

### ***Most: the View from Mass Quantification***

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**1. The puzzle and its solution in a nutshell.** Examples like (1a) are currently invoked in favor of the view that quantification over mass domains is allowed (Gillon 92, Higginbotham 94), but in examples like (1b), observed by Dayal and reported in Matthewson (01), quantification over mass domains is disallowed:

- (1) a. Most milk from old goats is sour.  
b. \*Most milk in this fridge is sour.

The problem was left open by Matthewson and has not been addressed since then. My solution relies on the distinction between entity-restrictor *most* and property-restrictor *most*:

- (2) a. Entity-restrictor *most* takes an entity-denoting (type e) restrictor.  
b. Property-restrictor *most* takes a property-denoting (type <e,t>) restrictor.

This distinction allows us to capture the contrast between (1b) and (3):

- (3) Most of the milk in this fridge is sour.

Given (2a-b), the contrast (1b) vs (3) can be captured by the generalization in (4):

- (4) Entity-restrictor *most* can apply to mass domains but property-restrictor *most* cannot do so.

Examples of the type (1a) are problematic if we take the *most* that occurs in this example as having a property-denoting restrictor. The problem can be solved by adopting Matthewson's 2001 view that when occurring in the restriction of *most*, bare NPs can be kind-referring (type e). Note that my analysis, which assumes the existence of a property-restrictor *most* (see (2b)), in addition to the entity-restrictor *most*, differs from Matthewson, according to whom *most* always takes an e-type restrictor.

**2. Confirming Crosslinguistic Evidence.** Romanian and Hungarian are two unrelated languages in which the superlatives of MUCH/MANY can take a property-denoting NP as a complement and can have the meaning of proportional *most*. The constraint in (4) correctly predicts that in these languages, MUCH<sub>superl</sub> is disallowed with NP<sub>mass</sub> (see Szabolcsi 12) [Note that in both languages relative superlative readings of MOST NP<sub>mass</sub> are allowed, e.g., Rom. *Cine a băut cel mai mult vin?* 'Who drank the most wine?']:

- (5) a. \*Cel mai mult lapte de capre bătrâne e acru. (MUCH<sub>superl</sub>)  
the more much milk of goats old is sour.  
b. \*Cel mai mult lapte din frigiderul ăsta e acru.  
the more much milk in fridge this is sour.

German examples of the type *Maria hat den meisten Kaffee in dieser Kanne getrunken* 'Mary drank most of the coffee in this pot', brought up by Szabolcsi 12, seem to disconfirm our prediction. This problem can be solved by adopting Roehr's 09 hypothesis that in certain German definite DPs, the definite article originates in a lower position. Extended to *meiste*, this means that *der meiste NP* 'the most NP' is base-generated as [meiste [der NP]] 'most the NP'; this configuration obeys the constraint in (4), because the restrictor of *meiste* is a definite DP (type e).

Examples of the type in (5b) provide interesting evidence in favor of the constraint in (4) but the crosslinguistic comparison becomes truly compelling when examples of the type in (5a), which contrasts with its English counterpart in (1a), are examined. This contrast is due to a parametrical choice regarding kind-referring bare NPs. For English, the kind-referring analysis of bare NPs in the complement position of *most* is supported by the fact that in this language, bare NPs in argument positions can also be kind-referring: (6) a. Water is liquid. b. Black cats are intelligent. c. Milk from old goats is sour. Stage-level modifiers prevent English bare NPs from referring to kinds (recall Carlson's observations regarding *parts of this machine*), hence the unacceptability of (1a): because of the s-level modifier, *milk in this fridge* cannot be kind-referring, and a property-restrictor is ruled out by (4).

Romanian and Hungarian differ from English in that they do not allow kind-referring bare NPs in argument positions (Farkas & de Swart (2007), Dobrovie-Sorin & Beyssade (2004, 2013)), and the 'null hypothesis' is that kind-referring bare NPs are also disallowed as complements of MUCH<sub>superl</sub>. The constraint in (4) correctly predicts that in both these languages (see Szabolcsi 12 for Hungarian) the counterparts of examples of the type in (1a) are as ungrammatical as those of (1b), because in both cases NP<sub>mass</sub> is property-denoting (type <e,t>), which is ruled out by (4). And this is indeed the case, as indicated by (5a) and (7):

- (7) \*Cea mai multă apă e lichidă. 'Most water is liquid'

The intended meanings of (5a-b) and (7) can be rendered by using partitive configurations of the type 'the

largest part of DP<sub>def/demonstr</sub>' (which are the closest counterparts of English *most* of DP<sub>def/demonstr</sub> and *most NP<sub>kind</sub>*).

[For clarification, let me briefly note that the distinction between entity restrictors and property restrictors correlates with the distinction between partitive and non-partitive restrictors in those languages (Romanian, Hungarian) in which (i) NPs are necessarily property-denoting and (ii) DP-restrictors must be marked with a partitive preposition or with morphological Case (Romanian). The correlation breaks down in English, because (i) bare NPs can be either property-denoting (type  $\langle e, t \rangle$ ) or kind-denoting (type  $e$ ) and (ii) regardless of their denotational type, bare NPs are not marked with a partitive preposition. In line with Matthewson 01 I assume that the presence or absence of partitive prepositions or Case markers are morphosyntactically motivated but do not bear on the semantics, i.e., they are expletive (*contra* Ladusaw 82, followed by others, who assumes that partitive prepositions apply to  $e$ -type expressions and yield  $\langle e, t \rangle$  type)).

**3. Towards an explanation.** Property-restrictor *most* is allowed with count Ns, e.g., *Most students in my class left early yesterday evening*. The same holds of a *leggtöb NP<sub>count</sub>* in Hungarian (Szabolcsi 12) and of the Romanian *cei mai multi* '*most<sub>pl</sub>*':

- (8) Cei mai mulți          studenți din clasa mea      au      plecat devreme.          (MANY<sub>superl</sub>)  
       the more many        students in my class      have left                  early.  
       most                    students in my class      have left                  early.

According to the set-theoretical analysis of *most*, examples of the type in (8) are true iff the set of students (in my class) for which the property denoted by the VP (*leave early*) is true has a greater cardinality than the set for which the VP-property is false:

- (9)  $|\{x: \text{student}(x)\} \cap \{\text{left-early}(x)\}| > |\{x: \text{student}(x)\} \cap \{\text{not-left-early}(x)\}|$

The constraint in (4) may be attributed to the fact that a condition of the type in (9) cannot be checked on the mass domain. This impossibility can be attributed to the poor algebraic structure of mass domains, more precisely to the fact that meet is not defined on join semi-lattices (Szabolcsi & Zwarts 93). [The non-overlap constraint currently invoked for constraining quantification over situations (e.g., Kratzer 95 a.o.) can also be invoked here, but it merely restates the observation.]. We may thus conclude that crosslinguistically, property-restrictor MOST yields set-quantification, which is allowed in count domains but ruled out in mass domains.

Turning now to the entity-restrictor MOST, I will assume that it denotes a relation between two objects (Moravcsik 73, Roeper 83, Lonning 87, Higginbotham 94), which are respectively supplied by the restrictor and by the maximal sum obtained by applying the sigma operator (generalized join) to the scope. Given this analysis, (3) is true iff the condition in (10) is satisfied:

- (10)  $\mu([\text{the milk in the fridge}] \cap \sum x. \text{sour}(x)) > 1/2 \mu([\text{the milk in the fridge}])$

In words, the measure of the meet of the [[the milk in the fridge]] and (the maximal sum of the sour parts in the domain) is bigger than half of the measure of the milk in the fridge. The computation required by (10) is legitimate because in this case meet applies to two mass entities (type  $e$ ) rather than to two join semi-lattices (type  $\langle e, t \rangle$ ). As to the measure function, we can use ratios as measure units (this is possible because size is a ratio scale (Lassiter 11)): the whole (in this case [[the milk in this fridge]]) is 1 and any part of the whole is a ratio comprised between 0 and 1. The same type of computation can apply to indeterminate/infinite entities such as kinds (see (1a) or the largest-part-of-DP<sub>kind</sub> in Romanian or Hungarian) since ratios can be used for measuring parts of kinds with respect to the kind itself, whose measure is 1.

In sum, the proposal made here confirms Higginbotham's view that mass quantifiers denote relations between objects rather than relations between sets, but unlike Higginbotham I crucially assume that the  $e$ -type denotation of the restrictor must be syntactically given as such, it cannot be obtained from a property-denoting restrictor via applying a default sigma-operator. If this were allowed, the contrasts examined here would not be accounted for. But it is precisely these contrasts that provide strong linguistic evidence in favor of Higginbotham's analysis of mass quantification.

**Selected References.** Gillon 92. Towards a common semantics for English count and mass nouns. *L&P* 15; Hackl 09. On the grammar and processing of proportional quantifiers: most versus more than half. *NLS* 17. 63-98; Higginbotham 94. Mass and count quantifiers. *L&P* 17; Lassiter 11. *Measurement and Modality*, NYU diss.; Matthewson 01. Quantification and the Nature of Crosslinguistic Variation. *NLS* 9; Roehrs 06 The Morphosyntax of the Germanic Noun Phrase ; Szabolcsi 12 Compositionality without word boundaries: (*the*) *more* and (*the*) *most* talk at SALT 22, Semantics Archive or Lingbuzz.