

RESEARCH

Partitives and Partitivity

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The paper offers a broad overview of several structures that fall under the umbrella term of “partitives”. It surveys previous analyses and proposes a treatment based on two null operators, PART% and PART^{PRO}, with different syntactic and semantic properties. The approach is argued to outperform previous theories in its ability to cover conjunctions, mass cases and contrastive differences across Italian and English. Crowd-sourced grammaticality judgments and corpus searches are used to supplement informal judgments and try to shed light on a complex set of facts.

Keywords: syntax; semantics; partitives; proportions; proforms; conjunction

1 Introduction

In 2016 and 2017 we edited a number of articles on partitives and related constructions, which appeared in a special collection on the topic in the journal *Glossa*.¹ The present contribution was initially conceived as an introduction to the collection, and as a way to discuss and organize the foundational issues those articles built upon. Along the way, however, the work developed into a full-fledged original theoretical proposal, which is now time to open to public discussion.

We begin with a broad definition of our topic of inquiry. The partitive construction is a noun phrase, like the subject of (1b), which is used to refer to a subset or subpart of another referent, the *antecedent*, typically one which has been previously introduced in the discourse, as in (1a). The antecedent (in (1a), a simple numeral plus noun—a structure which, following previous literature, we call a *quantitative*—is picked up by a definite noun phrase inside the bracketed nominal in (1b).

- (1) a. [Twenty students]_i took the exam.
b. [Two of {them_i/ the students_i/ these students_i}]_{jci} got top grades.

We will refer to the elements in curly bracket in (1b) as the “inner nominals”, and to their determiners as the “inner determiners”; the determiner that heads the whole partitive (here, *two*) will be the “outer determiner”.

Partitives have been frequently addressed in the literature, starting from Jackendoff (1968) and especially Selkirk (1977), who gives them the structure of a full noun phrase embedded within another noun phrase. A detailed structural analysis of partitives was offered in Jackendoff (1977), who called *Partitive Constraint* (PC) the requirement for the inner determiner to be definite, and set the stage for the discussion of three key points

¹ <https://www.glossa-journal.org/collections/special/partitives/>.

which have informed much of the research on the internal structure of these constructions: the possible presence of a phonetically null nominal element N^e between the external determiner and the partitive preposition (i.e. *three N^e of them*), the semantic import of the partitive preposition itself (English *of*, Genitive case in many languages, etc.), and the types of partitive which require *proper partitivity*, i.e. the necessity for the outer nominal to refer to a *proper* subpart of the referent of the inner nominal. Directly or indirectly, much of the research that followed has tackled these issues.

While written against this broad research background, the papers collected in the *Glossa* special collection differed precisely in that, instead of directly addressing issues like those above, they adopt results from previous work (assuming, in particular, the presence of an N^e), and use them to answer problems in gender agreement, differential object marking, quantificational suffixes and floating quantifiers, looking in all cases at languages different from English. This marks, it seems to us, a coming of age of partitive research, as this construction and its properties begin to enter the toolbox of more global linguistic research. The success of this new enterprise can thus be seen as indirect confirmation of the partitive structures and functions on which those works are based.

The present article takes up a complementary role: revisiting some of the background issues, adding a few novel facts and distinctions, and strengthening, if possible, the foundations on which those papers were built. To refine some of the delicate judgments found in the literature on this topic we decided to adopt the methods discussed in Sprouse et al. (2013); Sprouse & Almeida (2017) and use corpus searches, crowd-sourcing and on-line questionnaires² to obtain as many judgments as possible for various complex constructions, validating their statistical significance. To simplify, we translated the 1-to-5 judgment given by the informant pool into a more familiar linguistic scale: $1 \leq * \leq 2 \leq ?? < 3 \leq ? < 4 \leq \checkmark \leq 5$. Note that the marks refer to the *average* of all the judgments. Not all the data in the paper were obtained from informant pools: some come from the literature, others were obtained by asking a much smaller number of native speakers (mostly linguists) during the revision stage. To distinguish them, we mark pool judgments by boldfacing and italicizing them (e.g. *******, ***??*** vs. ***, *??*).

The structure of the paper will be as follows. In Section 2 we list a number of “partitive-like” constructions mentioned in the literature, and in Section 2.1 we carry out a preliminary review and exclude some cases from further consideration. Section 3 discusses general issues with the remaining cases, and gives an overview of the previous analyses. Sections 4 and 5 address more peripheral partitive constructions, including the important cases of *proportions* (Sec. 4.1) and *indefinite* partitives (Sec. 5). In Section 6 we focus on the structure of the “core” cases, drawing evidence from gender agreement in Italian (Sec. 6.1) and overt raising structures, (the so-called double genitives, in Sec. 6.2). In Sections 6.3 and 6.4 we make a case for a mixed analysis of canonical partitives and double genitives,

² We used the crowd-sourcing platform Crowdfunder (<https://www.crowdfunder.com/>) to validate the English data. Each example was judged by at least 20 self-assessed native speakers on a 5 point Likert scale (a 25.6 speaker-per-judgment average for English). We opted not to test whether the expression could have a certain meaning, or could be appropriate for a given context. Judgments were restricted to (self-assessed) American participants, connecting to the platform from US IP addresses, to increase consistency; we cannot therefore exclude that the judgments may be different in other varieties of English. We place our example sentences and individual judgments on-line for inspection at <https://github.com/roberto-zamparelli/Partitivity>.

Due to the low number of Italians on the Crowdfunder platform we could not use the same approach for the Italian data, and resorted to an on-line questionnaire administered to 22 native speakers of Italian, all master students at the University of Trento. Both dataset were analyzed using R and the RStudio environment. The Wilcoxon test (a non parametric test, since we could not assume a normal distribution of ratings) was used for significance.

Corpus analyses were carried out on UKWAC and ITWAC (both 2-billion word web-extracted corpora, POS-tagged and lemmatized to allow pattern searches; see Ferraresi et al. 2008), using the CQP/CWB query language (<http://cwb.sourceforge.net/index.php>).

which uses a matching analysis with a PRO-NP in the former and NP-movement in the latter; Section 6.5 considers other partitive cases (*among*-cases, extrapositions) in light of this proposal. Section 7 bolsters the approach using data from coordination, and Section 8 discusses two previous analyses similar to ours. In the last part of the paper we address the case of partitive structures containing two nouns, which we propose should be treated as *partitive appositions* (Sec. 9). A final section (10) wraps up the paper by giving syntactic trees for the two main structures, and concludes.

2 The many facets of partitivity

The formal inclusion relation between two sets ($A \subset B$) can be explicitly expressed in natural language in several different ways. At the nominal level, a speaker may simply use different restrictors in an inclusion relation (*freshmen* \subseteq *students*) (2).

- (2) Twenty **students**_i from different years took the exam.
The **freshmen**_{jci} did better than last year.

However, if the restrictor remains unchanged, we enter the rich world of *part-of constructions*, consisting of many different forms. In this section we draw heavily from Jack Hoeksema, who in a seminal 1984 paper and in the introduction to a 1996 collection devoted to this topic attempted a classification of all the English constructions that have a ‘subpart/subset’-related semantics. The present list tries to be even more inclusive, though some of the elements in this vast family will later be excluded from our investigation.

- A. **Canonical partitives (CANONP)** partitives introduced by a numeral or a quantity expression (*many*, *few*, etc.; “Q-adjectives”, in the terminology of Solt 2015), followed by a definite inner nominal introduced by a pronoun, a definite article, a demonstrative or a possessive DP (cf. (1b) above).

- (3) Twenty **students**_i from different years took the exam.
I spoke with [two of {them_i/the students_i/these students_i/John’s students_i}]_{jci}.

However, other inner nominals which are apparently definite or at least “strong” in the sense of Milsark (1974) do not work:

- (4) a. *One of both boys arrived. vs. one of the two boys
b. *Three of most boys arrived.

Conjunctions of inner nominals do not work either, even when they are definite:

- (5) a. *One of this boy and that girl came over.
b. *Some of Jack, Marc, Luis and Tom will not come.

The partitives in this section are the ones originally discussed in Jackendoff (1977), and those most frequently addressed in the literature that followed.

- B. **Indefinite Partitives (INDEFP)** are externally similar to canonical partitives, but with an *indefinite* inner nominal (6a, b). They are mentioned in Stockwell et al. (1973) and widely discussed in Abbott (1996) and Barker (1998).

- (6) a. He ate three of some apples he found on the ground.
b. John was one of several students who arrived late. Ladusaw (1982)

These examples are a direct counterexamples to Jackendoff's **Partitive Constraint** (PC)—the requirement for the inner nominal to be (in some sense) “definite”, which seems very much active in e.g. (7) (in contrasts with the *pseudopartitives* discussed below, at [PSEUDOP]).

(7) *Three of (some) friends arrived.

A characterization of these indefinite cases seems therefore quite important to achieve a deeper understanding of partitives.

C. **Proportional Partitives and Percentages (PROPORP)** they express the subset in terms of a proportion of its total, which can be given in raw form (8), or normalized, as in the case of percentages (9). Both cases can have singular inner nominals (10), in which case they apply to a global mass, or to the mass of each individual object, after its quantifier has taken scope over the proportion operator (like in (10b), interpreted as in (10c)).

(8) a. half of the doctors
b. all of the students

(9) a. 100% of the students
b. 20% of those

(10) a. {Almost all / Half / 80%} of the house was underwater.
b. (With the flood,) half of most buildings was underwater.
c. Most x: building(x). underwater(half_of(x))

The examples in (10) come close to constructions containing an overt measure noun, like *the biggest part of the house*, a meaning which is made explicit in Italian, where the only way to render English *most* is *la maggior parte* ‘the most part’.

Some proportional cases have inner nominals which are indefinite, either plural (11), or singular (12). The latter case seem to be limited to abstract nouns, and does not seem to apply to ‘mereological subparts’.

(11) 80% of school children

(12) a. Much of theater is improvisation.
b. Half of boxing is legwork. (Hoeksema 1996)

D. **The “Among” construction (AMONGP)** uses the preposition *among* in place of *of* (13). Following Hoeksema 1984, we also refer to it as the “semi-partitive”. Note that *among* partitives can frequently have a second noun before the PP (*freshmen* in (13)).

(13) Twenty **students**_i took the exam.
Only [five (freshmen) among all these students_i]_{jci} managed to pass.

The distinction between *of* and *among* partitives is likely to replay in other languages in terms of Case. Turkish, for instance, has ablative-marked partitives, discussed in von Heusinger & Kornfilt (2017), which seem at least partly equivalent to *among* constructions (double noun, no PPart, more Case marking variation in the inner nominal, see below) and a Genitive partitive which must contain a single

noun (14a), and possibly the special noun *tane* ‘item’ (14b) (from von Heusinger & Kornfilt 2017: ex. 17).

- (14) a. Meyve-ler-in {alti-sin-i / bazi-lar-in-i} ye-di-m.
fruit-PL-GEN {six-3P.SNG-ACC / some-PL-3P.SNG-ACC} eat-PST-1SNG
‘I ate six / some of the fruits.’
- b. Meyve-ler-in üç tane-sin-i ye-di-m.
fruit-PL-GEN three-3P.SNG-ACC item-3P.SNG-ACC eat-PST-1SNG
‘I ate three (items) of the fruits.’

E. **Superlative partitives (SUPERLP)** are introduced by the definite article plus a superlative form of the adjective.

- (15) (Only) [the most diligent of the freshmen]_{jci} managed to pass.

Note that the definite article is normally not possible in partitives (**the two of the freshmen*), while it is obligatory here (compare (15) with (16), where *most* is an intensifier, not a superlative).

- (16) a most diligent {freshman / *of the freshmen}

F. **Double-noun partitives (2NOUNSP)**. While often deemed ungrammatical (see e.g. Cardinaletti & Giusti 2007: ex. 120b), some partitive-like structures containing a noun before *of*, like (17), are fairly well-attested and should therefore be considered for examination.

- (17) a. I only got two packages of the mail you sent me.
b. ?I read two novels of the books you gave me.

If Italian *ne* ‘one(s)’ is a pro-NP (see Belletti & Rizzi 1981 in a pre-DP framework, Giusti 1997, Falco & Zamparelli 2016), then cases where *ne* coexist with a partitive PP, like (18) (from Cardinaletti and Giusti; their judgment) should be analyzed as double noun partitives.

- (18) *Ne_i ho letti molti t_i dei libri che mi hai consigliato.
ones I_{have} read many of_{the} books that to_{me} you_{have} recommended
‘I have read many, of the books you recommended.’

The question to address here is what determines the higher or lower marginality of such examples, as it emerges from our pooled judgments.

G. **“Bare partitives” (BAREP)**. Italian has indefinite nominal structures which formally resemble partitives in having the genitive preposition combined with a definite determiner, but lack any external determiner. These forms seem to replace unspecified plural indefinites, when absent (Spanish, which has a plural form of the indefinite article, *unos*, does not have bare partitives), with a comparable range of meanings.

- (19) a. Dei ragazzi sono qui.
of_{the} boys are here
‘Some boys are here.’

- b. Ho comprato della birra.
I bought of_i the beer
'I bought some beer.'

Chierchia (1998) proposed that they are indeed derived from partitives with a missing external vague numeral (cf. *alcuni dei ragazzi* 'some of the boys'). The analysis is debated; one obvious problem is that, unlike in other partitive cases, these examples do not presuppose the existence of any external target: the definite semantics is absent (Storto 2003). Zamparelli (2008) points out that the canonical partitive forms in (20a) and (21a) do not have corresponding bare forms (b), and suggests that bare partitives are actually derived from the kind-denoting definite nominals typical of Romance languages. Cardinaletti & Giusti (2017) on the other hand, treat them as lexicalized determiners.

- (20) a. Alcuni dei venti ragazzi sono qui.
some of_i the twenty boys are here
'Some of the twenty boys are here.'
b. *Dei venti ragazzi sono qui.
of_i the twenty boys are here
- (21) a. Alcuni dei loro sono qui.
some of_i the theirs are here
'Some of theirs are here.'
b. *Dei loro sono qui.
of_i the theirs are here

Note that even if the best analysis of so-called "bare partitives" turns out to be one which excludes them from the partitive family, a question remains: Italian does allow bare nominals in some environments (existentially interpreted verb objects, appositions); but then, why shouldn't these environments also license a "partitive" where the external numeral is missing? We return to this question in Section 9, where we suggest that such cases do exist, but only in the limited environment of *appositions*.

H. Covert partitives (COVERTP). These cases have partitive meaning without any overt partitive syntax.

- (22) [Ten students]_i took the exam.
Two_j got top grades.

Obviously, these cases can be linked to the structure of "fuller" partitives only if they covertly display some of the same syntactic or semantic properties. While we think that such properties can be found, we set these cases aside here to address them in depth in a separate paper (Falco and Zamparelli, in progress).

Some additional potential members of the partitive family contain ingredients of the cases seen so far, but present them in non-canonical orders, or add/subtract elements. We list and briefly discuss them for completeness.

I. Extraposed partitives (EXTRAP) are cases similar to canonical partitives in [CANONP](23), or to double-noun partitives [2NOUNSP], (24), but where the PP appears in dislocated (typically, fronted) position.

(23) Of (all) [the students who took the exam]_i, only [five]_{jCi} managed to pass.

(24) Of [the books you gave me]_i, I only read [two novels]_{jCi}.

While this could be a simple case of extraposition, it adds some constraints on the possible structures we want to assume for partitives.

J. **Inverted partitives (INVERTP)**. Canonical partitives have no noun between the external determiner and the PP, but there are constructions potentially related to partitives which have a noun between the external determiner and the preposition but no noun inside the PP. In English, one example is the so-called *double genitive* (in (25a), followed by a possible canonical counterpart (b)).

- (25) a. one friend of John's
b. one of John's friends

In Italian, another example is the inverted version of the 'superlative partitive' listed under [SUPERLP], i.e. (26a). In this case, unlike in the normal superlative partitive shown again in (26b), the definite determiner is not licensed:

- (26) a. {due / *i} ragazzi dei più piccoli
{Two / the} boys of_the_{PLUR} most small_{PLUR}
'two/the boys among the smallest ones'
b. il più piccolo dei ragazzi
the most small of_the boys
'the smallest of the boys'

K. **Maximal Pronominal partitives (MAXPROP)**, as in (27), depart from a canonical partitive with a personal pronoun by appending a universal or definite determiner externally (but not, e.g. a demonstrative: **these two of them*).

- (27) a. the two of us
b. all of them

Note that the meaning is akin to the form [*we/us two*], [*they/them all*]. Therefore, these cases do not refer to a *proper subset* of the antecedent, as obvious in the possibly related construction (28).

(28) There is only one of me.

In Jackendoff's terminology, they violate PROPER PARTITIVITY (**PPart**): the idea that partitives must always express a *proper subset* of the set they embed (i.e. [*n of [DP]_i]_{jCi}). The constraint was introduced in Jackendoff (1977) to rule out canonical partitives such as *??one of my nose*, *??two of my eyes*, in situations with the normal number of noses or eyes.*

L. **The "out-of" construction (OUT-OFP)**, shown in (29), in its two orders:

- (29) a. {two / four} out of four doctors
b. {two / four} doctors out of four

Intuitively, they express the proportion of the number of Ns who satisfy some predicate over the total number of Ns, and are thus strictly related to the count cases in (8b), but with a special syntax.

M. Pseudopartitives (PSEUDOP). A well-studied construction in which the preposition *of* is preceded by a relatively small number of semi-functional nominal elements (*number, dozen, lot, amount, deal, ...*) and followed by a bare plural count nominal or a singular mass nominal:

- (30) a. a number of objections
b. a great deal of money

In pseudopartitives, the referent of the outer DP is not linked to a previously established antecedent, but rather measured in (vague) units provided by the external semi-functional noun.

2.1 Delimiting the inquiry

This variety of ways to express what are after all very similar meanings is impressive, and makes partitivity a delicate topic of inquiry. Due to the competition of different structures with different requirements, judgments can be rather murky. Our strategy to contain the problem is three-pronged: we address the judgment variability by using corpora, pools of informants and significance tests, as described above; we delimit the space of our inquiry by adopting *structural consistency* within a single language as a criteria, and we use *cross-linguistic comparison* to further distinguish core aspects of the phenomenon from peripheral ones. Specifically, we take canonical partitives based on definites like (1b) as our reference point—our “core case”. Looking within a single language, we make use of classic linguistic tests to highlight major structural differences between the canonical cases and other constructions in the family, excluding (or analyzing as non-partitive) those that seem too different. Looking across languages, we assume that when a language has clear and productive canonical partitives but fails to realize one of the constructions in [INDEFP] to [PSEUDOP], or realizes it with a completely different preposition or Case, this is evidence that the construction at issue is not a “real” partitive, and should presumably be given a different syntactic structure and/or semantic derivation.

A case in point is that of pronominal partitives and *out-of* constructions. In Italian, canonical partitives are completely parallel to the English case, but the literal equivalent of (27) are all severely ill-formed (**i due di noi* ‘the two of us’, **tutti di noi* ‘all of us’ and **c’è solo uno di me* ‘there is only one of me’). On the other hand, a version of (27a) which respects PPart (*uno di noi/loro* ‘one of us/them’) is perfectly well-formed. This suggests that those forms in (27) which violate PPart should actually be regarded as inverted predicational structures, arising from as *we all, you two*. Indeed, the lack of **you several* (possibly connected with the oddness of (ii) in ft. 5) predicts that, while there is a real partitive like (31a), there is no (31b) to match it (Uli Sauerland, p.c.).

- (31) a. several of us
b. *the several of us

The *of* in (27) would then be a linking element (in the sense of den Dikken 1998 and Martí-Girbau 2010); i.e. the *of* in the construction (*he is*) *too much of a perfectionist*. The interlinguistic contrast follows, since this construction is much more limited in Italian than in English (see **tutti dei ragazzi dormono* ‘all of the boys sleep’).

The same considerations apply in the case of the Italian *out-of* construction ([OUT-OF]), which uses the preposition *su* ‘over’, not *di* ‘of’, and prefers the order *Num N* ‘su’

*Num*³—again suggesting a derivation different from the one required by a canonical partitive (but perhaps similar to the double genitives of Section 6.2).

- (32) Tre dottori **su** quattro raccomandano questo dentifricio.
 three doctors over four recommend this toothpaste
 ‘Three doctors out of four recommend this toothpaste.’

Turning to within-language consistency, Selkirk’s (1977) convincing analysis of pseudo-partitives ([PSEUDOP]) in terms of a *monoclausal* structure give us reasons to exclude them from the partitive family, since all the other structures seen so far appear to distinguish between an inner and an outer DP layer, as in (33).

- (33) [_{DP} D/Num ... of [_{DP} ... Noun]]

Selkirk’s argument rests on two syntactic tests, the possibility of PP-extrapolation in English and the availability of “stacked” relatives. PP extrapolation is possible when the PP is selected by a simple relational nouns like *review* (34a), but impossible when the same noun is embedded in a partitive (34b), and possible again if the noun is embedded inside a *pseudopartitive* (34c).

- (34) a. Two reviews have been reprinted of Helen’s first symphony.
 b. *Two of those reviews have been reprinted of Helen’s first symphony.
 c. A number of reviews have been reprinted of Helen’s first symphony.

Her analysis is that in (34b), but not in the other cases, the PP must go through a more complex nominal (a violation of the Complex NP constraint, see Ross 1967: 70). Quantitatives (34a) and pseudopartitives (34c) allow extrapolation; this suggests that both have simpler, monoclausal structures.

The relative clause test points to the same conclusions. In (35) (where the constituent we bracketed is assumed to be a partitive) the relative clause has two possible scopes: it can apply to the whole set of famous paintings/daffodils, or to the subpart denoted by the whole nominal. In the corresponding pseudopartitive cases, however (36), there is only one scope—the whole set.

- (35) a. In the Uffizi, they saw [a whole lot of [the famous paintings]_i]_j, several of which_{i/j} were by Sieneese authors. (Selkirk 1977: 307)
 b. She bought him [dozens of [those daffodils]_i]_j, only two of which_{i/j} were faded.
- (36) a. In the Uffizi, they saw [a whole lot of famous paintings]_j, several of which_j were by Sieneese authors. (Selkirk 1977: 307)
 b. She bought him [dozens of daffodils]_j, only two of which_j were faded.

Summing up, the monoclausal structures that Selkirk assigns to these cases, translated in the current DP framework as (37), is in contrast with the biclausal structure (33) we are assuming for partitives.⁴

³ The order closer to indefinite partitives *Num ‘su’ N Num*, e.g. *3 su 4 dottori* is rated ?? . The difference is $p < 0.005$. The same order and choice of preposition is found in French (*deux médecins sur quatre*).

⁴ An additional complication is that words like *number* can also be analyzed as full-fledged relational nouns, which can be definite, take a full DP complement (possibly, a bare one), and sport their own relative clauses. In this case they no longer function as measure expressions. Contrast (ia) and (b):

(37) $[_{DP} [_{DP/MEASUREP} \text{ a dozen/number/lot}] \text{ (of) NP}]$

We will therefore set aside the cases in [PSEUDOP] for the rest of the paper, along with the other cases previously excluded: “bare partitives” (no antecedent, so no partitive meaning according to the previous literature), covert partitive (to be discussed elsewhere), *the two of us* (not partitives at all) and *out-of* cases (different syntax, not discussed; see Sec. 4 and 5 for related semantic issues).

3 Partitive Issues

An examination of the remaining cases, [CANONP] to [2NOUNSP], along with their non-canonical order in [EXTRAP] and [INVERTP], reveals a number of important contrasts and one more theoretical issue, all to be addressed. At a data level, we have:

1. **The definiteness status of the inner nominal:** canonical partitives [CANONP] require a definite, while the cases in [INDEFNP] and some of the cases in [PROPORP] (see (11), (12)) do not.
2. **The possibility to take conjoined inner nominals.** They are barred in canonical cases [CANONP], but not in the [PROPORP] construction (Sec. 7).
3. **The need for the partitive to denote a proper subset** (PPart). What is it due to, and why is inactive in e.g. *100% of the students*, in [PROPORP]?
4. **The (im)possibility for the whole partitive nominal to be definite.** Why does a superlative like *the tallest* license a partitive in [SUPERLP], but the corresponding positive (**the tall of the students*) does not?
5. **The role of the particle ‘of’** (or the Genitive case), in contrast with more contentful particles such as *among*. *Of* might of course be the source of the partitives meaning itself (see Barker 1998, Zamparelli 1998, Ionin et al. 2006), but in this case the fact that in many languages and constructions (including, interestingly, the pseudopartitive, where it is often optional: *he bought a dozen (of) roses*) this particle seems to be completely bleached of meaning is unexpected.
6. **The possibility of having count or mass inner nominals**, which distinguishes “canonical” and “among” cases ([CANONP] and [AMONGP]) from [PROPORP].

At a more theoretical level, the comparison between canonical partitives [CANONP], double noun partitives [2NOUNSP] (to the extent they are possible) and inverted partitives in [INVERTP] raises a crucial question: do all partitive structures underlyingly contain two nouns (within a DP analysis, two NPs), one of which is typically non overtly realized? If they do, the outmost structure of (canonical) partitives, in (38a), becomes closer to the structure behind *three boys* (38b); moreover, the double noun makes it easier to explain mismatches in number between the inner and outer determiner (as in *one of those boys*), but of course the nature of N^e (PRO, in Jackendoff; see also Abney (1987: 344)) needs to be addressed.

(38) a. $[_{DP} \text{ Three } [_{NP} N^e [_{PP} \text{ of the boys}]]]$
 b. $[_{DP} \text{ Three } [_{NP} \text{ boys}]]]$

(39) $[_{DP} \text{ Three } [_{PP} \text{ of the boys}]]]$

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- (i) a. {*The / A} number of people who had kids as teens called me up last week.
 b. {The / *A} number of people who have kids as teens is astounding.

In (ib) the subject is of course a specific number.

If on the other hand the numeral is followed by a simple PP (39) (as proposed in Lobeck 1991; Kupferman 1999; Matthewson et al. 2001; Young Shin 2007 and Gagnon 2013), the question is where this PP is attached, and why every numeral must be able to select for either PP or NP.

The existence of null nominals inside partitives has been defended on (mostly) syntactic grounds in Giusti (1991), Cardinaletti & Giusti (1990; 2006; 2007), but is rejected in Martí-Girbau (2002), and in Martí-Girbau's (2010) dissertation on partitives. This thesis offers a third option: both partitives and quantitatives are seen as cases of nominal predicates which undergo inversion (in the sense of den Dikken 1998; 2006), and where the external determiner is raised before a DP or NP, respectively. *Of* is inserted as a linking element, the nominal equivalent of the copula. Unfortunately, this theory faces the challenge of explaining the facts presented in Section 6, which are problematic for the PP account, and adds a few problems of its own.⁵ For this reason we do not provide an in-depth analysis of Girbau's predicational analysis here.

A survey of the literature shows that the issues listed above in [1] to [5] are actually tightly interconnected. Zamparelli (1998) links the impossibility of coordinate inner nominals to a version of the double-noun idea, show in (40), in which N^e , placed in [Spec,PP], is an invisible copy of the NP within the inner nominal.

(40) $[_{DP} \text{ three } [_{PP} [_{NP} \text{ boys}]_i [_{P'} \text{ of } [_{DP} \text{ those } [_{NP} \text{ boys}]_i]]]]$

This structure creates a clash when the inner nominal is a conjunction containing two different inner NPs, solving the coordination problem. Zamparelli assumes that the PP inherits nominal features from the NP in its Spec, so this approach sits somewhat in the middle of the two structures in (38a) and (39). However, if structures with two nouns like (17a) share the structure in (40), with N^e overt, an extraposition like (24) (*Of the books you gave me, I only read two novels*) would break the PP at P'.

Barker (1998) links point [4] (the fact that the outer determiner cannot be definite) to point [5], PPart, via the following semantics. Let's assume a lattice-based semantics for plurals à-la Link (1983), with * as the plurality-forming operator, and Sharvy's (1980) MAX semantics for *the*, so that the definite determiner extracts the maximal element within a set of plural individual, and fails if none is present. Partitive *of* is assumed to be able to extract subpluralities out of a plural individual. Now, saying that the resulting set of pluralities denotes a *proper* subset of denotation of the inner nominal means saying that its maximal element has been removed; in turn, this entails that a uniqueness presupposition imposed by an outer definite determiner would fail. Assuming for instance, that there are three dogs in the context, we have:

⁵ Consider for instance Italian. If the source of quantitative adjectives such as *parecchi* 'several' in a partitive like (ia) is post-nominal, as Martí-Girbau (2010) proposes, one problem is why they cannot remain in this position (ib), unlike nearly all other Romance adjectives. Second, if the nature of the original position is a predication, it is unclear why the English *several* and other quantitative modifiers are degraded in copular predication (ii).

(i) a. parecchi dei partecipanti
several of_the participants
'several of the participants'

b. *i partecipanti parecchi
the participants several

(ii) ??The participants were several/few.

(see also (31b) below)

- (41) a. $\llbracket \text{dog} \rrbracket = \{a, b, c\}$
 b. $\llbracket \text{dogs} \rrbracket = *dog = \{a + b + c, a + b, a + c, b + c, a, b, c\}$
 c. $\llbracket \text{the dogs} \rrbracket = \text{MAX}(*dog) = a + b + c$
 d. $\llbracket \text{of the dogs} \rrbracket = \{a + b, a + c, b + c, a, b, c\}$ (PPart filters out $a + b + c$)
 e. $\llbracket \text{two of the dogs} \rrbracket = \{a + b, a + c, b + c\}$ (“2” filters out a, b, c)
 f. $*\llbracket \text{the two of the dogs} \rrbracket$ (uniqueness presupposition failure: no unique maximal element)

Kayne (1994: Chapter 8) and others have observed that when an additional restriction is present, the definite becomes again possible:

- (42) I saw the two of [the dogs] ??(that you fed yesterday).

Suppose that *that you fed yesterday* denotes $\{a + b, d\}$, and assume that the modifier is intersected with the denotation of the partitive before *the* (i.e. MAX) is applied (43). Now uniqueness can be reinstated, and *the* is correctly predicted to be acceptable.

- (43) $\text{MAX}(\llbracket 2 \text{ of the dogs} \rrbracket \cap \llbracket \text{that you fed yesterday} \rrbracket) = \text{MAX}(\{a + b\}) = a + b$

Barker, however, has to stipulate proper partitivity (point [3] above). Zamparelli (1998) tries to derive this effect by connecting PPart with the definiteness of the inner nominal, through a *subtractive* semantics of a special “partitive of”: the constituent *boys of the boys* in (40) would denote $*\llbracket \text{boys} \rrbracket - \text{MAX}(*\llbracket \text{boys} \rrbracket)$, i.e. the full plurality of boys, minus its maximal element (aka the *supremum*), which is the denotation of the inner definite nominal (*the boys*). Zamparelli argues that this semantics is natural in virtue of being the converse of the intersective semantics typical of a relative clause, but this new meaning for *of* raises questions with respect to point [5] above.

The connection between the (im)possibility of an external definite and proper partitivity explains why superlatives, where the adjective introduces an ordering source in the input set, do allow partitives (see item [SUPERLIP] above). On the other hand, inverted superlative partitives like (26a) are predicted not to allow an external definite any more than any other canonical partitive. In Zamparelli’s system, if (26a) is mapped onto the structure in (40) we get (44), with the overt noun in the outer nominal replacing N^e and the semantics shown in (44b).

- (44) a. $[_{DP} \text{due} [_{PP} [_{NP} \text{ragazzi}] [_{P'} \text{de} [_{DP} \text{i pi\`u piccoli} [_{NP} \text{ragazzi}]]]]]$
 $[_{DP} \text{two} [_{PP} [_{NP} \text{boys}] [_{P'} \text{of} [_{DP} \text{the most small} [_{NP} \text{boys}]]]]]$
 b. $\lambda x[\text{CARD}(x) = 2 \wedge (\llbracket \text{boys} \rrbracket - \llbracket \text{the smallest boys} \rrbracket)(x)]$ (no maximal element \Rightarrow no MAX)

At the same time, this approach puts some interesting constraints on the way in which definites link back to their antecedents. Consider for instance (45b) in Italian, uttered right after (a) (informal judgment).

- (45) a. [Cinque attori]_i sono arrivati all’ hotel ma due_{j,ci} sono ripartiti
 [Five actors]_i have arrived to_the hotel, but two_{j,ci} have left
 subito.
 immediately
 ‘Five actors have arrived to the hotel, but two left immediately.’

- b. ??[I due [degli attori]_i]_j non apprezzavano l' hotel.
 [The two [of_the actors]_i]_j didn't like the hotel
 '??The two of the actors didn't like the hotel.'

In the (b) example the presence of an immediate antecedent (the subgroup of actors who left) is not sufficient to restrict the context to a single pair; the situation seems identical in English, as shown in the glosses. Possessors have an even stronger effect (46).

- (46) John's sons and Bill's daughters all came to the party. They made quite a mess playing together, and I must say that ...
 a. *John's of the kids were louder than the others.

In this case, no restriction seems to improve (e.g. **John's of the kids who were at the party*).⁶ A similar effect is visible with demonstratives: deictic demonstratives do not seem to license partitives (47), but English non-deictic distal demonstratives, which come with an obligatory relative clause, do allow them (48).⁷

- (47) A. (pointing to some bears)
 Look! ??**Those** of the bears have caught fish!
 B: *And **these/this** of the bears, too!
- (48) Those of the inmates who desired it were made members of the congregation,
 upon the weakly payment of one penny. (from UKWAC)

This shows that partitives block not only the definites with a non-unique restriction, but also those that should be felicitous in virtue of their link to a previous antecedent (in the discourse or in the world). These are the *strong/anaphoric* type in the classification of Schwarz (2009; 2013); Jenks (2018) (see also Cheng et al. 2017). Since partitives only affect the restriction, it is not immediately clear why this should be the case. Here, we leave the puzzle noted, but not resolved.

Note at this point that Barker's and Zamparelli's analyses work only if PPart is a semantic effect.⁸ Ionin et al. (2006) criticize this assumption and propose that proper partitivity should be regarded as purely pragmatic: *two of my two eyes* would just be a cumbersome way of saying *my two eyes*, so it is ruled out as redundant.⁹

The problem for this position is that we do find pairs such as:

⁶ This seems to be related to the ill-understood fact that *John's kids that I know* seems worse than *John's kids*, *the kids that I know* or *the kids of John's that I know* (informal judgments, but no cases of the form DEM NUM "of" "the/DEM" were found in the half of UKWAC we tested).

⁷ The construction seems to belong to the legal or literary style (see *Those of the tenants who for the time being carry on the business are referred to as the "remaining tenants"*, or *A sequestered realm could be left for the exercise of mind, and especially for those of the intellectual analysts who alone could set out the laws which governed all of social and economic life*). Examples from UKWAC.

⁸ The semantic proposals from Barker and Zamparelli require the inner nominal to denote a (maximal) plural individual. This excludes strong quantificational elements like *both*.

(i) *one of both boys

Indeed, Ladusaw (1982) already proposed that (i) follows from the failure of *both*+N to denote a plural individual ("*group*", in his terminology, probably an unfortunate choice of terms since *one of the group/set/committee* is hardly grammatical). This should most likely be linked to the distributive nature of *both* (**both boys were a couple*).

⁹ See also Marty (2017) for an attempt to derive proper partitivity from a presuppositional mechanism of meaning strengthening. We leave a review of this approach for another occasion.

- (49) a. All of the boys slept. / The boys all slept.
 b. All of John is underwater. / John is all underwater.
 c. Both of my eyes are red. / My eyes are both red.

It is reasonable to assume that the first element of these pairs stresses the fact that the predicate applies to the totality of some referent, not anything less. Thus, a purely pragmatic approach would predict that an improper partitive like (50a, b), should just receive a stressed reading as good as the equivalent forms in (49b, c). Yet, the judgments we collected from the informant pool show that the cases in (50) remain marginal.

- (50) a. ?Ten of the ten disciples remained.
 b. ??One of one student remained.

The alternative is that the cases in (49) are structurally different from those (50), since the former are all impossible in Italian and arguably cases of “pivotal *of*” just like *the two of us*. In canonical partitives, on the other hand, something enforces proper partitivity at a semantic level. We will return on this issue in Section 5.

With this set of questions in mind, we turn to a more detailed classification of the English data in [CANONP] to [2NOUNSP], using Italian as a point of reference. We begin with three relatively peripheral cases: proportions, percentages [PROPORP] and indefinite partitives [INDEFPP], to then turn to the case of canonical partitives.

To anticipate, our main proposal is that, in general, the outer nominal of partitives contains a relational noun which introduces partitivity. This noun takes the PP as its complement (51), and can be overt (in proportions) or covert (in most other cases). The covert noun comes in two versions, PART[%] and PART^{PRO}, both taking crucial semantic information from their specifiers. PART[%] takes a degree, PART^{PRO}, an invisible pro-NP, which enforces the desired connection between the inner and the outer nominal.

- (51) [_{DP} NUM PART [_{PP} of DP]]

4 Out-of sentences, proportions and percentages

Proportional partitives and percentages (52) (see [PROPORP] above) are semantically quite similar to the *out-of* construction discussed in the previous section: if *3 doctors out of 4 recommend X*, we do not know the total number of doctors any more than with *75% of the doctors recommend X*. However, percentages use the P *di/of* in Italian and English, suggesting, once again, that percentages fall squarely within the partitive family.

- (52) ...75% **dei** dottori ...
 ...75% of_{the} doctors ...
 ‘75% of the doctors’

It would be premature, however, to assume that percentages work exactly the same in English and Italian. Revealing inter- and cross-linguistic differences emerge once we consider the possibility for the outer nominal to be *definite*. In English, a definite article introducing the *out-of* construction is degraded (53a), even when the percentage reaches totality (i.e. *??the two out of two*, in contrast with *the totality of doctors*), unless of course additional modifiers are present (53b) (the a/b difference is weekly significant, $p < 0.01$). Italian behaves identically.

- (53) a. ?The two out of three doctors recommend product X.

- b. ✓The four doctors out of four who recommended product X will surely also recommend product Y.

But with percentages, the two languages differ sharply. English percentages behave just like *out-of*: definites are impossible even when they express the totality, unless further modifiers are added (54b) (the ameliorating effect of modifiers noted in Kayne 1994: Chapter 8, Barker 1998, and explained by (43)).¹⁰ Italian percentages of any value, on the other hand, are normally introduced by a definite article, without any need for modifiers (55).¹¹ If the definite is omitted, as in (56) the result is marked (average judgment 2.5 out of 5, hereafter “2.5/5”; a $p < 0.001$ difference).¹²

- (54) a. ??The {20% / 100%} of the doctors recommend this.
 b. The 50% of Americans who don't pay income tax will never be a good revenue source. (from the Financial Times)
- (55) Il {✓40% / ✓100%} dei dottori raccomanda ...
 the {50% / 100%} of_the doctors recommends
 'The {50% / 100%} of the doctors recommends ...'
- (56) ??100% dei dottori raccomanda questo dentifricio.
 100% of_the doctors recommends this toothpaste
 '100% of the doctors recommends this toothpaste.'

Corpus searches show that the same effect can be found with proportions that are not percentages, i.e. those based on words such as *half*, *quarter*, *third*, etc. (collectively called *denominator* nouns, since they provide the denominators of the fraction expressed by the proportion). In English, structures like *the NUM DENOMINATOR of DP* are very infrequent (23 cases, mostly *the two halves of DP*, vs. 1086 without *the*), and limited to cases where the whole has a very salient partition, as in (57).

- (57) a. This is achieved by angling **the two halves of the keyboard** at 30 degrees to each other.
 b. The city lies where the rivers Saine and Rhone and **the two halves of France** – the industrious north and the indulgent south – join.
 c. ... It is divided into **the four quarters of the year**.

¹⁰ The existence of (54b) proves that the deviance of (54a) in English cannot be explained with the idea that “20%” functions as a determiner in English but like a post-determiner in Italian, much as *my/mio* in the contrast between *my dogs* and *il mio cane* ‘the my dog’. **The my N* is never improved by adding modifiers to N.

¹¹ It should be noted that it is difficult to bring out this effect with on-line grammaticality questionnaires. In Italian, a canonical partitive with a definite scored *(1.6/5), which became ??(2.3/5) adding a modifier, but the difference is not statistically significant. We suspect that this could be due to the fact that to see any improvement it is crucial to interpret the modifier at the level of the external DP, out of the scope of the inner definite, i.e. (ib), not (a). This problem, which points to a more general limit of on-line judgments with naive informant pools, is confirmed by the extremely high variance (2.6) in the Italian judgments for the modifier structure.

- (i) a. The 3 of [the students who came over] ... *wrong*
 b. The 3 of [the students] who came over ... *right*

¹² The judgments actually belittle the phenomenon. A search on the Italian corpus ITWAC reveals that while argumental uses nearly always use the definite, parenthetical uses of percentages (e.g. *A scegliere il ristorante per [...] Pasqua saranno principalmente le famiglie (55,6% delle prenotazioni)* ‘Picking the restaurants for [...] Easter will be mostly done by families (55,6% of the bookings)’, from ITWAC) are overwhelmingly often without it.

In Italian, on the other hand, the definite pattern is far more common (296 cases with a definite vs. 1058 without in one section of ITWAC), and is applied to cases lacking a clear partition, e.g. (58):

- (58) Ancora 40 anni fa i tre quarti delle proteine erano di fonte
still 40 years ago the three quarters of the proteins were from source
vegetale.
vegetable
'Still 40 years ago three quarters of proteins came from vegetable sources.'

Since Italian and English do not show any contrast in their possibility of taking definites with canonical partitives (i.e. they both allow them, marginally, only with modifiers), their contrast in the *out-of* construction and in proportions (percentages i.e. (54a) vs. (55), plus the cases in (58)) shows that both constructions should be treated differently from canonical partitives, but for different reasons: *out-of* differ in preposition from canonical partitives (and indefinite partitives, see below), but behave identically with respect to definiteness; proportions use the same preposition as canonical partitives, but have diverging patterns with respect to definiteness in the absence of further modifiers—frequent in Italian, excluded in English.

Additional differences can be spotted at a syntactic level: Italian percentages always take singular number and masculine gender, even when the inner noun is feminine (59) (informal judgments). This does not happen in canonical partitives, in Italian as in French, see Sleeman & Ihsane 2016, and Section 6.1). When definites appear in Italian proportions they agree in gender and number with the denominator noun (60), which means that they are typically *plural*.

- (59) {il / *le / *la } 20% delle donne
{the_{MS.SNG} / the_{FEM.PL} / the_{FEM.SNG}} 20% of the women_{FEM}
'20% of the women'

- (60) {i / *il / *le } due terzi delle donne
{the_{MS.PL} / the_{MS.SNG} / the_{FEM.PL}} two thirds_{MS} of the women
'two thirds of the women'

One could at this point suspect that Italian percentages are idiomatic and non compositional, yet argue that English percentages should still fall under a canonical partitive analysis. This position is ruled out by three additional facts. First, percentages, like all proportional determiners but unlike canonical partitives, can also take mass nominals:

- (61) {half / most / two thirds / 25%} of the oxygen

Second, percentages can be larger than the whole of which they are supposed to be “a part” (62); canonical partitives cannot do this (nor can the *out-of* construction: *??five doctors out of four* is jocular).

- (62) His wage must be 133% of the minimum income.

Third, the inner nominal may be a bare plural (or bare mass singular), unlike in canonical partitives:

- (63) 74% of whites and more than half of Asians (Hoeksema 1996: 10)

These facts also hold in Italian, where bare nominals are more restricted than in English. In this case, however, the percentage *must* be preceded by a determiner (64) (the difference with and without *un buon* is $p. < 0.001$; the difference between the determinerless percentage in (64) and in (56) is $p. < 0.005$).

- (64) ✓C'è *(un buon) 50% di clienti insoddisfatti di questo prodotto.
 there is (a good) 50% of customers dissatisfied with this product
 '(Some) 50% of all customers are not satisfied by this product.'

Demonstratives also appear before percentages, e.g. (65), and when they do they are followed three times more frequently by bare inner nominals than by full definite DPs.¹³

- (65) quell' 80% di spesa per investimenti che gli enti locali
 that 80% of expenses for investments that the institutions local
 assicurano ...
 guarantee
 'that 80% of investment budget which local institutions guarantee ...'

Finally, a plural outer determiner is better than no determiner (66), but the difference is only weakly significant ($p \leq 0.01$).

- (66) ?Due 50% di un salario fanno un salario intero.
 two 50% of a salary make up a salary whole
 'Two 50 percents of a salary make up a whole salary.'

Turning to number, in Italian a verb that agrees with a percentage in the *singular* is much preferred, especially if a definite is present. English has a more mixed agreement: data from UKWAC shows that percentages which embed singular DPs can trigger singular, or more rarely, plural verb agreement (e.g. *18% of the population of the Russian federation [...] are not ethnic Russians*), while those that embed plural DPs always trigger plural verb agreement.

Taken together, these facts suggest that an analysis spanning (at least) English and Italian would be preferable, provided it can explain their diverging behavior with respect to definiteness. The analysis we want to propose covers all these facts and derives the contrast in definiteness from an independent parameter.

4.1 An analysis of proportions and percentages

Let's start from the case of proportions with denominator nouns (*quarter, thirteenth*, etc.). We will assume that the structure is (67): *quarter* is a noun which takes the *of* PP as its complement; the numeral is merged in [Spec,NP].¹⁴

- (67) a. three quarters of the people
 b. [_{DP} D⁰ [_{NP} [_{CARDP} three] [_{N'} quarters [_{PP} of [_{DP} the people]]]]]

¹³ Demonstratives plus percentages and bare nominals are well attested also in English (i). We thank an anonymous reviewer for pointing out to us the relevance of these cases.

(i) This 1% of public servants in Whitehall effectively drives most of what happens.

¹⁴ As it will be clear later, the numeral is inserted as the argument of an (often, null) operator. This is a limited variation on the idea, put forth in Krifka (2003), that numerals should be seen as arguments of nouns, and contrasts with the analysis given in Ionin & Matushansky (2006) to *two hundred people*, where *two* is argued to be a numeral head in the main DP spine, taking the NP *hundred* as its complement. Our proposal to explain the Italian/English difference in the presence of definite articles crucially rests on the assumption that *tre* in *i tre quarti di* 'the three quarters of' is in Spec, and not in the position it normally occupies (see later, the discussion around ex. (74)).

From [Spec,NP], we take the cardinal numeral to be able to transmit its formal features to the DP layer above it, thus licensing a null Det head (in an alternative formulation, CardP is moved to [Spec,D⁰] where it licenses this empty category, but is ‘reconstructed’ to [Spec,NP] for interpretation, see (68)).

$$(68) \quad [_{DP} [_{CARDP} \text{three}]_i D^0 [_{NP} t_i [_{N'} \text{quarters} [_{PP} \text{of} [_{DP} \text{the people}]]]]]$$

We assume that the complement PP has the same denotation as the definite inner nominal, i.e. a plural individual, and that “ \leq ” is the plural individual nonempty subpart relation (see Link 1983). The semantics of denominator words like *quarter* will make use of a *discretizer*: a measuring function AMOUNT, from objects and measuring units to numbers (69). When applied to pluralities formed with count nouns the unit defaults to the atomic item measure.

$$(69) \quad [AMOUNT(x,u)]_{\langle e \langle en \rangle \rangle} = \text{amount of } x \text{ measured in unit } u$$

(70) gives the semantics for the expression in (67a), assuming that $\llbracket \text{of the people} \rrbracket = \llbracket \text{the people} \rrbracket = a$.¹⁵ Note that using \leq as the subpart relation means that proper partitivity is (correctly) inactive in these cases (so, *three thirds of the people* is semantically well-formed, and usable in the appropriate pragmatic contexts).

- (70) a. $\llbracket \text{quarter} \rrbracket = \lambda n \lambda e \lambda x \exists u [x \leq e \wedge AMOUNT(x,u) = AMOUNT(e,u) \times n/4]$
- b. $\llbracket \text{three quarters} \rrbracket = \lambda e \lambda x \exists u [x \leq e \wedge AMOUNT(x,u) = AMOUNT(e,u) \times 3/4]$
- c. $\llbracket \text{three quarters of the people} \rrbracket = \lambda x \exists u [x \leq a \wedge AMOUNT(x,u) = AMOUNT(a,u) \times 3/4]$
 “the set of plural individuals which are subparts of *the people* and whose amount, measured by unit *u*, is three quarters the amount of *the people*”

Now the presence or absence of an external definite determiner follows from the well-known observation that Italian, like all European Romance languages but unlike English, requires a definite article to give a DP a kind denotation (71a vs. b) (Contreras 1986; Longobardi 1994). In certain cases, the definite can also yield a pure indefinite existential interpretation (72) (Zamparelli 2002). We propose that the definite found in Italian proportions is precisely this kind of “generic article”.

- (71) a. *(I) cani sono mammiferi.
 (the) dogs are mammals
 ‘(The) dogs are mammals.’
- b. Dogs are mammals.

- (72) In questa casa ci sono i fantasmi.
 in this house there are the ghosts
 ‘there are ghosts in this house.’

¹⁵ A mathematical problem arises in the case of expressions like:

- (i) one third of the ten participants

Since 10 is not divisible by 3, (i) seems to entail the existence of participant pluralities whose by-item measure is $3.\bar{3}$. This might be desirable in some special cases (especially *averages*, see e.g. *the average family has 1.2 children*, Kennedy & Stanley 2009), but it is not usually a welcome result. Three solutions seem possible: (i) using a different measure function (e.g. height in *two thirds of the four buildings are underwater*); (ii) adding a presupposition that the measure of the pluralities in the set must be an integer (so, (i) becomes infelicitous) or (iii) approximating the pluralities in the set to the closest integer (so that (i) ends up referring to 3 participants). We will not take a stand on these possibilities here.

In English and Italian, any attempt to use a “normal” definite with denominator nouns is blocked by the same effect that blocks definites with canonical partitives (see ex. (41)): the lack of a unique/maximal element in the set taken by the definite. We suggest that, like English bare plurals, the “generic definites” in (71) and (72) do not require a (extensional) set of objects with a maximal element, so they are not excluded. In those proportional cases where the denominator noun refers to contextually specific portions (e.g. in (57), the left and right side of the keyboard, the four seasons, etc.), a unique/maximal element can be formed and extracted by the regular definite determiners, which thus remain possible, in English as in Italian, in these special circumstances.

Romance generic definites are normally incompatible with the insertion of a numeral before the noun: the DP in (73) has no kind reading, and can only apply to a specific set of ten rhinos (say, those still alive in 2006), thus barring kind-level predicates like *are very rare*, *practically extinct*, etc. Longobardi (1994) proposes that this happens because the numeral, a head in the main DP line (74), blocks the abstract movement of N to D needed for the kind reading to emerge.

(73) *i dieci rinoceronti bianchi settentrionali*
 the ten rhinoceros white Northern
 ‘the ten Northern white rhinos’

(74) $[_{DP} \text{ the } [_{NUMP} 10 \dots [_{NP} \text{ rhinos }]]]$

In the structure we are giving to proportions, repeated in (75) with the definite added, the numeral is actually in [Spec,NP] (an argument of the denominator), so it does not interfere with N raising or other known mechanisms to license the generic DP (see e.g. Borer 2005: Section 5.1, 6.1).

(75) $[_{DP} I^{gen}[_{NP} [_{CARD} \text{ due}] [_{N'} \text{ quarti } [_{pp} \text{ de- } [_{DP} \text{ le persone }]]]]]]$ (cf. (67b))

This analysis now makes an interesting prediction. In Romance, just as in English, the use of a *singular* generic definite determiner is quite limited: with some approximation, it can only be applied to well-established, non-modified natural kinds (Carlson 1977; Dayal 2004). Since a *wounded tiger* is not in this category, the oddness of (76) follows.

(76) {Generally speaking / Normally}, the (??wounded) tiger {is dangerous / roars}.

If the Italian definite seen with proportions is a case of generic article, we expect that when the denominator noun is *count singular* (forcing any determiner to appear in the singular, due to agreement) this “generic definite” should become impossible (assuming, that is, that *un quarto* ‘one quarter’ is more like *wounded tiger* than like *tiger*). The only remaining strategy to license the whole DP is movement of the singular indefinite *un* (or of its formal features, depending on one’s favorite theory of “reconstruction”) to D, as illustrated in (68). This is indeed what happens: excluding the irrelevant ordinal meaning (the fourth person in a sequence), (77) behaves just like English (54b) in requiring a modifier, and contrasts with the plural case in e.g. (58).¹⁶

¹⁶ These are informal judgments, since we did not have the opportunity to include this data in the Italian crowd-sourcing survey, but they match corpus searches on ITWAC. The first ITWAC section contains 1421 matches for *un* + DEN + *di*, with DEN a denominator noun in the range from 3 to 10 (e.g. *un decimo di* ‘a tenth of’). This number falls to 0 if DEN is singular and is preceded by a singular definite (e.g. *il decimo di* ‘the tenth of’), once the irrelevant ordinal cases are filtered away.

- (77) a. Il quarto del gruppo ??(che hai visto) è qui.
 the_{SNG} quarter of the group (that you have seen) is here
 ‘The quarter of the group (that you have seen) is here.’
- b. L’ un tredicesimo del totale ??(che deve essere messo da parte)
 the one thirteenth of the total (that must be set aside)
 deve poi essere riportato alla fine.’
 must then be recorded at the end
 ‘The one thirteenth of the total (that must be set aside) must then be recorded at the end.’

The case of percentages is conceptually not different from that of proportions (*25% of the people* just means *one quarter of the people*), but with a syntactic twist: the symbol “%”, read “percent”, is a less likely candidate for a nominal head meaning *hundred*. Moreover, the fact that here the Italian accompanying determiner is always singular requires a slightly different analysis.

We propose that percentages contain an abstract relational noun, written **PART%**, which in Spec position takes the value “CARD%” (the phrase formed by the numeral CARD and the “%” sign, tentatively marked AdvP/PP due to the presence of the morpheme *per-* ‘by’) (78). **PART%** bears the syntactic features +N (nominal) and +MASS; in Italian, it has no gender feature, so it takes +MASC (the canonical default value, in this language). The semantics for the example *10% of the people* (with \llbracket of the people $\rrbracket = \llbracket$ the people $\rrbracket = a$) is given in (79).¹⁷ Note that here the CARD element that was able to license a DP in (68) is further embedded inside an Adv/PP.

- (78) $[_{DP} (Det_1) [_{NP} [_{ADV/PP} [_{CARDP} Card] [_{ADV/P'} percent]]] [_{N'} PART\%_{[+N,MASS]}]$
 $[_{PP} of [_{DP} Det_2 NP]]]$

- (79) a. $\llbracket PART\% \rrbracket \lambda n \lambda e \lambda x \exists u [x \leq e \wedge AMOUNT(x,u) = AMOUNT(e,u) \times n]$
 b. $\llbracket \% (percent) \rrbracket = \lambda n [n/100]$
 c. $\llbracket 10\% \rrbracket = \lambda n [n/100](10) = 10/100 = 1/10$
 d. $\llbracket 10\% PART\% \rrbracket \lambda n \lambda e \lambda x \exists u [x \leq e \wedge AMOUNT(x,u) = AMOUNT(e,u) \times n](1/10)$
 $= \lambda e \lambda x \exists u [x \leq e \wedge AMOUNT(x,u) = AMOUNT(e,u) \times 1/10]$
 e. $\llbracket 10\% PART\% of the people \rrbracket = \lambda x \exists u [x \leq a \wedge AMOUNT(x,u) = AMOUNT(a,u) \times 1/10]$
 “the set of plural individuals which are subparts of *the people* and whose amount, measured by unit *u*, is $1/10^{th}$ of the amount of *the people*”

Let’s see how the syntactic behavior of the construction follows from (78). When the nominal relational element is present, the verb agrees in number with it, rather than with the plurality generated by the percentage; the result is singular. Licensing the whole DP by means of the cardinal in [Spec,%], as in (68) is not an option (possibly because it would involve a left-branch subextraction of CARDP), except in special non-argumental cases, where the whole DP layer might be missing (see ft. 12). Plural external determiners at the DP layer are also out, since **PART%** is +MASS; singular indefinites are apparently possible, but they apply to the overt measure (i.e. to 50 in the example (66)), yielding an approximative meaning (cf. the translation of (64): *some 50%*).¹⁸ Modifying an amount is

¹⁷ To simplify, we disregard cases where the proportion is larger than its argument (120%), since we believe that they require an intensional treatment which is outside the scope of this paper. See Section 7 for further discussion. Like above, we omit the definite associated with the Italian **PART%**_[+MASS]. The problem of non-integer pluralities discussed in ft. 15 applies to this case as well.

¹⁸ We suspect that the slight improvement with the numeral in (66) could also be due to an interpretation which associates it with the numeric argument of **PART%**: $\llbracket [due\ 50]\% di \dots \rrbracket$.

indeed a characteristic behavior of the singular indefinite article when combined with an abstract mass nouns, see (80) (Tovena 2001).

(80) There was a certain {silence / speed / space}. (i.e. a certain amount of)

Like in proportions, the presence of an external definite determiner in Italian but not in English follows from the parameter regulating the distribution of “generic definite” articles, this time with mass nouns. The contrast seen in (54a) vs. (55) (i.e. the widespread use of a singular definite in Italian percentages vs. its absence in English) can now be reduced to the contrast in (81).

- (81) a. *(La) democrazia è spesso problematica.
 the democracy is often problematic
 ‘(*The) democracy is often problematic.’
 b. Ho appena visto *(la) democrazia in azione.
 I have just seen the democracy in action
 ‘I have just seen (?the) democracy in action.’

In Italian, determinerless examples such as (56), to the extent they are possible in argumental position (see ft. 12 for the non-argumental position) can be treated as cases where the overt percentage is reinterpreted as a quantity expression akin to *many*, so that the construction is coerced into the mold of a canonical partitive, whose structure is discussed in Section 6 below. Now the verbal agreement can be plural, and an external determiner becomes impossible unless modification is added (much as in (42), *the two of the dogs that ...*).

The fact that in Italian determiners become *obligatory* when the complement is a bare nominal (as in (64), (65)) suggests that such cases should be analyzed as pseudopartitives, much like *a number of objections* or *this low number of participants*. As well-known, this construction requires the element before P to be +N (witness **many/*200 of objections*); the only element capable of delivering this feature is the relational noun PART% which in turn forces the presence of an overt determiner, which can be the generic definite article in Italian, but not in English (following the pattern in (81)). In other terms, the presence of a bare inner nominal blocks any possibility to interpret the construction as a canonical partitive.¹⁹

Additional evidence for PART% comes from its role in explaining the (non) acceptability of nominals introduced by *most* with collective predicates like *gather* or *disperse*, noted in van der Does (1993) (see Dobrovie-Sorin 2015).

When *most* takes a noun directly, the resulting nominal does not combine with collective predicates (82); but if an (apparent) partitive is formed, everything works (82b).

- (82) a. Most soldiers {*gathered / *dispersed / were here}.
 b. Most of the soldiers {gathered / dispersed / were here}.

¹⁹ Remembering that *of* can be missing in pseudopartitives (*a dozen (of) roses*), we suggest that the case of *non conservative* proportions (1a) studied by Ahn & Sauerland (2017) are also pseudopartitives, or anyway measure phrases. Interestingly, their Italian correspondents must place the percentage inside a PP when in argument position (1b).

- (i) a. The company hired 30% WOMEN.
 b. La compagnia ha assunto *(al) 30% donne.
 the company has hired (at the) 30% women
 ‘The company hired 30% women.’

Taking the lead from the Italian sole translation for *most*, in (83), we propose that in (82b) *most* is not a determiner, but again, an argument of the abstract relational mass noun PART% (cf. the collocation *for the most part*). (84) shows that the overt noun *part* is fully compatible with cumulativity; so is, we propose, its cover counterpart.

(83) La maggior parte dei soldati si radunò.
the main part of the soldiers gathered
'Most of the soldiers gathered.'

(84) Part of the soldiers {gathered / dispersed}.

To summarize this section, we have proposed that percentages and proportions differ from canonical partitives in containing a relational nominal element, overt in proportions, covert in percentages, whose syntactic properties dictate a different behavior even in languages where the behavior of canonical partitives does not differ. Some of their special properties follow from the possibility to reclassify some cases of percentages as pseudopartitives or as canonical partitives.

As discussed above, proper partitivity is not enforced in our semantics, thus freely allowing *100% of the people* (cf. *four out of four doctors*). The partitivity does not come from the Case marker *di/of*, but from the semantics of a special class of nouns, in agreement with an analysis put forth in Chierchia (1998). The inner nominal could contain any constituent whose semantics returns a single plural individual, a point which will be important when we discuss the coordination effects, in Section 7.

5 Indefinite partitives

Let's now turn to consider Indefinite Partitives (case [INDEFP] in Section 2 above), an intriguing case of non-canonical partitives used in Abbott (1996) to reject Jackendoff's P(artitive) C(onstrain). According to Abbott, virtually all the examples in (85) (unjudged) become acceptable once set in the proper context (e.g. (86), Abbott's ex.28).

(85) a. three of some men
b. many of all women
c. several of no books
d. two of too many acquaintances
e. several of twenty of his roses that were sick
f. few of many questions

Abbott (1996: ex.24)

(86) a. I know you have too many acquaintances, but you only need to bring two of them. Two of too many acquaintances is still only two.
b. [...] I am sure that each student only answered few of many questions that he might have been able to get with a little thought.

There are two observations to be made about these cases. First, several natural examples came with the word *only* or *just* associated to the external determiner. Second, many of the examples provided by Abbott improve with restrictions on the internal nominal: de Hoop (1992) reports the contrast in (87).

(87) John was one of several students *(who arrived late). (de Hoop's judgment)

Our corpus searches reveal that the vast majority of these cases are of the form *CARDINAL of CARDINAL* (e.g. *All networks fall into one of two categories: source/destination or pro-*

ducer/consumer). Indeed, cases introduced by *some*, *many* and *all* were rather very low in the crowd-sourcing task, while cases introduced by a numeral fared better (89) (the difference between (88a) and (89a) is highly significant). Note that (89a vs. b) does not support de Hoops' judgment, though the difference did not come out as statistically significant in the crowd-sourced data.

- (88) a. ??Some of many soldiers died.
 b. *Most of some say that the Earth is flat.
 c. ??All of many soldiers died.
 d. ??Some of all apples were rotten.
 e. ??Some of twenty soldiers died.
- (89) a. ✓John was one of several students.
 b. ?John was one of several students who arrived late.
 c. ?Speaking of acquaintances, only two of many came to the party.

Barker (1998: Section 2) capitalizes on the presence of a strong restrictor to argue that the internal nominal in these cases is specific in context and must thus denote a plural individual. Barker cites *I found an even prime* as another example where an indefinite has the same model-theoretic referent as a definite, and points out that cases such as **I hurt two of half of my fingers*, which entail the existence in context of additional relevant elements, make the partitive unacceptable.

If the PC is recast in a purely semantic version (90), and specific indefinite are interpreted as in (91) via Choice Functions (CF, see Reinhart 1997; Winter 1997) which yield a (plural) individual, no PC violation arises.²⁰ Such a formulation is in any case desirable to accommodate Ladusaw's observation about **one of both boys* (*both boys* is not a plural individual, witness **both boys are a couple*).

- (90) **Partitive Constraint (Barker/Ladusaw's Semantic Version)**
 The nominal after *of* must denote a (plural) individual.

- (91) a. If I expel two students that cheated in my exam I will be criticized.
 b. $\exists f[\text{expel}(I, f(\text{student_who_cheat}) \rightarrow \text{criticized}(I))]$
 'There is a certain method to chose individuals such that if I expel two individuals chosen by this method from the set of exam-cheating students, I will be criticized.'

One potentially problematic aspect of Barker's proposal is that the inner nominals in indefinite partitives may contain determiners like *many* or *several*, which do not pass another classic test of specificity, the possibility of scoping out of strong islands. For instance, (92a) has the wide scope made explicit in (92b) only when D is a simple cardinal (*three*) but not when it is *most* or a vague amount modifier (*many*, *few*, *several*) (Liu 1990; Zamparelli 2005).

- (92) a. If you see {three / many / few / several / most} people with red hats, let me know.
 b. There are D people with red hats such that, if you see them, you let me know.

²⁰ Recall that choice functions are arbitrary ways or methods to extract one (singular or plural) individual out of a set. Such methods can be quantified upon from outside the island domain (i.e. the conditional in (ii)), giving the appearance that an element which is not moving at all is violating a strong island. See also Schwarzschild (2002) for discussion and an alternative.

If wide scope is connected to the possibility of denoting an individual (Fodor & Sag 1982), or of being under a Choice Function bound from outside the conditional, then the Q-adjectives that yield clause-bound indefinites must be quantificational (see, indeed, an analysis along these lines in Solt 2015).

In conclusion, appealing to specific indefinites might be a valid solution for some of the cases pointed out by Abbott, but this solution might not extend to other cases (for instance, to the contested case with *several*).

An additional possibility, suggested by the presence of *just/only*, is that some indefinite partitives may actually be *focus constructions*, based on quantities. This means that while the communicative goal of a canonical partitive is to show that some entities are part of a larger, contextually salient group, the focus of some indefinite cases would be to contrast two quantifiers in a Horn scale: the actual amount of entities to which some predicate applies, given by the external determiner, and the larger number to which it *might* have applied, given by the internal one. If this idea is on the right track, *only one of four students came* would end up having the informal semantics in (93) (with *one* and *four* in a Horn scale, *four* a stronger value than *one*).

- (93) a. One student came in world *w*
 b. It is not true that four students came in *w*
 c. There are worlds *w'* accessible from *w* such that four students came in *w'*
 (i.e. four students might have come)

This fits with the fact that numeric partitives with no inner determiner like **three of apples were rotten* are severely ill-formed in any context, since bare plurals are not specific and their “null” determiner is not focusable.

Leaving a formal rendering of (93) and its compositional derivation for future work, we tentatively conclude that indefinite partitives might be seen as a combination of two strategies: one in which the inner nominal denotes a plural individual much like a definite (but without a presupposition that the hearer should be able to identify the referent) and one which overlaps in function with the *out of* construction (but without *out*), contrasting an actual and a possible or expected amount. In Italian, where the preposition *su* ‘over’ is used for *out-of* cases like *one doctor out of four*, the same preposition can be used in a subset of non-definite partitives given by Abbott (e.g. *solo uno su quattro controesempi possibili* ‘only 1 over 4 possible counterexamples’), blurring the distinction between the two constructions.

6 The internal structure of canonical partitives

As we have seen, one of the structures proposed for partitives involves an empty nominal category, marked N^e , before the partitive PP:

- (94) $[_{DP} \text{ two } N^e [_{PP} \text{ of } [_{DP} \text{ the } [_{NP2} \text{ pens}]]]]]$

The analysis of proportional partitives we have proposed in the previous section sees N^e as a null relational noun, $PART^%$, which takes the partitive PP as its argument. There is however strong evidence that this structure does not fit all partitives, and in particular, that it should not be adopted without considerable modification for canonical cases like *many of the boys* (witness the impossibility of **many% of the boys*). In the next sections we will defend a “matching” version of the structure in (94) where N^e contains an empty proform coindexed with the inner NP (NP2 in (94)). This coindexing makes it a variant of the movement approach adopted in Zamparelli (1998; 2008), while overcoming some of its defects. Though unpronounced, the upper nominal is semantically active.

There are two main arguments in favor of this structure: the pattern of gender agreement between the outer determiner and the inner noun, and “double genitives”, where the outer NP is actually a raised copy of inner one. A third crucial consequence of the analysis—the ill-formedness of some coordinated inner nominals—will be taken up later, in Section 7.

6.1 Agreement patterns in Italian

The relevance of gender to make the case for the existence of a null nominal category in partitives was pointed out already in Sleeman & Kester (2002). Cardinaletti & Giusti (2006: §3.3.4) discuss the fact that in French partitive constructions introduced by a quantifier cannot present mismatches in gender:

- (95) {une / *un} de mes filles
 {one_{F.SNG} / one_{M.SNG}} of my daughters_{F.PL}
 ‘one of my daughters’

In an analysis in which a copy of *filles* is present after the outer determiner, as in (96), the impossibility of agreement mismatches reduces to the ungrammaticality of *un fille* ‘a_{M.SNG} daughter_{F.SNG}’ (see Sleeman and Ishane, 2016 §4 and 5, for a technical implementation). Note that, crucially, we do not want number features to be copied as well, or (96) would be ungrammatical due to the number mismatch in **une filles* (we also don’t want (96) to refer to a granddaughter—this semantic problem will have to wait till Section 6.4; see the discussion around ex. (121)).

- (96) une ~~fil~~_{F.SNG} de mes filles_{F.PL}

In (95), however, semantics is a strong confound: *un* could be impossible not for grammatical reasons, but because it is a masculine pronoun which refers to (a subpart of) a group of females—the antecedent of the partitive. A better test should use human plural nouns that have a single grammatical gender but comprise either man or women, such as *persone_F* ‘people’ or *partecipanti_M* ‘participants’, in Italian. Sleeman & Ihsane (2016) analyze the situation in French and conclude that gender mismatch may be allowed (especially in superlatives) only when the mismatched quantifier is masculine, the default form. Here we report on Italian, which seems at first glance more permissive: mismatches like (97) seem fairly acceptable in both directions, and they are robustly represented in web searches with human nouns (though not with animals), even if the matching case is far more common.²¹

- (97) a. ?Una dei partecipanti era arrivata molto presto.
 one_{F.SNG} of_the participants_{M.PL} was arrived_{F.SNG} very early
 ‘One of the participants arrived very early.’
 b. ?Uno delle persone era arrivato molto presto.
 one_{M.SNG} of_the people_{F.PL} was arrived_{M.SNG} very early
 ‘One of the people arrived very early.’

²¹ Specifically, a simple Google search finds the following numbers: *uno dei* (M.SNG-M.PL) 67M; *una delle* (F.SNG-F.PL) 52M; *uno delle* (M.SNG-F.PL) 368K; *una dei* (F.SNG-M.PL) 439K; *alcuni dei* (M.PL-M.PL) 10M; *alcune delle* (F.PL-F.PL) 8M; *alcuni delle* (M.PL-F.PL) 53K; *alcune dei* (F.PL-M.PL) 32K. Many of the residual mismatched cases are explained by observing that *alcuni/i* and *uno/a* may function as +HUMAN indefinite pronouns (‘some guy(s)’), which may be followed by *di* ‘of’ adjuncts or partitive determiners entirely by chance.

In the plural, however, a gender mismatch is much less tolerated (98) (the difference between the FEM-MASC mismatch in (97a) and (98a) is $p. < 0.001$).

- (98) a. **Alcune dei partecipanti sono arrivate molto presto.*
 some_{F.PL} of the participants_{M.PL} are arrived_{F.PL} very early
 ‘Some of the participants arrived very early.’
- b. **Alcuni delle persone sono arrivati molto presto.*
 some_{M.PL} of the people_{F.PL} are arrived_{M.PL} very early
 ‘Some of the people arrived very early.’

The general preference for gender matching supports a double noun structure in canonical partitives, and the existence of MASC-FEM mismatches like (97b) (informal judgment) could perhaps be tolerated on account of the default nature of masculine gender in French and Italian. But the fact that gender mismatches go in both directions and depend on number clearly calls for an explanation.

6.2 Double genitives as inverse partitives

The possibility of a hidden double-noun structure in partitives would obviously be strongly boosted by constructions with a partitive meaning but where the outer noun is overt. Double genitives,²² [INVERTP], introduced in Section 2 seem to fit the bill. Indeed, Kayne (1994: Chapter 8) and Barker (1998) already regard these cases as “inverted partitives” (as we listed them in our initial review of the partitive family).²³

- (99) a. two books of John’s
 b. a relative of mine

Like canonical partitives, double genitives display PPart: it is odd to say ??*a mother of John’s*, ??*a nose of mine*.²⁴ Building on Kayne’s idea that (100) involves fronting of a subpart of the inner nominal, Zamparelli (1998) argued that both partitives and double genitives involved raising the inner NP to a position to the right of the outer determiner (*two*). Partitives would then spell out only the foot of the chain, double genitives, only the head. Zamparelli linked the two orders in (99) to the two orders found in the “kind construction”: *a car of this kind/this kind of car*.

- (100) a. two books_i of John’s books_i
 b. two books_i of John’s books_i

The Kayne/Zamparelli analysis of double genitives can of course be extended to (99b), assuming that *mine* is a morphological manifestation of the pronominal possessor *my* in the absence of an overt possessee (as is *This plate is mine*).

²² The construction is also known as “OF/Z possessives”. This terminology is adopted in Zamparelli (1998), but we do not find it sufficiently transparent, even though the term “double genitives” does not extend to the cases with demonstratives or superlatives seen in Italian (102) or (103).

²³ Kayne proposes that the outer determiner is also moved from the inner DP. However, examples like *most friends of John’s* or *those friends of Johns who came over*, show that the partitive determiner must be external, and not come from **John’s those/most friends*.

²⁴ In corpus searches we actually found quite a few cases of demonstratives heading double genitives, many with clear unique restrictors: *this mind/love/belly/conjecture of mine/yours*, but no real case with a simple definite. The meaning of these demonstratives is hard to pin down, but they seem to add an endearing quality; the construction might not be too far off from *my/your kind of mind/love/belly/conjecture*. We leave a real analysis to braver souls.

Note that this raising structure would have to apply even in cases like *two of them*. This is unproblematic, if we adopt Elbourne's (2005) structure for pronouns, which makes them hidden definite descriptions with an invisible restrictor:

(101) two $N_{\text{restrictor}}$ of THE $N_{\text{restrictor}}$ (simplified)

Italian has a broader range of constructions similar to (100b). (102) (originally discussed in Cardinaletti & Giusti 1990) has a demonstrative as the inner determiner.²⁵ Inverted superlative partitives (103) were mentioned in Section 2, item [SUPERLP].

- (102) a. due ~~amici~~_i di quegli amici_i che porti sempre a casa
two ~~friends~~ of those friends that you_i bring always home
'Two of those friends you always take home'
- b. due amici_i di quelli ~~amici~~_i che porti sempre a casa
two friends of those ~~friends~~ that you_i bring always home
'Two friends of the kind you always take home'
- (103) a. due ~~vini~~_i dei vini_i migliori
two ~~wines~~ of the wines best
'Two of the best wines'
- b. due vini_i dei ~~vini~~_i migliori
two wines of the ~~wines~~ best
'Two wines of the best'

In an approach that does not posit an identity between the inner nominal and the noun after the outer determiner, the parallel between the cases in (a) and those in (b) is lost. Of course, this is a shortcoming only if we have convincing evidence that (a) is indeed a variant of (b). But this position has come under attack.

One problem, noted in McCawley (1988) and rediscovered in Storto (2000), is that English double genitives allow only a subset of the types of possessive relations which canonical partitives allow. Thus, (104) shows that "small" DP possessors which express a *modifier* relation (place and especially time) worsen when inverted ($p < 0.001$ for time, (104b)); (105) shows that leaving a numeral after the possessor in the lower DP degrades only the inverted order; (106), modeled after an example in Storto (2005), shows that possessive relations which are assigned by the context (here, the patient of the attack event) are worse in double genitives than in the corresponding partitives (the difference is shared by McCawley and other native speakers we asked, but it was not statistically significant for our naive informant's pool).

- (104) a. (i) ✓One of Rome's hills has a spring.
(ii) ?One hill of Rome's has a spring.

²⁵ As discussed in Zamparelli (1998), these demonstrative are non-deictic, and tend to have a qualitative, kind-oriented meaning (see also Cardinaletti & Giusti 2007: Section 3.3). If the inner demonstrative has no modifiers it takes a negative connotation (e.g. *that lousy kind*), as in (i), where *ne* has been extracted from after the demonstrative:

- (i) Di stupidaggini_i, ne_i ha fatte di quelle!
of silly_i things, one(s) he did of those
'He did such silly things!'

A possibly better translation of (102)b is 'two friends of the kind you always bring home'. See ft. 34 for further remarks.

- b. (i) ✓One of yesterday's lectures was boring.
- (ii) ??One lecture of yesterday's was boring.

(105) ??A novel of Jack's two was made into a movie.

- (106) Two distinct groups of dogs attacked Jack and John.
- a. ✓Unfortunately, one of John's dogs turned out to be rabid.
 - b. ?Unfortunately, one dog of John's turned out to be rabid.

These distinctions show that the differences between double genitives and canonical partitives cannot be a matter of spell out—which of the two copies gets pronounced. However, other possibilities remain open. Far from undermining the link between double genitives and partitives, we believe that these facts point to a way for refining it. Consider for a moment the alternatives. The hallmark of double genitives is a simple possessor not followed by a noun. But this is only possible when the context presents an overt noun whose content can be identified with the missing one: out of the blue, (107) cannot be understood as *Mozart's music is played a lot* (note that *Mozart is still played a lot* can metonymically get precisely this meaning).

(107) *Mozart's is still played a lot.

This strongly suggests that, if double genitives are not a case of raising, they must be cases of *nominal ellipsis*, on the model of (108).

(108) John's friends are wiser than Mary's friends.

But in English, nominal ellipsis has none of the restrictions reported above. (109) shows that “modifier” possessors are fine; (110) is fine both in subject and object cases; (111) (contrasting with (105) at $p. < 0.001$), shows that stranded numerals are fine in ellipsis contexts.

- (109) a. ✓I like today's lectures, but I hated yesterday's. ($p. < 0.001$ vs (104b-ii))
 b. ✓I like Rome's hills, but I hate Boston's.

- (110) Two distinct groups of dogs attacked Jack and John.
- a. ✓John's dogs turned out to be rabid, while Jack's didn't.
 - b. ✓I had to check John's dogs for rabies, while my colleague checked Jack's.

(111) ✓John's four novels may be bestsellers, but Jack's two are masterpieces.

Thus, in an ellipsis account, the restrictions noted for double genitives remain a mystery. What we really need is a movement-based account of double genitives that can also explain them.

6.3 An analysis of double genitives

Zamparelli (1996: Pg.136) proposed that possessors may occupy a higher or a lower position in the DP spine (say, [Spec,DP], preferably, or [Spec,NumP], in special cases; see Cheng et al. 2017), and that the presence of a numeral in Num (as in *John's two wishes*) forces the possessor to occupy the higher position. Suppose that double genitives are indeed derived by moving the inner nominal to the outer DP. To move overtly, however,

the edge of the inner DP, a phase in the system of Chomsky (2001; 2008), must be unoccupied (112).²⁶

(112) $[_{DP} \text{two NP}_i \text{ of } [_{DP} t_i D^0 [_{NUMP} [_{DP} \text{possessor}] \text{-s } t_i]]]$

When a numeral is present, the possessor is forced into the high position, at the edge of the DP (113), but now this position hinders NP extraction. This obtains the contrast between (105) and (111) seen above.²⁷

(113) $*[_{DP} \text{two NP}_i \text{ of } [_{DP} [_{DP} \text{possessor}] [_{D'} \text{-s numeral } t_i]]]$

Suppose, further, that the possessor can be assigned a thematic relation by the noun (as in *John's arrival*), or a default 'ownership' relation (as in *John's bike*) regardless of its position within the possessee DP, but that context-dependent relations (including time and location relations, as in *Rome's hills/yesterday's lectures*) are only assigned in the more external position (say, [Spec,DP]; this is in line with approaches which see the outer edge of the DP as the locus for anaphoric definite meanings, like Schwarz 2009; 2013). However, by hypothesis this position blocks NP-raising in double genitives, so context-assigned possessive relations are not available. This derives McCawley's and Storto's observation that a case like *a dog of John's* has a limited range of possessive meanings.

6.4 A matching theory of canonical partitives

While the various restrictions of double genitives can be addressed, we believe, in a raising analysis, the fact that none of them applies to canonical partitives casts doubts on a simple raising theory like Zamparelli's (1998), which sees "canonical" and "inverted" partitives (e.g. the examples in (100), (102) and (103) above) as simple spell-out variants. This approach predicts that, across languages, it should be possible to overtly extract the inner NP out of definites and even demonstratives. In actual fact, constructions like the (b) variant of (102) or (103) are marginal or impossible in languages where (a) is perfect (English is one example: **Two people of the tallest*, **A wine of the best*).²⁸ In addition, the reason why in the canonical partitive case languages should spell-out the foot and not the head of the movement chain remains mysterious. Last but not least, Zamparelli's movement-to-[Spec,of] analysis does not solve the syntactic problem raised by the side-by-side existence of quantitatives and partitives: most determiners would have to select either for NP or PP (abstracting away from intermediate functional projections).

What is needed is a theory that preserves the advantages of the raising analysis—the idea that there is a match between the inner nominal and an invisible element to the left of the preposition—without treating partitives as cases of covert NP movement. We believe that our proposal for canonical partitives can achieve this goal.

²⁶ See Fiengo & Higginbotham 1981; Campbell 1996 for discussion and different approaches to this problem in relation to the "Specificity Condition" on extraction.

²⁷ Some speaker we consulted found the variant *two children of Jack's four* grammatical, with contrastive focus on *four*. We suggest that this might be a case closer to *out-of* "partitives". In such cases, the PP may be preposed.

(i) (out) of John's *(FOUR), I bought THREE books.

²⁸ In Italian, we find semi-lexicalized cases of *ne* extraction (where *ne* is a pro-NP) out of distal demonstratives, as in (i), but not from other cases (on the meaning of demonstratives in (102) and (i), see footnote 25).

(i) Ne ha fatte di {quelle! / *queste! / *quelle laggiù}.
them he_has done of {those! / these! / those over_there}
'He did such (naughty) things!'

Suppose that in partitives the outer determiner selects a null relational element $PART^{PRO}$, which hosts in its specifier a pro-NP, equivalent to a null version of the Italian clitic *ne* or English pro-NP *one* (see Falco & Zamparelli 2016 for a full treatment of these elements). $PART^{PRO}$, in turn, selects for the *of* PP. In canonical partitives, the PRO in [Spec, $PART^{PRO}$] is coindexed with (i.e. cataphorically controlled by) the NP² in the inner nominal (114).

$$(114) \quad [_{DP1} D^0 [_{NUMP} Num [_{NP1} PRO_i [_{N'} PART^{PRO} [_{PP} of [_{DP2} [_{NP2} N]]]]]]]]$$

Let's review some features of this proposal. First, both partitives and quantitatives contain a nominal element and have the same structure, so there is no need to assume that D or Num select for NP in quantitatives and for PP in partitives. Second, the fact that the determiners which support partitives are those which allow null-nominals constructions (witness the contrast between *each* and *every* in (115)) is no longer a coincidence: in partitives, the null nominal is $PART^{PRO}$. We propose that, unlike $PART^{\%}$, $PART^{PRO}$ is not mass and can be freely singular or plural, compatibly with the number specification it gets from PRO.

- (115) a. When the kids came, {each / *every} got a gift. (null nominal)
- b. When the kids came, {each / *every} of them got a gift. (partitives)

Next, let's reconsider the Italian agreement facts presented in (97) and (98): gender mismatches between the outer determiner and the inner nominal are more or less tolerated, but not when the outer determiner is plural. In the theory we are proposing, gender features in the upper nominal are normally inherited via PRO in [Spec, $PART^{PRO}$] (possibly via $PART^{PRO}$ itself, assuming that it does not have gender features of its own). But PRO can inherit a smaller or larger set of grammatical features from the inner NP, by coindexing—we suggest—with a larger or smaller nominal portion of the inner DP. To spell out the idea, suppose that gender is contributed either by a Gender projection which is adjacent to the NP proper and inserted from the lexicon along with it (116a) (cf. Harris' 1991 notion of "Word Marker", but also to the Classifier Phrase proposed for many classifier languages, see e.g. Cheng & Sybesma 1999; Simpson 2005), or delivered by the same phrase that contributes plurality, tagged PIP here, (116b) (this second structure, defended in Di Domenico, 1997 is probably an option only for those animate nouns with a semantically interpretable gender, e.g. Italian *ragazz-o/a* 'boy/girl'). Number, on the other hand, is always realized in the projection higher than NP, and is independent from it (see Ritter 1991; Borer 2005; Heycock & Zamparelli 2005, a.o.).

$$(116) \quad \begin{array}{l} \text{a.} \quad \dots [_{PLP} Pl_{\pm PLUR} [_{GENDP/WMP} Gend_{\pm FEM} [_{NP} Noun]]] \\ \text{b.} \quad \dots [_{PLP} Pl_{\pm PLUR/FEM} [_{NP} Noun]]] \end{array}$$

Either configurations in (116) make it possible for PRO to target a noun *with* its gender (by coindexing with GendP or PIP) or, in more marked cases, *without* it (by coindexing with just the NP). The singular mismatching case can thus receive the structure in (117a): PRO targets NP, the DP formal gender features are not copied on PRO, the gender of the outer D reflects the semantics of the referent (its biological sex; recall that gender mismatches are restricted to humans, where grammatical gender is interpretable) and its singular number is a default value for number.

When the outer D is plural, however, it must agree with PART/PRO, which must in turn obtain fully specified number features by coindexing with Pl(ural)P (117b). But now the gender features from the inner nominal are carried along, blocking the possibility of mismatched gender, as we saw in (98).

- (117) a. $[[_{DP1} \text{una}_{FEM} [_{NP1} \text{PRO}_i \text{PART}^{PRO} [_{PP} \text{de-} [_{DP2} i [_{PIP2} \text{Plur} [_{GENDP} \text{Gend}_{MS} [_{NP1} \text{partecipant-i}]]]]]]]]]]$ (cf. (97a))
 b. $[[_{DP1} \text{alcune}_{FEM.PL} [_{NP1} \text{PRO}_i \text{PART}^{PRO} [_{PP} \text{de-} [_{DP2} \text{le} [_{PIP1} \text{Pl}_PL [_{GENDP} \text{Gend}_{MS} [_{NP} \text{partecipant-i}]]]]]]]]]]$ (cf. (98a))

In Zamparelli (1998), the internal NP was moved to the Spec of a PP headed by a “residue head”, a head which subtracts the semantic of its complement (a maximal plural individual) from that of its specifier (a semilattice). This derived PPart at the cost of an unusual semantics for *of*. Here the preposition *of* reverts to being a simple Case assigner with the semantics of an identity operator, and the “residue” semantics is transferred to PART^{PRO} (118), which combines first with PRO (denoting a plural property), then with the definite complement (denoting its maximal element), subtracts the second from the first (“P-x” in (118)) and uses the result as the new nominal restrictor (i.e. $\lambda y[P-x(y)]$).

$$(118) \quad [[\text{PART}^{PRO}]] = \lambda P \lambda x \lambda y [P-x(y)]$$

$$(119) \quad [[[_{DP1} D [_{NP1} \text{PRO}_i [N' \text{PART}^{PRO} [_{PP} \text{of} [_{DP2} D [_{NP2} N]]]]]]]]]] \\
 = [[D]] ([[PRO_i] - [[DP2]]) \\
 = [[D]] ([[NP2] - \text{Max}([NP2]])]$$

In double genitives, on the other hand, $[\text{Spec}, \text{PART}^{PRO}]$ hosts an actual movement copy of the inner NP. Just like PRO-NP, the overt NP denotes a property and the semantics works exactly as in the last line of (119).

It is now easy to show that the partitive PP is not a complement of the raised nominal by simply picking raised nominals which have complements of their own, like *director of immigration services* in (120).

- (120) a. Your director of immigration services made an awful mess.
 b. This [director of immigration services]_i of yours t_i made an awful mess.

This defuses the possible objection that (121a, b) cannot have a covert structures which is similar to (121c) (with one of the two *friends* replaced by a PRO-NP or a trace).

- (121) a. two of John’s friends
 b. two friends of John’s
 c. two friends of John’s friends

The objection now has no force, since (121a) means something very different from (121c): in (121c) the PP is the object of the upper *friends*, while in (121a) the PP is an object of PART^{PRO} , not of PRO coindexed with *friends*. Likewise, *of John’s* in (121b) is not an object of the raised *friends*. In (120), the argument of the noun *director* is *of immigration services*, which has raised along with it to the Spec position to the left of the PP *of yours*.²⁹

Positing an empty nominal element at the core of partitive semantics leads to the expectation that this element might be overt in some languages. A concrete possible candidate for PART^{PRO} is the Turkish “classifier-noun” *tane* we saw in (14b), and which might be realized overtly as a way to support number and Case morphology (when this noun is missing, the same morphological markers appear on the numeral, see (14a)).

²⁹ *Mutatis mutandis*, this reasoning also holds in theories that do not assume that nouns take real complements, only loose, more adjunct-like dependents.

6.5 Predictions for other partitive structures

We can now observe what happens when we cross double genitives with other members of the partitive family: the proportional partitives studied in Section 2, ([PROPGRP]), and the *among*-partitives ([AMONGP], Hoeksema's *semipartitive*). Proportions are impossible as double genitives: (122b) is grammatical, but not with the meanings of (122a) (rather, something like *I talked to semi-friends of John's*). (122c), where this meaning is not available since *friends* doesn't take a "fraction" argument, is out.

- (122) a. I talked to half of John's friends.
 b. I talked to half friends of John's. (not a double genitive)
 c. ??I talked to 50% friends of John's.

Also out, given the characterization of percentages given above, is a structure where the inner noun has moved to [Spec,PART[%]]: unlike PART^{PRO}, this noun does not take a nominal argument.

Among can more or less freely replace *of* in most types of partitives, but not in mass partitives (**half among the people*), nor, again, in double genitives like (123).

- (123) *A friend among John's just left.

In plural cases like (124) the difference was not so clear-cut, however.

- (124) a. ??Two among John's novels have become bestsellers.
 b. ??Two novels among John's have become bestsellers.

Unlike other linguists we have asked, our informant pool did not detect any difference between (124a and b) (note that, due to randomization, the two cases were judged *independently*). Additional, informal judgments, show that adding a numeral after the possessor in (124b) (e.g. *?Only two novels among John's twenty became best sellers*) does not degrade the situation much, suggesting that perhaps (124b) should be regarded as a case of nominal ellipsis (125), and that the more degraded status of (123) could be due to a number mismatch (*a friend among John's friends*).

- (125) two novels among John's (twenty) ~~novels~~

Italian informal judgments show that *fra* 'among' tolerates the presence of two full nominals in cases which would be impossible with *di* 'of' partitives (126). The situation is probably identical in English (see Section 9 for similar cases).

- (126) due persone {fra / *di} loro
 two people {among / of} them
 'Two people among/*of them'

Cardinaletti & Giusti (2006: 2007: Section 3.2) examined the Italian *semipartitives* and conclude that *among* cases are in fact adjuncts, not selected by D or N.³⁰ von Heusinger & Kornfilt (2017) give an analogous analysis to Turkish ablative-marked partitives (see (175)

³⁰ One could of course wonder if the "partitive" meaning of *among* is simply a special case of a locative meaning, visible in e.g. (i) (from UKWAC).

(i) Among some papers from Atherton & Clothier we find 2 gallons of egg listed in the ingredients required for dyeing sheep skin.

below), but also point out (von Heusinger & Kornfilt 2017: Ft.11) that Turkish has a separate adverbial which more closely resembles *from among*, and that ablative-marked cases can apparently take mass nouns as inner nominals (127). This could mean that the count semantics of *among* is orthogonal to its adjunct status, or that (127) should in fact be reanalyzed as a pseudopartitive (cf. English *two glasses of wine*).

- (127) Ali şarap-tan iki bardak iç.
 Ali wine-Abl two glass drink
 ‘Ali drank two glasses of the wine.’

In conclusion, in agreement with previous literature we believe that an adjunct analysis is the best one for *tra/among* constructions and for Turkish ablative-marked cases. One consequence is that semipartitives should not allow movement of the type used in double genitives; the contrast in (126) follows straightforwardly: in the *among* case, *people* is generated in the external position, not moved from somewhere inside the inner nominal.

We return to semipartitives in Section 9, where we discuss in more details the possibility of dislocated PPs and doubly-filled partitive nominals.

7 Coordination

A strong argument in support of a matching analysis of canonical partitives comes from the coordination of definites. Semantically, the conjunction of two definite arguments under a single collective predicate, as in (128), must denote either a plural entity whose atoms are the denotations of the individual definites (i.e. $j + m$ in (128a)), or a generalized quantifier, GQ, whose generator is $j + m$ (i.e. $\lambda P[*P(j + m)]$). Opinions differ on how to derive these denotations (see e.g. Winter 2001 for discussion), but there is no disagreement on what the final output should be.

- (128) a. John and Mary broke up.
 b. The boy and the girl had met last year.

Thus, if the boy and the girl in question are my best friends, the denotation of *the boy and the girl* should be the same as that of *my two best friends*. Yet, surprisingly, while the latter is perfect within a partitive (129a), the former isn't (129b), (130b). The same holds in Italian (131).

- (129) a. I am looking for one of my best friends.
 b. ??I am looking for one of [the boy and the girl].
 c. *One of [this boy and that girl] came over.

- (130) a. Some/Two of those 4 boys will not come.
 b. {??Two / *Some} of Jack, Marc, Luis and Tom will not come.

- (131) *Conosco bene uno del ragazzo e della ragazza.
 I_know well one_of_the boys and_of_the girl
 ‘I know well one of the boys and of the girl.’

The quantifier *each* provides an interesting minimal pair, since it can form partitives with plural definites (132a), appear ‘floated’ in association with singular definite conjunctions or plural definites (132b), but not form a partitive with a singular definite conjunction (132c) (p. < 0.001 for b/c) (de Hoop 1997).

- (132) a. Each of the two students ate one ice-cream.
 b. {✓John and Mary / ✓the two students} ate one ice-cream each.
 c. ??Each of John and Mary ate an ice-cream.

Again, the contrast holds cross-linguistically—see the equivalent sentences in Italian (133) ($p. < 0.0001$ for a/c) and German (134) (informal judgments).

- (133) a. ✓Ciascuno dei due studenti ha mangiato un gelato. (= (132a))
 b. ✓{Gianni e Maria / i due studenti} hanno mangiato un gelato ciascuno. (= (132b))
 c. *Ciascuno di Gianni e Maria ha mangiato un gelato. (= (132c))
- (134) a. Jeder von beiden Studenten hat ein Eis gegessen. (= (133a))
 b. Johan und Mario haben jeder ein Eis gegessen. (= (133b))
 c. *Jeder von Johan und Mario haben ein Eis gegessen. (= (133c))

This unexpected contrast is unlikely to be due to a general problem with applying *of* to a coordination (*a friend of the baron and the general* is after all impeccable). Also, Hoeksema (1996) cites good mass proportional partitives such as *Only about half of John and Jacky was visible for the sniper*, which were partly confirmed by our informant pools in English (135) and in Italian (136) (the contrast between (135) and e.g. (130b) is $p. < 0.01$).

- (135) a. ?Half of John and Mary was underwater.
 b. ?A quarter of Trilly and Wendy was already underwater.
- (136) ?Il cecchino riusciva a vedere solo metà di [Carlo e Franco].
 the sniper managed to see only half of [Carlo and Franco]
 ‘The sniper managed to see only half of [Carlo and Franco].’

The contrast between ??*one of John and Mary* and *half of John and Mary* is noted and discussed in Helen de Hoop (1997). She proposes to distinguish the two cases on the basis of a broader divide between *number-based* and *amount-based* partitives. Cardinal numerals can introduce only the former (*3 of the boys*), mass determiners only the latter (*much of John*), but most determiners (notably, proportional ones like *all*, *most*, *20%*, *one third*, *half*) are ambiguous between the two types, so we get an ambiguity in cases such as (137).

- (137) Half of the flowers should now be in the water.
 (i.e. 3 out of 6, or the lower part of each flower)

De Hoop’s (1997) proposal is that the two readings come from a semantic ambiguity in the denotation of the DP embedded in partitives: in number-based cases, *the flowers* would denote a contextually restricted set of atomic individuals, in amount-based ones, a plural individual whose atomic components are flowers.

One positive feature of this approach is that since *the flowers* can have the same semantic type as that of the common noun *flowers* (i.e. $<et>$), she can explain the existence of both *all flowers* and *all the flowers*. Crucially, she proposes that the option to have these different denotation types is open to all definites, but not, apparently, to conjunction: *John and Mary* can only have the “plural individual” meaning, so this nominal is excluded from number-based partitives, but remains possible in amount-based ones.

This proposal covers the facts, but at the expense of overgeneration. If both *flowers* and *the flowers* can be a property (i.e. $<et>$ -type), it is not clear what blocks **{three/many/red}*

the flowers.³¹ In addition, the semantic effect of plurality remains unclear in this system. Worse, without independent motivations, the proposal that conjunction does not have a set denotation is a mere stipulation. De Hoop points to the fact that definites involve contextual restrictions while conjunctions like *John and Mary* do not, but it is unclear why this should matter for having a set rather than an individual denotation. Moreover, coordinations of two definites (e.g. *the boy and the girl*) should also have undergone contextual restriction at the level of conjuncts, yet their status in partitives is unchanged. Finally, not all definites require contextual restrictions: *the Earth poles* has none, and it denotes what *the North pole and the South pole* denotes, yet the former is allowed in partitives, the latter is not. We conclude that de Hoop's approach is neither viable nor very explanatory.

In the approach pursued in this paper (and in the raising theory from which it derives), the ban on conjunction in canonical partitives comes for free. In the matching theory, partitives crucially contain a PRO (an NP proform) coindexed with the inner NP. The source of the problem is that in conjunctions there are multiple distinct NPs (in *the boy and the girl*), or none at all (in *John and Mary*) to which PRO should be simultaneously coindexed.

(138) *one PRO_i, PART^{PRO} of [the boy_i and the girl_j]

One could wonder if (138) could not simply be available as a case of *split reference*, as in *John_i told Mary_j that they_{i+j} should split up*. Remember, however, that our PRO is actually closer to an overt NP/GendP/PIP proform like *ones*: it picks up *properties*, not individuals. Split reference may be possible for individuals, but interestingly it is not possible for properties, as shown by the contrast between *them* and *ones* in (139).

(139) John wanted [two blue shirts]_i and [three gray sweaters]_j and Mary bought {them_{i+j} / *four brown ones_{shirtsUsweaters}} (instead).

The same applies to the Italian pro-NP clitic *ne*: in (140b) *ne* (object of *sei* 'six' before movement) cannot mean "martinis and spritz" (see also the English translation).

(140) a. I ragazzi ha bevuto tre martini_i, e le ragazze hanno poi
the boys have drunk three martinis, and the girls have then
preso quattro spritz_j.
taken four spritz
'The boys drank three martinis_i; later the girls took four spritz_j.'

b. Alla fine, {li_{i+j} ho pagati tutti io / *ne_{martinisUspritz} ho pagati sei t}.
At the end, {them have paid all I / ones I have paid six }
'At the end {I paid them_{i+j} all / I paid six (i.e. six out of set of martinis and spritz)}'

Note that an account which posits a null nominal before PP but does not obligatorily coindex it with the elements inside the inner DP does not predict any problem with coordination (see the discussion in Sec. 8, on alternative double-noun analyses, esp. (158) and (160)). Neither does an approach à la Kupferman, Lobeck, etc., which has no empty outer nominal at all.

Our account predicts that, in principle, the situation might get better if the two inner DPs had restrictors which referred to the same individuals. The test is only feasible in the

³¹ De Hoop could argue that *many [the flowers]_{<et>}* is precisely what is overtly realized as a partitive (*many of the flowers*), but then why is *of* only optional with *all in all (of) the flowers*, and how to block **red of the flowers*, in the intended reading?

plural, but indeed, we believe that if in a certain context *the singers* are the same as *the songwriters*, (141) is felicitous.

(141) one of the singers and (the) songwriters

Natural cases where the NP in the two antecedents is identical are harder to construct, but we believe that (142) can be easily understood as entailing the partitive in (143), and that both are acceptable (informal judgments).

(142) Mary bought [two blue shirts]_i, then [three additional gray shirts]_j.
 a. She then gave the four more expensive ones_{shirts} to John.

(143) Mary gave [four of [the blue shirts] and [the gray shirts]] to John.

On the other hand, our pool informants found that even disjoint plural conjunct like (144) were significantly better than the singular case. Since a potential confound is the possibility of a two-people reading with ellipsis (from *one of the boys and one of the girls*), we also tested (145), which of course cannot be derived from *three of these two boys and three of those two girls*. (145) was found to be worse, but not significantly worse than (144) (though still significantly worse than the case of singular conjuncts).³² The improvement thus remains unresolved.

(144) ?One of the boys and the girls will come over.

(145) ?Three of the two boys and the two girls set up a tent.

As we have seen, mass partitives allow conjoined inner nominals. This is expected, since proportions are based on PART%, which does not have a PRO. The only remaining ingredient to obtain mass proportions is the presence of a count-to-mass type-shift (from an object to its material constituent part), which seems to be independently needed in light of many mass uses of count nouns, well documented in the literature (Pelletier & Schubert 1989). Here we assume a single such operators (MASS), but this is a simplification, since cases like *Some of theater is improvisation* or *Most of cheese is saturated fat* (to the extent they are acceptable: our pool raters gave them ?? and ?, respectively) require more abstract types of count-to-mass operators (on which see Zamparelli 2019).³³ De Hoop’s flower sentence can thus be rendered as:

³² Audience members who were native speakers of other languages (German, Russian and Bulgarian) also reported an improvement for plural conjoined partitives like (129b) over the singular cases.

³³ Of course, we also predict that cases like *Half of John and Mary* (or *one third of John, Jack and Jim*) should be acceptable even in their *count* meaning and yield the same as *John or Mary* — while they sound very odd indeed. In this case, however, we think that the effect might be given by a pragmatic competition with the corresponding (and much simpler) disjunctions. Note that this cannot be used to derive the awkwardness of (130b) (*Two of Jack, Marc, Luis and Tom*), since (130b) is *not* equivalent to *Jack, Marc, Luis or Tom*.

On the other hand, a competition approach could be used to model the intuition, pointed out to us by Sebastian Löbner (pc), that *half of John and Jack was visible* cannot really refer to a situation in which Jack is completely visible and Jack completely hidden: each conjunct must contribute something to the proportion. This meaning could be obtained semantically, by scoping the conjunction over each proportion, with or without mass conversion, e.g. (i); or syntactically, by ellipsis of the proportion (ii).

- (i) a. $\text{visible}'(\text{PART}^{\%}(\frac{1}{2})(\text{MASS}(\text{john}))) \wedge \text{visible}'(\text{PART}^{\%}(\frac{1}{2})(\text{MASS}(\text{jack})))$ *mass*
- b. $\text{visible}'(\text{PART}^{\%}(\frac{1}{2})(\text{john})) \wedge \text{visible}'(\text{PART}^{\%}(\frac{1}{2})(\text{jack}))$ *count*
- (ii) 30% of John and 30% of Jack

- (146) Half of the flowers (should now be in the water).
 a. $\text{PART}^{\%}(\frac{1}{2})(\text{MAX}(\llbracket \text{flowers} \rrbracket))$ *count meaning*
 b. $\text{PART}^{\%}(\frac{1}{2})(\text{MASS}(\text{MAX}(\llbracket \text{flowers} \rrbracket)))$ *mass meaning*

If double genitives are partitives in which the inner NP has overtly raised to [Spec,PART^{PRO}], they should be acceptable only if the extraction can be carried out from each conjunct (in ATB ‘Across The Board’ fashion). Indeed, the following cases seem to be all fine according to informal judgments.

- (147) a. a friend of John’s and Mary’s
 b. some friends of {John’s and Mary’s / mine and yours}

Similarly, in Italian the pro-NP clitic *ne* can be extracted ATB from a conjunction of “weak” demonstratives.³⁴

- (148) Fiori, ne_i ho di quelli t_i rossi e di quelli t_i gialli.
 flowers, ones I_have of those red and of those yellow
 ‘As for flowers, I have some red ones and some yellow ones.’

Let’s take stock. We have proposed that the null nominal which has been claimed to be present in the outer DP layer of partitives is a relational noun (PART^{PRO}) which takes *of*-marked (or equivalent) PPs as its internal argument, and a null PRO-NP (obligatorily coindexed with the inner NP) as its external one. In double genitives, the inner NP has actually moved to [Spec,PART]; this is possible, however, only from inner nominals which allow extractions, yet satisfy the semantic requirements of partitives. This is a narrow window, which leaves in certain types of (arguably, more internal) possessors, superlatives and certain uses of demonstratives with modifiers in Italian. (149a) is thus excluded for English (no extraction out of these definites), while the corresponding partitive (149b) remains possible.

- (149) a. ??Two cats of the four came.
 b. Two of the four cats came.

Proportional partitives, on the other hand, have been argued to contain a different relational nominal, PART[%], whose external argument, in Spec, is a degree. Since there is no coindexing with the internal NP, these cases end up being better even with coordinated complements.

This would however predict that the two conjuncts should contribute *exactly* the same proportion—a requirement which we actually find too strong. A pragmatic solution, which we will not try to formalize here, could strike the correct middle ground: have all conjuncts contribute something, but not exactly the same.

³⁴ Recall that Italian allows raised partitives with demonstratives, provided they have restrictive material (see (102) above), or a kind-level meaning (see footnote 25). We assume that in this language a non-deictic demonstrative can be inserted in a position low enough to leave an “escape hatch”. This position is incompatible with numerals, as shown by the pattern of *ne* extraction in (i).

(i) Di stupidaggini, ne_i ha fatte di quelle (*dieci) $t...$
 of silly things, NE he_has done of those ten
 ‘He made silly actions of such magnitude...’ not ‘He did some of those ten silly actions...’

We hypothesize that what makes this construction impossible in English is precisely the impossibility for demonstratives to settle in such a low position, acquiring the corresponding meaning.

8 Alternative double nominal analyses

Let's now discuss two alternative incarnations of the "covert noun structure" which have been proposed in the literature on canonical partitives. Both posit an outer NP, but do not assume coindexing or movement. Both will turn out to be more problematic than the $PRO_i \dots NP_i$ analysis advocated here.

Sauerland & Yatsushiro (2004) proposes that partitives have an outer noun which is identical in form to the inner noun, but is not coindexed with it. The upper noun is then deleted at PF under identity of form with the second. As in Barker, Kayne and Zamparelli's previous accounts, double genitives have the same structure, but erase the lower NP.

Since the upper noun is not extracted, this approach, unlike Zamparelli's (1998) NP-movement system, avoids the island status of the inner definite DP. In addition, it explains the status of (150), which seems to be marginal out of redundancy, more than grammar (no PF-deletion has taken place).

(150) ?Three sofas of those sofas you bought.

As observed in Cardinaletti & Giusti (2006), assuming that *sofas* and *couches* denote the same objects, (150) is still better than (151), where PF-deletion cannot take place.

(151) *Three sofas of those couches you bought.

On the other hand, since the final structure is a matter of PF, this account predicts that double genitives should have exactly the range of meanings as the corresponding canonical partitives, which we have seen to be incorrect (Section 6.2).

A second problem is the direction of PF-deletion: partitives should have the same status of e.g. (152). But (152) is marginal, at best.

(152) ?Two ~~balls~~ hit three balls.

Allowing backward NP ellipsis in partitives is in fact not enough: some amount of cancellation should be obligatory, or we could create examples like (153) (from Martí-Girbau 2002): a partitive structure like *two of them*, but without an (overt) inner NP which could license the ellipsis of *people*.

(153) *two people of them

Even with a fuller inner DP, a PF account runs into other problems. Imagine a context with 6 books, 3 red and 3 yellow-covered. Now (154) is possible, but (155) is not (see Martí-Girbau 2002 for a similar point).

(154) The three books with a red cover are on the table, the three ~~books~~ with a yellow one, on the shelves.

(155) *I bought three ~~books~~ with a red cover of the books.

One could counter that the problem of (155) is that the upper PP should be obligatorily extraposed (yielding *three [of the books] with the red cover*), but then the question is why the same does not apply in e.g. *I bought five books. The three with a yellow cover are still in the bag*. The PRO-matching system seems to fare better in this respect, since it does

not use ellipsis, but an element which simply lacks a PF component. It is not clear that such elements can take overt restrictive modifiers, as (156) illustrates for PRO-DP and relative clauses:

- (156) a. It is wise for people that have a fever to stay home.
 b. It is wise PRO to stay home, if you have a fever.
 c. *It is wise (for) PRO that have a fever to stay home.

Even setting modifiers aside, the PF analysis raises a fundamental question: how should the upper NP *books* be interpreted in e.g. (157)?

- (157) three ~~books~~_i of the [books with a red cover]_j.

If *three* in (157) applies to ~~books~~_i (all of them, yellow or red) it may end up picking three *yellow* books, disregarding the contribution of the PP. If, on the other hand, *three* applies to the set defined by the PP, i.e. the *red* books, then ~~books~~_i becomes just a syntactic peg for nominal features, devoid of any semantic role. We still need two separate versions of all the determiners which take partitives: one for quantitatives, where they apply to their complement NP (even when invisible, as in (154)), another for partitives, where despite the presence of an (invisible) NP complement, they take their restriction from the PP, as it must happen in (157). Thus, this theory seems to combine PF complexity (backward ellipsis), syntactic complexity (a null NP which violates Full Interpretation) and semantic complexity (a double meaning for most determiners), gaining very little in return. It would, for instance, not explain the conjunction facts we have reviewed, since it should be expected to allow (158).

- (158) ??one ~~book~~ of this book and that notebook

Let's now consider another possibility. Suppose that the empty category posited by Jackendoff (1977) is not a phonologically empty token of the lower NP, but a maximally underspecified nominal category, meaning something like *person*, *object* or *entity*. This is suggested as a possibility in Sauerland & Yatsushiro (2017), and is implicit in various syntactic accounts of partitives, e.g. Sleeman & Kester (2002), or even Jackendoff's own account. A partitive such as *I saw two of the boys/two of the boxes* would end up being semantically equivalent to (159).

- (159) a. I saw two [~~persons~~] of the boys.
 b. I saw two [~~objects~~] of the boxes.

Where ~~person/object~~ are abstract nominals with no phonetic form. This approach would ease the PF problem of backward ellipsis, but not the semantic problem discussed above, which leads to a double version for all determiners. In addition, it would not explain the conjunction facts: (160) would be a perfectly viable form.

- (160) I saw one ~~person~~ of the boy and the girl.

Last but not least, this approach would have to face the fact that while (150), *three sofas of those sofas you bought*, seems redundant more than ungrammatical, (161) seems outright out (as a partitive), despite the fact that each of the bracketed nouns fits the bill for an overt version of the maximally general nominal meaning in (160).

(161) *I saw two {objects / persons / things / entities} of the boys/boxes.

In this respect, the “same NP” view embodied by (150) seems in fact better, but still more problematic than our PRO-matching analysis.

9 An analysis of partitives with two overt nouns

It is important to point out, at this stage, that while (161) is bad, there are well-formed partitive-like cases where two overt nouns are present. Some have the order of canonical partitives (162); in others the PP has been fronted (163).

(162) a. ✓I only got two packages of the mail you sent me.
b. ?I read two novels of the books you gave me.

(163) a. ✓Of the mail you sent me, I got only two packages.
b. ✓Of the books you gave me, I only read two novels.

Cases like (162) were discussed in Cardinaletti & Giusti (2006), and judged ungrammatical for Italian (their ex. (120b)). However, the crowd-sourced English data show that they range from completely acceptable to slightly marginal. Cardinaletti & Giusti do observe, however, that extraposed cases like (163) are better in Italian, and that even the order in (162) becomes better if partitive *di/of* is replaced with *tra/fra* ‘among’.

(164) a. ✓Ho letto solo due romanzi, dei libri che mi hai dato.
I have read only two novels, of the books that to me you have given
'I have read only two novels, of the books you gave me.'
b. ?Ho letto solo due libri, dei romanzi che mi hai dato.
I have read only two books, of the novels that to me you have given
'I have read only two books, of the novels you gave me.'

The partial acceptability of partitives with two nouns is unexpected, and needs to be addressed, but a preliminary question is how to account for the acceptability contrast between (165a) and (b) (both understood as partitives, both containing two nouns; informal judgments).

(165) a. ??I returned two presents of the books I got for Christmas. (cf. (161))
b. I returned two books of the presents I got for Christmas. (cf. (162a))

The difference, of course, is that the first has a more general noun (*presents*) followed by a nominal potentially referring to a subset of the first one (*books I got for Christmas*), the second has the opposite order. Now, the order < superset, subset > is found elsewhere in language. One example is anaphoric reference, see (166) and (167).

(166) a. Last month I bought [a gray parrot]_i, but [the animal]_j kept screeching.
b. ??Last month I bought [an animal]_i, but [the gray parrot]_j kept screeching.

(167) a. Only [one ring]_i was bequeathed to Mary by her aunt. She found [the object]_i ugly, but valuable.
b. ??Only [one object]_i was bequeathed to Mary by her aunt. She found [the ring]_i ugly, but valuable.

The order < superset, subset > is not entirely impossible, but it requires a certain amount of accommodation. A stronger effect in the same direction is found in appositions (a type of nominal adjunct, we assume), as in the following examples with relative clauses (the (a)-cases are once again taken from the UKWAC corpus³⁵).

- (168) a. Fruits also contain [ethanol and pectin]_i, [antidotes]_i which prevent methanol from being metabolized into formaldehyde.
 b. *Fruits also contain [antidotes]_i, [ethanol and pectin]_i which prevent methanol from being metabolized into formaldehyde.
- (169) a. Specialist advisors will involve developing [basic legal theory or philosophy]_i, [disciplines]_i that still tend to be somewhat marginalized today.
 b. *Specialist advisors will involve developing [disciplines]_i, [basic legal theory or philosophy]_i that still tend to be somewhat marginalized today.

Note that appositive nominals are typically determinerless: apposition is in fact known to license even bare count singulars (e.g. *John, vice-president at Exxon*)—subject to various language-specific constraints (e.g. uniqueness, animacy).

Putting all these facts together, we are now ready to propose that partitive-like double-noun cases such as (162a) or (165b) are *appositional partitives*, with the structure shown in (170).

- (170) I only got [two packages]_j[PRO_i PART^{PRO} of the [mail you sent me]_i]_j.

In (170) the determinerless partitive constituent [PRO_i PART^{PRO} of the [mail you sent me]_i] is an apposition of the previous NP. The fact that the order is < subset, superset > now aligns with the corresponding phenomenon in other kinds of appositions, and with the observation that, at least in Italian, the construction improves if there is a pause (a comma, in the instructions given to the informants pool) between the first noun and the PP.

Consider now in this light the paradigm in (171): *ne* (a clitic, moved to V from below *due*) is a pro-NP, so the configuration is essentially that of a double-noun partitive. The a/b and the a/c difference is $p < 0.0001$, b/c is weakly significant ($p < 0.01$).

- (171) a. ✓Ho visto due dei partecipanti.
 I_i have seen two of_i the participants
 ‘I have seen two of the participants.’
- b. ??Ne ho visti due dei partecipanti.
 Ones I_i have seen two of_i the participants
 lit. ‘I have seen two ones (= participants) of the participants.’
- c. ?Ne ho visti due, dei partecipanti.
 Ones I_i have seen two, of_i the participants
 (like above, but with a pause before the PP)

³⁵ Other natural occurring examples are in (i)

- (i) a. He then found out that he was [an immortal]_j, [someone]_j who will live forever, unless he is decapitated.
 b. A reduction in annual leave entitlement by [three to five days]_j, [time]_j which could be earned back for low sickness absence
 c. A large number of birds, including many so-called [Neotropical migrants]_j, [species]_j which breed in North America but go south in the winter.

While our informant pool did not detect a similar contrast in English, some cases can be constructed with demonstratives. Without a pause, (172a) is a normal partitive with the maximality problem we have seen and analyzed in (42) above. As with *the*, an additional restrictor solves the problem (172b), but so does a pause before the PP, since now the deictic gesture can identify a referent, which is then modified by the partitive apposition.

- (172) a. ??I read only **those** of the books you gave me. (pointing to some books, cf. (47) above)
 b. I read only those of [the books you gave me] [that had less than 50 pages]. (cf. ex. (48))
 c. I read only those (books), of (all) the books you gave me. (pointing to some books)

If these partitive PPs are essentially adjuncts, it is not surprising to see them in dislocated positions (compare *President of Exxon Corporation, John could easily afford a private jet.*). As we have seen, (173a) is judged nearly perfect, and significantly better than the non-extra-posed version in (173b). Note that in contrast with the Italian (171c), the comma does not seem to improve the rating of (173b)—for reasons which remain to be understood.

- (173) a. ✓Of the mail you sent me, I got only two packages.
 b. ??I only got two packages, of the mail you sent me.

In the fronted position, *of* PPs do not seem to differ from *among* semipartitives, which are nearly perfect in our tests.

- (174) a. ✓Among John's novels, two have become bestsellers.
 b. ✓Among John's novels, I have liked two.

This is not surprising. If the analysis in (170) is on the right track, the PP (actually, a bare predicate nominal, headed by PART^{PRO}) is an adjunct, so its behavior matches that of *among* PP adjuncts (see the discussion at the end of Section 6.4). Indeed, Turkish ablative-marked partitives, which are analyzed as adjuncts in von Heusinger & Kornfilt (2017: 12) and have no PPart, routinely contain two overt nouns (175). Unlike in Genitive-marked partitives, the subset (*elma* 'apple') is free to take Accusative case, depending on specificity.

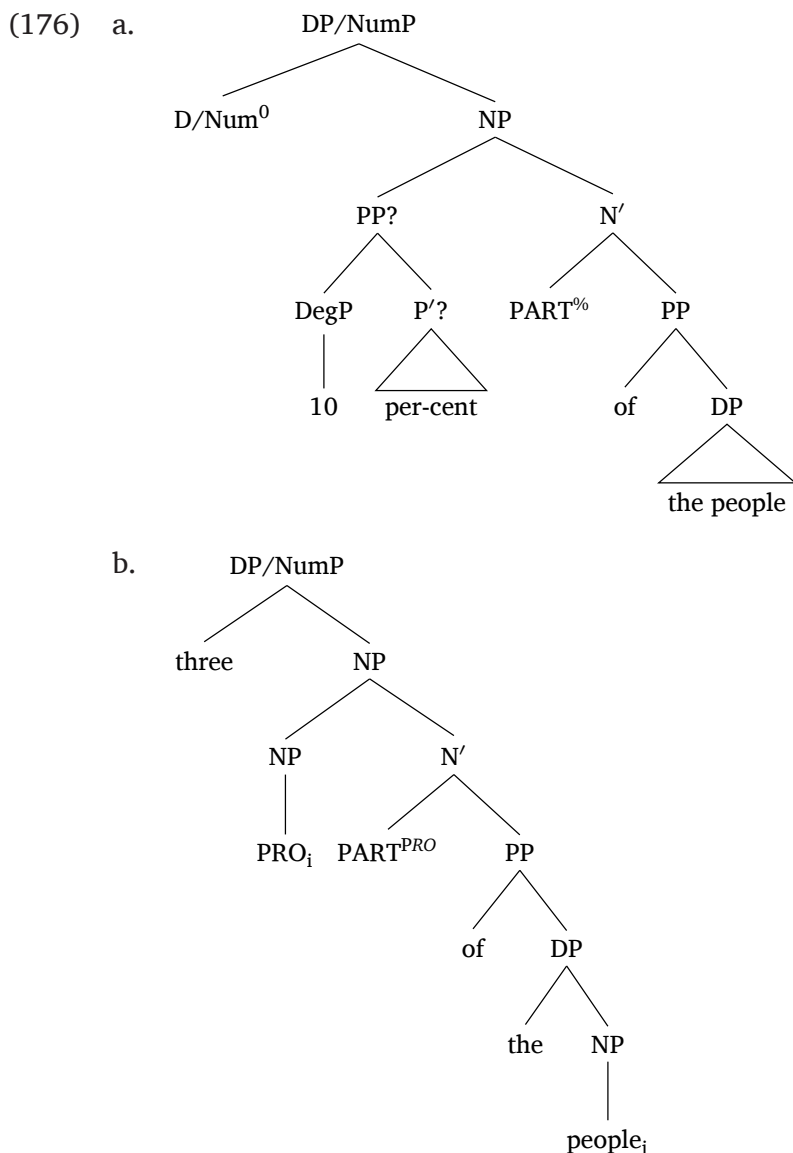
- (175) Meyve-ler-den üç elma-sin(-yi) ye-di-m.
 fruit-PL-ABL three apple-3P.SNG(-ACC) eat-PST-1.SNG
 'I ate three apples of the (set of) fruits.'

10 Conclusions

In this paper we reviewed a number of constructions typically collected under the umbrella of "partitives", arguing that they can be divided in three broad classes.

- Constructions which establish a contrastive comparison between real and potential amounts (the *out-of* construction *two out of four Ns* and some indefinite partitives *only one of several (possible) Ns*);
- constructions which express an indefinite whose amount is defined as a proportion of a previous entity (plural, as in *half of the children*, mass, as in *30% of the butter*, or "massified" by a type-shifting operator, as in *most of John*);
- constructions where the indefinite is built from the plural restriction of the inner NP (boys in *three of the boys*), removing its supremum and thus yielding Proper Partitivity.

We argued that the last two cases are the effect of two distinct silent nominal operators, $PART^{\%}$ and $PART^{PRO}$. The first takes a (proportional) amount as its external argument, the second, a pro-NP co-indexed with the internal NP, or, in the case of double genitives, an overt movement copy of the internal NP. Both operators can be overt in special cases (with words like *quarter* or *half*, in proportions, possibly with classifier-nouns like *tane*, in Turkish canonical partitives). The corresponding tree structures (minus any raising of the numeral to D, possibly needed to license the (a) case, see (68)) are in (176).



Due to the coindexing between PRO and the inner NP in (176b), canonical partitives cannot take non-identical conjoined complements (though distinct plural conjuncts appear to be better, for reasons that remain to be clarified). Finally, we argued that partitives with two nouns (like *two novels of the books I gave you*), to the extent they are acceptable, should be analyzed as a quantitative (*two books*) followed by a determinerless partitive apposition, preferably with a slight pause. Extraposed cases and the similarity with *among* semipartitives follow from their status of adjuncts.

We assumed that the proliferation of similar and partially overlapping structures can make judgments difficult and potentially inconsistent. To address this issue, we used crowd-sourcing to assess the grammaticality of a core subset of our cases, obtaining judgments

from up to 117 (self assessed) native speakers (average: 25.6 for English, 22 for Italian). This gave us the possibility to statistically validate some subtle cases (e.g. the difference between simple and conjoined inner nouns), but also gave us results which disagreed with the intuitions of some linguist native speakers we consulted (e.g. the lack of difference between *Two among John's books* vs. *Two books among John's*), possibly pointing to limits in the technique (e.g. presentation order, instructions, sentence complexity, gold items) which we hope to address in future work.

Some aspects of the problem of partitivity remain only marginally addressed, first and foremost at a typological level: most of our data come from English and Italian, and the conclusions we reached cannot go much beyond these and related languages. However, we are confident that the general methodological approach (especially the contrastive use of conjunction and overt raising cases like double genitives) can be easily extended to other language families without special difficulties.

Abbreviations

ABL = ablative, ACC = accusative, AMONGP = among construction, BAREP = bare partitives, CANONP = canonical partitives, COVERTP = covert partitives, DEGP = degree phrase, DP = determiner phrase, EXTRAP = extraposed partitives, F = feminine, GENDP = gender phrase, GQ = generalized quantifier, INVERTP = inverted partitives, K (in e.g. “32K”, ft. 21) = thousands, M = masculine, or (in e.g. “76M”, ft. 21) millions, MAXPROP = maximal pronominal partitives, N^E = phonetically null nominal element, NP = noun phrase, NUMP = numeral phrase, PF = phonetic form, OUT-OFP = out-of construction, PC = partitive constraint, PLP = plural phrase, POS = part of speech, PPART = proper partitivity, PP = prepositional phrase, PST = present, PROPROP = proportions and percentages, PSEUDOP = pseudopartitives, SNG = singular, SUPERLP = superlative partitives, 2NOUNSP = double-noun partitives.

Bold face and italics judgement marks (“✓”, “?”, “??”, “*”) come from pooled crowd-sourced judgements; other judgement marks (“?”, “??”, “*”) come from native speakers we consulted directly.

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The authors have no competing interests to declare.

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