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).

Introduction

- It has been long observed that classifier languages lack plural marking on nouns in counting constructions (Greenberg et al. 1963; Sanches and Slobin 1973; Aikhenvald 2000).

(1) a. *three student

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'three students'
(Mandarin, Jiang 2020)

- The question probed in this talk is on the nature of the interaction between number marking plurals (#-**PL**) and classifiers (**CL**).
- *What are the systems that underlie counting constructions which causes crosslinguistic variation?*

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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
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✘	✔	Mandarin, Bangla, Korean
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- 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).
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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:

parameters	**NP[+pred, ±arg]**	**NP[-pred, +arg]**
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- Khasi plural *ki* exhibits properties typical of number marking languages, *and* its classifiers exhibit typical properties found in CL languages.
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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).

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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
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- 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
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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).

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- 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.'

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- 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
SG.F-water/ SG.M-beer
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- 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).

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

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

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- 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.
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- Variation in counting systems result from different parametric settings.

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- 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**
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- 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

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

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 $\mathbf{n}_{card}$**

a. $[\![\mathrm{n}_{card}]\!] = \lambda P \lambda x.\exists S[\Pi(S)(x) \wedge |S| = \mathrm{n} \wedge \forall s \in S\ P(s)]$

b. $\Pi(S)(x) = 1$ iff S is a cover of x, and $\forall z,y \in S[z{=}y \vee \neg\exists a[a \leqslant z \wedge a \leqslant y]]$ (Forbidding that cells of the partition overlap ensures that no element is counted twice.)

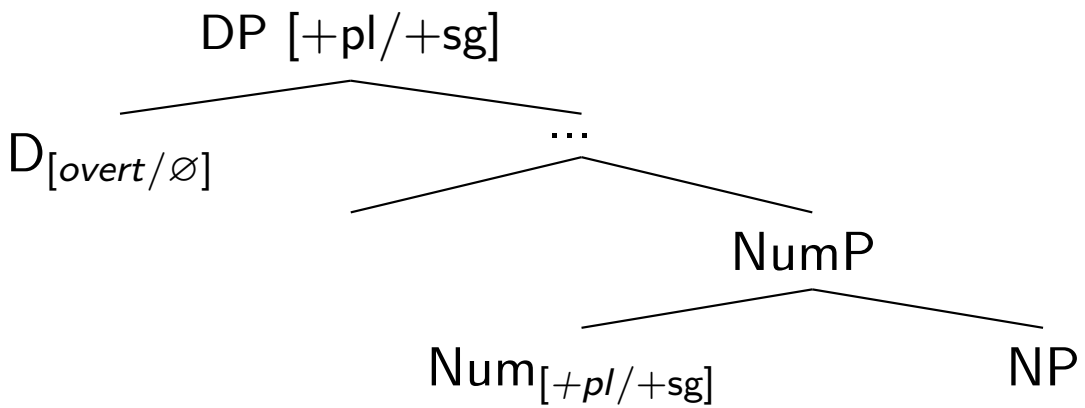
c. A set of individuals C is a cover of a plural individual X iff X is the sum of all members of
C: $\sqcup C = X$

(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)



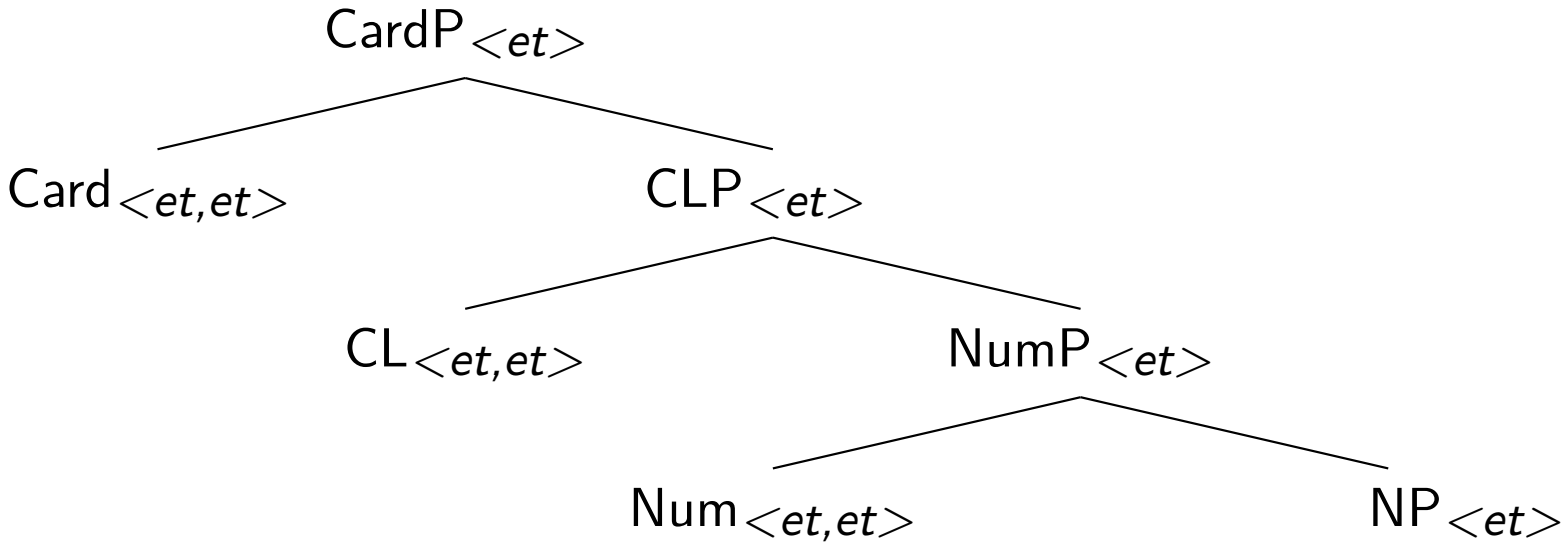
Theoretical assumptions: Structure of CardP

- 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.

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

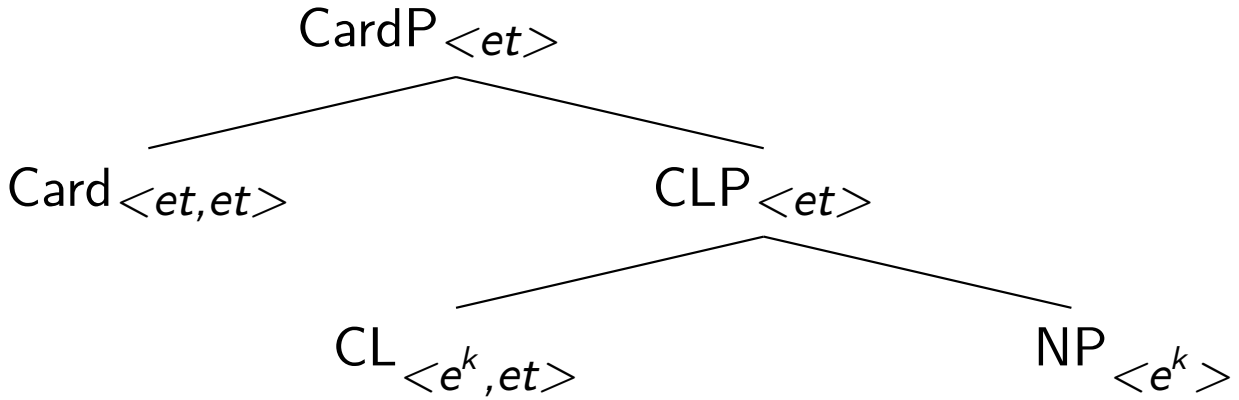
Theoretical assumptions: CardP structure - NP[+pred]

(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**

a. $[\![\#\text{-PL}]\!]^{g,c} = \lambda P.\ {}^*P$

b. ${}^*P(X) = 1$ iff there is a cover C of X with $P(x) = 1$ for every x in C

c. A set of individuals C is a Cover for X iff $\oplus C = X$

(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**

$$[\![\text{\#-SG}]\!] = \lambda P_{<e,t>} : \forall x[P(x) \rightarrow AT(x)].\ P_{<e,t>}$$

⇒ 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 <e^k,et> or <et,et>.

(21) **Definition of CL**

a. $[\![\mathbf{CL}_{<e^k,et>}]\!] = \lambda k \lambda x.\ [^{\cup}\mathrm{k}(\mathrm{x}) \wedge AT(x)]$

b. $[\![\mathbf{CL}_{<et,et>}]\!] = \lambda P \lambda x.\ [\mathrm{P}(\mathrm{x}) \wedge AT(x)\ ]$

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

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

$\text{NP}_{<e,t>}$-*kot*
$=\lambda x.book(x)$
{a,b,c}

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

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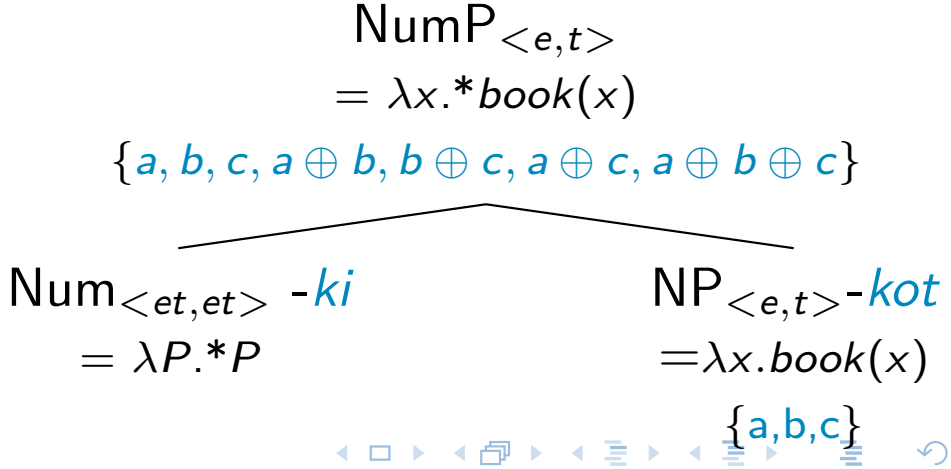

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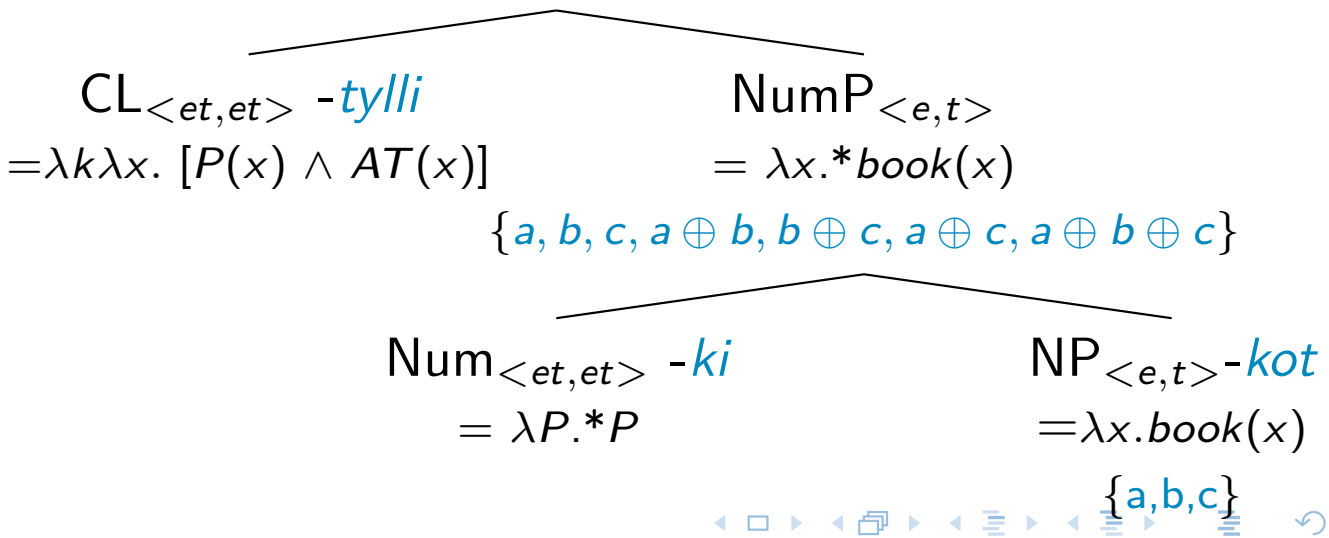

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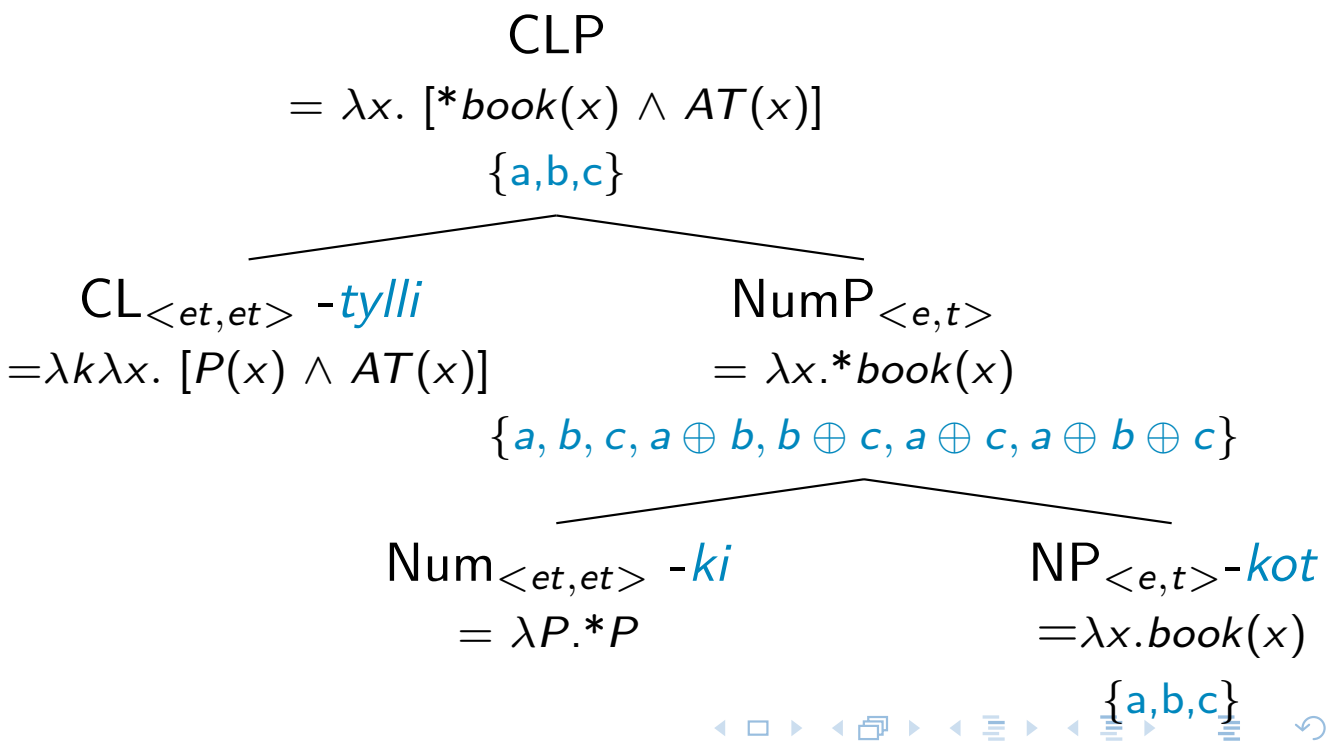

Why add sums just to take them out?

- 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[+pl] or i[+sg], which can then undergo *Agree* with an u[+pl] or u[+sg] feature on the VP.
- → #-PL **(a)** carries *agreement feature* i[+pl] 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.

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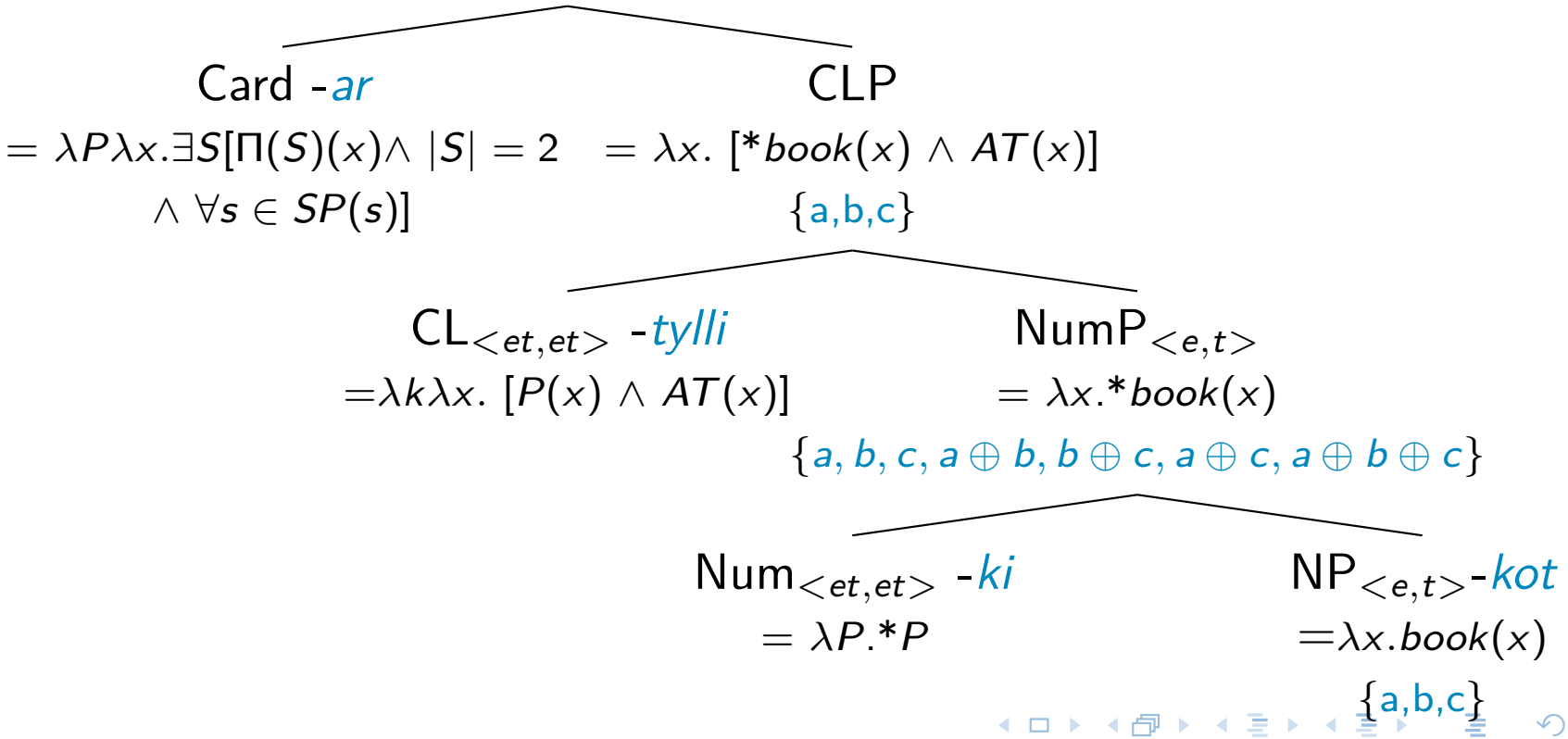

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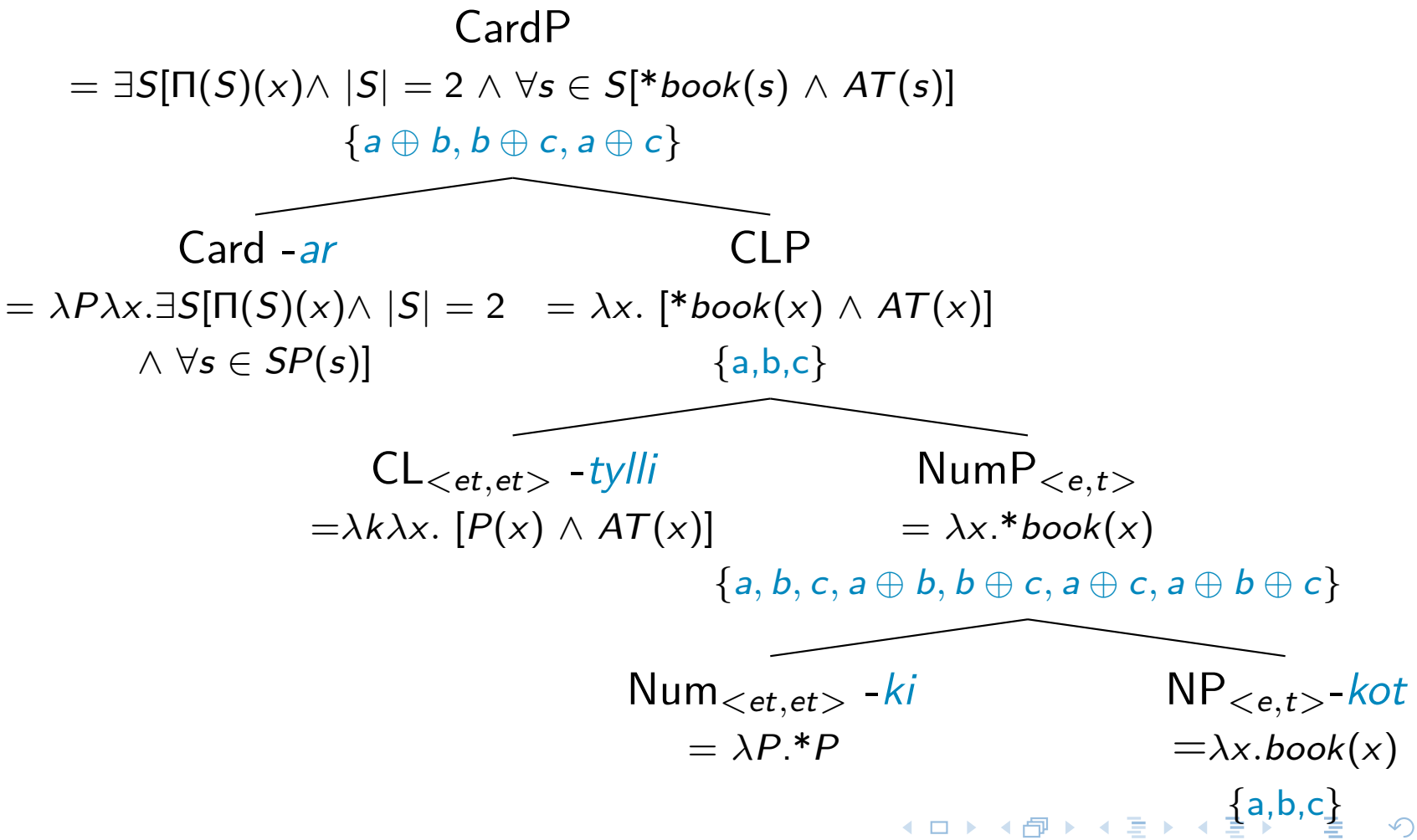


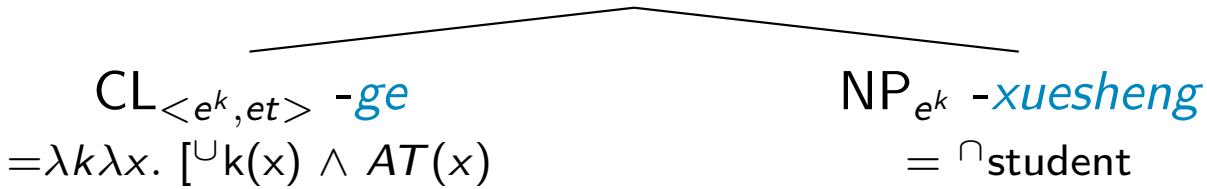
Deriving counting: Mandarin NP[-pred, +arg], ✘Card/CL

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

NP_{e^k} -*xuesheng*
$= {}^{\cap}$student

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

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



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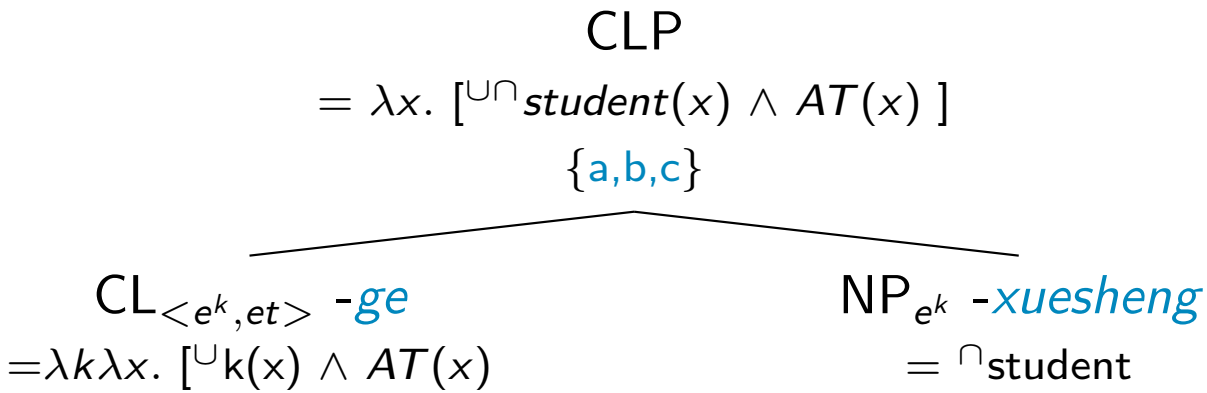

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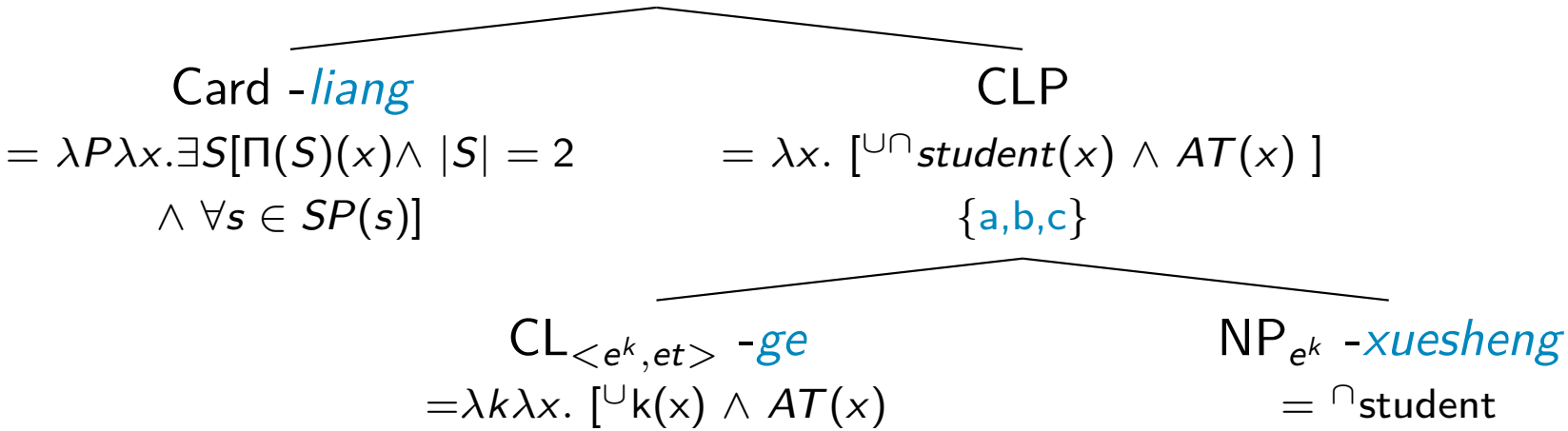

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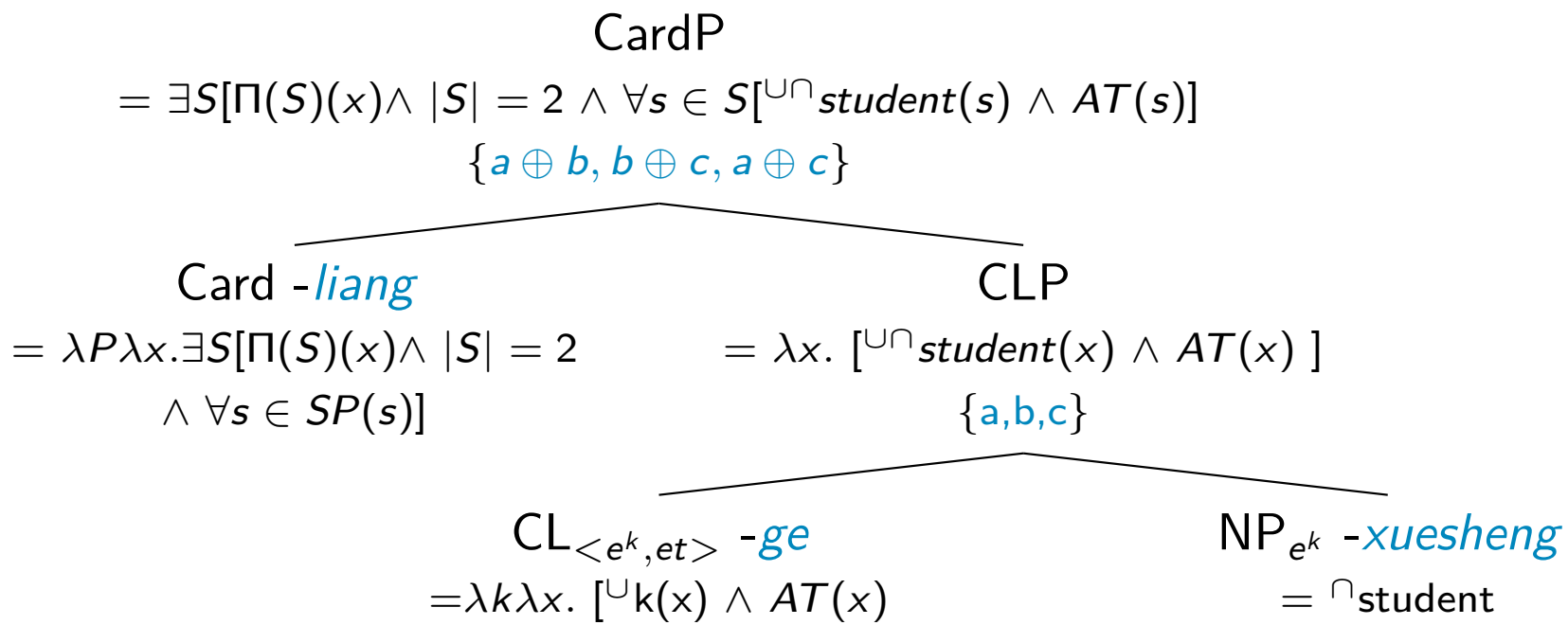
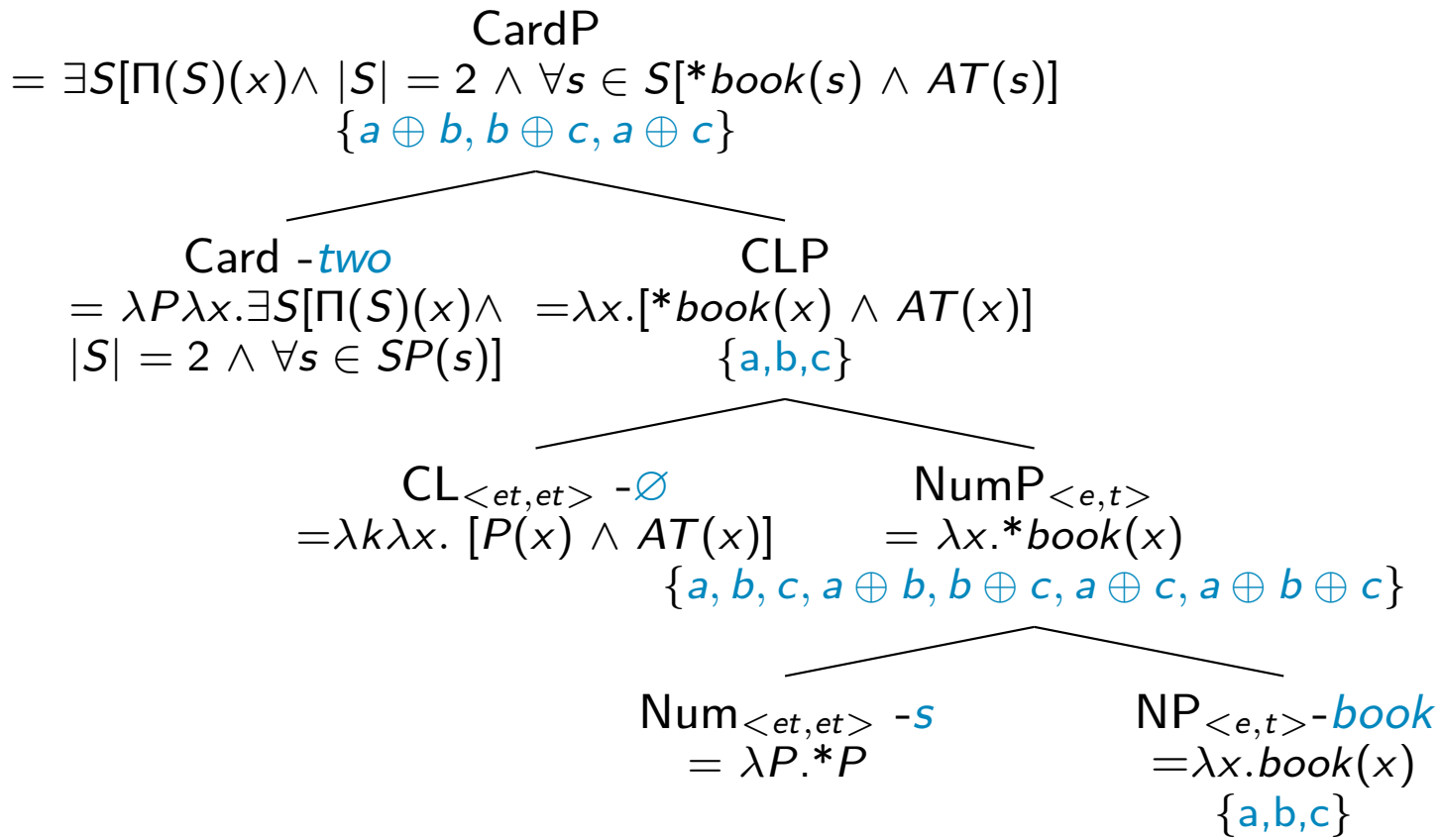


Deriving counting: English NP[+pred, +arg], ✔Card/CL

(24) The composition of *two books*

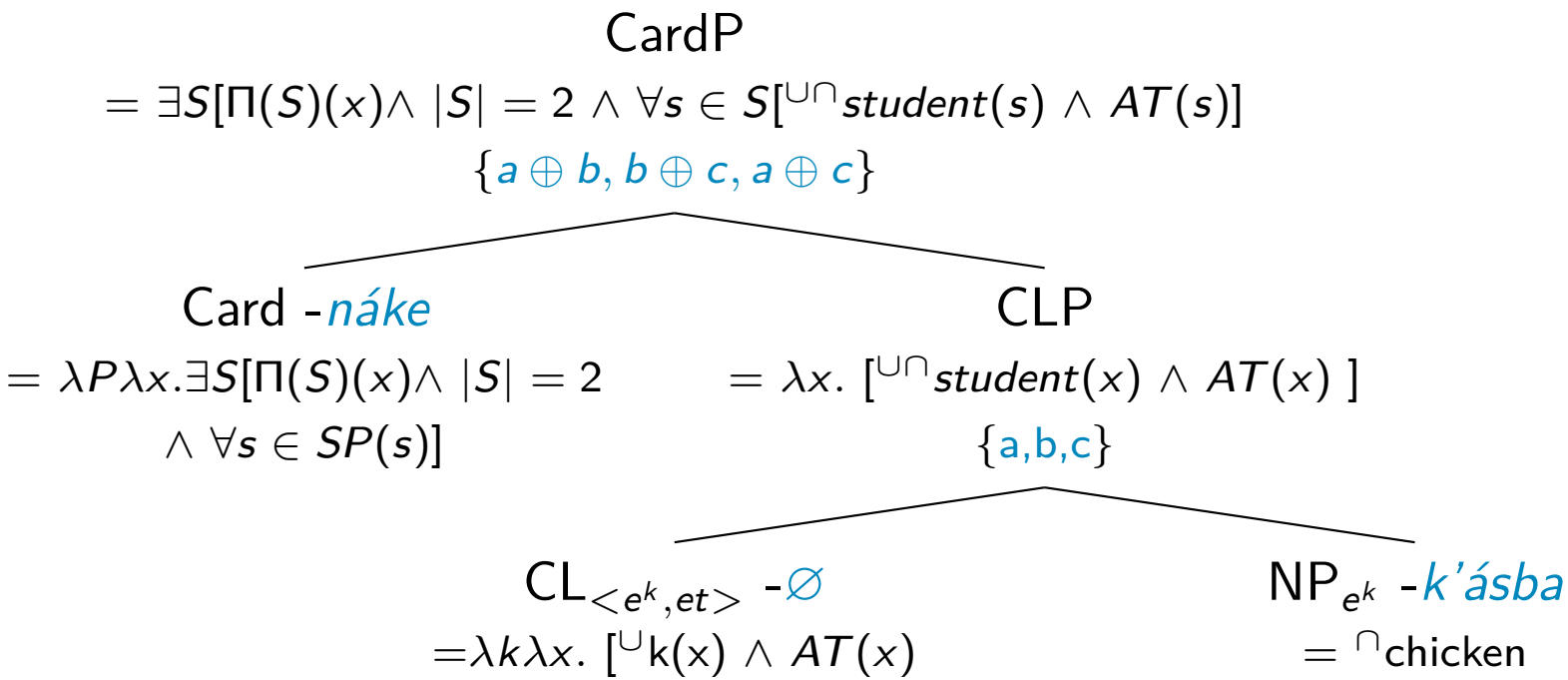


(25) Vocabulary insertion

[Card: 2, CL: +] ↔ *two*

Deriving counting: Dëne Sųłiné 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 Sųłiné, claiming that the difference between English/ Dëne Sųłiné and Mandarin is the variation in the semantics of numerals, drawing evidence from data such as in (28).

(28)

basic	*human*
ʔįłághe ‘one’	ʔįłághį ‘one’
náke ‘two’	nádëne ‘two’
tághe ‘three’	tághį/ tanį ‘three’
dįghį ‘four’	dįghį/ dįnį ‘four’
sǫlághe ‘five’	sǫlághį ‘five’

(Cook 2004, Wilhelm 2008)

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sǫlághe ‘five’	sǫlághį ‘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.	ẹ̀ta	m + ẹ̀ta	mẹ́ta	'three'
c.	ẹ̀rin	m- + ẹ̀rin	mẹ́rin	'four'

adapted from (Ajíbóyè and Déchaine 2004, Ajiboye 2010)

(31)

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

(Chhangte 1986)

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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 Sųłiné 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.
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Semantic plurality, syntactic singularity

- This typology also provides some insights on counting systems such as Hungarian, Finnish or Welsh where nouns show singular marking in counting constructions (Ionin and Matushansky 2006).

(32) a. Yhdeksän omena-a puto-si maa-han
nine-NOM apple-PART.SG fall-PAST-3SG earth-ILL
'Nine apples fell to earth. (*Finnish*; Nelson and Toivonen 2000)

b. három gyerek/ *három gyerekek
three child/ three child.PL
'three children (*Hungarian*; Swart and Farkas 2010)

Semantic plurality, syntactic singularity

- Arguments in Hungarian/Finnish type languages are **semantically plural** but **syntactically singular**.
- As I argued before, the mismatched values of sytactic 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).
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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
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✘	✘	Dëne Sųłiné, Yoruba
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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.

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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.

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✘*Card/CL*	(i) ✔#-PL; (ii) overt CLs Eg.***Khasi***	(i) ✘#-PL; (ii) overt CLs Eg.***Mandarin***
✔ *Card/CL*	(i) ✔#-PL Eg.***English***	(i) ✘#-PL Eg.***Dëne Sųłiné***

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?

Acknowledgements

Very thankful for the support and help and discussions due to my amazing peers - Bianca, Ka Fai, Catarina, Jez, Comfort, Dani, Yusuke.
Extremely grateful to my mentors Veneeta Dayal, Zoltán Szabó, and Ayesha Kidwai; the members of Yale Semantics Reading Group for their comments and feedback, in particular Lydia for her generosity with time and kindness; Pauline Jackobson, Mitcho (Michael Yoshitaka Erlewine), Helen Koulidobrova for insightful discussions; Frances Conlin for humbling support.

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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])
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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])
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    ➜ Hindi, Russian (NP[+pred, +arg])
  - Covert D/ ✘def. articles ➜ Cantonese, Bangla (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

- Khasi exhibits *NumP to Spec DP movement* in definite constructions with cardinals ≥ 2.

(33) a. ar tylli ki-kot
two CL PL-book
'Two books.'

b. ki-kot ar tylli
PL-book two CL
'The two books.'

(34) $[_{DP}\ [_{NumP}$ ki-kot$]\ [_{D'}\ \phi\ [_{CardP}$ ar $[_{CLP}$ tylli $[_{NumP}$ ~~ki-kot~~ t]]]]

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.

parameters	**NP[+pred, ±arg]**	**NP[-pred, +arg]**
✘ *Card/CL*	***Khasi*** - covert D	① ***Cantonese*** - covert D ② ***Nyosu Yi*** - overt D ③ ***Mandarin*** - ι type-shift
✔ *Card/CL*	① ***English*** - overt D ② ***Hindi*** - ι type-shift	***Dëne Sųłiné*** - ι type-shift

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

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