The Finnish partitive in counting and measuring constructions*

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1 INTRODUCTION: THE PARTITIVE PUZZLE

- In (1) we see that count nouns like ‘apple’ are in the partitive case after numerals, whereas mass nouns are ungrammatical
- In measure constructions in (2) mass and count nouns are in the partitive case, but the count noun additionally has the plural marker[1]

(1)

kaksi	omena-**a**	/	#riisi-ä
two	apple-**PART**	/	rice-PART

‘two apples/#rices’

(2)

kaksi	kilo-a	riisi-**ä**	/	omeno-**i-ta**	/	#omena-**a**
two	kilo-PART	rice-**PART**	/	apple-**PL-PART**	/	apple-**PART**

‘two kilos of rice/apples/#apple’

- The pattern in Finnish is surprising given the typology across other number marking languages
  - Usually count nouns are either plural in both counting and measuring constructions, like English (3), or both singular like Turkish (4)

(3) English

a. two apple**s**

b. two kilos of apple**s**

(4) Turkish

a. iki elma
two apple
‘two apples’

b. iki kilo elma
two kilo apple
‘two kilos of apples’

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[1]Abbreviatons: 1 = first person; 3 = third person; ADESS = adessive; ALLAT = allative; INESS = inessive; N = noun; PART = partitive; PL = plural; PST.P = past participle suffix; SG = singular.

- Finnish employs different strategies for the counting and measuring terms
  - While *omena-a* 'apple-PART' is in the partitive singular in (1), in measure terms as in (2) *omeno-i-ta* 'apple-PL-PART' is in partitive plural
  - Mass nouns are ungrammatical with numerals but in the partitive singular in measuring constructions

The puzzle

A.	Nouns in counting constructions denote *cumulative predicates*: they denote single entities and sums thereof	(premise)
B.	So *omena-a* ('apple.SG-PART') denotes a cumulative predicate, even though it is singular	(A, 1)
C.	Measure phrases (*kilo-a*, 'kilo-PART') select for cumulative predicates	(premise)
D.	Singular nouns in partitive case in Finnish (e.g., *omena-a*) should be felicitous in measure constructions	(C)
E.	But they are not! [CONTRADICTION]	(2)

Outline

- In this talk, we propose a compositional semantic analysis for the singular and plural partitive constructions in Finnish in (1-2) to account for why count nouns in counting constructions are partitive singular, but partitive plural in measure constructions
  - We argue that each morpheme contributes to the semantic interpretation of the NP, cf. Ionin & Matushansky (2004); Ionin et al. (2006) who assume plural morphology is semantically vacuous
- We propose a solution to this puzzle that analyses the Finnish partitive as semantically sensitive to both the semantic type of the nominal predicate it applies to and to whether or not type $\langle e, t\rangle$ predicates are quantized (QUA) in the sense of Krifka (1989)
- The goal of this paper is therefore to account for the distribution of the partitive singular and plural in counting and measuring constructions (1) and (2), namely:
  1. Count nouns in counting constructions are partitive singular but partitive plural in measure constructions
  2. Mass nouns are infelicitous in counting constructions but are partitive singular in measure constructions
- We do this by making the semantics of the partitive morpheme:
  1. Derived from the notion of mereological parthood and at the same time; and
  2. Sensitive to quantization
- Bare singular count nouns denote quantized predicates, mass nouns and plural count nouns denote non-quantized predicates
  - We argue that the partitive morpheme is polysemous and is interpreted with a different sense depending on whether the predicate it applies to is quantized, i.e. a mass or count N
- We argue that our analysis can also predict a major distributional fact about partitive subjects

ROADMAP

[2] Data [3] Theoretical background [4] Analysis [5] Partitive subjects [6] Conclusion

2 EMPIRICAL GENERALIZATIONS ON FINNISH

2.1 The partitive

- The partitive case is a grammatical case that roughly conveys a meaning related to parthood, nonspecificity, or something without result and is common across Finnic languages
- The partitive singular has three endings: *-a/-ä*, *-ta/-tä*, or *-tta/-ttä* and the partitive plural is built by adding *-i/ -j* to the stem and then the partitive ending (Table 1)

Table 1: Finnish partitive singular and plural endings

N Concept	N.NOMINATIVE	N-PARTITIVE	N-PL-PARTITIVE
apple	omena	omena**-a**	omeno**-i-ta**
language	kieli	kiel**-tä**	kiel**-i-ä**
room	huone	huone**-tta**	huone**-i-ta**

- There are other uses of the partitive (see Appendix A), we focus on partitive subjects and counting and measuring constructions in subject position

2.2 Evidence for a mass/count distinction in Finnish

- Finnish has a lexicalized count/mass distinction, exhibited by the following contrasts with the quantifiers *monta* (5) and *paljon* (6) and the distributive determiner *jokainen* (7)

(5) a. Kuinka **monta** pallo**-a** on laatiko-ssa?
how **many** ball**-PART** be.3 box-INESS
'How many balls are in the box?'

b. #Kuinka **monta** riisi**-ä** on pakkaukse-ssa?
how **many** rice**-PART** be.3 package-INESS
'#How many rice(s) is/are in the package?'

(6) a. Tuo-lla on **paljon** #ihmis**-tä** / ihmis**-i-ä**.
that-ADESS be.3 **a.lot.of** person**-PART** / person**-PL-PART**
'There is/are a lot of #person/people over there.'

b. Pakkaukse-ssa on **paljon** riisi**-ä** / #riise**-j-ä**
package-INESS be.3 **a.lot.of** rice**-PART** / rice-PL**-PART**
'There is/are a lot of rice/#rices in the package.'

(7) a. **Jokainen** kultainen **sormus** maksa-a yli 200 euro-a.
each golden **ring** cost-3 over 200 euro-PART
'Each gold ring costs over 200 euros.'

b. #**Jokainen kulta** maksa-a yli 200 euro-a.
each gold cost-3 over 200 euro-PART
'#Each gold costs over 200 euros.'

2.3 The partitive in counting and measuring constructions

- We focus on the pattern repeated in (8) and (9), namely that:
  1. Count nouns in counting constructions are partitive singular but partitive plural in measure constructions
  2. Mass nouns are infelicitous in counting constructions but are partitive singular in measure constructions

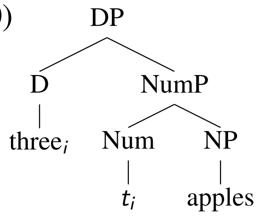
(8) kaksi omena**-a** / #riisi-ä
two apple**-PART** / rice-PART
'two apples/#rices'

(9) kaksi kilo-a riisi**-ä** / omeno**-i-ta** / #omena**-a**
two kilo-PART rice**-PART** / apple**-PL-PART** / apple**-PART**
'two kilos of rice/apples/#apple'

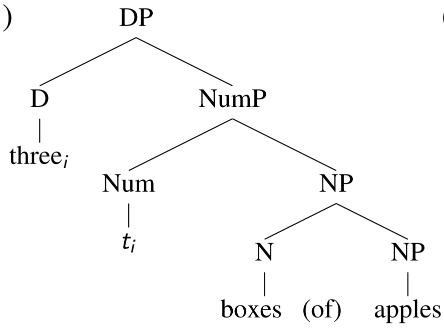
3 THEORETICAL BACKGROUND

3.1 Counting and Measuring Constructions

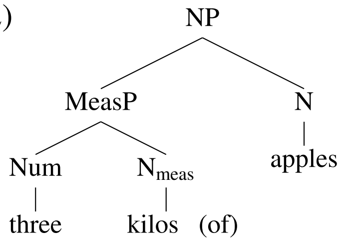
- Rothstein (2011, 2016, 2017), based upon data from English, Hebrew, and Mandarin, proposes that counting constructions (10,11), are distinct from measure constructions (12)

(10)


Count: direct

(11)


Count: container

(12)


Measure

- There are important semantic differences between counting and measuring phrases
- But these differences do not underlie the pattern we see in Finnish with respect to *omena* ('apple'):
  - (13) and (14) do not pattern together
  - (14) and (15) do pattern together

(13) kaksi omena-**a**
two apple-**PART**
'two apples'

(14) kaksi laatikko-a omeno-**i-ta**
two box-PART apple-**PL-PART**
'two boxes of apples'

(15) kaksi kilo-a omeno-**i-ta**
two kilo-PART apple-**PL-PART**
'two kilos of apples'

- Cross-linguistically, the Finnish (Finnic) pattern is distinctive in this way:

Table 2: Distribution of PL and SG marking in counting and measuring constructions

Phrase type:	Count: direct	Count: container		Measure	
N concept:	*apple*	*box*	*apple*	*kilo*	*apple*
English	**PL**	PL	**PL**	PL	**PL**
German	**PL**	PL	**PL**	SG	**PL**
Turkish	SG	SG	SG	SG	SG
Finnish	SG.PART	SG.PART	**PL.PART**	SG.PART	**PL.PART**

3.2 Previous analyses of the NP use of the Finnish partitive

3.2.1 Kiparsky (1998)

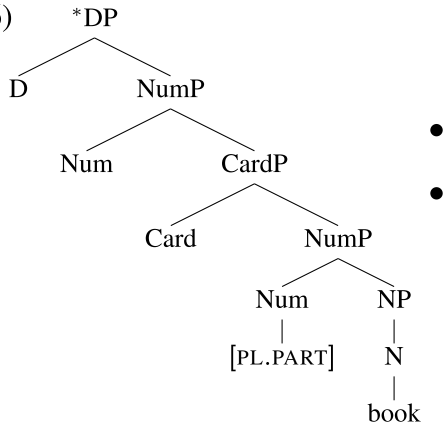
- Partitive subjects are VP internal subjects
- "In its NP-related function, partitive case is assigned to quantitatively indeterminate NPs (including indefinite bare plurals and mass nouns)" (Kiparsky, 1998, §1)
- "On subjects, partitive case marks the unboundedness of the NP itself" (Kiparsky, 1998, §7)
- Unbounded (approximately):
  - P is unbounded iff non-atoms of P have P-parts, and sums of Ps are Ps
    - + Explains why SG count Ns do not take partitive case when in subjects
    - + Explains why partitive subjects are only found with intransitive verbs
    - + Combines an analysis of NP and VP uses of the partitive
    - − Doesn't obviously extend to counting constructions: SG count Ns are not cumulative

3.2.2 Danon (2012)

- Although Finnish is not the main focus, Danon 2012 analyses the partitive case in counting constructions as being assigned to the noun by the numeral
  - This is based on his analysis for numerals, number marking and the structures of numeral-noun-complexes found across languages
- He also remarks on the puzzle of why the partitive plural may not appear on nouns in counting constructions
  - To account for this he proposes a possible explanation where partitive plural is ruled out due to structural competition of number marking (NumP), making (16) ungrammatical

    > "Having an embedded NumP which is both plural and partitive might then be blocked either for semantic reasons or due to a structural competition for the Num[ber marking] position, making the following recursive structure ungrammatical" (Danon, 2012, p.1305)

(16)



- Syntactic analysis
- Semantic reasons are left open
  - + Can account for SG.PART Ns in counting constructions
  - − Not (yet) extended to measure constructions

- While Kiparsky (1998) and Danon (2012) provide valuable insight on the partitive case in subject position and its syntactic licensing, respectively, there is, to our knowledge, no formal semantic account of the distribution of plural and partitive morphology in counting *and* measuring constructions

4 ANALYSIS

*4.1 Reiterating **the puzzle***

(1) kaksi omena-**a** / #riisi-ä
two apple-**PART** / rice-PART
'two apples/#rices'

(2) kaksi kilo-a riisi-**ä** / omeno-**i-ta** / #omena-**a**
two kilo-PART rice-**PART** / apple-**PL-PART** / apple-**PART**
'two kilos of rice/apples/#apple'

A.	Nouns in counting constructions denote *cumulative predicates*: they denote single entities and sums thereof	(premise)
B.	So *omena-a* ('apple.SG-PART') denotes a cumulative predicate, even though it is singular	(A, 1)
C.	Measure phrases (*kilo-a*, 'kilo-PART') select for cumulative predicates	(premise)
D.	Singular nouns in partitive case in Finnish (e.g., *omena-a*) should be felicitous in measure constructions	(C)
E.	But they are not! [CONTRADICTION]	(2)

4.2 Preliminaries

P-parts of entities

- Claim: Both *counting and partitivity are based on the notion of parts relative to a predicate:* $PartSet(x, P)$
- This is formalised below in (17)

(17) $$PartSet(x, P) := \{y : y \sqsubseteq x, y \in P\}$$

i.e. the set of all Boolean P-parts of x,

- If $apple = \{a, b, c\}$, $book = \{d\}$, and $x = a \sqcup b \sqcup d$, then $PartSet(x, apple) = \{a, b\}$

Cardinality functions

- Counting requires a cardinality function, which we define in terms of $PartSet$
- The cardinality function $\mu_{\#}$ is of type $\langle et, \langle n, \langle et \rangle\rangle\rangle$ is given as follows:[2]
  - Predicates are of type $\langle et \rangle$, numerals are of type n

(18) $$\mu_{\#}(x, P) = \begin{cases} |PartSet(x, P)| & \text{if } QUA(P) \\ \bot & \text{otherwise.} \end{cases}$$

- Example: If $apple = \{a, b, c\}$, $book = \{d\}$, and $x = a \sqcup b \sqcup d$, then $\mu_{\#}(x, apple) = 2$

The *-operator

- Typically, the interpretation of PL-morphemes (also our assumption here for Finnish)
- Applies to a set of entities. Returns a set of those entities and all of the mereological sums thereof
- Example: If $apple = \{a, b, c\}$, then $^*apple = \{a, b, c, a \sqcup b, a \sqcup c, b \sqcup c, a \sqcup b \sqcup c\}$

The context parameter: c

- Count Ns are indexed to contexts (e.g., $apple_c$), since what counts as 'one' varies across contexts (Rothstein, 2010; Sutton & Filip, 2016, among many others)

[2]Why relativity to a predicate? – *deck of cards* vs. *cards* (Link, 1983)

Two schemas for counting constructions

- There are two coextensional, but procedurally distinct means of interpreting counting constructions (coextensional when $\mathcal{D}_e - 0$)

1. Counting based on a semantically number neutral predicate

- Semantically number neutral predicates denote individuals and sums thereof
- English case: semantically number neutral PL Ns
  Turkish case: semantically number neutral SG Ns

(19) $$\lambda x[\mu_{\#}(x, P_c) = 2 \wedge {}^*P_c(x)]$$

(20) $$[\![\text{two apples}]\!]^c = \lambda x\, [\mu_{\#}(x, apple_c) = 2 \wedge {}^*apple_c(x)]$$

Example: If $[\![\text{apple}]\!]^c = \{a, b, c\}$, then $[\![\text{two apples}]\!]^c = \{a \sqcup b, a \sqcup c, b \sqcup c\}$

2. Counting based on a semantically singular predicate (that only denotes individuals)

- Finnish case: Semantically **singular** SG Ns
- No ${}^*P$ predicates are supplied as arguments as nouns in Finnish counting constructions are partitive *singular* (* is encoded by plural morphology)
  - So representations like in (20) cannot work for Finnish

Proposal for Finnish: At its core, the partitive morpheme encodes $PartSet$[3]

- Our analysis: a counting construction with the numeral 2, for a singular predicate P is:

(21) $$\lambda x[\mu_{\#}(x, P_c) = 2 \wedge \sqcup(PartSet(x, P_c)) = x]$$

In words: an expression that denotes the set of xs, such that each x has a cardinality of 2 wrt the predicate P_c, and x is no more than all of its P_c-parts.

[Supremum operator, $\sqcup$. Example: $\sqcup\{a, b\} = a \sqcup b$, $\sqcup\{a, b, c\} = a \sqcup b \sqcup c$]

(22) $$[\![\text{kaksi omena-a}]\!]^c = \lambda x\, [\mu_{\#}(x, apple_c) = 2 \wedge \sqcup(PartSet(x, apple_c)) = x]$$

Example 1: If $[\![\text{omena}]\!]^c = \{a, b, c\}$, and $x = a \sqcup b$, then:
then $\sqcup(PartSet(x, apple_c)) = x$ iff $\sqcup\{a, b\} = a \sqcup b$ ✓;

Example 2: If $[\![\text{omena}]\!]^c = \{a, b, c\}$, then $[\![\text{kaksi omena-a}]\!]^c = \{a \sqcup b, a \sqcup c, b \sqcup c\}$
(= extensionally identical to (20) when $0 \notin \mathcal{D}_e$)

[3] $PartSet$ is clearly related to the meaning of partitivity defined in terms of mereological parthood (Krifka, 1992; Marty, 2017): $[\![\text{PART}_{\text{basic}}]\!] = \lambda x.\lambda y.x \sqsubseteq y$

4.3 Compositional Analysis: The meaning of the partitive morpheme is sensitive to quantization

- We propose **two** semantic entries for the partitive to capture its distribution with mass and count nouns, both of which are derived from (21)
  - The meaning of partitive morphology is sensitive to whether the noun denotes a quantized type $\langle e, t\rangle$ predicate (23a), or not (23b)
  - Both of our lexical entries for $[\![\text{PART}]\!]$ in (23a) and (23b) are type shifting functions defined in terms of a context-indexed predicate, P_c, and $PartSet$

$[\![\text{PART}]\!] =$		
(23a)	$\lambda P.\lambda c.\lambda n.\lambda x.[\mu_{\#}(x, P_c) = n \wedge \sqcup(PartSet(x, P_c)) = x]$	if $\mu(x, P_c) \neq \bot$
(23b)	$\lambda P.\lambda c.\lambda x.\exists y.[P_c(y) \wedge x \in PartSet(y, P_c) \wedge x \neq y]$	otherwise

- When (23a) is applied to quantized $\langle e, t\rangle$ predicates (i.e. interpretations of SG count Ns)
  - introduces a cardinality function ($\mu_{\#}$): this allows composition of numerals of type n
  - introduces $\sqcup(PartSet(x, P_c)) = x$: this restricts the extension to only Ps
  - (23a)(P_c) is of type $\langle n, \langle et\rangle\rangle$
- If (23a) were to be applied to plural non-quantized $\langle e, t\rangle$ predicates (i.e. interpretations of PL count Ns and mass Ns), (23a) is not defined due to the selectional restrictions of $\mu_{\#}$
- The meaning of partitive morphology in (23b) has a parthood and an indefiniteness effect
  - In words: The set of proper P_c-parts of some (contextually provided) P_c
  - I.e. For a plural entity y that is in P_c, denotes the set of P_c parts of y other than y itself
  - Example: If $a \sqcup b \sqcup c$ is the supremum of $^*cat_c$, then $[\![\text{PART}]\!](^*cat_c)$ denotes the set $\{a, b, c, a \sqcup b, a \sqcup c, b \sqcup c\}$. (It does not denote $a \sqcup b \sqcup c$)
  - (23b)(P_c) is of type $\langle et\rangle$
- When applied to singular quantized $\langle e, t\rangle$ predicates (i.e. interpretations of SG count Ns), (23b) vacuously denotes the empty set
  - In other words, (23a) is only defined for quantized predicates and (23b) is only a sieve on entities relative to non-quantized predicates

4.4 Deriving the compositionality facts

Counting constructions:

- Partitive singular count Ns (e.g., *omena-a* 'apple-PART') are felicitous, since they are the right type to compose with a numeral: (24), (25), (26), (27)

(24) $[\![\text{kaksi}]\!] = 2$

(25) $[\![\text{omena}]\!]^c = \lambda x\,[apple_c(x)]$

(26) $[\![\text{omena-a}]\!]^c = [\![\text{PART}]\!]([\![\text{omena}]\!]^c))$
$= (23a)([\![\text{omena}]\!]^c)$
$= \lambda n.\lambda x\,[\mu_{\#}(x, apple_c) \wedge \sqcup(PartSet(x, apple_c)) = x]$

(27) $[\![\text{kaksi omena-a}]\!]^c = [\![\text{omena-a}]\!]^c([\![\text{kaksi}]\!])$
$= \lambda n.\lambda x\,[\mu_{\#}(x, apple_c) = n \wedge \sqcup(PartSet(x, apple_c)) = x]\ (2)$
$= \lambda x\,[\mu_{\#}(x, apple_c) = 2 \wedge \sqcup(PartSet(x, apple_c)) = x]$

- Plural partitive count Ns (e.g., *omeno-i-ta* 'apple-PL-PART') and SG partitive mass Ns (e.g., *riisi-ä* 'rice-PART') are not felicitous, since neither are of type $\langle n, \langle e, t\rangle\rangle$: (24), (28), (29), (30)

(28) $[\![\text{riisi}]\!] = \lambda x\, [rice_c(x)]$

(29) $[\![\text{riisi-ä}]\!] = [\![\text{PART}]\!]([\![\text{riisi}]\!])$
$= (23b)([\![\text{riisi}]\!])$
$= \lambda x.\exists y\, [rice_c(y) \wedge x \in PartSet(x, rice_c) \wedge x \neq y]$

(30) $[\![\#\ \text{kaksi riisi-ä}]\!] = [\![\text{riisi}]\!]([\![\text{kaksi}]\!])$
$= [\![\text{riisi-ä}]\!]_{:\langle et\rangle}\ (2)_{:\,n} \Leftarrow$ TYPE CLASH!

Measure constructions:

- Partitive morphology and measure expressions of type $\langle n, \langle e, t\rangle\rangle$ (e.g., *kilo*). Two options:
  - Option 1: Partitive morphology is semantically vacuous. *kilo*, *litra* ('kilo', 'litre') are already of the type that singular common nouns are shifted into by partitive morphology (31a)
  - Option 2: Partitive morphology builds the argument structure for a measure phrase (31b)

(31a) $[\![\text{kilo}]\!] = [\![\text{kilo-a}]\!] = \lambda n.\lambda x.\mu_{\mathbf{kg}}(x) = n$

(31b) $[\![\text{kilo-a}]\!] = \lambda P.\lambda x.\mu_{\mathbf{kg}}(x) = n \wedge P(x)$

- Partitive singular count Ns (e.g., *omena-a* 'apple-PART') are ruled out via the standard assumption that measure expressions select for type $\langle e, t\rangle$ non-quantized predicates (Krifka, 1989): (26), (31), (32), (33)

(32) $[\![\text{kaksi kilo-a}]\!]^c = [\![\text{kaksi kilo-a}]\!]^c([\![\text{omena-a}]\!]^c)$
$= \lambda P.\lambda x.[\mu_{\mathbf{kg}}(x) = 2 \wedge P_c(x)]$

(33) $[\![\#\ \text{kaksi kilo-a omena-a}]\!]^c = \lambda P_{:\langle et\rangle}.\lambda x.[\mu_{\mathbf{kg}}(x) = 2 \wedge P_c(x)]\ ([\![\text{omena-a}]\!]^c_{:\langle n, \langle et\rangle\rangle})$
$\Leftarrow$ TYPE CLASH!

- Plural partitive count Ns (e.g., *omeno-i-ta* 'apple-PL-PART') and SG partitive mass Ns (e.g., *riisi-ä* 'rice-PART') are felictous and get an indefinite reading: (32), (34), (35)

(34) $[\![\text{omeno-i-ta}]\!]^c = [\![\text{PART}]\!]([\![\text{PL}]\!]([\![\text{omena}]\!]^c))$
$= (23b)(\lambda x.{}^*apple(x))$
$= \lambda x.\exists y.[{}^*apple_c(y) \wedge x \in PartSet(y, {}^*apple) \wedge x \neq y]$

(35) $[\![\text{kaksi kilo-a omeno-i-ta}]\!]^c = \lambda x.\exists y.[\mu_{\mathbf{kg}}(x) = 2 \wedge$
${}^*apple_c(y) \wedge x \in PartSet(y, {}^*apple) \wedge x \neq y]$

4.5 Summary

- Using familiar semantic properties and operations, we capture the distribution and interpretation of the partitive singular and plural in Finnish
  - The restrictions on the meaning of the partitive morpheme is defined in terms of quantization (i.e. mass vs. count, and SG count vs PL count and mass)
  - The meaning of the partitive morpheme in context is derived from parthood and the interpretation of the N it applies to (*PartSet*)
- Next, we argue that, though our analysis is motivated only by the data from Finnish counting and measuring constructions, we can also derive a central restriction on partitive subjects

5 ACCOUNTING FOR A RESTRICTION ON PARTITIVE SUBJECTS

- Partitive subjects — felicitous with a subclass of intransitive verbs (Kiparsky, 1998) — may be post-verbal and give rise to existential interpretations as in (36,37)[4]

(36) a. #Pöydä-llä on **kirja-a**.
table-ADESS be.3 **book-PART**
'#There is book on the table.'

b. Pöydä-llä on **kirjo-j-a**
table-ADESS be.3 **book-PL-PART**
'There are books on the table.'

(37) a. Pakkaukse-ssa on **riisi-ä**.
package-INESS be.3 **rice-PART**
'There is rice in the package.'

b. #Pakkaukse-ssa on **riise-j-ä**.
package-INESS be.3 **rice-PL-PART**
'#There are rices in the package.'

- To summarize the data in (36) and (37):
  - Partitive singular count Ns cannot be subjects (barring mass-to-count coercion)
  - Partitive plural count Ns and partitive mass nouns can be subjects, but always indefinite
- The use of the partitive with Ns in subject position is sensitive to the mass/count distinction
  - Count Ns cannot appear as partitive singular subjects, only as partitive plural or as singular or plural nominative as in (36-37)
  - Mass Ns can be nominative or partitive subjects, but are always singular
- Partitive singular count Ns cannot be subjects because they are the wrong type
  - $[\![\text{omena-a}]\!]^c$ is type $\langle n, et\rangle$, but standardly, subject DPs are derived from type et predicates[5]
- Partitive plural count Ns and partitive singular mass nouns are of the right type to be subjects
  - $[\![\text{omeno-i-ta}]\!]^c$ and $[\![\text{riisi-ä}]\!]^c$ are of type et
  - There are no articles in (written) Finnish
    - ∗ On the assumption that indefinite DPs can be derived via ∃-closing type e arguments of type et NPs and forming a GQ, then there's no block on these being subjects
- Then why must they always be indefinite and we cannnot apply an ι-closure operation on their interpretations?
  - The standard interpretation for ι-closure in a classical mereological setting is in terms of the supremum of a set:

(38) $$\iota x.P_c(x) \leftrightarrow \sqcup(P_c)$$

- But this is at odds with the semantics of $[\![\text{PART}]\!]$ in (23b), repeated here as (39), which excludes the supremum of the relevant set in the context

(39) $$\lambda P.\lambda c.\lambda x.\exists y.[P_c(y) \wedge x \in PartSet(y, P_c) \wedge x \neq y]$$

- Treating the partitive as polysemous and sensitive to quantization also predicts a restriction on the distribution of partitive subjects

[4]Nominative subjects are always possible. They usually give rise to definite interpretations.

[5]One possible worry is why is it not possible for the type n variable be ∃-closed first. We argue that ∃-closing type $\langle n, et\rangle$ expressions is existentially equivalent to applying the *-operator to the interpretation of the nominative singular expression and therefore ruled out via competition with the nominative plural.

$$(i) \quad \forall P.\forall x.QUA(P) \rightarrow \exists n.[\![\text{PART}]\!](P_c)(n)(x) \leftrightarrow {}^*P_c(x)$$

6 CONCLUSION

- We began with the data on Finnish counting and measuring constructions repeated below in (40) and (41)

(40)	kaksi omena-**a**	/ #riisi-ä	(41)	kaksi kilo-a	riisi-**ä**	/ omeno-**i-ta**	/ #omena-**a**
	two apple-**PART**	/ rice-PART		two kilo-PART	rice-**PART**	/ apple-**PL-PART**	/ apple-**PART**
	'two apples/#rices'			'two kilos of rice/apples/#apple'			

- The partitive in counting and measuring constructions:
  1. Count nouns in counting constructions are partitive singular but partitive plural in measure constructions
  2. Mass nouns are infelicitous in counting constructions but are partitive singular in measure constructions

- The puzzle exhibited is that nouns in counting constructions (i.e. *omenaa*) should denote single entities and pluralities of those entities, or cumulative predicates)
  - But *omenaa* is partitive singular in (40)

- We'd then expect that measure phrases to also select for cumulative predicates, but *omenaa* is infelicitous in these constructions
  - Instead, the partitive plural is used (*omenoita* in (41))

- We posited that to capture the data the partitive is derived from mereological parthood (the notion of *PartSet*) and sensitive to quantization (mass/count)

- Making the partitive sensitive to quantization also correctly predicts the distribution of partitive subjects
  - Partitive mass nouns can be in subject position but partitive count nouns may not

- The analysis proposed here supports theories that argue that PL nouns in counting constructions are semantically plural

- Our proposed analysis
  - is (to our knowledge) the first compositional analysis of the Finnish partitive morpheme
  - accounts for counting and measuring constructions
  - also predicts the distribution of partitive subjects

- Finally, we would like to highlight the variation attested across languages in deriving counting and measuring constructions
  - While some languages use plural marking (e.g., English) or have singular, but semantically number neutral nouns (e.g., Turkish), Finnish exploits the partitive case to derive extensionally equivalent representations of counting and measuring phrases

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APPENDIX

A. Other uses of the partitve

- The partitive is used for a number of constructions, like under the scope of negation (42-a), with certain verbs (42-b) as well as to express telicity (42-c) (Luraghi & Huumo, 2014; Karlsson, 2018)[6]

(42) a. En näh-nyt kirja-**a**.
NEG.1 see-PST.P book-**PART**
'I didn't see a book.'

b. Rakasta-n tä-tä kaupunki-**a**.
love-1 this-**PART** city-**PART**
'I love this city.'

c. Kirjoita-n sinu-lle kirje-**ttä**.
write-1 you-ALLAT letter-**PART**
'I am writing you a letter.'

B. The semantics of counting constructions

- Point of contention:
  - Is PL morphology in counting constructions semantically vacuous?
    - No: among others, Chierchia (2010, 2015); Rothstein (2010); Filip & Sutton (2017)
    - Yes: among others, Krifka (1989); Ionin & Matushansky (2004); Ionin et al. (2006)
- Our answer: No (at least for English and Finnish)
- Arguments for 'yes', and possible counter-responses:
  - Krifka (1989): In English, PL morphology is also triggered by 0 and by decimals (*Zero/0.5/1.0 apples/#apple*)
    - Plausibly, decimals and fractions encode sub-atomic quantification (Wągiel, 2019)
    - Evidence: *1.0 apples* can denote parts of apples that sum to the equivalent of one apple:
      Some test participants were monitored while consuming 1.5 apples per hour (i.e., one slice of apple every 6-7 minutes), other test participants were monitored while consuming 1.0 apples per hour (i.e., one slice of apple every 10 minutes).
  - Ionin & Matushansky (2004); Ionin et al. (2006): There is reason to think that PL morphology in English counting constructions is vacuous, because of data from i.a. Turkish, Hungarian, and Finnish (Table 2)
    - This faces two problems for Finnish
      1. It ignores the semantic role of the partitive in counting constructions
      2. It leaves unexplained why partitive plural count nouns and partitive singular mass Ns can be subjects, when partitive singular count nouns cannot (more on this below)
    - Furthermore, the inference from Turkish and Hungarian data to English is unsound:
      - It has been argued that, in Turkish (Bale et al., 2011) and Hungarian (Farkas & de Swart, 2010), singular nouns are *not* semantically singular and can have semantically plural reference
- If PL morphology is not semantically vacuous, the standard kind of representation for (direct) counting constructions in a classical mereological framework is:

(43) $$[\![\text{three}]\!] = \lambda P.\lambda x[\mu_{\#}(x, P) = 3 \wedge P(x)]$$

(44) $$[\![\text{apples}]\!] = \lambda x.{}^{*}apple(x)$$

(45) $$[\![\text{three apples}]\!] = \lambda x.[\mu_{\#}(x, P) = 3 \wedge {}^{*}apple(x)]$$

[6] It is also used in some predicate adjectival constructions, with certain adpositions, as well as to express adverbials of reason, route or path, some idiomatic expressions, and many greetings (Karlsson, 2018, Ch. 12).

In words: The set of entities that have a cardinality of 3 and are in the set of single apples or sums thereof.

C. Quantization/Non-Quantization relative to a context

The property of being a *quantized* (QUA) predicate (relative to a context, c):

- Distinguishes count Ns from non-count Ns
- Distinguishes singular Ns from plural count and non-count Ns is Krifka (1989); Filip & Sutton (2017)
- Two key notions:
  1. Extension, e.g.:
     - for *apple*, the set of single apples
     - for *apples*, the set of single apples and sums thereof
     - for *rice*, the set of rice grains and sums thereof
  2. Counting base: The set of entities that is accessed by grammatical counting operations, (see, Landman, 2011, 2016; Sutton & Filip, 2017, 2016; de Vries & Tsoulas, 2018, amongst others)

     If the extension of P is X, then the extension of $\mathbf{cbase}(P)$ is a subset of X. E.g.
     - for *apple*, the set of single apples
     - for *apples*, the set of single apples
     - for *rice*, theories vary, but, e.g., the set of rice grains and sums thereof or the set of rice stuff

- SG Count versus PL Count and Non-count – Quantized versus non-quantized extensions
  - For a predicate P and a context c, if the extension of P_c is quantized, then P is a singular count predicate. P is plural count or non-count, otherwise

$QUA([\![\text{apple}]\!]^c)$ $\leftarrow$ no single apples are proper parts of other single apples
$\neg QUA([\![\text{apples}]\!]^c)$ $\leftarrow$ single apples & apple sums are proper parts of other apple sums
$\neg QUA([\![\text{rice}]\!]^c)$ $\leftarrow$ some rice stuff is a proper part of other rice stuff

- Count versus Non-count – Quantized versus non-quantized counting bases
  - For a predicate P and a context c, if the extension of $\mathbf{cbase}(P)_c$ is quantized, then P is a count predicate. P is not count otherwise

$QUA(\mathbf{cbase}([\![\text{apple}]\!]^c))$ $\leftarrow$ no single apples are proper parts of other single apples
$QUA(\mathbf{cbase}([\![\text{apples}]\!]^c))$ $\leftarrow$ no single apples are proper parts of other single apples
$\neg QUA(\mathbf{cbase}([\![\text{rice}]\!]^c))$ $\leftarrow$ some rice stuff is a proper part of other rice stuff