

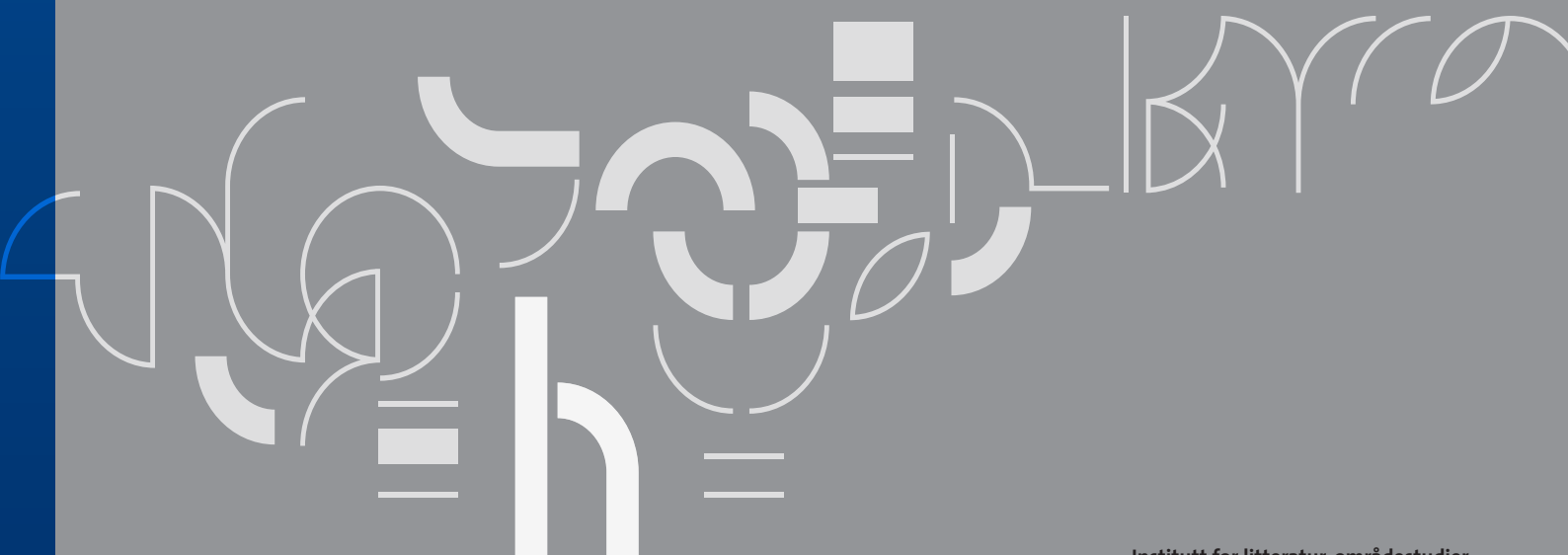


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# The Sortal Theory of Plurals

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## Abstract

This paper explores the hypothesis of a semantics for plurals with no atomic partial order defined on the domain of quantification, and thus no ontological distinction between singular and plural individuals. The idea is that the work usually done in the semantics by the atomic partial order is instead done by the syntax, which makes available to the semantics a phonologically covert sortal which provides the suitable granularity. This sortal theory of plurals is compared to the standard atomic theory with the two case studies of partitives and distributivity.

## 1 The Standard Approach: the Atomic Theory of Plurals

In this Section, I introduce the core assumption of the standard approach to count nouns: that the domain of quantification is endowed with an atomic partial order. I discuss the main properties of this approach and illustrate it with the two case studies of plural partitives and distributivity. Finally, I note that the atomic partial order needs to be supplemented with another non-atomic partial order. This observation will be the starting point for an alternative non-atomic framework, introduced in the next Section.

**Core assumptions.** The standard approach to count nouns rests on the following assumption (1) concerning the structure of the domain of quantification  $\mathcal{D}$ .

- (1) The domain  $\mathcal{D}$  is endowed with a partial order  $\leq_{\text{one/many}}$  such that  $(\mathcal{D}, \leq_{\text{one/many}})$  is isomorphic to<sup>1</sup>  $(\wp^*(\mathcal{A}t), \subseteq)$  for some (unique) subset  $\mathcal{A}t \subseteq \mathcal{D}$ .

The elements of  $\mathcal{A}t$  are called *singular* or *atomic*; those of  $\mathcal{D} \setminus \mathcal{A}t \stackrel{\text{def}}{=} \mathcal{P}l$  are called *plural*; singular individuals do not have proper  $\leq_{\text{one/many}}$ -parts; plural individuals do.<sup>2</sup> Let  $+_{\text{one/many}}$  be the operation on  $\mathcal{D}$  associated with  $\leq_{\text{one/many}}$ , namely such that  $(\mathcal{D}, +_{\text{one/many}})$  is isomorphic to  $(\wp^*(\mathcal{A}t), \cup)$ . The denotations of count nouns are constrained as in (2).

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<sup>1</sup>Let  $\wp^*(\mathcal{X})$  be the collection of all subsets of the set  $\mathcal{X}$ , but the empty set.

<sup>2</sup>Let  $\leq$  be a partial order on a set  $\mathcal{X}$ ; for every  $x_1, x_2 \in \mathcal{X}$ ,  $x_1$  is a *proper part* of  $x_2$  wrt  $\leq$  iff  $x_1 < x_2$ .

- (2) For every singular count noun  $N_{SG}$  and corresponding plural noun  $N_{PL}$ :
- a.  $\llbracket N_{SG} \rrbracket \subseteq \mathcal{A}t$ .
  - b.  $\llbracket N_{PL} \rrbracket \stackrel{\text{def}}{=} PL_{\text{one/many}}(\llbracket N_{SG} \rrbracket)$ .
- where the *plural operator*  $PL_{\text{one/many}}$  returns the closure of  $\llbracket N_{SG} \rrbracket$  under  $+_{\text{one/many}}$ .

Assumption (1) says that  $\leq_{\text{one/many}}$  is an *atomic* partial order. I will thus dub (1)-(2) as the *atomic* theory of plurals (henceforth: ATP). As it stands, assumption (1) says that standard set theory provides a suitable framework for the semantics of plurals. Yet, at the end of this Section, we'll see that assumption (1) needs to be supplemented by positing further structure on the domain of quantification.

**Main properties.** After Sharvy (1980), let's assume the semantics (3) for the definite article:  $\llbracket \text{the} \rrbracket$  takes a property; sums up all its elements wrt  $+_{\text{one/many}}$ ; checks whether this sum belongs to the given property; if it does, returns that sum; otherwise, is undefined.

- (3)  $\llbracket \text{the} \rrbracket \stackrel{\text{def}}{=} \iota_{\text{one/many}}$

This semantics for definites yields (4): the singular term 'the boy', if defined, denotes a singular individual; the plural term 'the boys' denotes a plural individual.<sup>3</sup> Thus, the ATP (1)-(2) maps the morphological distinction between singular and plural number into the ontological distinction between singular and plural individuals.

- (4) First property: morphology/ontology correspondence.
- a.  $\llbracket \text{the boy} \rrbracket \in \mathcal{A}t$ .
  - b.  $\llbracket \text{the boys} \rrbracket \in \mathcal{P}l$ .

Consider next the function  $\llbracket \text{the}^{-1} \rrbracket$  defined in (5), which takes an individual and returns the set of its  $\leq_{\text{one/many}}$ -parts (namely, the *ideal* associated with that individual).

- (5)  $\llbracket \text{the}^{-1} \rrbracket \stackrel{\text{def}}{=} \lambda x_e . \lambda y_e . y \leq_{\text{one/many}} x$ .

The two functions  $\llbracket \text{the} \rrbracket$  and  $\llbracket \text{the}^{-1} \rrbracket$  are related as in (6): the property  $\llbracket \text{boy(s)} \rrbracket$  can be reconstructed from the individual  $\llbracket \text{the boys} \rrbracket$  by means of  $\llbracket \text{the}^{-1} \rrbracket$ . Thus, the ATP (1)-(2) allows the definite article  $\llbracket \text{the} \rrbracket$  to be inverted through  $\llbracket \text{the}^{-1} \rrbracket$ .

- (6) Second property: invertibility of 'the'.
- a.  $\llbracket \text{the}^{-1} \rrbracket(\llbracket \text{the} \rrbracket(\llbracket \text{boys} \rrbracket)) = \llbracket \text{boys} \rrbracket$ .
  - b.  $\llbracket \text{the}^{-1} \rrbracket(\llbracket \text{the} \rrbracket(\llbracket \text{boys} \rrbracket)) \cap \mathcal{A}t = \llbracket \text{boy} \rrbracket$ .

I now illustrate with the two case studies of plural partitives and distributivity the crucial role played by the invertibility of 'the' in (6).

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<sup>3</sup>This statement is not accurate: if a noun denotes a singleton, its corresponding plural definite denotes a singular individual. I assume that this pathological case is ruled out independently, say by a constraint which forbids vacuous application of the plural operator, as in the case of singleton nouns.

**First case study: plural partitives.** Consider a plural partitive construction such as (7-a). We want the denotation of (7-a) to be equivalent to that of non-partitive (7-b).

- (7) a. many of the boys.  
b. many boys.

Following Barker (1998) a.o., assume that (7-a) has the structure (8). If ‘of<sub>part</sub>’ is semantically vacuous, then (8) yields a type mismatch: definites cannot be fed to determiners.

- (8) [ many [ of<sub>part</sub> [ the boys ] ] ].

The embedded definite article needs to be “gotten rid of”, so to speak. A straightforward way to do that is (9): partitive ‘of<sub>part</sub>’ denotes the inverse  $\llbracket \text{the}^{-1} \rrbracket$  of ‘the’.<sup>4</sup>

- (9)  $\llbracket \text{of}_{\text{part}} \rrbracket \stackrel{\text{def}}{=} \llbracket \text{the}^{-1} \rrbracket$ .

By (6-a), assumption (9) guarantees (10), hence the equivalence between (7-a) and (7-b).

- (10)  $\llbracket \text{of}_{\text{part}} \rrbracket (\llbracket \text{the} \rrbracket (\llbracket \text{boys} \rrbracket)) = \llbracket \text{the}^{-1} \rrbracket (\llbracket \text{the} \rrbracket (\llbracket \text{boys} \rrbracket)) = \llbracket \text{boys} \rrbracket$ .

Let me wrap up: plural partitives seem to require the semantics to be able to reconstruct the property  $\llbracket \text{boys} \rrbracket$  from the individual  $\llbracket \text{the boys} \rrbracket$ ; this is easy to do within the ATP (1)-(2), by using the inverse  $\llbracket \text{the}^{-1} \rrbracket$  of the definite article.

**Second case study: distributivity.** Consider the instance of distributive predication in (11-a). We want to derive truth conditions for (11-a) equivalent to those of (11-b).

- (11) a. The boys were wearing a yellow T-shirt.  
b. Every boy was wearing a yellow T-shirt.

As argued in Winter (2000) a.o., in order to get the desired equivalence, we need to posit a distributivity operator. Here is a way to define it, using covers. A *cover* is a function  $\mathcal{C}$  of type  $\langle e, \langle e, t \rangle \rangle$  which satisfies condition (12): it takes an individual  $x$  and returns a set of individuals  $y_1, y_2, \dots$  that, if added up using  $+_{\text{one/many}}$ , return  $x$ .

- (12) If  $\mathcal{C}(x) = \{y_1, y_2, \dots\}$ , then  $x = y_1 +_{\text{one/many}} y_2 +_{\text{one/many}} \dots$

The *distributive operator* can now be defined as in (13): the property  $\text{DIST}_{\mathcal{C}}(P)$  is true of a plural individual such as  $\llbracket \text{the boys} \rrbracket$  iff it is true of every individual in  $\mathcal{C}(\llbracket \text{the boys} \rrbracket)$ .

- (13)  $\text{DIST}_{\mathcal{C}} \stackrel{\text{def}}{=}} \lambda P_{\langle e, t \rangle} . \lambda x_e . \mathcal{C}(x) \subseteq P$ .

<sup>4</sup>An obvious alternative would be to stick to the assumption that ‘of<sub>part</sub>’ is semantically vacuous, and posit a type shifter. The difference between these two alternatives is irrelevant to my point.

Assume that the cover relevant for (11-a) is the distributive one, namely  $\mathcal{C}(\llbracket\text{the boys}\rrbracket) = \llbracket\text{boy}\rrbracket$ . The equivalence between (11-a) and (11-b) is thus trivially derived. Condition (12) entails that  $\mathcal{C} \subseteq \llbracket\text{the}^{-1}\rrbracket$ . By (6-a), condition (14) thus holds: covers have the right granularity, namely a cover of a plurality of boys can only be made up of boys.

$$(14) \quad \mathcal{C}(\llbracket\text{the boys}\rrbracket) \subseteq \llbracket\text{the}^{-1}\rrbracket(\llbracket\text{the boys}\rrbracket) = \llbracket\text{boys}\rrbracket$$

Let me wrap up: also in the case of distributivity, as in the case of partitivity, the property  $\llbracket\text{boys}\rrbracket$  needs to be reconstructed from the definite  $\llbracket\text{the boys}\rrbracket$ , in order to get covers of the right granularity, as in (14); this is easy to do within the ATP (1)-(2), since covers come out as subsets of the inverse  $\llbracket\text{the}^{-1}\rrbracket$  of the definite article.

**An extension.** Consider the singular partitive (15). Intuitively, ‘some’ in (15) quantifies over parts of that table. This intuition cannot be captured within the ATP (1)-(2), as it stands: the term ‘that table’, being morphologically singular, denotes an atomic individual which has no proper parts; thus, there is nothing for ‘some’ to quantify over.

$$(15) \quad \text{Some of that table.}$$

A way to cope with this problem is to assume that the individual  $\llbracket\text{that table}\rrbracket$  does have proper parts after all, but with respect to a partial order different from  $\leq_{\text{one/many}}$ . Let’s denote this new partial order by  $\leq_{\text{part/all}}$  and let’s revise (1) as (16). Intuitively,  $\leq_{\text{part/all}}$  is the relation which holds between that table and one of its legs.

$$(16) \quad \text{The domain } \mathcal{D} \text{ is endowed with two partial orders } \leq_{\text{one/many}} \text{ and } \leq_{\text{part/all}} \text{ such that } \leq_{\text{one/many}} \text{ but not } \leq_{\text{part/all}} \text{ is necessarily an atomic partial order.}^5$$

We can now let ‘some’ in (15) quantify over  $\leq_{\text{part/all}}$ -parts of  $\llbracket\text{that table}\rrbracket$ , as in (17-a). By comparison with the treatment of plural partitives discussed above and summarized in (17-b), we see that this extended ATP handles singular and plural partitives in a unified, elegant way: the two constructions are interpreted in a parallel fashion, using  $\leq_{\text{part/all}}$  and  $\leq_{\text{one/many}}$ , respectively.

$$(17) \quad \begin{array}{l} \text{a. Singular partitives use } \leq_{\text{part/all}}. \\ \quad \llbracket\text{some of the boy}\rrbracket = \llbracket\text{some}\rrbracket(\{x \in \mathcal{D} \mid x \leq_{\text{part/all}} \llbracket\text{the boy}\rrbracket\}). \\ \text{b. Plural partitives use } \leq_{\text{one/many}}. \\ \quad \llbracket\text{some of the boys}\rrbracket = \llbracket\text{some}\rrbracket(\{x \in \mathcal{D} \mid x \leq_{\text{one/many}} \llbracket\text{the boys}\rrbracket\}). \end{array}$$

Since Link (1983), (16) and (2) summarize the standard semantics for count nouns.

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<sup>5</sup>These two partial orders  $\leq_{\text{one/many}}$  and  $\leq_{\text{part/all}}$  should be connected by suitable axioms. For example, we might want to require that  $\leq_{\text{one/many}}$  be a subset of  $\leq_{\text{part/all}}$ .

## 2 An Alternative Approach: the Sortal Theory of Plurals

As seen at the end of the Section 1, the individual  $\llbracket \text{this boy} \rrbracket$  must be construed as atomic for some grammatical phenomena (say, morphological number) but as nonatomic for others (say, singular partitives). This is the issue of the variability of atomicity. The ATP sticks to the tenet that atomicity is encoded in the ontology, and thus copes with the variability of atomicity by positing two partial orders with different atomicity. In this Section, I pursue a more radical intuition: that the variability of atomicity suggests that atomicity should not be encoded in the ontology in the first place.

**Core assumptions.** Contra (16), let me assume that the domain of quantification  $\mathcal{D}$  is endowed with the unique partial order  $\leq_{\text{part/all}}$ . In other words, that an atomic partial order such as  $\leq_{\text{one/many}}$  is not needed to develop the semantics of count nouns.

- (18) The domain of quantification  $\mathcal{D}$  is endowed only with the partial order  $\leq_{\text{part/all}}$ , whose atomicity is left unspecified.

According to the original assumption (2-a), the denotation  $\llbracket N_{\text{SG}} \rrbracket$  of a singular count noun  $N_{\text{SG}}$  is a set of  $\leq_{\text{one/many}}$ -atoms. This entails that the restriction of  $\leq_{\text{one/many}}$  to  $\llbracket N_{\text{SG}} \rrbracket$  is empty. I take the latter fact to be the definitional property of the denotation of singular count nouns, as stated in (19-a).<sup>6</sup> My assumption (19-b) on the denotation of plural count nouns is analogous to the original assumption (2-b), with the only difference that the plural operator is defined using the operation  $+_{\text{part/all}}$  associated with  $\leq_{\text{part/all}}$ , rather than the operation  $+_{\text{one/many}}$  associated with  $\leq_{\text{one/many}}$ .

- (19) For every singular count noun  $N_{\text{SG}}$  and corresponding plural noun  $N_{\text{PL}}$ :
- a.  $\leq_{\text{part/all}}$  restricted to  $\llbracket N_{\text{SG}} \rrbracket$  is empty.
  - b.  $\llbracket N_{\text{PL}} \rrbracket \stackrel{\text{def}}{=} \text{PL}_{\text{part/all}}(\llbracket N_{\text{SG}} \rrbracket)$ .

For every singular count noun  $N_{\text{SG}}$  and corresponding plural noun  $N_{\text{PL}}$ , let  $\leq'_{\text{part-all}}$  be the restriction of  $\leq_{\text{part/all}}$  to  $\llbracket N_{\text{PL}} \rrbracket$ ; the following fact (20) holds.

- (20)  $\leq'_{\text{part-all}}$  is an atomic partial order over  $\llbracket N_{\text{PL}} \rrbracket$  with set of atoms  $\llbracket N_{\text{SG}} \rrbracket$ .

The core difference between the ATP reviewed in Section 1 and the semantics sketched here is as follows: according to the former, atomicity is encoded once and for all in the structure of the domain of quantification through  $\leq_{\text{one/many}}$ ; according to the latter, atomicity is not encoded in the domain of quantification but rather provided each time by a noun which acts as the relevant sortal, thanks to (20). I thus dub this alternative semantics the *sortal* theory of plurals (henceforth: STP).

<sup>6</sup>This assumption might be too strong: isn't a portion of a twig a twig itself? It seems to me that the problem of the denotation of singular count nouns in a nonatomic semantics is intriguingly analogous to the problem of the definition of minimal events or situations, and thus amenable to the same technology.

**Main properties.** The ATP assumes the semantics for the definite article in (3) and thus maps the morphological distinction between singular and plural number into the ontological distinction between singular and plural individuals, as noted in (4). Within the STP, the semantics for ‘the’ in (3) must be adapted as in (21), in terms of  $\leq_{\text{part/all}}$ .

$$(21) \quad \llbracket \text{the} \rrbracket = \iota_{\text{part/all}}$$

By (18), there is no ontological atomicity and thus no distinction among singular and plural individuals. Thus, within the STP there is no ontological correlate of the morphological distinction between singular and plural number. Given (20), such a correlation is only possible wrt the denotation of a plural noun, as stated in (22).

- (22) First property: morphology/ontology correspondence, relative to a sortal.
- a.  $\llbracket \text{that boy} \rrbracket$  is an atomic element of  $(\llbracket \text{boys} \rrbracket, \leq'_{\text{part-all}})$ .
  - b.  $\llbracket \text{those boys} \rrbracket$  is a plural element of  $(\llbracket \text{boys} \rrbracket, \leq'_{\text{part-all}})$ .

As noted in (6), the ATP allows ‘the’ to be inverted: by applying the function  $\llbracket \text{the}^{-1} \rrbracket$  defined in (5) to the individual  $\llbracket \text{the boys} \rrbracket$ , we get back the property  $\llbracket \text{boys} \rrbracket$ . Within the STP, the definition (5) of  $\llbracket \text{the}^{-1} \rrbracket$  must be adapted as in (23), in terms of  $\leq_{\text{part/all}}$ .

$$(23) \quad \llbracket \text{the}^{-1} \rrbracket = \lambda x_e . \lambda y_e . y \leq_{\text{part/all}} x.$$

By applying  $\llbracket \text{the}^{-1} \rrbracket$  in (23) to the individual  $\llbracket \text{the boys} \rrbracket$  we get back a property much bigger than  $\llbracket \text{boys} \rrbracket$ , which contains body parts besides whole size boys. Thus, the invertibility of ‘the’ is not guaranteed within the STP. Given (20), the invertibility of ‘the’ is only possible wrt the denotation of a plural noun, as stated in (24).

- (24) Second property: invertibility of ‘the’, relative to a sortal.
- $$\{x \in \mathcal{D} \mid x \text{ is a boy among those boys}\} = \llbracket \text{the}^{-1} \rrbracket(\llbracket \text{those boys} \rrbracket) \cap \llbracket \text{boys} \rrbracket.$$

I now illustrate the STP with the two case studies of plural partitives and distributivity.

**First case study: plural partitives.** In order to interpret the plural partitive (7-a), the property  $\llbracket \text{boys} \rrbracket$  must be reconstructed by the time we hit ‘many’. As seen in Section 1, within the ATP this can be done in the semantics: we assumed that ‘of<sub>part</sub>’ denotes  $\llbracket \text{the}^{-1} \rrbracket$  and exploited fact (6-a) that  $\llbracket \text{the}^{-1} \rrbracket$  applied to  $\llbracket \text{the boys} \rrbracket$  returns the property  $\llbracket \text{boys} \rrbracket$ . Of course, this analysis fails within the STP:  $\llbracket \text{the}^{-1} \rrbracket$  applied to  $\llbracket \text{the boys} \rrbracket$  returns a property bigger than  $\llbracket \text{boys} \rrbracket$ , which contains body parts too. Thus, to interpret plural partitives within the STP we need syntax to help out in reconstructing the property  $\llbracket \text{boys} \rrbracket$ . A way to do that is to assume that the proper LF is (25) rather than (8), which has a covert noun ‘ones’ above the definite. I assume that  $\llbracket \text{ones} \rrbracket \approx \llbracket \text{boys} \rrbracket$ .

$$(25) \quad [ \text{many} [ \text{ones} [ \text{of}_{\text{part}} [ \text{these boys} ] ] ] ].$$

Let's stick to the assumption that 'of<sub>part</sub>' denotes  $\llbracket \text{the}^{-1} \rrbracket$ , as defined in (23). Thus, by applying  $\llbracket \text{the}^{-1} \rrbracket$  to the individual  $\llbracket \text{these boys} \rrbracket$  we get the property which contains these boys together with their body parts; by further intersecting with  $\llbracket \text{ones} \rrbracket$ , we throw away the body parts and are left with the set of these boys, as desired. In conclusion, the hidden noun 'ones' acts like a sortal which provides the relevant granularity.

**Second case study: distributivity.** In order to check whether a predicate holds distributively of the individual  $\llbracket \text{the boys} \rrbracket$  means to check whether the predicate holds of all the singular boys. The problem of distributivity is thus analogous to that of partitivity: we need to reconstruct the property  $\llbracket \text{boy} \rrbracket$  from the individual  $\llbracket \text{the boys} \rrbracket$ . As seen in Section 1, within the ATP this can be done in the semantics: we introduced the notion of a cover  $\mathcal{C}$ , constrained it in such a way that  $\mathcal{C} \subseteq \llbracket \text{the}^{-1} \rrbracket$  and noted that this guarantees that covers have the right granularity, namely that  $\mathcal{C}(\llbracket \text{the boys} \rrbracket)$  only contains whole size boys. Of course, this analysis fails within the STP: the constraint  $\mathcal{C} \subseteq \llbracket \text{the}^{-1} \rrbracket$  does not in any way force covers to have the right granularity. Once more, we need syntax to help out by providing the property  $\llbracket \text{boys} \rrbracket$ . Here is a way to do that. Let's assume the version of the copy-theory of movement of Fox (1999), in (26).

- (26) a. Copy the DP in the target position and project a binding index  $i$  below it:  
 $[ \text{DP } [ i [ \dots [ \text{DP } \dots ] ] ] ]$ .  
 b. Delete the determiner of the copy of the DP remained *in situ*:  
 $[ \text{DP } [ i [ \dots [ [_{\text{DP}} \text{ } \text{NP} ] \dots ] ] ] ]$ .  
 c. Adorn the NP of the copy remained *in situ* with the same index  $i$ :  
 $[ \text{DP } [ i [ \dots [ [_{\text{DP}} \text{ } \text{NP}_i ] \dots ] ] ] ]$ .  
 d. Interpret the stripped copy in situ as a presuppositional sortal, as follows:  

$$\llbracket [_{\text{DP}} \text{ } \text{NP}_i ] \rrbracket^{[i \rightarrow x]} = \begin{cases} x & \text{if } x \in \llbracket \text{NP} \rrbracket \\ \text{undefined} & \text{otherwise} \end{cases}$$

I adopt the definition of covers  $\mathcal{C}$  and of the distributive operator  $\text{DIST}_{\mathcal{C}}$  in (12) and (13), only restated using  $+_{\text{part/all}}$  instead of  $+_{\text{one/many}}$ . I also make the following assumption:

- (27) The distributive operator  $\text{DIST}_{\mathcal{C}}$  is as high as possible in the LF.

Consider sentence (28-a). Assume that the subject 'these boys' is base generated inside VP and then moved out. According to assumptions (26-a)-(26-c), this movement introduces a binding index  $i$  and leaves in situ a copy 'these boys', whose determiner 'these' is stripped and whose NP 'boys' is assigned the index  $i$ . According to assumption (27), the distributive operator  $\text{DIST}_{\mathcal{C}}$  sits as high as possible, i.e. not below the binding index between  $v$  and the lower copy of the subject but above the binding index between the entire VP and the higher copy of the subject. Thus, we get the LF (28-b).

- (28) a. These boys are tall.  
 b.  $[ \text{These boys}_i [_{\beta} \text{DIST}_{\mathcal{C}} [_{\alpha} i [_{\text{VP}} [_{\text{DP}} \text{these boys}_i ] \text{tall} ] ] ] ]$ .



Let's now turn to the semantics. By (26-d), the node  $\alpha$  gets the interpretation in (29-a). The distributive operator is a universal quantifier, restricted to the cells of the cover. Thus, I assume that its presuppositional behavior is that of universal quantifiers: presuppositions project universally out of it. Hence, the denotation of node  $\beta$  is (29-b), which yields the right truth conditions for (28-a).

- (29) a.  $\llbracket \alpha \rrbracket = \lambda x : \llbracket \text{boys} \rrbracket(x) . \llbracket \text{tall} \rrbracket(x)$ .  
 b.  $\llbracket \beta \rrbracket = \lambda x : \mathcal{C}(x) \subseteq \llbracket \text{boys} \rrbracket . \mathcal{C}(x) \subseteq \llbracket \text{tall} \rrbracket$ .

As shown in (29-b), the lower copy of the subject, stripped of its determiner, forces the cover to have the right granularity, namely to only contain whole size boys.<sup>7</sup>

### 3 Comparison between the two approaches

The ATP and the STP derive the same truth conditions for plural partitives and distributive predication. Yet, they use very different technologies. In this Section, I compare the two approaches and try to argue that the new STP is superior to the standard ATP.

#### 3.1 The case of partitives

The STP requires partitives to contain a phonologically covert sortal above the embedded definite. This assumption is not at all new. The syntactic literature which argues for a hidden noun in partitives treats singular and plural partitives on a par; this makes good sense: from the point of view of syntax, we expect no difference between the LFs of 'some of the boys' and 'some of the boy'. Assume that the ATP extended with both  $\leq_{\text{one/many}}$  and  $\leq_{\text{part/all}}$  were on the right track. Then, also from the point of view of semantics, we would expect no difference between the LFs of singular and plural partitives: as shown in (17), the interpretation of the two constructions is fully parallel, thanks to the two partial orders. Assume instead that the STP were on the right track. Then, we might expect a difference between the LFs of singular and plural partitives: singular partitives can be interpreted straightforwardly by means of  $\leq_{\text{part/all}}$ , without any need for covert sortals; only plural partitives require a sortal, because of the lack of  $\leq_{\text{one/many}}$ . I will thus try to build an argument for the STP as follows: I will review from the syntactic literature various arguments for a covert noun in partitives and I will argue that the arguments don't quite hold for the case of singular partitives.

**First argument.** As shown in (30), partitives indeed allow for an overt noun above the definite. Cardinaletti and Giusti (2006) use this observation as an argument for a

<sup>7</sup>There are of course many issues that need to be settled in order to fully develop this approach, concerning for instance conjoined subjects, pronominal subjects, etcetera. Yet, note that these are not issues that pertain to the STP as implemented here but rather, more generally, to the copy-theory of movement.

covert sortal in plural partitives: “the null hypothesis concerning the [sortal] is that it also occurs when the noun is nonovert”.<sup>8</sup>

- (30) a. Four of those *pictures* which have been stolen.  
 b. Four *pictures* of those which have been stolen.

Sauerland and Yatsushiro (2004) a.o. note that singular partitives can be adorned with an overt noun above the embedded definite too, as in (31)-(32). Thus, there seems to be no difference between singular and plural partitives.

- (31) a. Some of the stolen amount reappeared.  
 b. Some *money* of the stolen amount reappeared.
- (32) a. Most of the book is interesting.  
 b. Most *content* of the book is interesting.

Yet, an observation made by Cardinaletti and Giusti (2006) might be used to cast some doubt on this conclusion. They note the pattern in (33) and comment as follows: “The lexical items that realize the [higher sortal] and the [embedded DP] must be lexically identical for reasons that are not logically necessary since the same requirement does not hold for [(33-c)]. The fact that this property appears quite generally across languages leads us to assume that the lexical non-distinctness requirement is a UG principle.”

- (33) a. I have read many *books* of the *books* of the library.  
 b. \*I have read many *novels* of the *books* of the library.  
 c. I have read many *novels* among the *books* of the library.

This non-distinctness requirement is clearly violated by the singular partitives with an overt sortal in (31-b) and (32-b). I thus tentatively conclude that these cases are not partitives, but rather structures of a different type. These examples thus do not bear on the issue of the existence of a covert sortal in singular partitives.

**Second argument.** Selkirk (1977) notes an ambiguity with relative clauses in partitives: the several paintings by Sieneese artists in (34-a) can be either among the paintings they saw or among the famous paintings in the museum and not necessarily seen by them; the ambiguity is lost in the case of the non-partitive (34-b). Under the assumption (25) that partitives have two nouns, this ambiguity is straightforwardly accounted for: the relative clause can modify either the higher or the lower noun.

- (34) a. In the Uffizi they saw many of the famous paintings, several of which were by Sieneese artists.  
 b. In the Uffizi they saw many famous paintings, several of which were by Sieneese artists.

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<sup>8</sup>But see Martí Girbau (2003, p. 10) for discussion of this argument.

Selkirk only considers plural partitives, such as (34). Let's now turn to singular partitives, by comparing the two pairs (35) and (36). Sentences (35) contain a plural partitive: the relative clause 'most of which ...' is ambiguous in the way detected by Selkirk, with no difference between (35-b) with an overt sortal above the definite and (35-a) without it. The case of the singular partitive in (36) is different: the relative clause is ambiguous only in the case of (36-b) with the overt sortal but not in the case of (36-a) without it.

- (35) a. In the library, they read some of those books, most of which were interesting.  
 b. In the library, they read some *books* of those, most of which were interesting.
- (36) a. In the library, they read some of that book, most of which was interesting.  
 b. In the library, they read some part of that book, most of which was interesting.

The contrast between (35) and (36) suggests that there is no sortal for the relative clause to modify in the case of singular partitives, contra the case of plural partitives.<sup>9</sup>

**Third argument.** Cardinaletti and Giusti (2006) argue that 'ne'-cliticization in Italian provides a further argument for a covert sortal in partitives. The basic pattern of 'ne'-cliticization is illustrated in (37), for the case of a simple, non-partitive noun phrase: (37-c) shows that the cliticized noun cannot occur overt.

- (37) a. Gianni ha letto molti libri.  
 Gianni has read many books  
 b. Gianni ne ha letto molti [e]<sub>N</sub>.  
 Gianni NE has read many [e]<sub>N</sub>  
 c. \*Gianni ne ha letto molti libri.  
 Gianni NE has read many books

Let's now turn to the case of partitives. Sentence (38-a) contains a plural partitive and sentence (38-b) contains that same partitive with an overt noun above the embedded definite. The two sentences (38-c) and (38-d) are the same two sentences (38-a) and (38-b) with 'ne' cliticization. In analogy with (37-c), the deviance of (38-d) suggests that what is being cliticized is the noun above the definite. The possibility of 'ne' cliticization in (38-c) thus suggests the existence of a hidden noun above the definite, even in cases where it is not overtly realized.

- (38) a. Gianni ha letto molti di quelli [che gli hai consigliato].  
 Gianni has read many of those [that (you) him have suggested]

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<sup>9</sup>Martì Girbau (2003) finds the evidence (34) not conclusive for the existence of a hidden sortal in partitives: "I claim that there is no need to postulate two nouns to account for the ambiguity of relative clauses: assuming Kayne's DP-hypothesis, in partitives there are two determiners that can license a relative clause: the upper one – I assume that nominals are all DPs – and the lower one." Yet, this analysis fails to account for the contrast between (35) and (36), since in both cases of plural and singular partitives we have two DPs. Thus, the contrast between (35) and (36) protects the argument for a hidden sortal in plural partitives based on relative clauses against Martì Girbau's objection.

- b. Gianni ha letto molti libri di quelli [che gli hai consigliato].  
Gianni has read many books of those [that (you) him have suggested]
- c. Gianni ne ha letto molti di quelli [che gli hai consigliato].  
Gianni NE has read many of those [that (you) him have suggested]
- d. \*Gianni ne ha letto molti libri di quelli [che gli hai  
Gianni NE has read many books of those [that (you) him have  
consigliato].  
suggested]

Cardinaletti and Giusti only consider plural partitives, such as (38). Let's now turn to singular partitives. Sentence (39-a) illustrates once more 'ne'-cliticization with singular partitives; sentence (39-b) differs only because the plural partitive has been replaced by a singular partitive, and 'ne'-cliticization turns deviant.<sup>10</sup>

- (39) a. Quei libri di linguistica, di cui Gianni ne ha letto molti, sono  
those books about linguistics, of whom Gianni NE has read many, are  
noiosissimi.  
very-boring.
- b. \*Quel libro di linguistica, di cui Gianni ne ha letto molto, è  
that book about linguistics, of whom Gianni NE has read many, is  
noiosissimo.  
very-boring.

The paradigm (38) shows that 'ne'-cliticization in plural partitives targets the sortal above the embedded definite. Thus, the contrast in (39) shows that there is no sortal to cliticize in the case of singular partitives, contra the case of plural partitives.

**A problem.** Jackendoff (1977) provides an argument for a covert sortal in partitives based on restrictions on determiners that can head a partitive: as shown in (40-c), 'everyone' but not 'every' can head a partitive; as shown in (40-b), 'everyone' but not 'every' allows for deletion of its restrictor; this correlation suggests that partitives contain a covert sortal and that restrictions on determiners that can head a partitive thus follow from independent restrictions on determiners that allow deletion of their restrictor.

- (40) a. John saw every boy.   \*John saw everyone boy.  
b. \*John saw every.    John saw everyone.  
c. \*Every of the boy   Everyone of the boys.

Exactly the same pattern holds for singular partitives, as shown by the 'no'/'none' alternation in (41). By parity of reasoning, (41) thus suggests the presence of a covert sortal in singular partitives too, contrary to what I have argued for so far.

- (41) a. Bill drank no water.   \*Bill drank none water.

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<sup>10</sup>As pointed out to me by Benjamin Spector (p.c.), the same contrast (39) holds for French.

- |    |                              |                               |
|----|------------------------------|-------------------------------|
| b. | *Bill drank no.              | Bill drank none.              |
| c. | *Bill drank no of the water. | Bill drank none of the water. |

Yet, the argument relies on a specific hypothesis on what governs the ‘every’/‘everyone’ and ‘no’/‘none’ alternation, namely that we get ‘none’/‘everyone’ every time the restrictor is syntactically present but phonologically covert. An alternative hypothesis is that we get ‘none’/‘everyone’ every time there is no overt restrictor, either because it is syntactically present although phonologically covert or because it is not syntactically present at all. Under this alternative hypothesis, the paradigms (40) and (41) do not argue for the existence of a covert sortal, and thus do not threaten my claim that singular partitives do not contain it. I leave the issue open for the time being.<sup>11</sup>

### 3.2 The case of distributivity

The approach to distributivity within the STP sketched in Section 2 uses the tail copy of the subject (and possibly other arguments) to constrain the granularity of the cover used by the distributive operator. I will now defend this approach as follows: I will suggest that subject-predicate number agreement can be used to probe the content of the copy of the subject left in situ in [Spec, VP]; I will then use this probe to argue that the content of the copy does indeed control the granularity of the cover.

**Preliminaries on agreement in BE.** A singular collective noun in British English (henceforth: BE) can trigger both singular and plural VP-agreement, as shown in (42).

- (42) A committee of students was/were holding a meeting in here.

Elbourne (1999) notes two restrictions on plural agreement with collective nouns in BE: only singular agreement is possible in the case of the ‘there’-construction (43) and in the case of the narrow scope reading of the indefinite collective subject in (44).

- (43) There was/\*were a committee holding a meeting in here.

- (44) a. A northern team *is* likely to be in the final.       $\exists > \text{likely}, \text{likely} > \exists$

<sup>11</sup>Note crucially that the morpheme ‘one’ in ‘everyone’ and ‘none’ cannot be interpreted as the realization of the deleted restrictor. This can be seen in two ways. First, by noting that ‘none’ would then be inconsistent with a mass interpretation of singular partitives, contra (41-c). Second, by noting that an alternation analogous to that of ‘every’/‘everyone’ is displayed by Italian ‘qualche’/‘qualcuno’, as shown in (i), and that ‘ne’-cliticization is possible with ‘qualcuno’, as shown in (ii).

- (i) a. Ho visto qualche ragazzo. \*Ho visto qualchuno ragazzo.  
 b. \*Ho visto qualche. Ho visto qualcuno  
 c. \*Ho visto qualche di loro. Ho visto qualcuno/ognuno di loro.
- (ii) a. \*Gianni ne ha letto qualche libro.  
       Gianni NE has read some book  
 b. Gianni ne ha letto qualcuno  
       Gianni NE has read someone.

- b. A northern team *are* likely to be in the final.  $\exists > \text{likely}, * \text{likely} > \exists$

Here is a way to account for the facts in (42)-(44). Let me assume that number VP-agreement is always established with the copy of the subject in [Spec, VP]:<sup>12</sup> plural (singular) VP-agreement corresponds to a plural (singular) copy in [Spec, VP]. Thus, what's special about BE is that a singular collective subject can leave in situ in [Spec, VP] a plural copy. There might be many ways in which this might happen; for concreteness, here is a possible way. Barker (1998) suggests that "a count noun will be a [collective] noun just in case it can take an 'of' phrase containing a plural complement, but not a singular complement." Let me assume that this plural PP complement is always present at LF, even when it is not overtly realized. Thus, the copy left in situ in [Spec, VP] by the singular collective subject of (42) is (45).

- (45) [ a [ committee [ of [ students ] ] ] ].

By step (26-b) of the definition of movement, the copy of the subject in [Spec, VP] is stripped of a bit of its left periphery, in order to avoid a type mismatch. In the case of a copy with a complex left periphery such as (45), we then have to ask how much of the left periphery is deleted: just the upper determiner or a bit more? Let me suggest that what's special about BE collective nouns is that both options are available, as in (46).

- (46) a. [ a [ committee of [ students ] ] ].  
 b. [ a [ ~~committee~~ of [ students ] ] ].

In the case of (46-a), [Spec, VP] contains the singular property 'committee of students', which thus triggers singular VP-agreement; in the case of (46-b), [Spec, VP] contains the plural property 'students', which thus triggers plural VP-agreement. The ban on plural agreement in the 'there'-sentence (43) follows from the fact that the subject does not move in 'there'-sentences and thus there is no lower copy that can be stripped of its left periphery as in (46)b in order to obtain a plural property in [Spec, VP]. The same analysis applies to (44), under the assumption that the narrow scope reading for the indefinite subject is obtained by reconstructing the subject into its base position. In conclusion, agreement in BE can be used to access the tail copy of the subject.

**Distributivity and agreement.** Let me point out one more restriction on plural agreement with singular collective subjects in BE: as shown in (47), plural agreement is required in the case of the inherently distributive predicate 'to be odd'.<sup>13</sup> Let me show that this restriction follows straightforwardly from the assumptions I have in place.

- (47) a. \*This set of numbers *is* (all) odd.  
 b. This set of numbers *are* (all) odd.

<sup>12</sup>VP-agreement with the copy in [Spec, VP] might happen either by T probing down into VP or by V agreeing with its specifier; the details of the agreement operation are irrelevant here.

<sup>13</sup>The judgment reported in (47) was provided to me by Paul Elbourne (p.c.).

The two sentences (47) correspond to the two LF's (48) respectively, which only differ wrt the amount of left periphery deleted in the copy of the subject left in [Spec, VP].

- (48) a.  $[_{IP} [\text{This set of numbers}]_i [_\alpha \text{ DIST}_C [_{VP} [\text{this set of numbers}]_i [_V \text{ be odd} ] ] ] ]$ .  
 b.  $[_{IP} [\text{This set of numbers}]_i [_\alpha \text{ DIST}_C [_{VP} [\text{this set of numbers}]_i [_V \text{ be odd} ] ] ] ]$ .

According to the theory of predication developed within the STP in Section 2, the denotation of the nodes  $\alpha$  of these two LF's (48-a) and (48-b) are those in (49-a) and (49-b), respectively. The denotation of node  $\alpha$  in (49-b) yields the right truth conditions for the fine sentence (47-b) with plural agreement. Assume that what makes 'odd' inherently distributive is the fact that the intersection between  $\llbracket \text{odd} \rrbracket$  and  $\llbracket \text{set of numbers} \rrbracket$  is empty.<sup>14</sup> Hence, the denotation of node  $\alpha$  in (49-a) is always empty and the deviance of sentence (47-a) with singular agreement thus follows.

- (49) a.  $\llbracket \alpha_{(48a)} \rrbracket = \lambda x: \mathcal{C}(x) \subseteq \llbracket \text{set of numbers} \rrbracket . \mathcal{C}(x) \subseteq \llbracket \text{odd} \rrbracket$ .  
 b.  $\llbracket \alpha_{(48b)} \rrbracket = \lambda x: \mathcal{C}(x) \subseteq \llbracket \text{numbers} \rrbracket . \mathcal{C}(x) \subseteq \llbracket \text{odd} \rrbracket$ .

Let me wrap up. According to the STP, the copy of the subject left in situ, stripped of its determiner, provides the granularity of the corresponding cover. According to the account for BE agreement sketched above, verbal number morphology in BE provides a way to access the content of the lower copy. I have thus used agreement in BE to support the claim that the the granularity of the cover is controlled by the tail copy.

**Distributivity and movement.** Ferreira (2005) and Kratzer (in progress) claim that a predicate can apply distributively to an argument only if that argument has undergone movement. Suppose this claim is right: why are syntax (movement) and semantics (distributivity) connected in this way? The ATP does not shed any light on this connection: distributivity is implemented entirely within the semantics, since the right granularity of the cover can be guaranteed using the atomic partial order  $\leq_{\text{one/many}}$ . The STP would instead provide a rationale for this connection between movement and distributivity: in order to apply a predicate distributively to the individual  $\llbracket \text{the boys} \rrbracket$ , we need to reconstruct the property of singular boys; because of lack of the atomic partial order  $\leq_{\text{one/many}}$ , this cannot be done in the semantics; as suggested in Section 2, the only option is to move out the argument 'the boys' and use the copy 'the boys' it leaves in situ as the relevant sortal.<sup>15</sup>

<sup>14</sup>There are a variety of ways to derive this condition, all compatible with my proposal. One strategy is to assume that 'set of numbers' denotes pluralities of numbers and that 'odd' has a non-cumulative denotation, which only contains singular numbers. Another strategy is to assume that 'set of numbers' denotes special individuals which are different from any plurality of numbers and that 'odd' is a (possibly cumulative) property of numbers.

<sup>15</sup>In particular, Ferreira argues that the distributive operator is part of the rule for the interpretation of the binding index produced by movement. This assumption derives my assumption (27) that the distributive operator sits above the binding index.

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