

On the source of proper partitivity¹

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Abstract. This paper investigates into the meaning and use of partitive constructions such as *three of John's lawyers*. These constructions have long been observed to give rise to inferences of proper partitivity: upon hearing a sentence like *Sue talked to three of John's lawyers*, we spontaneously understand that John has more than three lawyers, that is we interpret the partitive *three of John's lawyers* as denoting a proper subset of the denotation of *John's lawyers*. Contra the common idea that proper partitivity follows from the plain meaning of partitives, I defend here the view that partitives semantically express partitivity *tout court*, that is they encode the reflexive 'part-of' relation, and that proper partitivity comes about as a result of a presuppositional implicature on the basis of the competition between those indefinite expressions and their non-partitive definite alternatives, e.g., *John's three lawyers*.

Keywords: partitives, proper partitivity, anti-definiteness, anti-maximality, *Maximize Presupposition!*, exhaustivity operator, scalar implicatures, oddness.

1. Introduction

The study of logical expressions (e.g., truth-functional connectives, quantifiers) raises many interesting challenges for formal approaches to natural languages. One of these challenges is to succeed in disentangling their plain from their possibly enriched meaning, that is in disentangling the logical inferences these expressions license simply by virtue of their literal meaning from other kinds of inferences they may give rise to by virtue of other principles or mechanisms being operative in natural languages at the semantics-pragmatics interface (e.g., *or* understood as *not and*, *some* understood as *not all*, the anti-uniqueness inference associated with singular indefinites). The difficulty in taking up on this challenge often boils down to finding suitable empirical tests for singling out the different inferential components at stake and determining their licensing conditions, for instance by varying the properties of the context in which these expressions are used (e.g., the speaker's epistemic status) or the logical properties of the grammatical environments in which they occur (e.g., the monotonicity of the environment).

In this paper, I pursue this line of research by investigating into the meaning and use of partitive constructions like *three of the lawyers*, and more specifically into the nature of the part-whole relation expressed by partitive *of* in these constructions, henceforth *of*_{PART}.² As a starting point, let me begin here with two platitudes. First, there exists a variety of partitive constructions, which we can appreciate by emphasizing certain characteristic properties of the different nominals that *of*_{PART} can possibly relate, as exemplified in (1).

¹This paper summarizes some of the ideas and material originally presented in Chapter 4 of my doctoral dissertation, Marty (2017), *Implicatures in the DP domain*. I am indebted to Irene Heim, Danny Fox and David Pesetsky for sharing with me their invaluable insights on this topic. For useful discussion and feedback, I am also thankful to my colleagues of the Semantics and Pragmatics group (FB IV) at ZAS, Alan Bale, Brian Buccola, Nick Longenbaugh, Sophie Moracchini, Marcin Wągiel, the reviewers and audiences at SuB 23 and to the proceedings editors. This work was supported by Bundesministerium für Bildung und Forschung (Grant Nr. 01UG1411).

²Throughout this paper, I will follow the previous literature and assume that the part-whole relation comes from the semantics of the preposition *of*. The notation *of*_{PART} is intended to facilitate the distinction between partitive *of* and its possessive homonym, e.g. *a brother of John*, which I will note *of*_{POSS}.

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|-----|----|----------------------------|----------------|
| (1) | a. | two of my books | cardinal-count |
| | b. | a quarter of my books | fraction-count |
| | c. | a quarter of my spare time | fraction-mass |
| | d. | two hours of my spare time | measure-mass |

Second, despite their diversity, all partitive constructions have something in common: their interpretation exhibits a ‘part-of’ requirement, hence their name. In short, partitive constructions are sensical only if it is possible to build up the denotation of the higher nominal as a ‘part’ of the denotation of the lower one, as evidenced by the following contrasts:

- (2) a. #I met four of John’s three lawyers.
 b. I met two of John’s three lawyers.
- (3) a. #I spent four hours of my three-hour of spare time sleeping.
 b. I spent two hours of my three-hour of spare time sleeping.

The research question I will seek to address is the following: what kind of part-whole relation is exactly expressed by partitive constructions? To address this question, I will compare and test two distinct hypotheses about the meaning of of_{PART} that are commonly found in the literature: does of_{PART} encode the ‘part-of’ relation, (4a), or the stronger ‘proper-part’ relation, (4b)?

(4) **Two working hypotheses**

- a. PARTITIVITY: of_{PART} expresses the ‘part-of’ relation
 $[[of_{PART_{\leq}}]](y)(x) = 1$ if and only if $x \leq y$
 Example: $a \oplus b \oplus c$ counts 7 parts, namely $a, b, c, a \oplus b, a \oplus c, b \oplus c$ and $a \oplus b \oplus c$.
- b. PROPER PARTITIVITY: of_{PART} expresses the ‘proper-part’ relation
 $[[of_{PART_{<}}]](y)(x) = 1$ if and only if $x < y$
 Example: $a \oplus b \oplus c$ counts 6 proper parts, namely $a, b, c, a \oplus b, a \oplus c$ and $b \oplus c$.

Everything else being equal, the PARTITIVITY hypothesis (a.o., Ladusaw, 1982), (4a), offers the most conservative way to capture the ‘part-of’ requirement on partitives, e.g., it accounts for the impossibility that an individual made up of n parts be part of another individual made up of less than n parts. However, since its inception in Barker (1998), the PROPER PARTITIVITY hypothesis, (4b), has been largely followed, and with some good reasons. In essence, partitives appear to be subject not just to a ‘part-of’, but to a ‘proper-part’ requirement: they give rise to proper partitivity inferences which contribute to their felicity conditions, as exemplified in (5). These data are left unexplained if one assumes that of_{PART} expresses partitivity *tout court*, (4a): unlike the proper-part relation, the part-of relation is reflexive (i.e., everything is part of itself) and so cases of identity qualify by definition as cases of partitivity. On the other hand, these data are accounted for if one assumes that of_{PART} expresses proper partitivity, (4b).

(5) *Proper Partitivity Effects*

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|----|---------------------------------------|--|
| a. | Sue talked to two of John’s lawyers. | \rightsquigarrow John’s lawyers are more than two |
| b. | #Sue talked to two of John’s parents. | \rightsquigarrow #John’s parents are more than two |

While the PROPER PARTITIVITY hypothesis offers itself as an obvious direction, we shall see in the following that this direction is also misleading: this hypothesis makes incorrect predictions regarding both the distribution and the semantic strength of the proper-part inferences associated with the use of partitives. As a way out of this dilemma, I will propose that, contra appear-

ances, the PARTITIVITY hypothesis is in fact empirically adequate, that is of_{PART} expresses partitivity *tout court*, and that the source of proper partitivity is to be found somewhere else. Specifically, I will argue that proper partitivity comes about as a by-product of the competition between indefinite partitives, *three of the lawyers*, and their presuppositionally stronger, non-partitive definite alternatives, *the three lawyers*: because partitives are semantically weak, they prompt scalar reasoning, the outcome of which results in the proper-part inferences observed in (5). These inferences will be shown to be derivable from general mechanisms of meaning strengthening and ultimately to reduce to genuine anti-maximality implicatures similar to those previously observed in the literature.

The rest of this paper is organized as follows. In Section 2, I present in more detail the PROPER PARTITIVITY view on partitives and summarize its immediate empirical advantages. In Section 3, I present various empirical arguments against this view, establishing by means of different tests that proper partitivity inferences have the linguistic signature of implicated presuppositions. In Section 4, I develop my alternative account on which proper partitivity falls out from the PARTITIVITY hypothesis together with general mechanisms of meaning strengthening, and explain how this account solves the empirical challenges raised in Section 3. Finally, I conclude in Section 5 by reflecting on the scope of this paper for the study of partitives and, more generally, for the study of presuppositionally enriched meanings.

2. The Proper Partitivity Hypothesis

The PROPER PARTITIVITY view on partitives hypothesizes that partitive nominal phrases have in their extension only proper subparts of the entity denoted by the DP within their *of*-phrase. One striking appeal of this view is that it offers to kill two birds with one stone: in addition to account for the proper partitivity effects we are primarily interested in, this view is also argued to account for the long-standing observation that cardinal partitives may not appear with a definite determiner unless modified (a.o., Jackendoff, 1968), as exemplified in (6).

(6) *Anti-Definiteness Effects*

- a. *John met the one/two/three of Mary's lawyer.
cf. John met Mary's lawyer.
- b. *John met the one/two/three of Mary's lawyers.
cf. John met one/two/three of Mary's lawyers.

To understand how these results are obtained, let us go over the specifics of Barker's (1998) proposal.³ On the syntactic side, Barker assumes that the structure of a partitive like *three of the lawyers* is as shown in (7). On this representation, partitives of the surface form *Det of Det NP* contain a phonetically silent nominal, and the *of*-phrase is analyzed as an NP modifier.⁴

³Barker (1998) and Zamparelli (1998) offer two contemporary and very similar implementations of the PROPER PARTITIVITY view. For time reason, however, I will restrict the following discussion to Barker's (1998) proposal.

⁴The hypothesis of a silent NP in partitives originates in the pioneer works of Jackendoff (1977), Ladusaw (1982) and Hoeksema (1984), and has received since then substantial empirical support (see Sauerland and Yatsushiro, 2004, 2017). In particular, it accounts for the possibility to extract the *of*-phrase out of the partitive DP, e.g., *Of the seventeen passengers, three/many/only a few survived*. On Barker's view, this silent noun, \emptyset_N , is interpreted anaphorically as referring to the set expressed by the embedded NP in the *of*-phrase. Technically, this is achieved by treating \emptyset_N as a semantically transparent nominal with the following denotation: $[[\emptyset_N]] := \lambda x \in D_e. (x = x)$. A more common way to implement this idea consists in analyzing the silent NP as a full NP that has undergone deletion at PF, as originally proposed in Jackendoff (1977). See also footnote 11 below for discussion.

With this in mind, we can turn to how this proposal intends to explain the proper partitivity and the anti-definiteness effects. Consider first the sentence in (12), which gives rise to the proper-part inference that the relevant set of lawyers counts more than three individuals:

(12) *Proper Partitivity Effects à la Barker (1998)*

Three of the lawyers showed up.

- a. SS: $[[\text{three } [\emptyset_N [\text{of}_{\text{PART} <} [\text{the lawyers-PL}]]]] [\text{showed up}]]$
- b. Assertion: $\exists x(\#x = 3 \wedge x < [[\text{the lawyers-PL}]] \wedge [[\text{showed up}]](x))$
i.e., there is an individual x made up of 3 atomic individuals such that x is a proper part of the maximal lawyer-individual and x showed up.

The proper-part inference we are interested in is logically entailed by (12): the truth of (12) entails that there is a plural individual made up of three atomic parts that is a proper part of the maximal lawyer-individual, and therefore that the maximal lawyer-individual denoted by the plural definite counts more than three atomic parts. Hence, this analysis accounts for the proper-part inference associated with (12) and, subsequently, for the oddness of sentences like *#Two of John's parents showed up* in run-of-the-mill contexts: if it is common knowledge that everyone has at most two (biological) parents, then the proper-part entailment of this sentence (i.e., that John's parents are at least three) leads to a contextual contradiction, hence the oddness.

Turning next to the anti-definiteness effects, consider now the sentence in (13), which is the definite variant of the previous example; for exposition purpose, (13) follows Barker's (1998) assumptions in treating 'the three' as a complex definite determiner with its own lexical entry.

(13) *Anti-Definiteness Effects à la Barker (1998)*

*The three of the lawyers showed up.

- a. SS: $[[\text{the three } [\emptyset_N [\text{of}_{\text{PART} <} [\text{the lawyers-PL}]]]] [\text{showed up}]]$
- b. Presupposition: $\exists!x(\#x = 3 \wedge x < [[\text{the lawyers-PL}]])$
i.e., there is a unique individual x made up of 3 atomic individuals such that x is a proper part of the maximal lawyer-individual.

Barker proposes that the incompatibility of these partitive NPs with the definite determiner results from the false triviality that arises from the composition of their respective meanings: since any countable entity has by definition either no proper part made up of n atomic elements or else more than one, the presuppositions (of both existence and maximality) carried by these definite descriptions can never be satisfied all together, hence their deviance. On this proposal, proper partitivity and anti-definiteness effects should be thus thought of as having one and the same source, namely the irreflexive proper-part relation expressed by of_{PART} .

To summarize, the PROPER PARTITIVITY view hypothesizes that partitive *of* encodes the proper-part relation and, in so doing, provides an account of two sets of otherwise puzzling facts concerning partitives: (i) the referent of the whole partitive DP is readily interpreted as a proper part of the referent of the embedded one, and (ii) cardinal partitives are deviant with the definite determiner. In the following section, I present yet several issues for this view which will lead me to reject its two key claims, first the claim that proper partitivity and anti-definiteness effects are to be accounted for in a uniform way, and then the very idea that proper partitivity is lexically encoded in the semantics of partitives.

3. Empirical Challenges

3.1. Distribution of the anti-definiteness and proper partitivity effects

On Barker's (1998) proposal, anti-definiteness and proper partitivity effects are hypothesized to follow from the same source, namely from the proper-part implication of of_{PART} , and consequently these effects are expected to have the same distribution. In particular, it is predicted that, for any properly partitive phrase α , the definite variant of α should be deviant. However, this prediction is not empirically borne out. In the count domain, we observe for instance that pronominal partitives like *three of them*, involving a pronominal form in place of the embedded description, pattern like genuine cardinal partitives as far as the proper partitivity effects are concerned, (14a), and yet are exempt from anti-definiteness effects, (14b).⁵

(14) *Pronominal Partitives*

- a. Three of them were sick.
 \rightsquigarrow 'them' counts more than three atomic individuals
 (cf. Sue, Peter and Mary didn't show up today: #three of them were sick)
- b. The three of them were sick.
 \Rightarrow 'them' counts exactly three atomic individuals

Similarly, in the mass domain, we observe that measure partitives like *two hours of John's spare time*, involving a measure phrase and a definite noun phrase indicating what is measured, give rise to proper partitivity effects, (15a), and yet their definite variants are grammatical, (15b).⁶

(15) *Measure Partitives*

- a. John spent two hours of his spare time sleeping.
 \rightsquigarrow John had more than two hours of spare time
 (cf. John only had two hours of spare time yesterday: #he spent two hours of his spare time sleeping)
- b. John spent the two hours of his spare time sleeping.
 \Rightarrow John had exactly two hours of spare time

Finally, we note that genuine cardinal partitives like *three of John's lawyers*, although incompatible with the definite determiner, are nonetheless compatible with other maximality-inducing expressions such as *all*, (16).⁷ On the plausible assumption that the instance of of_{PART} in these constructions is the same as in their *all*-less versions, the PROPER PARTITIVITY view also incorrectly predicts that these constructions should be deviant or, at any rate, that speakers should continue to get a proper part inference, contrary to facts.

- (16) All three of John's lawyers were sick.
 \Rightarrow John has exactly three lawyers

The take-home message of these observations is thus twofold. First, the naturalness and the interpretation of the partitive constructions in (14b), (15b) and (16) are incompatible with a

⁵The paradigms in (14) and (15) are modeled after examples (39b) and (40b) in Ionin et al. (2006), to whom I owe the observation that the PROPER PARTITIVITY view incorrectly rules out the definite partitives in (14b) and (15b).

⁶Following the previous literature, I assume here that measure partitives like those in (15) involve a meaningful instance of partitive *of*, and are thus to be distinguished from pseudo-partitives (e.g., *two hours of spare time*); see Selkirk (1977), Ladusaw (1982), Krifka (1989), Schwarzschild (2002), among others, for discussion.

⁷I thank Alan Bale and Brian Buccola for discussing the data in (16) with me.

proper-part analysis of *of*_{PART}. Second, in addition to be distinct in nature, anti-definiteness and proper partitivity effects also have different distributions. Overall, the present data suggest that both kinds of phenomena have in fact distinct sources and that, in all likelihood, the anti-definiteness effects should receive an independent, grammatical explanation, as proposed for instance in Marty (2017).⁸ It is thus without loss of generality that the remainder of this paper will focus on describing and capturing the linguistic signature of the proper-part inferences.

3.2. Linguistic signature of the proper-part inferences

3.2.1. Projective behavior and not-at-issue content

Proper-part inferences present certain characteristics that are reminiscent of presuppositions: (i) their distribution parallels that of ‘presupposition projection’ effects and (ii) their contribution is not at-issue. To establish the first point, consider the examples in (17) and (18), where the description *John’s four lawyers* and the partitive *three of John’s lawyers* first appear in a declarative sentence and then embedded in a yes/no question, one of the embedding environments from which presuppositions are expected to project.

- (17) a. Sue talked to John’s four lawyers. \Rightarrow *John has (exactly) four lawyers*
 b. Did Sue talk to John’s four lawyers? \Rightarrow *John has (exactly) four lawyers*
- (18) a. Sue talked to three of John’s lawyers. \rightsquigarrow *John has more than three lawyers*
 b. Did Sue talk to three of John’s lawyers? \rightsquigarrow *John has more than three lawyers*

We observe here that, just like the presupposition in (17), the proper-part inference in (18) can readily survive embedding under question: in a way similar to (17b), the question in (18b) is reliably taken to convey that John has more than three lawyers and to signal that this information is not questioned, but rather taken as granted by the speaker. Similar observations hold for the examples in (19) and (20), where the relevant expressions are now embedded in the antecedent of a conditional, a position from which presuppositions can project unharmed.

- (19) If Sue talked to John’s four lawyers, then the trial can begin.
 \Rightarrow *John has (exactly) four lawyers*
- (20) If Sue talked to three of John’s lawyers, then the trial can begin.
 \rightsquigarrow *John has more than three lawyers*

The second point is evidenced by the following two observations. First, as for genuine presuppositions, speakers may use a *Hey, wait a minute!* response to call into dispute the contribution of a proper-part inference; by contrast, expressions of negation or disagreement, which are generally linked to acceptance of not-at-issue contents, cannot be felicitously used to achieve this same purpose (see von Stechow (2004) and George (2008) for discussion of this test).⁹

⁸Building upon Ionin et al.’s (2006) observations, Marty (2017) proposes that the anti-definiteness effects follow from a general economy constraint on structural complexity. In substance, definite cardinal partitives like **the three of the lawyers* are ungrammatical because the meaning they express on their non-strict ‘part-of’ semantics is logically equivalent to that expressed by their structurally simpler non-partitive definite alternatives, i.e., *the three lawyers*. This account is shown to predict the grammaticality of definite pronominal and measure partitives.

⁹Some speakers may find the *Hey, wait a minute!* reply in (17a) slightly more natural than the one in (18a). As we shall later see, such variations are expected if the proper-part inference in (18a), unlike the plain existential presupposition in (17a), arises as an implicature which, upon contextual demands, can be weakened or suspended.

- (17a) Sue talked to John's four lawyers.
 a. Hey, wait a minute! I didn't know John had more than three lawyers.
 b. #No, I disagree! John only has three lawyers.
- (18a) Sue talked to three of John's lawyers.
 a. Hey, wait a minute! I didn't know John had more than three lawyers.
 b. #No, I disagree! John only has three lawyers.

Second, the contribution of proper-part inferences cannot easily be targeted by a negation in discourse, (21a). In that respect, these inferences behave much like presuppositions, (21b), and unlike mere conjuncts, (21c) (see Potts (2005) and Schlenker (2010) for discussion of this test).

- (21) *The contribution of proper-part inferences is not at issue*
- a. A: Sue talked to three of John's lawyers. B: No!
 \rightsquigarrow John has more than three lawyers
- b. A: Sue talked to John's four lawyers. B: No!
 \rightsquigarrow John has (exactly) four lawyers
- c. A: John has more than three lawyers and Sue talked to them. B: No!
 $\not\rightsquigarrow$ John has more than three lawyers

These observations raise an issue for Barker's (1998) proposal: in case where partitives are embedded in a downward-entailing environment as in (18b) and (20), proper-part inferences are predicted to remain embedded, hence delivering readings that are intuitively too weak. The additional case in (22) offers a simple illustration of this issue:

- (22) *Partitives embedded under negation*
 It is not the case that Sue talked to three of John's lawyers.
- a. Predicted: $\neg(\text{John's lawyers are more than three} \wedge \text{Sue talked to three of them})$
 b. Observed: $(\text{John's lawyers are more than three}) \wedge \neg(\text{Sue talked to three of them})$

In (22), the partitive *three of John's lawyers* is embedded under negation, a downward-entailing environment from which presuppositions can project. Barker's (1998) proposal predicts this sentence to have the reading in (22a), and thus to be felicitous and true in a situation where John is known to have exactly three lawyers and where Sue talked to the three of them. Yet speakers consistently judge (22) as infelicitous in such situations, and report instead a reading along the lines of (22b), where the target proper-part inference is outside the scope of negation.

These observations teach us that proper-part inferences are not part of the asserted content of partitives; rather, these inferences pattern much like presuppositions regarding both their distribution and their conversational status. While the subgeneration issues we pointed out could be addressed by turning Barker's (1998) proper-part requirement into a plain presupposition, it is worth emphasizing that this move would still face the problems discussed in 3.1. The next section discusses further examples where such a move would also lead to overgeneration issues in predicting felicity conditions that are stronger than empirically attested.

3.2.2. Sensitivity to speakers' epistemic state and semantic strength

Proper-part inferences also have certain features which are characteristic of conversational implicatures: (i) their generation is sensitive to the speakers' epistemic state, and (ii) their seman-

tic strength depends upon that of the presupposition of competing sentences. To begin with, we observe that a partitive α can be felicitously used in contexts where the speaker is known to be ignorant as to whether α is properly partitive, showing that these inferences can be suspended. The following contrast establishes this point:

- (23) a. OPINIONATED SPEAKER
I know exactly how many lawyers John hired, and I know for sure that [three of his lawyers/three of them] graduated from Harvard.
 \rightsquigarrow *John's lawyers are more than three*
- b. IGNORANT SPEAKER
I can't remember whether John hired four or only three lawyers, but I know for sure that [three of his lawyers/three of them] graduated from Harvard.
 $\not\rightsquigarrow$ *John's lawyers are more than three*

In (23a), we are told that the speaker is opinionated about the number of lawyers John hired, and we spontaneously conclude from his utterance that the speaker is taking for granted that John hired more than three lawyers. In (23b), by contrast, we are told that the speaker is ignorant regarding the exact number of lawyers John hired, and we conclude instead that the speaker is agnostic as to whether John hired exactly three or more than three lawyers. Yet we observe that the discourse in (23b) is fully felicitous. This observation is incompatible with the idea that *of*_{PART} would semantically express, presuppositionally or assertively, the proper-part relation.

Second, we observe that, for a given sentence S , the semantic strength of the proper-part inference associated with S depends upon the presuppositional strength of minimally different sentences competing with S . Consider the following example:

- (24) *Bound partitives in the scope of universals*
Every prisoner _{x} talked to three of his _{x} lawyers.
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|----|--|-----------------------|
| a. | \Rightarrow <i>every prisoner has (at least) three lawyers</i> | plain presupposition |
| b. | \rightsquigarrow <i>every prisoner has more than three lawyers</i> | possible, predicted |
| c. | \rightsquigarrow <i>not (every prisoner has exactly three lawyers)</i> | possible, unpredicted |

In (24), the partitive *three of his _{x} lawyers* is embedded in the scope of a universal quantifier: the pronoun *his _{x}* is bound by the subject *every prisoner* and, as it seems, the VP carries the presupposition that x has (at least) three lawyers which projects universally across the subject. Crucially, if partitive *of* were expressing the proper-part relation, the sentence in (24) should entail (24b) and thus this sentence should be perceived as odd when uttered in a context where (24b) is known to be false. Yet the felicity of the example in (25) proves this prediction wrong.¹⁰

- (25) *Context: Some prisoners have more than three lawyers, others only three*
Every prisoner _{x} talked to three of his _{x} lawyers. Even John _{y} talked to his _{y} three lawyers.
(cf. #Every prisoner _{x} talked to his _{x} three lawyers)

Instead, as previously noted in Sauerland and Yatsushiro (2004: footnote 6), it appears that the sentence in (24) licenses a weaker proper-part inference of the form in (24c), i.e., that not every prisoner has exactly three lawyers, which intuitively corresponds to the negation of the (stronger) presupposition carried by the minimally different sentence *Every prisoner _{x} talked*

¹⁰I refer the reader to Marty (2017) for discussion of related facts regarding the interpretation of bound partitives in the restrictor of universals, where the proper-part analysis of *of*_{PART} is also found to make incorrect predictions.

to *his_x three lawyers*. And indeed, as illustrated in (26), we find that sentences like (24) are perceived as odd precisely in those contexts where (24c) is known to be false and where, in comparison to (25), speakers could felicitously utter the relevant competing sentence.

- (26) *Context: Every prisoner has three and only three lawyers*
 #Every prisoner_x talked to three of his_x lawyers.
 (cf. Every prisoner_x talked to his_x three lawyers)

These observations allow us to extend our initial paradigm to the one in (27) by emphasizing some of our core observations. First, the felicitous use of partitives is subject to a weaker requirement than previously thought: although an utterance of *Sue talked to three of John's lawyers* may convey that John has more than three lawyers, it only requires to be felicitous that it be not taken for granted that John has exactly three lawyers. Next, the semantic force and distribution of the proper partitivity effects are predictable from the strength and satisfaction of the presuppositions carried by their definite alternatives, e.g., partitives are infelicitous whenever the (stronger) presuppositions expressed by these competing expressions are known to hold.

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|------|---|----------------------------|
| (27) | <i>Conditions on the felicitous use of partitives</i> | <i>Common Ground:</i> |
| a. | John hired only three lawyers and ... | $ John's\ lawyers = 3$ |
| (i) | #Sue talked to [three of John's lawyers/three of them] | |
| (ii) | Sue talked to [John's three lawyers/the three of them] | |
| b. | John hired four lawyers and ... | $ John's\ lawyers > 3$ |
| (i) | Sue talked to [three of John's lawyers/three of them] | |
| (ii) | #Sue talked to [John's three lawyers/the three of them] | |
| c. | I don't know if John has three or four lawyers, but ... | $ John's\ lawyers \geq 3$ |
| (i) | Sue talked to [three of John's lawyers/three of them] | |
| (ii) | #Sue talked to [John's three lawyers/the three of them] | |

The bulk of our data demonstrates that the source of proper partitivity cannot lie in the plain logical meaning of partitives, and reveals instead that the proper-part inferences associated with these constructions have the linguistic signature of the so-called 'implicated presuppositions' (Sauerland, 2008). In the next section, I move back to the only analytical option that remains, the PARTITIVITY view, and propose that the proper partitivity effects arise as a result of an anti-maximality implicature on the basis of the general competition between indefinites and their presuppositionally stronger definite alternatives.

4. Deriving Proper Partitivity from Partitivity and Scalar Reasoning

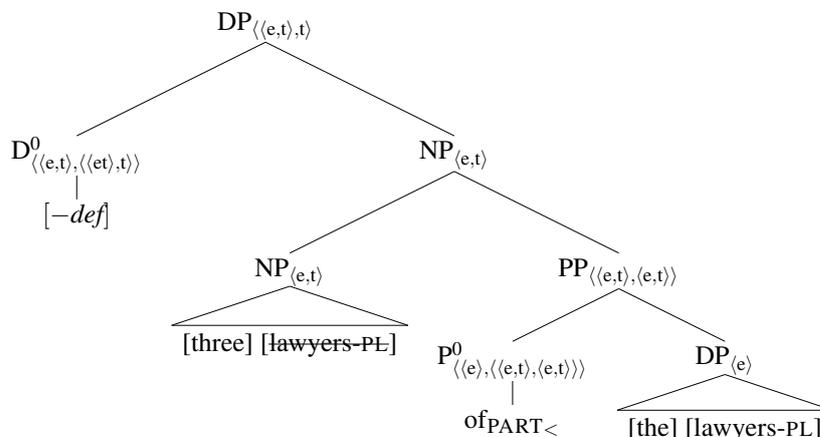
4.1. Plain ingredients of partitives

Following the PARTITIVITY hypothesis, I propose that *of*_{PART} semantically encodes the part-of relation and that this relation is expressed both at the presuppositional and assertion level:

$$(28) \quad [[of_{PART \leq}]] := \lambda x \in D_e. \lambda P \in D_{(e,t)}. \lambda y \in D_e : (P(y) \wedge y \leq x). (P(y) \wedge y \leq x)$$

As far as the composition of partitives goes, my assumptions are very much in line with Barker (1998) and the previous literature (a.o., Jackendoff, 1977; Hoeksema, 1984; Schwarzschild, 2002; Sauerland and Yatsushiro, 2004; Ionin et al., 2006; Sauerland and Yatsushiro, 2017):

(29)



The only noticeable aspect on which I differ from Barker (1998) concerns the treatment of cardinal numerals. In line with Ionin and Matushansky (2005) and Ionin et al. (2006), I will assume that simplex cardinal numerals are lexical heads with an ‘adjectival’ meaning which requires the predicate they combine with to be a set of individuals divisible into a certain number of atomic parts, e.g., $[[\text{three}]] := \lambda x \in D_e. \#x = 3$. In cardinal partitives, these expressions combine with the silent NP that contains the *of*-PP, which I will take here to be a full NP which undergoes deletion at PF.¹¹ Since cardinal numerals do not have by themselves any quantificational force, I further assume that existential quantification comes about by means of a silent indefinite determiner, noted $[-def]$, whose meaning is akin to that of the indefinite determiner *some* in English: $[[[-def]]] := \lambda P \in D_{\langle e,t \rangle}. \lambda Q \in D_{\langle e,t \rangle}. \exists x (P(x) \wedge Q(x))$. On these assumptions, the truth-conditions of a sentence like *three of the lawyers showed up* are as follows:

- (30) Three of the lawyers showed up.
- a. Presupposition: $\exists x (\#x = 3 \wedge [[\text{lawyers-PL}]](x) \wedge x \leq [[\text{the lawyers-PL}]])$
i.e., there is a maximal lawyer-individual and there is an individual x such that x is made up of three lawyer-atoms and x is part of the maximal lawyer-individual
 - b. Assertion: $\exists x (\#x = 3 \wedge [[\text{lawyers-PL}]](x) \wedge x \leq [[\text{the lawyers-PL}]] \wedge [[\text{showed up}]](x))$
i.e., there is an individual x such that x is made up of three lawyer-atoms, x is part of the maximal lawyer-individual, and x showed up

In short, (30) presupposes that there is a lawyer-individual who is made up of three atomic lawyer-individuals and who is part of the maximal lawyer-individual. This presupposition obtains by existentially projecting across $[-def]$ the presupposition which is carried by $of_{\text{PART} \leq}$ and subsequently inherited by the partitive NP that $[-def]$ composes with. When this presupposition is met, (30) is true if and only if the plural lawyer-individual in question showed up. Consistent with the PARTITIVITY hypothesis, the plain meaning of (30) does not exclude cases of identity where maximality holds. That is, *on its plain meaning*, (30) is predicted to be felicitous and true in a situation where the relevant set of lawyers counts exactly three individuals.

¹¹ This line of analysis is supported for instance by the observation that the determiners that cannot occur in the higher position of partitives when the NP is silent (e.g., **John didn't talk to the/every/no lawyers of the lawyers*) are precisely those that do not license NP-deletion in English (e.g., **John didn't talk to the/every/no lawyers*). This line of analysis is also successful in accounting for cases where one underlying structure allows different surface realizations, including realizations where the usually silent NP is made overt (e.g., *three lawyers of the lawyers that John hired*). See also footnote 4 for references and discussion.

4.2. Competition between indefinite partitives and their definite alternatives

If partitivity is simply partitivity, then why and how are cases of identity ruled out by speakers? I propose that these interpretative effects arise because of the competition between indefinite partitives and their definite alternatives at the presuppositional level, (31): by scalar reasoning, speakers interpret the weak existential presupposition of partitives (e.g., that the lawyers are at least three) as conveying the falsity of the stronger maximality presupposition of their definite alternatives (e.g., the lawyers aren't exactly three), which results in a proper-part inference (i.e., the lawyers are more than three). On this proposal, this competition can be seen as a particular instance of the general competition between indefinite and definite DPs, whose underlying logic has commonly been analyzed along the lines of a principle like *Maximize Presupposition!* (a.o., Heim, 1991; Sauerland et al., 2005; Percus, 2006; Sauerland, 2008; Chemla, 2008; Singh, 2009, 2011; Schlenker, 2012; Lauer, 2016; Leahy, 2016; Rouillard and Schwarz, 2017).

- (31) *Indefinite partitives and their definite competitors*
- | | | |
|----|---------------------------------|----------------------|
| a. | Three of the lawyers showed up. | indefinite partitive |
| b. | The three lawyers showed up | definite alternative |

To establish this point properly, let us show that, on most (if not all) formulations of *Maximize Presupposition!*, (31b) meet the criteria to qualify as a presuppositional competitor to (31a). First, adopting the notion of *structurally-defined alternatives* proposed in Katzir 2007 (see also Katzir, 2008; Fox and Katzir, 2011), we verify below that (31b) is a formal alternative to (31a): (31b) is derivable from (31a) by substituting the whole partitive NP with its higher NP, (a), and subsequently by substituting the indefinite determiner with its definite counterpart, (b).¹²

- (31a) Three of the lawyers showed up.
- SS: [DP [-def] [NP₁ [NP₂ three lawyers-PL] [of_{PART} [the lawyers-PL]]]] showed up
- | | | |
|----|--|---------|
| a. | Substitution of NP ₁ with its sub-constituent NP ₂ : | |
| | [DP [-def] [NP ₂ three lawyers-PL]] showed up | |
| b. | Substitution of the determiner [-def] with <i>the</i> : | |
| | [DP [the] [NP ₂ three lawyers-PL]] showed up | = (31b) |

Second, it is easy to verify that (31b) is presuppositionally stronger than (31a): if the maximal lawyer-individual counts three atomic parts, then there is an individual made up of three atomic parts that is part of the maximal lawyer-individual (i.e., (32b) entails (32a)), while the reverse is not true (i.e., (32a) doesn't entail (32b)). Finally, note that (31a) and (31b) are Strawson-equivalent: whenever (31a) and (31b) are defined at a world w , i.e., (31a) and (31b) do not yield presupposition failure relative to w , then both sentences have the same truth-value at w .

- (32) a. Plain presupposition of (31a):
 $\lambda w. \exists x(\#x = 3 \wedge [[\text{lawyers-PL}]](x)(w) \wedge x \leq [[\text{the lawyers-PL}]](w))$
- b. Plain presupposition of (31b) (simplified):
 $\lambda w. \exists!x(\#x = 3 \wedge [[\text{lawyers-PL}]](x)(w))$
- c. Strawson-equivalence:
 $\forall w \in W, \text{ if } [[(31a)]] \text{ and } [[(31b)]] \text{ are defined at } w, \text{ then } [[(31a)]](w) = [[(31b)]](w)$

¹²In short, the set of structural alternatives to a sentence ϕ , noted $\text{ALT}_{str}(\phi)$, is the set of syntactic structures that are derivable from ϕ by a finite series of substitutions in ϕ , and that are therefore *structurally at most as complex as* ϕ : $\text{ALT}_{str}(\phi) := \{\psi : \psi \lesssim \phi\}$. See Katzir (2007: (18)-(20)) for formal definitions and discussion.

To the best of my knowledge, the competition at work in (31) extends to all other cases of indefinite partitives discussed in this paper, including pronominal and measures partitives, whose definite alternatives are easier to identify in the absence of anti-definiteness effects, (14)-(15). Furthermore, it is worth noting that, on the non-strict ‘part-of’ semantics we adopted, the grammaticality and the maximal-interpretation of the (b)-sentences are now fully expected.¹³

(14) *Pronominal Partitives*

- a. [[-def] three of them] were sick.
⇒ *them* counts at least three atomic parts
- b. [[the] three of them] were sick.
⇒ *them* counts three and only three atomic parts

(15) *Measure Partitives*

- a. John spent [[-def] two hours of his spare time sleeping]
⇒ John had at least two hours of spare time
- b. John spent [[the] two hours of his spare time sleeping]
⇒ John had two and only two hours of spare time

On current approaches to presuppositional implicatures, the output of these competitions is predicted to be twofold: (1) the use of an indefinite partitive can convey that the maximality presupposition of its definite alternative is taken to be false, and (2) the use of an indefinite partitive is felicitous only if it is not common ground that the maximality presupposition of its definite alternative holds. Our core observations can be shown to follow from these predictions.

4.3. Presuppositional scalar strengthening: a possible implementation

To explain the derivation of anti-maximality inferences in further detail, let us assume for the sake of explicitness that presuppositional scalar strengthening can be captured in terms of an exhaustivity operator, notated EXH^{prs} , which is attached to the matrix level of every sentence. Capitalizing on various insights from the previous literature on presuppositional implicatures, this operator can be defined for our purposes as in (33). Notation-wise, ‘ S_p ’ stands for any sentence S carrying presupposition p , ‘ $\text{IE}^{\text{prs}}(S_p)$ ’ stands for the set of innocently excludable presuppositional alternatives to sentence S_p , and \mathcal{H} stands for the predicate *harmless*.

(33) *Presuppositional Scalar Strengthening (in a nutshell)*

- a. $\text{E}^{\text{prs}}(S_p) = \{S_q: S_q \text{ is a structural alternative to } S_p \ \& \ S_q \text{ is presuppositionally stronger than } S_p \ \& \ S_q \text{ is Strawson-equivalent to } S_p\}$
- b. $\text{IE}^{\text{prs}}(S_p, \Sigma) = \bigcap \left\{ \Sigma' \mid \begin{array}{l} \Sigma' \subseteq \Sigma \text{ and } \Sigma' \text{ is a maximal subset of } \Sigma \\ \text{such that } \{\neg q: S_q \in \Sigma\} \cup \{S_p\} \text{ is consistent} \end{array} \right\}$
- c. Harmless presupposition: presupposing q is *harmless*, that is $q \in \mathcal{H}$, as long as q is non-controversial and non-critical to the purpose of the conversation; presupposing q is *trivially harmless* at a context c if c entails q .
- d. $[[\text{EXH}^{\text{prs}} S_p]](w) = p(w) \wedge \forall S_q (q \in \mathcal{H} \wedge S_q \in \text{IE}^{\text{prs}}(S_p, \text{E}^{\text{prs}}(S_p))) [\neg q(w)]. S(w)$

¹³I refer the reader to Marty (2017) for a complete description of the cases in (14)-(15) as well as for discussion of additional ones such as double genitives (a.k.a. partitive possessives), e.g., *Three (lawyers) of John's (lawyers) showed up*, which are argued to have the same definite structural alternatives as genuine cardinal partitives, i.e., *John's three lawyers*, derivable from very similar substitution operations as those described here.

In substance, $[\text{EXH}^{\text{PRS}} S_p]$ is defined only if (a) p is true and (b) for every innocently excludable presuppositional competitor S_q to S_p such that presupposing q is *harmless*, q is false. To explain how this mechanism of presuppositional strengthening works, let us consider the case of singular indefinites. So suppose that the sentence S_p in (34), which EXH^{PRS} is attached to, is uttered in a context in which the differential maximality presupposition q of its definite alternative is *harmless*, then $[\text{EXH}^{\text{PRS}} S_p]$ will presuppose that the company has a lawyer (i.e., the presupposition p) but not a unique one (i.e., the presuppositional implicature $\neg q$).

- (34) $[\text{EXH}^{\text{PRS}} [S_p \text{ Sue talked to a lawyer of}_{\text{POSS}} \text{ the company}]]$
- a. $[[[S_p \text{ Sue talked to a lawyer of}_{\text{POSS}} \text{ the company}]]]$
 $= \lambda w : \text{the company has a lawyer in } w. \text{ Sue talked to a lawyer of the company in } w$
 - b. $[[[S_q \text{ Sue talked to the lawyer of}_{\text{POSS}} \text{ the company}]]]$
 $= \lambda w : \text{the company has a unique lawyer in } w. \text{ Sue talked to the lawyer of the company in } w$
 - c. $[[[\text{EXH}^{\text{PRS}} [S_p]]]]$ is defined at a world w only if
 $(\text{the company has a lawyer in } w) \wedge \neg(\text{the company has a unique lawyer in } w)$
 $\Rightarrow (\text{the company has at least two lawyers in } w)$

As illustrated in (35), this mechanism of presuppositional strengthening derives the proper-part inferences associated with indefinite partitives through a similar kind of scalar reasoning:

- (35) $[\text{EXH}^{\text{PRS}} [S_p \text{ Sue talked to three of}_{\text{PART}} \text{ the lawyers}]]$
- a. $[[[S_p \text{ Sue talked to three of}_{\text{PART}} \text{ the lawyers}]]]$
 $= \lambda w : \text{the lawyers are at least three in } w. \text{ Sue talked to three of the lawyers in } w$
 - b. $[[[S_q \text{ Sue talked to the three lawyers}]]]$
 $= \lambda w : \text{the lawyers are exactly three in } w. \text{ Sue talked to the three lawyers in } w$
 - c. $[[[\text{EXH}^{\text{PRS}} [S_p]]]]$ is defined at a world w only if
 $(\text{the lawyers are at least three in } w) \wedge \neg(\text{the lawyers are exactly three in } w)$
 $\Rightarrow (\text{the lawyers are at least four in } w)$

Crucially, this mechanism mimics the effects of *Maximize Presupposition!* in predicting the use of singular indefinites or partitive indefinites to be infelicitous in contexts where the maximality presupposition of its definite alternative is common ground (e.g., #*Sue talked to a mother of John/two of John's parents*). In these contexts, since the relevant differential presupposition q in (34)-(35) is mutually believed by the interlocutors, presupposing q is *trivially harmless* and consequently, the implicatures in (34)-(35) ought to be derived, resulting in representations that directly conflict with common knowledge (i.e., the speaker believes q and $\neg q$). This line of explanation is essentially similar to Magri (2009, 2011, 2014) in explaining oddness in such cases from the obligatory generation of an implicature that clashes with common knowledge.

4.4. Capturing the linguistic signature of proper-part inferences

4.4.1. Projective behavior and not-at-issue content

This analysis straightforwardly captures the projective behavior of proper-part inferences: since presuppositional strengthening is performed on the basis of the plain presuppositions of competing alternatives, these inferences are predicted to be found in any environment where the presuppositions of the relevant competitors are expected to project, regardless of the monotonicity of that environment. To illustrate, consider again the case in (22), and assume that natural negation (notated NOT here) behaves as a hole for presuppositions. On our proposal, S_p and $\neg S_p$ have similar presuppositional alternatives, S_q and $\neg S_q$, which have identical presup-

positions, q . Upon strengthening of their presuppositional contents, both sentences deliver the same proper-part inference and therefore end up with the same felicity conditions.

- (22) [EXH^{Prs} [NOT [S_p Sue talked to three of_{PART} the lawyers]]]
- a. [[NOT [S_p Sue talked to three of_{PART} the lawyers]]]
= λw : *the lawyers are at least three in w . \neg (Sue talked to three of the lawyers in w)*
 - b. [[NOT [S_q Sue talked to the three lawyers]]]
= λw : *the lawyers are exactly three in w . \neg (Sue talked to the three lawyers in w)*
 - c. [[EXH^{Prs} [NOT S_p]]] is defined at a world w only if
(*the lawyers are at least three in w*) \wedge \neg (*the lawyers are exactly three in w*)
 \Rightarrow (*the lawyers are at least four in w*)

On our view, the not-at-issue contribution of these inferences is thus unsurprising since it directly follows from their presuppositional status. It is worth emphasizing however that, since these inferences lie in the generation of an implicature, whose computation can be refrained in some contexts (e.g., when presupposing q *isn't harmless*), the life of these inferences is necessarily more fragile than that of plain presuppositions. As a result, would some uncertainty remain as to whether presupposing q is truly harmless from the speaker's perspective, calling their contribution into dispute would then appear as an unworthy conversational detour.

4.4.2. Sensitivity to the speakers' epistemic state and semantic strength

This analysis captures the context-sensitivity of proper-part inferences through the notion of *harmless presupposition*: a presuppositional implicature $\neg q$ obtains at a context c only if presupposing q at c is *harmless*, e.g., because q is entailed in C or else easy to accommodate. As seen above, this notion accounts for the infelicity of indefinites in contexts where the maximality presupposition q of their alternatives is satisfied and thus *trivially harmless*. We can now observe that this notion also accounts for the felicitous use of indefinites in contexts where the speaker is known to be ignorant regarding the truth of q , as in (23b): because q is now controversial, presupposing q cannot be harmless, and therefore the computation of the implicature associated with q does not go through, hence avoiding any conflict with the common ground.

Finally, for the sake of completeness, we note that a mechanism of presuppositional scalar strengthening in the spirit of the one we have sketched above makes correct predictions concerning the semantic strength of the proper-part inference associated with bound partitives in the scope of universals, (24):

- (24) EXH^{Prs} [S_p every prisoner _{x} talked to three of his _{x} lawyers]
- a. [[[S_p every prisoner _{x} talked to three of his _{x} lawyers]]]^g
= λw : *every p . has at least three lawyers in w . every p . x talked to three of x 's lawyers in w*
 - b. [[[S_q every prisoner _{x} talked to his _{x} three lawyers]]]^g
= λw : *every p . has exactly three lawyers in w . every p . x talked to x 's three lawyers in w*
 - c. [[EXH^{Prs} [S_p]]] is defined at a world w only if
(*every p . has at least three lawyers in w*) \wedge \neg (*every p . has exactly three lawyers in w*)
 \Rightarrow (*at least one prisoner has at least four lawyers in w*)

In this case, the presuppositional alternative S_q to S_p presupposes that *every prisoner has exactly three lawyers*: conjoining p with the negation of q delivers the enriched presupposition that every prisoner has at least three lawyers and that at least one of them has more than three.

5. Discussion

The idea that *of*_{PART} simply expresses the ‘part-of’ relation is far from obvious: it is at odd with our immediate intuitions about the ‘properly partitive’ meaning conveyed by partitives. Yet this working hypothesis was found to be empirically adequate. For the proper-partitivity puzzle to be solved, the definite competitors to partitives must enter the picture. Once the picture enriched, proper-part inferences can be shown to pattern with other anti-presuppositional effects previously observed in the literature, to be derivable from general mechanisms of meaning strengthening and ultimately to reduce to genuine cases of anti-maximality implicatures. As an attempt to capture the linguistic signature of these inferences on formal grounds, I have sketched out a basic mechanism for presuppositional scalar strengthening which borrows insights from both the pragmatic and the grammatical approach to presuppositional implicatures. While this mechanism was shown to be functional for the cases at hand, a more in-depth discussion of its novelties, like the notion of *harmless presupposition*, is left for future works.

Before closing, let me briefly emphasize two instructive challenges that we have encountered in this study before reaching this simple conclusion. The first one was to shake off the misleading, yet tenacious, intuition that partitives express proper partitivity. As we have explained, there is in fact some empirical basis for the longevity of this impression. Unlike regular scalar implicatures, presuppositional implicatures have a presuppositional source and consequently their presence is pervasive: as long as the environment at hand permits presuppositions to project, these inferences can arise. In that respect, the tests for detecting presuppositionally enriched meanings are harder to come by; in particular, these inferences are left unaffected by certain factors that are known to impact on the generation of regular scalar implicatures such as the monotonicity of the environment. However, one such test seems general enough to cover all scalar strengthening phenomena, the IGNORANCE TEST in (36), which relates to previous observations from Heim (1991) and Sauerland (2008) and which we have implicitly used in 3.2.2. As far as I can tell, this test remains the touchstone for the kind of study we have conducted.

(36) Ignorance Test

Let S be any sentence and ϕ be any contingent proposition. If there is a context c in which S can be felicitously uttered by a speaker who is known to be ignorant about the truth of ϕ at c , then ϕ is not entailed by S 's logical meaning.

The second challenge was to explain in a principled way how partitive constructions such as *three of the lawyers* relate to their non-partitive definite competitors, i.e., *the three lawyers*. This was achieved in this paper through the synergy of two independent avenues of research: (a) previous works on the syntactic composition of partitives and specifically the empirical corroboration of the hypothesis that these constructions contain silent material (a.o., Jackendoff, 1977; Sauerland and Yatsushiro, 2004, 2017), and (b) previous works contributing to elucidate the grammatical procedures that speakers rely on for deriving the set of alternatives that can enter scalar implicature reasoning (a.o., Katzir, 2007, 2008; Fox and Katzir, 2011).

In addressing both these challenges, the present study offers on the one hand a more fine-grained analysis of the interpretation and use of partitives, and on the other a new case study on the nature of strengthened meanings which, I hope, will contribute to further improve our understanding of the scalar strengthening mechanisms operative in natural languages.

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