

Accounting for counting (crosslinguistically)

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A note on Khasi data

- The Khasi data in this presentation have been taken from on-going joint work with Bianca Tara Faith Nongkinrih, a linguist at North East Hill University, India.
- The project is aimed at documenting the nominal system of Khasi, a linguistically understudied language and probing questions on definiteness, indefiniteness and genericity adopting the questionnaire developed in Dayal (to appear).

A crosslinguistic picture

- Languages that have been discussed in the literature show either complementarity between #-PL and CL, or absence of both.
- Crucially, the existing theories argue that they **do not co-occur** -
 - (a) they occupy the same syntactic slot (Borer 2005)
 - (b) kind terms are not compatible with the PL function (Chierchia 1998).

#-PL	CL	Languages
✓	✗	English, Hindi, Spanish
✗	✓	Mandarin, Bangla, Korean
✗	✗	Dëne Sųłiné, Yoruba
✓	✓	?

Table 1: Distribution of #-PL and CL and (non-exhaustive) corresponding languages

A crosslinguistic picture: ?co-occurrence

- Plural morphemes are found in CL languages, but they all exhibit special properties.
- Mandarin *men*: has been analyzed as the realization of the D head (Li 1999); as an associative plural (Jiang 2020).
- Bangla *ra*: has been analyzed as an associative plural (Biswas 2013); as an animacy classifier (Dayal 2014), as a classifier to turn singular kinds to plural kinds (Saha 2023).
- Some other cases include the plural *eet/aat* in Lebanese Arabic (Borer and Ouwayda 2010, 2021); *tul* in Korean, *tachi/tati* in Japanese (Nemoto 2005).

Overview of the talk

- I introduce novel data from Khasi which shows an **obligatory co-occurrence** of #-PL and CL.
- I argue that individual classifiers are **universally** required to combine plural nouns with cardinals - it is an atomizing function.
- I propose a new typology integrating two parametric settings -
 - **NP[±pred, ±arg]** - determines the NP denotation.
 - **Card/CL** - determines the morphological form of the Card and CL heads.
- The proposed typology can not only capture obligatory co-occurrence in Khasi, but also other counting systems:

<i>parameters</i>	NP[+pred, ±arg]	NP[-pred, +arg]
✗ <i>Card/CL</i>	(i) ✓ #-PL; (ii) overt CLs Eg. <i>Khasi</i>	(i) ✗ #-PL; (ii) overt CLs Eg. <i>Mandarin</i>
✓ <i>Card/CL</i>	(i) ✓ #-PL Eg. <i>English</i>	(i) ✗ #-PL Eg. <i>Dëne Sųtiné</i>

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Points made in this section

- Khasi plural *ki* exhibits properties typical of number marking languages, *and* its classifiers exhibit typical properties found in CL languages.
- That is, Khasi is a language with true co-occurrence of #-PL and CL.

#-PL	CL	Languages
✓	✗	English, Hindi, Spanish
✗	✓	Mandarin, Bangla, Korean
✗	✗	Dëne Sųłiné, Yoruba
✓	✓	Khasi

Table 2: Updated distribution of #-PL and CL and (non-exhaustive) corresponding languages

Nominals in Khasi

- Khasi is a Mon-Khmer language of the Austroasiatic language family spoken predominantly in the Khasi hills of Meghalaya, India.
- Nouns in Khasi are morphologically enriched:
 - singular feminine nouns are marked with the morpheme **ka-** (3a).
 - singular masculine nouns are marked with the morpheme **u-** (5b).
 - plural nouns are marked with the morpheme **ki-** (3c).

(3) a. ka-sngi
SG.F-sun
'sun'

b. u-tiew-kulap
SG.M-flower-rose
'rose'

c. ki-tiew-kulap
PL-flower-rose
'roses'

Nominals in Khasi

- Khasi shows subject-verb agreement - the number and gender values on the subject must match with that on the VP.

(4) a. **u**-ksew **u**-dang-wiar
 SG.M-dog SG.M-PROG-bark
 'The dog is barking.'

b. **ki**-ksew **ki**-dang-wiar
 PL-dog PL-PROG-bark
 'The dogs are barking.'

- Not only does Khasi have systematic number agreement, it **obligatorily** requires both CL and #-PL in counting constructions.

(5) a. ar *(**tylli**) *(**ki**)-kot
 two CL PL-book
 'two books'

b. phra *(**tylli**) *(**ki**)-khynnah
 eight CL PL-student
 'eight students'

Khasi plural *ki* is not a special plural such as Mandarin *men*

- Firstly, as shown in (4), Khasi shows systematic number agreement between the subject and the VP, a property not typical of special plurals.
- This system is morphologically analogous to Hindi (6) and (7).

(6) a. **u**-ksew **u**-dang-wiar
 SG.M-dog SG.M-PROG-bark
 'The dog is barking.' (**Khasi**)

b. kutt-**a** bhōk rah-**a**
 dog-SG.M bark PROG-SG.M
 hai
 AUX.SG
 'The dog is barking.' (**Hindi**)

(7) a. **ki**-ksew **ki**-dang-wiar
 PL-dog PL-PROG-bark
 'The dogs are barking.' (**Khasi**)

b. kutt-**e** bhōk rah-**e** hāi
 dog-PL bark PROG-PL AUX.PL
 'The dogs are barking.' (**Hindi**)

Khasi plural *ki* is not a special plural such as Mandarin *men*

- Secondly, associative uses are not available with *ki* (8), which is a robustly common feature among special plurals in classifier languages (Nemoto 2005 for Japanese *tati* and Korean *tul*, Jiang 2020 for Mandarin *men*, a.o)

(8) ki-Molly na ka-klas ki-thied-kali

PL-Molly of SG.F-class PL-buy-car

Available: ✓ 'The Mollys of the class bought cars.'

✗ 'Molly and her associates bought cars.'

Khasi plural *ki* is not a special plural such as Mandarin *men*

- Thirdly, *ki*-marked NPs are not instances of *pluralia tantum* since Khasi makes a grammatical mass-count distinction as shown in (9).
- Mass nouns cannot be marked with the plural morpheme *ki* (9b).

(9)	a.	ka-um/	u-beer	b.	*ki-um/	*ki-beer
		SG.F-water/	SG.M-beer		PL-water/	PL-beer
		'water' /	'beer'		Intended: 'water' /	'beer'

- If *ki*-marked NPs were instances of fake mass nouns, they would be expected to behave the same as regular mass nouns in the grammar.

Obligatory CLs in Khasi

- Khasi classifiers show properties typical of classifier languages.
- There are two individuating classifiers - *tylli* as a default, and *ngut* which is specific to human nouns such as *girl*, *boy*, *woman*, *man* (10).

(10) a. saw **tylli** ki-bilor
four CL PL-bottle
'four bottles'

b. saw **ngut** ki-kynthei
four CL PL-girl
'four girls'

Obligatory CLs in Khasi

- There are group classifiers that combine with count nouns (11).

- (11) a. saw **synduk** ki-kot
four CL_{box} PL-book
'four boxes of books'
- b. ar **jur** ki-juti
two CL_{pair} PL-shoe
'two pairs of shoes'

- There are mensural classifiers that combine with mass nouns (12).

- (12) a. saw **bilor** u-beer
four CL_{bottle} SG.M-beer
'four bottles of beer'
- b. lai **klat** ka-um
three CL_{glass} SG.F-water
'three glasses of water'

Obligatory CLs in Khasi

- Classifiers in Khasi don't recur, which is another property true of typical classifier languages (13).

(13) a. *lai tylli synduk ki-kot b. *lai tylli tylli ki-kot
 three CL_{indiv} CL_{box} PL-book three CL_{indiv} CL_{indiv} PL-book

- This indicates that the classifier *tylli* is not a vacuous morpheme, and has a well-defined function in the grammar.

Implication

- Khasi exhibits co-occurrence of #-PL of the English type and CL of the Mandarin type.

#-PL	CL	Languages
✓	✗	English, Hindi, Spanish
✗	✓	Mandarin, Bangla, Korean
✗	✗	Dëne Sų́tiné, Yoruba
✓	✓	Khasi

Table 3: Updated distribution of #-PL and CL and (non-exhaustive) corresponding languages

- The implausibility of co-occurrence of #-PL and CL is not a bug but a *feature* of the existing theories - it cannot account for the Khasi data.

In what follows...

- I propose a new typology for counting constructions based on parametric variation of **Nominal Mapping** (NP[±pred, ±arg]) and **Morphological fusion** (Card/CL).
- I argue that individuating classifiers are universally required for purposes of counting.
- The co-occurrence of #-PL and CL in Khasi is not an anomaly, but exactly what we would expect counting constructions to look like.
- I demonstrate how the new typology can account for counting constructions not only in Khasi, but the three other types of languages - English, Mandarin, Dëne Sų́tiné.

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Proposal: Parameters

- Variation in counting systems result from different parametric settings.

I. Nominal Mapping (Chierchia 1998)

- NP[+pred, ±arg] - nouns are ordinary predicates of $\langle e, t \rangle$ type. This would cover both cases like English, Hindi, or Khasi (NP[+pred, +arg]) as well as French, Italian (NP[+pred, -arg]).
- NP[-pred, +arg] - nouns enter the lexicon as kind-terms. This would represent *typical* classifier languages like Cantonese, Korean, or Bangla.

Proposal: Parameters

II. Fusion of Card/CL (Noyer 1992, Halle et al. 1993; Halle and Marantz 1994)

- Fusion creates a single syntactic node for lexical insertion of separate heads, which results in suppletion.
- Languages either fuse the Card and CL heads or they do not: ✓**Card/CL** or ✗**Card/CL**
- ✓**Card/CL** - the features of the Card and the CL get bundled into a single syntactic head that gets expressed as a single exponent - *numeral*.
- ✗**Card/CL** - the features of the Card and the CL remain to be in separate heads and therefore get separate exponents - *numeral* and *classifier*.

Proposal: A new typology

<i>parameters</i>	NP[+pred, ±arg]	NP[-pred, +arg]
✗ <i>Card/CL</i>	(i) ✓ #-PL; (ii) overt CLs Eg. <i>Khasi</i>	(i) ✗ #-PL; (ii) overt CLs Eg. <i>Mandarin</i>
✓ <i>Card/CL</i>	(i) ✓ #-PL Eg. <i>English</i>	(i) ✗ #-PL Eg. <i>Dëne Sųfiné</i>

Table 4: Matrix of parametric variation for counting constructions

Rest of this section

- The definitions of Card, Num, CL adopted in this analysis.
- Derivations for the four corners of the matrix.

Theoretical assumptions: Cardinals are modifiers

- Following Ionin and Matushansky (2006), I argue that cardinals are modifiers that have an atomic requirement.
- A cardinal n is a function from predicate P to a set of entities x such that x can be partitioned into n parts that each have the property P .

(14) Definition of n_{card}

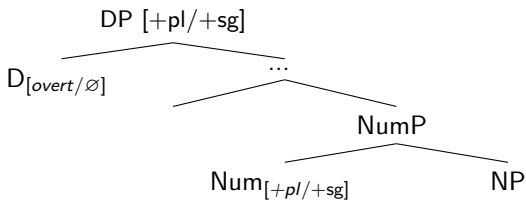
- $\llbracket n_{card} \rrbracket = \lambda P \lambda x. \exists S [\Pi(S)(x) \wedge |S| = n \wedge \forall s \in S P(s)]$
- $\Pi(S)(x) = 1$ iff S is a cover of x , and $\forall z, y \in S [z=y \vee \neg \exists a [a \leq z \wedge a \leq y]]$ (Forbidding that cells of the partition overlap ensures that no element is counted twice.)
- A set of individuals C is a cover of a plural individual X iff X is the sum of all members of C : $\sqcup C = X$

(Ionin and Matushansky 2006)

Theoretical assumptions: Num introduces $i[+pl]$ and $[+sg]$

- I argue that in a number marking language, the NP denotes a set of atoms.
- NPs in number marking languages need to be determined for number - $i[+pl]$ or $i[+sg]$. The Num head does exactly that (Kramer 2016).
- The $[+pl]$ feature or $[+sg]$ feature of the Num percolates up to DP, thereby facilitating agreement with the VP (15).

(15)



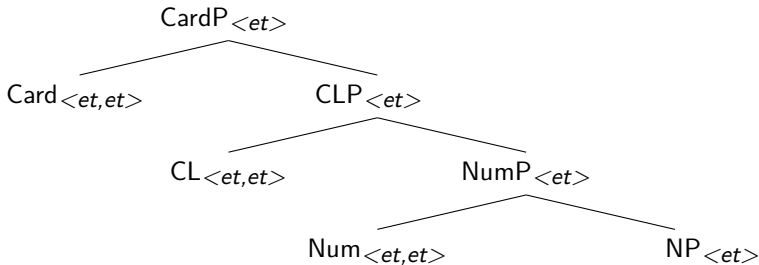
Theoretical assumptions: Structure of CardP

- A consequence of the parametric variation is that languages are divided on what the structure of a CardP fragment is.
- NP[+pred, ±arg] languages - show systematic number agreement. That indicates that the nominal spine consists of a Num head which carries number features i[+pl] and i[+sg].
- NP[-pred, +arg] languages - do not show number agreement. This indicates the lack of a Num projection.

<i>parameters</i>	NP[+pred, ±arg]	NP[-pred, +arg]
✗ <i>Card/CL</i>	(i) ✓ #PL; (ii) overt CLs Eg. <i>Khasi</i>	(i) ✗ #PL; (ii) overt CLs Eg. <i>Mandarin</i>
✓ <i>Card/CL</i>	(i) ✓ #PL Eg. <i>English</i>	(i) ✗ #PL Eg. <i>Dëne Sųłiné</i>

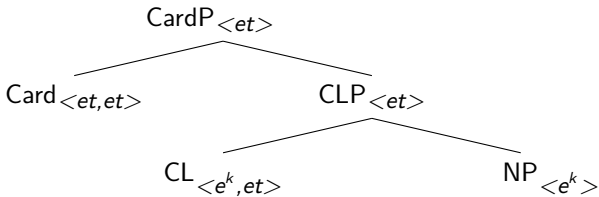
Theoretical assumptions: CardP structure - NP[+pred]

(17) NP[+pred] languages with NumP



Theoretical assumptions: CardP structure - NP[-pred]

(18) NP[-pred] languages without NumP



Theoretical assumptions: #-PL is semantically contentful

- I adopt the view that plural marking is *semantically contentful*.
- A #-PL that occupies Num is interpreted as the *-operator following Link (1983).

(19) Definition of #-PL

- $[[\text{\#-PL}]]^{g,c} = \lambda P. *P$
- $*P(X) = 1$ iff there is a cover C of X with $P(x) = 1$ for every x in C
- A set of individuals C is a Cover for X iff $\bigoplus C = X$
(adapted from Sauerland 2003:263)

Theoretical assumptions: #-SG is semantically null



- As for the singular noun, I propose that #-SG is *semantically null*.
- It is an identity function over sets that carries a presupposition that the set be atomic (20).

(20) Definition of #-SG

$$\llbracket \text{\#-SG} \rrbracket = \lambda P_{\langle e,t \rangle} : \forall x [P(x) \rightarrow AT(x)]. P_{\langle e,t \rangle}$$

⇒ While #-PL carries interpretable [+pl] feature, #-SG carries interpretable [+sg] feature.

Theoretical assumptions: Card Num

- CardP cannot combine directly with #-PL marked NP owing to the atomic requirement of cardinals (Ionin and Matushansky 2006).
- This is exactly the job of the CL : Card  CL  Num
- Following Borer (2005), I argue that CLPs are universal in cardinal constructions.
- However, Khasi shows that #-PLs and CLs **do not** occupy the same syntactic slots.
- #-PL is necessary for plural agreement and it's a function that adds sums to a predicate (Link 1983).
- CL is a function that atomizes a predicate (Krifka 1995, Chierchia 1998, Bale, Gagnon, and Khanjian 2010).

Theoretical assumptions: Classifiers are type flexible

- I further argue that the function of a classifier is the same across languages - number marking or *typical* classifier languages.
- However their semantic type varies between the two types of languages - they can be functions from either kinds (Chierchia 1998; Dayal 2012; Jiang 2012 et seq.) or predicates (Krifka 1995, Bale et al. 2019) to sets containing atoms; either $\langle e^k, et \rangle$ or $\langle et, et \rangle$.

(21) Definition of CL

a. $\llbracket \mathbf{CL}_{\langle e^k, et \rangle} \rrbracket = \lambda k \lambda x. [\cup^k(x) \wedge AT(x)]$

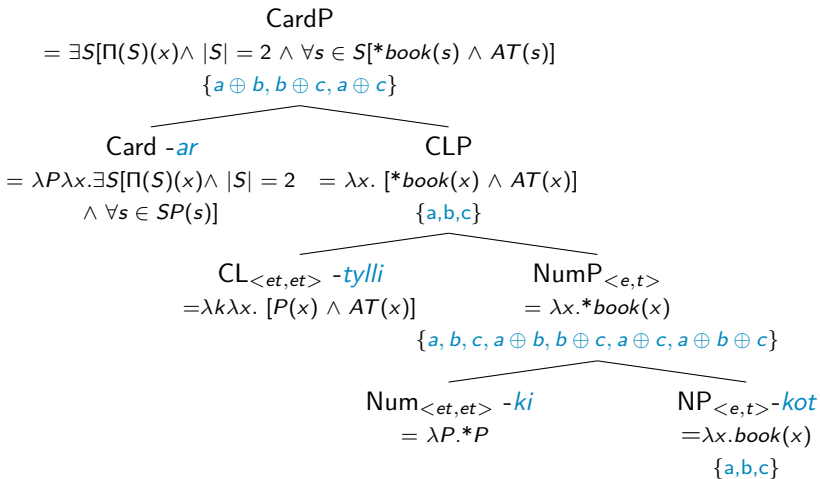
b. $\llbracket \mathbf{CL}_{\langle et, et \rangle} \rrbracket = \lambda P \lambda x. [P(x) \wedge AT(x)]$

Why add sums just to take them out?

- I argue that a different principle competes with the Economy principle.
- This principle favors a positive correspondence between syntactic and semantic features.
- NPs in number-marking languages need to be specified for the number features of the NP - $i[+p]$ or $i[+sg]$, which can then undergo *Agree* with an $u[+p]$ or $u[+sg]$ feature on the VP.
- #-PL **(a)** carries *agreement feature* $i[+p]$ necessary for VP agreement;
(b) is interpreted as the *-operator which reflects *semantic plurality*.
- Crucially, if a modified NP is semantically plural (sum reference), it is also marked as such in the syntax.

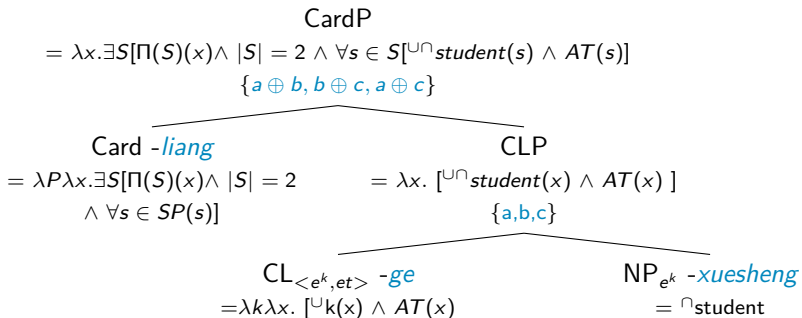
Deriving counting: Khasi NP[+pred, +arg], ✕Card/CL

(22) The composition of *ar tylli ki-kot* ‘two books’



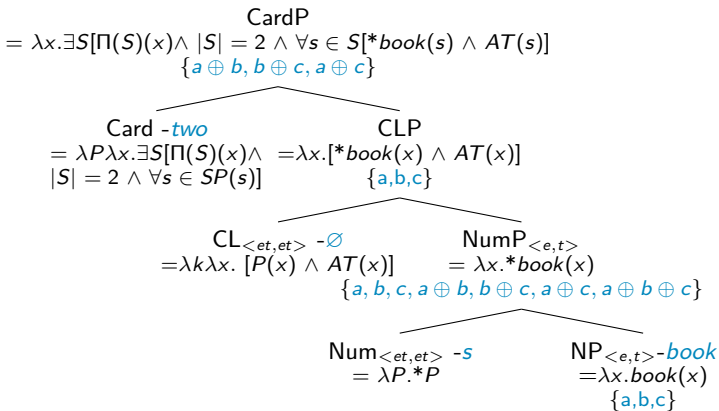
Deriving counting: Mandarin NP[-pred, +arg], *Card/CL

(23) The composition of *liang ge xuesheng* 'two students'



Deriving counting: English NP[+pred, +arg], ✓Card/CL

(24) The composition of *two books*

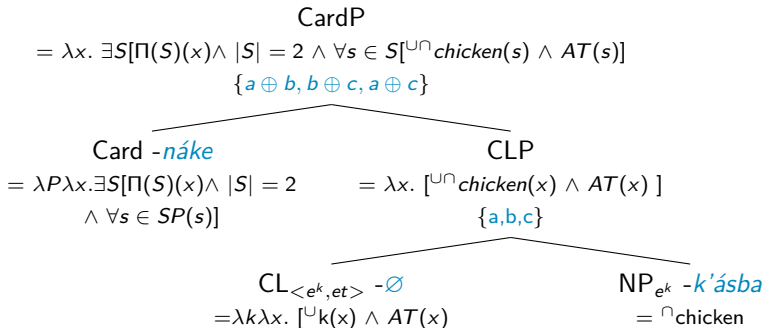


(25) Vocabulary insertion

[Card: 2, CL: +] ↔ *two*

Deriving counting: Dëne Sųłíné NP[-pred, +arg], ✓Card/CL

(26) The composition of *náke k'ásba* 'two chickens'



(27) Vocabulary insertion

[Card: 2, CL: +] ↔ *náke*

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Evidence for Card/CL: suffixed cardinals

- Numerals have been argued to have a “built-in classifier” (Krifka 1995: 406).
- Krifka (1995) argues (for English) that the meaning of a numeral has a predicativising and an atom-accessing function.
- Wilhelm (2008) extends this analysis for Dëne Sų́líné, claiming that the difference between English/ Dëne Sų́líné and Mandarin is the variation in the semantics of numerals, drawing evidence from data such as in (28).

(28)

<i>basic</i>	<i>human</i>
ʔiʔághe ‘one’	ʔiʔághị ‘one’
náke ‘two’	nádëne ‘two’
tághe ‘three’	tághị/ tanị ‘three’
dịghị ‘four’	dịghị/ dịnị ‘four’
sọlághe ‘five’	sọlághị ‘five’

(Cook 2004, Wilhelm 2008)

Evidence for Card/CL: suffixed cardinals

- Little et al. (2022) argue that there are two kinds of classifiers found across languages - *nominal* and *numeral*, drawing evidence from Shan and Ch'ol.
- They show that numeral classifiers exhibit a closer connection with numerals, such as ones found in Ch'ol (29).

(29)

1	jum-p'ej	6	wäk-p'ej
2	cha'-p'ej	7	wuk-p'ej
3	ux-p'ej	8	waxäk-p'ej
4	chäm-p'ej	9	bolom-p'ej
5	jo'-p'ej	10	lujum-p'ej

(López 2009, Little et al. 2022)

Evidence for Card/CL: suffixed cardinals

- Similar morphologically complex numerals have been attested in Yoruba (30) and Mizo (31).

(30)

	Base	m-form	Output	Gloss
a.	èjì	m + èjì	méjì	'two'
b.	èta	m + èta	mèta	'three'
c.	èrin	m- + èrin	mérin	'four'

adapted from (Ajíbóyè and Déchaine 2004, Ajiboye 2010)

(31)

pa-khat	'one'
pa-nhi?	'two'
pa-thuml	'three'
pa-liil	'four'
pa-ngaal	'five'
pa-ruk	'six'

(Chhangte 1986)

Evidence for Card/CL

- These provide empirical evidence that the Card and CL heads undergo morphological operations across language families.
- This is a prediction of the proposed typology - we would expect to find morphologically complex numerals in languages that bundle Card and CL.
- The Dëne Sų́líné data in (28) shows that the language does make a human/non-human class distinction in its nominals - a covert classifier for the basic type, and an overt classifier for [+ human] type which is transparent in the resulting lexical exponent.
- Atomizing classifiers are for the purposes of counting but they interact with noun classes as well.
- This indicates that the CL layer exists between NP/NumP and CardP that allows this interaction.

Semantic plurality, syntactic singularity

- Arguments in Hungarian/Finnish type languages are **semantically plural** but **syntactically singular**.
- As I argued before, the mismatched values of syntactic and semantic number information is a principle that trumps over the Economy principle in cases like English or Khasi.
- The Hungarian/Finnish type of counting system shows that there can be variation in which principle is more valuable to a language.
- The distinction between Hungarian/Finnish and English/Khasi falls out of such a variation (in spirit of the unidirectional OT analysis in Swart and Farkas [2010](#)).
- Classifiers do not get employed because the NumP denotation is already atomic.

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The story

- ① The existing theories on #-PLs and CLs hinge on the claim that these two categories exhibit complementarity. This does **not** hold for Khasi.

#-PL	CL	Languages
✓	✗	English, Hindi, Spanish
✗	✓	Mandarin, Bangla, Korean
✗	✗	Dëne Sųłiné, Yoruba
✓	✓	Khasi

- ② I argue that classifiers are universally required for mediating between cardinals and number neutral predicates - a claim that has been claimed previously. Khasi provides empirical evidence for this claim.

The story

- ③ A new typology integrating two parametric settings **Nominal Mapping** (NP[±pred, ±arg]) and **Morphological fusion** (Card/CL) can account for the variation in counting strategies crosslinguistically.

<i>parameters</i>	NP[+pred, ±arg]	NP[-pred, +arg]
✗ Card/CL	(i) ✓ #-PL; (ii) overt CLs Eg. <i>Khasi</i>	(i) ✗ #-PL; (ii) overt CLs Eg. <i>Mandarin</i>
✓ Card/CL	(i) ✓ #-PL Eg. <i>English</i>	(i) ✗ #-PL Eg. <i>Dëne Sų́finé</i>

Future directions

- Where do optional classifiers fall in the typology?
- What is the status of group forming classifiers, plural classifiers? *Specifically, do they occupy the same slot in the syntax?*
- Why are languages with complementary #-PL & CL attested more frequently than languages with obligatory #-PL & CL or absent #-PL & CL?

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To D or not to D : Chierchia (1998)

- Khasi also informs the typology about the status of DP projection crosslinguistically.
- There are two strategies of forming definite arguments in the Chierchia system:
 - Overt D/ ✓definite articles → English, Italian (NP[+pred,±arg])
 - *ι* type-shifting/ ✗definite articles → Mandarin (NP[-pred,+arg])
→ Hindi, Russian (NP[+pred, +arg])

To D or not to D: Expanded typology

- Cheng and Sybesma (1999), Simpson (2005), Wu and Bodomo (2009); Dayal (2012) show that NP[-pred, +arg] languages also project D. They lack determiner articles but show *N to D movement* (Cantonese) or *NP to Spec DP movement* (Bangla).
- Lastly, Jiang (2012, 2020) shows that NP[-pred, +arg] languages can also have determiner articles, thus overt D, which further expands the typology.
 - Overt D/ ✓def. articles → English, Italian (NP[+pred, ±arg])
→ Nyosu Yi (NP[-pred, +arg])
 - *ι* type-shifting/ ✗def. articles → Mandarin (NP[-pred, +arg])
→ Hindi, Russian (NP[+pred, +arg])
 - Covert D/ ✗def. articles → Cantonese, Bangla (NP[-pred, +arg])

To D or not to D: Khasi

- We can see from (55) that Nominal Mapping Parameter does not show any inherent interaction with strategies to form definite arguments.

<i>parameters</i>	NP[+pred, ±arg]	NP[-pred, +arg]
✗ <i>Card/CL</i>	<i>Khasi</i> - covert D	① <i>Cantonese</i> - covert D ② <i>Nyosu Yi</i> - overt D ③ <i>Mandarin</i> - ι type-shift
✓ <i>Card/CL</i>	① <i>English</i> - overt D ② <i>Hindi</i> - ι type-shift	<i>Dëne Sɔfiné</i> - ι type-shift

Table 5: How definite arguments are formed in the 4 types of counting systems

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