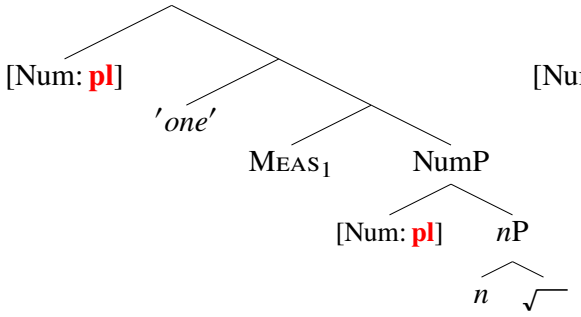
(62) $[\![\,\text{MEAS}_1$ **du** NP$\,]\!] = \{ab, bc, ac, ...\}$

We predict that if 'two' combines with dual number (as opposed to singular or plural), it cannot be number-denoting (determiner) but must be a modifier. (Pancheva 2022)

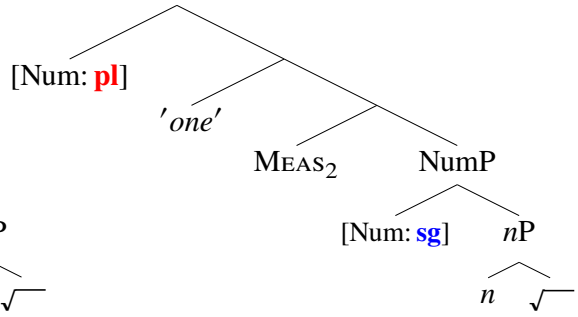
Numeral 'one' is compatible with both (59a) and (59b), yet we don't ever see it with MEAS$_1$. It typically has the syntax of an adjective and combines with singular number.

- incompatible with plural number (via MEAS$_1$) as the higher number is plural
- incompatible with singular number (via MEAS$_2$) as long as the higher number is plural

(63) a.



b.



'One' and 'two', cross-linguistically:

- 'One' does not trigger partitive case in Finnish, unlike 'two' and the rest of the numerals. 'One' is adjectival, 'two' is number-denoting, combining with MEAR$_2$.

(64) *in accusative case contexts*

a. yhde-n piene-n talo-n — *Finnish*
one-**ACC.SG** small-**ACC.SG** house-**ACC.SG** (Brattico 2010: (5b) modified)
'one small house'

b. kaksi pien-tä auto-a — *Finnish*
two.**SG** small-**PART.SG** car-**PART.SG** (Brattico 2010: (14) modified)
'two small cars'

- Hebrew 'one', unlike other numerals, agrees with singular nouns and has the syntax of an adjective (it appears post-nominally and shows robust gender agreement). 'Two' is not compatible with dual number, and it has the syntax of a number-denoting numeral, i.e., it appears pre-nominally and does not show robust gender agreement; it combines with MEAS$_1$.

(65) a. xatul 'exád
cat.**M.SG** one.**M**

b. šloša xatul-im — *Hebrew*
three.**M** cat-**M.PL** (Borer 2005: 194, 209)

c. štey 'ozn-ayim
two.**F** ear-**F.PL**

d. * {šney/štey} yom-ayim
two.**M**/two.**F** day-**M.DU**

- Arabic 'one' and 'two' are adjective-like in their syntax, i.e., they appear post-nominally and show gender agreement. 'Two' combines with dual-marked nouns.

(66) a. m?allm-eh waHd-eh
teacher-**F.SG** one-**F.SG**

b. m?allm-t-ein tn-t-ein — *Lebanese Arabic*
teacher-**F-DU** two-**F-DU** (Ouwadaya 2014: 1.3.3)

c. arba? m?allm-eet
four teacher-**F.PL**

d. arb?iin m?allm-eh
forty teacher-**F.SG**

- in Slovenian 'two' combines with dual number and is adjectival: it shows agreement, it is not associated with case-licensing

(67) *in accusative contexts*

a. dv-e knjig-i
two.F book.F.DU

b. dv-a avtomobil-a
two.M car.M.DU

Slovenian

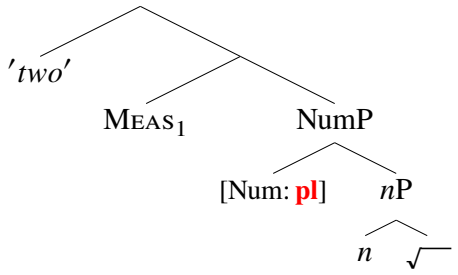
c. tri knjig-e
three book.F.PL

d. tri avtomobil-i
three car.M.PL

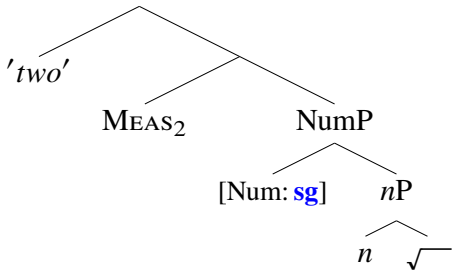
e. pet knjig
five book.F.GEN.PL

f. pet avtomobil-ov
three car.M.GEN.PL

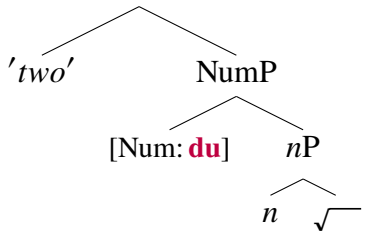
(68) a. *Hebrew*



b. *Finnish*

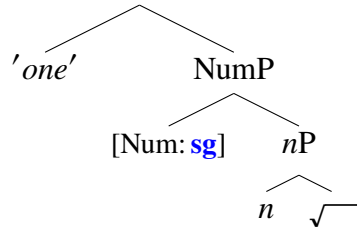


(69) *Arabic, Slovenian*



An adjectival structure for 'one' cross-linguistically (compatible with singular number as not subject to the monotonicity constraint)

(70) *Arabic, Hebrew, Slovenian, Russian, Bulgarian, Finnish*



References

Alexiadou, A. (2019). Morphological and semantic markedness revisited: the realization of plurality across languages. *Zeitschrift für Sprachwissenschaft*, 38:123–154.

Bale, A., Gagnon, M., and Khanjian, H. (2011). Cross-linguistic representations of numerals and number marking. In *Proceedings of SALT XX*, pages 582–598. CLC Publications.

Bale, A. and Khanjian, H. (2014). Syntactic complexity and competition: the singular-plural distinction in Western Armenian. *Linguistic Inquiry*, 45:1–26.

Borer, H. (2005). *Structuring Sense, vol I: In Name Only*. Oxford University Press, Oxford.

Brattico, P. (2010). The two-part models and one-part models of nominal case: Evidence from case distribution. *Journal of Linguistics*, 45:47–81.

Chierchia, G. (2010). Mass nouns, vagueness and semantic variation. *Synthese*, 174:99–149.

Danon, G. (2012). Two Structures for Numeral-Noun Constructions. *Lingua*, 122:1282–1307.

Ionin, T. and Matushansky, O. (2006). The composition of complex cardinals. *Journal of Semantics*, 23:315–360.

Ionin, T. and Matushansky, O. (2018). *Cardinals: The Syntax and Semantics of Cardinal-Containing Expressions*. MIT Press, Cambridge, MA.

Kaiser, E. (2022). Referential effects on verb agreement: Finnish numeral-noun constructions. In *Proceedings of SALT 32*, pages 420–442.

Krifka, M. (1989). Nominal reference, temporal constitution and quantification in event semantics. In Bartsch, R., van Benthem, J., and van EmbdeBoas, P., editors, *Semantics and Contextual Expression*, pages 75–115. CSLI Publications, Standord, CA.

Landau, I. (2016). Dp internal agreement: A configurational analysis. *Natural Language and Linguistic Theory*, 34:975–1020.

Landman, F. (2004). *Indefinites and the Types of Sets*. Oxford University Press.

Link, G. (1983). The logical analysis of plurals and mass terms: A lattice-theoretical approach. In Bäuerle, R., Schwarze, C., and von Stechow, A., editors, *Meaning, Use and Interpretation of Language*, pages 302–323. De Gruyter, Berlin.

Martí, L. (2020). Numerals and the theory of number. *Semantics and Pragmatics*, 13:1–57.

Norris, M. (2014). *A Theory of Nominal Concord*. PhD thesis, UC Santa Cruz.

Ortmann, A. (2000). Where plural refuses to agree: feature unification and morphological economy. *Acta Linguistica Hungarica*, 47:249–288.

Ouwadaya, S. (2014). *Where number lies: Plural marking, numerals, and the collective–distributive distinction*. PhD thesis, University of Southern California.

Pancheva, R. (2022). Determiner vs. Adjectival Numerals and Nominal Number. In Stockall, L., Martí, L., Adger, D., Roy, I., and Ouwayda, S., editors, *For Hagit: A Celebration*. QMUL Occasional Papers in Linguistics 47.

Pancheva, R. (2023). Morphosyntactic variation in numerically-quantified noun phrases in Bulgarian. *Journal of Slavic Linguistics*, 31:1–18.

Pancheva, R. and Cao, Y. (2024). The three musketeers: plural marking in Turkish nominal phrases with cardinal numerals. In *Proceedings of TU+9, Cornell University*.

Partee, B. (1987). Noun Phrase Interpretation and Type-Shifting Principles. In Groenendijk, J., de Jongh, D., and Stokhof, M., editors, *Studies in discourse representation theory and the theory of generalized quantifiers*, chapter 5, pages 115–141. Foris, Dordrecht.

Rothstein, S. (2009). Individuating and measure readings of classifier constructions: Evidence from Modern Hebrew. *Brill's Journal of Afroasiatic Languages and Linguistics*, 1:106–145. https://doi.org/10.1163/187666309X12491131130783.

Rothstein, S. (2017). *Semantics for Counting and Measuring*. Cambridge University Press, Cambridge, UK.

Sağ, Y. (2024). On the (non) optionality of the Turkish classifier *tane*. *Natural Language & Linguistic Theory*, pages 1–58.

Sağ, Y. (2018). The semantics of Turkish numeral constructions. In Sauerland, U. and Solt, S., editors, *Sinn und Bedeutung 22*, pages 307—324.

Sağ, Y. (2019). *The Semantics of Number Marking: Reference to Kinds, Counting, and Optional Classifiers*. PhD thesis, Rutgers University.

Sağ, Y. (2022). Bare singulars and singularity in Turkish. *Linguistics and Philosophy*, 45:741–793.

Schwarzschild, R. (2006). The role of dimensions in the syntax of noun phrases. *Syntax*, 9:67–110.

Scontras, G. (2013a). Accounting for counting: A unified semantics for measure terms and classifiers. In Snider, T., editor, *Semantics and Linguistic Theory (SALT) 23*, pages 549–569. CLC Publications.

Scontras, G. (2013b). A Unified semantics for number marking, numerals, and nominal structure. In Chemla, E., Homer, V., and Winterstein, G., editors, *Proceedings of Sinn und Bedeutung 17*, pages 545–562.

Scontras, G. (2022). On the semantics of number morphology. *Linguistics and Philosophy*.

Solt, S. (2015). Q-Adjectives and the semantics of quantity. *Journal of Semantics*, 32:221–273.

Toquero-Pérez, L. M. (2024). *The Grammar of Individuation, Number and Measurement*. PhD thesis, University of Southern California.