On the (non-)cumulativity of cumulative quantifiers

Synopsis – This paper provides an explanation for an asymmetry between English partitive and non-partitive phrases containing *most* - namely that only partitives participate in cumulative/collective readings. We argue that this is due to (i) the generic nature of non-partitive *most*-phrases and (ii) the unavailability of cumulative readings in generics.

Data – 1. It has been observed that non-partitive DPs headed by *most* do not participate in cumulative readings with numeral DPs (1-a) (Zweig 2008). However, this does not extend to sentences with *most of the NP* (1-b) (confirmed in an informal survey).

(1) Scenario: 30% of the boys kissed girl 1, 30% of the boys kissed girl 2, 40% no one
   a. #Most boys kissed the two girls  
   b. Most of the boys kissed the two girls

2. Non-partitive *most*-phrases do not allow collective readings with mixed predicates, while their partitive counterparts do (2) (Nakanishi and Romero 2004).

(2) Scenario: 60% of the boys in the room jointly lifted a piano
   a. #Most boys lifted a piano  
   b. Most of the boys lifted a piano

3. Unlike partitive *most*-phrases, non-partitives do not participate in cumulative readings even in environments where these are available for distributive quantifiers like *every NP*. One such environment is the double object construction where a cumulative interpretation is generally possible if the quantifier is the direct object (3). This type of example is an extension of a paradigm discussed by Kratzer (2003) (cf. Schein 1993), in which a subject DP and a non-subject distributive QP allow a cumulative interpretation.

(3) Scenario: 50% of John’s books go to Mary, 50% go to Sue
   John gave two girls every book

(4) Scenario: 30% of John’s books go to Mary, 30% go to Sue
   John gave two girls {most of the / #most} books

The unacceptability of the non-partitive *most* in (4) and the fact that (3) is felicitous indicate that the non-cumulativity observed with non-partitives cannot be due simply to their generalized quantifier semantics (contra Nakanishi and Romero 2004).

Partitive *most* and cumulativity – We adopt an approach to partitives in which the definite DP is an argument of the adnominal quantifier *most* (Matthewson 2001). The meaning of *most* is in (5). The cumulative readings are derived using the approach to plurality developed in Kratzer (2003) in which lexical predicates are plural (** indicates cumulation). The derivation of the cumulative reading of (1-a) is illustrated in (6). Analogous derivations deliver collective readings of mixed predicates, whereby the relevant cumulated predicate is the respective activity head (Brisson 1998, Nakanishi & Romero 2004 for details).

(5) \[
\text{most}_{\text{reg}} = \lambda x_{(e)}. \lambda P_{(e,(p,t))}. \lambda e_{(p)}. \exists y \leq x[P(e,y) \land (\mu(\{z | z \leq_{\text{at}} y\}) > \frac{1}{2}\mu(\{z | z \leq_{\text{at}} x\}))]
\]
(6) a. \[\text{QP most (of) [DP the boys]} \quad \text{Voice kiss [the two girls]}
\]
   b. \[\exists e \exists y [y \leq_{\text{b} \text{boys}} \land **ag(e,y) \land **kiss(e,2\text{girls}) \land (\mu_{\text{AT}}(y) > \frac{1}{2}\mu_{\text{AT}}(\text{b\text{boys}}))]]

Non-partitive *most* and genericity – Cooper (1996) and Matthewson (2001) observed that sentences with non-partitive *most*-phrases tend to be generic and that *most* does not allow contextual restrictions. An example of this pattern is given in (7).

(7) a. Most linguists are millionaires (Matthewson 2001)
   b. #Most linguists went to New Zealand for Christmas last year

Following Matthewson (2001), we assume that the sister of the non-partitive *most*-determiner is a kind-denoting bare plural. Accordingly, we assign *most* the interpretation in (9) where only the minimal non-overlapping individual realizations of a kind are counted (8). This minimality restriction, which is relativized to the main predicate to derive appropriate meanings for collective predicates, is a reflex of a more general counting principle (cf. Casati and Varzi 1999, Kratzer 2008).

\[\text{most}_{\text{reg}} = \lambda x_{(e)}. \lambda P_{(e,(p,t))}. \lambda e_{(p)}. \exists y \leq x[P(e,y) \land (\mu(\{z | z \leq_{\text{at}} y\}) > \frac{1}{2}\mu(\{z | z \leq_{\text{at}} x\}))]]
\]
(8) \[ R_{min,P}(x,y) = 1 \text{ iff } R(x,y) = 1 \land x \in \text{dom}(P) \land \forall z \leq x [z \in \text{dom}(P) \rightarrow z = x] \\\n(9) [most_{knd}], \lambda x. \lambda P. \lambda e. \mu\{z \mid R_{min,P}(z,x) \land \exists e \leq e[P(e',z)]\} > \frac{1}{2}\mu\{y \mid R_{min,P}(y,z)\} \]

The truth-conditions of (1-a) are computed in (10). The distributivity over minimal individuals encoded in the lexical entry in (9) is thereby a property shared by all generic quantifiers. Distributivity with generics is illustrated in (11).

(10) a. \[ Q_P \text{ most } [DP \text{ boys}] \text{ Voice kiss [the two girls]} \]
    b. \[ \exists e\mu\{z \mid R_{min,kiss}(z,\text{boys_k}) \land \exists e' \leq e[**ag(e',z) \land **kiss(e',\text{girls})]\} > \]

(11) Students \{mostly / always / \emptyset\} kiss two girls \[ \frac{1}{2}\mu\{y \mid R_{min,kiss}(y,\text{boys_k})\}\]

≠ When there are students, they between them (mostly) kiss two girls

The reason for the non-cumulative behavior of non-partitives in double object constructions (4) is the same. The fact that strictly distributive generalized quantifiers can receive cumulative interpretations in such configurations can be explained by assuming a neo-Davidsonian association of certain thematic arguments with the verb (Kratzer 2003): in (12) two girls are introduced as the possessor of a complex eventuality identified as having every book (Beck and Johnson 2004 for the decomposition of double object constructions).

(12) a. John [v give BECOME [two girls [Appl APPL every book]]]
    b. [Appl] = \lambda x. \lambda e. \text{possessor}(e,x) \land \forall x (\text{book}(x) \rightarrow \exists e' \leq e[\text{have}(e,x)])
    c. [(12-a)] = \lambda e. \text{ag}(e,\text{John}) \land \exists e' \leq e[\text{BECOME}(e',\lambda e''. \text{possessor}(e'',2\text{girls}) \land \forall x (\text{book}(x) \rightarrow \exists e'' \leq e'[\text{have}(e''',x)]) \land \text{CAUSE}(e',e'')]

Some consequences – 1. Zweig (2008) argued that the infelicity of (1-a) – together with the felicity of Most boys kissed girls in contexts where the boys each kissed only one girl – is an argument against reducing dependent readings of bare plurals to cumulative readings. The above analysis accounts for the non-cumulativity of (1-a). The ‘cumulativity’ of the example with the bare plural, on the other hand, follows from the genericity of the sentence and the usual number-neutral interpretation of bare plurals in generics. This explains the illusion of non-reducibility of dependent plurals to cumulative readings. 2. Non-partitive most sometimes allows a non-generic interpretation, e.g. Most people who came to the party left early (Matthewson 2001). The bare plural in these cases cannot denote a kind (cf. the discussion of parts of that machine in Carlson 1977) and is assigned a choice-functional interpretation – most is thus interpreted as most_{reg}. Correspondingly, collective and cumulative readings should be available. This prediction is borne out: e.g. Most people who were sitting there lifted a piano can be interpreted collectively.

Further work – 1. We need to determine the source of distributivity over the (relative) minimal individuals that obtains with generics (11). Since this is also responsible for the non-cumulativity effects in (1-a) and (2-a), a simpler characterization of most_{knd} should thereby become possible. 2. An obvious question is whether other intriguing contrasts (13) that Zweig (2008) uses to argue for the non-reduction of dependent plurals to cumulative readings could be explained in a similar way. It is suggestive that both sentences in (13) are generic.

(13) a. Seven trains leave every day to Amsterdam from this station (#cumulative)
    b. Trains leave every day to Amsterdam from this station (√dependent plural)