Most: the View from Mass Quantification*

Carmen Dobrovie-Sorin

LLF-CNRS, Université Paris 7
carmen.sorin@linguist.univ-paris-diderot.fr

Abstract

It is currently assumed that *most* can quantify over mass domains [12][14]. The crosslinguistic data (English, Romanian, Hungarian and German) examined in the paper indicates that this is true of entity (type e)-restrictor *most* but not of set (type <e,t>)-restrictor *most*, which strongly supports the view that mass quantifiers denote relations between entities rather than relations between sets [26] [21] [14]. Nevertheless my proposal differs from previous proposals in assuming a more constrained view of the syntax-semantics mapping.

1 Introduction: The puzzle and its solution in a nutshell

Examples of the type in (1) are currently invoked in favor of the view that quantification over mass domains is allowed [12] [14], but examples like (2) go against this generalization. (2a-c) are from Matthewson ([22]:174); (2d) is my example:

(1) a. Most milk from old goats is sour.
b. Most water is liquid.

(2) a. *Most milk in this fridge is sour.
b. *I shoveled most snow that was in this yard.
c. *Most mud that you traipsed in the house ended up on my rug.
d. *Most furniture in this house is broken.

The problem was left open by Matthewson and to my knowledge it has only rarely been brought up in the subsequent literature (Szabolcsi [28] observes it, but leaves it aside). My solution relies on the distinction between entity-restrictor *most* and set-restrictor *most*:

(3) a. Entity-restrictor *most* takes an entity-denoting (type e) restrictor.
b. Set-restrictor *most* takes a set-denoting (type <e,t>) restrictor.

Given this distinction, the contrast between (2) and (4) can be captured by the generalization in (5):

(4) a. Most of the milk in this fridge is sour.
b. I shoveled most of the snow that was in this yard.
c. Most of the mud that you traipsed in the house ended up on my rug.
d. Most of the furniture in this house is broken.

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

Going back to (1a-b), they are problematic if we take the *most* that occurs there as having a set-denoting restrictor. The problem can be solved by assuming (6):

(6) When occurring as complements of *most*, bare NPs *can* be kind-referring (type e) in English.

(6) is weaker than Matthewson's [22] hypothesis, according to which bare NP complements of *most* are *necessarily* kind-referring. My weaker hypothesis correlates with the assumption that a set-restrictor *most* (see § 2.1 and § 2.3 below) exists (although it turns out to be illegitimate for mass domains), in addition to the entity-restrictor *most*. According to Matthewson herself, *most* always takes an e-type restrictor[1].

*This research is supported by the LABEX-PLU project. Thanks to D. Büring, P. Cabredo Hofherr, L. Champollion, I. Giurgea, D. Lassiter, F. Landman, B. H. Partee and A. Szabolcsi for comments on a previous draft of the ideas presented here. I am also indebted to my mathematician husband, Sylvain Sorin, who - after listening to me for 10 minutes - solved in 2 minutes the problem of 'measuring kinds' that constantly came up in my previous attempts of dealing with mass quantification. Sylvain just said : 'Well, you just take the whole as 1.'

[1] See also [1] for the view that all Quantifiers always take DPs as complements.

2 MOST across languages

2.1 Romanian and Hungarian: MOST *vs* THE LARGEST PART OF

The examples in (7), (8) and (9) show that in English, Romanian and Hungarian the superlative forms of MANY, although quite different from each other in terms of morphosyntactic complexity, all allow the proportional interpretation characteristic of the quantificational use of *most* in English (this reading should be carefully distinguished from the relative/comparative reading, which in English is signalled by the presence of *the*, e.g., *Who read the most books?* In Romanian and Hungarian the definite article also appears in the proportional use):

(7) Most students in my class left early.

(8) Cei mai multi elevi din clasa mea au plecat devreme[2].
the more many students in my class have left early.
'Most students in my class left early.'

(9) A legtöbb fiù már hazament[3][4].
the most boy already is-gone-home.
'Most boys are gone home already.'

Turning now to the mass domain, the constraint in (5) correctly predicts the unacceptability shown in (10), which is parallel to the unacceptability of (2a-d) in English:

(10) a. *Cel mai mult lapte din frigiderul ăsta e acru.
the more much milk in fridge-the this is sour.
b. *Cea mai multă mobilă din această casă e veche.
the$_{fem}$ more much$_{fem}$ furniture in this$_{fem}$ house is old.

Although she does not provide explicit examples, Szabolcsi [28] [27] makes it clear that the proportional reading of a *legtöbb* is disallowed with NP$_{mass}$[5].
The intended meanings of (10a-b) can be rendered by using partitive configurations of the type *the largest part of DP* (which are the closest counterparts of the English *most* of DP)[6]:

(11) Cea mai mare parte din untul din acest frigider e acru.
the more big part of butter-the in this fridge is sour.
'The largest part of/most of the butter in this fridge is sour'

Examples of this type (their Hungarian counterparts are also acceptable) obey the constraint in (5) - on a par with the English examples in (4) - because the complement of *the largest part* is a DP, which is an e-type expression.
In sum, the following generalizations hold in English, Romanian and Hungarian:

[2]Romanian superlatives are built like in the other Romance languages: the (strong form of the) definite article + *mai* 'more' +Adj, e.g., *cel$_{msg}$ mai bun unt* 'the$_{msg}$ more good butter' 'the best butter', *cele$_{fempl}$ mai bune eleve* 'the$_{fempl}$ more good$_{fempl}$ students$_{fempl}$ 'the best women students'.

[3]The fact that *sok* 'much', *több* 'more' and a *legtöbb* 'the most' are not marked as plural correlates with the fact that their NP complements, just like the complements of cardinals, are not plural marked in Hungarian, e.g., *három fiú* 'three boy' meaning 'three boys'.

[4]Anna Szabolcsi (p.c., November 10, 2012) observes that the example in (9) - which she kindly provided - 'is kind of okay, if I am saying this more in virtue of what I deduce from the fact that it's midnight now, than in virtue of having checked on the individual boys.' This comment is in line with Szabolcsi [28] [27], according to whom *a leggtöbb* is acceptable with count NPs, but only 'in generic contexts'. Whatever the fine-grained description of the data might be, the crucial point for our present purposes is that *a legtöbb* is allowed with NP$_{count}$.

[5]In both Romanian and Hungarian, relative superlative readings of *THE MOST NP$_{mass}$* are allowed, e.g., Romanian *Cine a băut cel mai mult vin?* and Hungarian *Ki ivott a legtöbb bort?* 'Who drank the most wine?'.

[6]In Romanian (as well as in Hungarian) the distinction between entity restrictors and set restrictors perfectly correlates with the distinction between partitive and non-partitive constituents. In line with Matthewson [22] I assume that partitive prepositions or Case markers are morphosyntactically motivated but do not bear on the semantics, i.e., they are expletive (*contra* Ladusaw [17], followed by others, who assumes that partitive prepositions apply to e-type expressions and yield <e,t> type). Anticipating on the discussion in § 2.3, it should be pointed out that the correlation between e-type denotation and morphosyntactic partitive marking breaks down in English, because (i) bare NPs can be either set-denoting (type <e,t>) or kind-denoting (type e) and (ii) regardless of their denotational type, bare NPs are not marked with a partitive preposition.

(12) a. MUCH/MANY$_{superl}$ NP$_{count}$ VP allows the proportional reading.
b. MUCH$_{superl}$ NP$_{mass}$ VP disallows the proportional reading.

2.2 The German puzzle

The German example in (13)[7] seems to go against (12b):

(13) Maria hat den meiste Kaffee weggewischt.
Maria has the most coffee wiped-away
(aber es ist noch ein bisschen in den Ecken geblieben).
Mary wiped away most of the coffee (but there is still a bit in some corners)'

This problem can be solved by adopting Roehrs' ([25]:107) hypothesis that in German the definite article raises to D^o from a low position labelled (Art(icle), which means that *der meiste NP* 'the most NP' is base-generated as *[meiste [$_{ArtP}$ der NP]]* '[most [$_{ArtP}$the NP]]'. Assuming that *der* is interpreted in the low position, example (13) turns out to obey the generalization in (5), since – at the relevant level of representation – *meiste* does not take NP (type <e,t>), but rather ArtP (type e) as a complement.

2.3 MOST in generic contexts

Romanian examples of the type in (14) contrast with their English counterparts in (15):

(14) a. *Cea mai multă apă e lichidă.
the more much water is liquid
b. *Cel mai mult lapte de capre bătrîne e acru.
the more much milk of goats old is sour.

(15) a. Most water is liquid.
b. Most milk from old goats is sour.

This contrast is parallel to the contrast in (16)-(17), which shows that bare NPs in argument positions can be kind-referring in English but not in Romanian [8], [9], [11], [7]:

(16) a. *Apă e lichidă.
Water is liquid
b. *Lapte de capre bătrîne e acru.
Milk of goats old is sour

(17) a. Water is liquid.
b. Milk from old goats is sour.

The two sets of contrasts can be correlated by assuming that kind-referring bare NPs are allowed in the complement position of MOST only if kind-referring bare NPs are allowed in argument positions. Kind-referring bare NPs [2] can be analyzed as DPs headed by a null Det with the semantics of Chierchia's [3] Down operator:

(18) *[$_{QP}$[$_{Q}$cea mai multă] [$_{NP}$apă]] e lichidă. (= (14a))
the more much water is liquid

(19) [$_{QP}$[$_{Q}$Most] [$_{DP}$[$_{Det}$Ø] [$_{NP}$water]]] is liquid. (= (15a))

[7]The judgments indicated in this section, due to Patricia Cabredo-Hoffherr and Barbara Hemforth, confirm the generalization reported in Szabolcsi [28] where the judgments are attributed to Lucas Champollion.

The contrast between (14) and (15) can now be explained on the basis of the generalization in (5). The English examples are acceptable because the restriction/complement position of MOST is filled with kind-referring (type e) mass bare NPs, i.e., DPs headed by a covert Down operator (see (19). The Romanian examples are ruled out because in this language bare NPs cannot be kind-referring (as indicated by the unacceptability of (16)); the only option is shown in (18), where [apă] is a genuine NP, a configuration that is ruled out by the ban against set-denoting restrictors[8].
Going back to the English examples in (2), repeated under (20), they are unacceptable because stage-level modifiers prevent bare NPs from referring to kinds (recall Carlson's observations regarding *parts of this machine*); *milk in this fridge* can only be analyzed as a set-denoting bare NP, which is ruled out by (5):

(20) a. *[$_{QP}$[$_{Q}$Most] [$_{NP}$milk in this fridge]] is sour.
b. *I shoveled most snow that was in this yard.
c. *Most mud that you traipsed in the house ended up on my rug.
d. *Most furniture in this house is broken.

Note that it is not modification *per se* that blocks kind-reference. Those modifiers that are compatible with kind-reference are allowed, in particular (certain) i-level predicates, e.g., *black* or *from old goats* in *black cats* or *milk from old goats*:

(21) a. Most black cats are intelligent.
b. Milk from old goats is sour.

Let us finally consider the examples in (22) from Matthewson [22], who attributes them to V. Dayal (p.c.):

(22) a. Most men who came to the party left early.
b. Most people at yesterday's rally were Democrats.
c. Most voters surveyed indicated that...
d. [context: Last night I threw a party and a bunch of linguists and philosophers got drunk]
Most linguists who got drunk merely passed out, but most philosophers who got plastered revealed interesting things about their colleagues.

The contrast between (20) and (22) cannot be explained by Matthewson's [22] assumption that the NP complement of *most* is always kind-referring[9]. I take this contrast to support (12a-b), showing that a set-denoting (type <e,t>) restrictor is allowed with count quantifiers but not with mass quantifiers (see § 3 for the explanation). The contrast in (23) provides further evidence in favor of the same generalization:

(23) a. I am sure most men will arrive late.
b. *I know most wine will be delivered late.

In this pair of examples the kind-reference of the restrictor is blocked by the s-level nature of the main predicate. We are again left with the only other possibility, a set-denoting restrictor, which is allowed with NP$_{count}$ but disallowed with NP$_{mass}$.
In sum, the contrast between MOST$_{count}$ and MOST$_{mass}$ can be observed in English only in non-generic contexts, more precisely in those contexts in which the kind-reference of the restrictor is blocked. In Romanian and Hungarian, on the other hand, the contrast can be observed even in generic contexts, because in these languages the NP-complements of MOST are always set-denoting. Which is allowed for count quantification, but not for mass quantification.

3 Towards an explanation

The fact that *most* is the superlative of *much/many* has lead Hackl [13] to propose that proportional *most* is not a quantificational Determiner (*contra* the Generalized Quantifier Theory (GQT) analysis) but rather an adjective (both syntactically and semantically). This analysis incorrectly predicts that (THE)

[8]The counterparts of (14) and (16) are also unacceptable in Hungarian.
[9]But see Crnic [4], who relies on heavy type-shifting combined with stipulated constraints.

MOST NP_{mass} can take a proportional reading[10]. The systematic contrast between the acceptability of the relative reading and the unacceptability of the proportional reading of (THE) MOST NP_{mass} can be explained if we assume (24a,b):

(24) a. On its relative reading, THE MOST is a superlative adjective.
b. On its proportional reading, (THE) MOST is a quantificational Det.

3.1 Set Quantification

According to the set-theoretical analysis of *most* [23] [24] examples of the type in (25) are true iff (26) is satisfied; ∩ notates the general lattice-theoretic operation 'meet' (intersection is meet applied to sets):

(25) Most students in my class have left early.

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

In words, (26) says that 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.
Let us now turn to the unacceptable example in (27), which illustrates the ban on applying the set-restrictor MOST to mass domains (capital X notates a variable that ranges over non atomic entities):

(27) *Most milk in the fridge is sour.

The condition in (28) - written on the model of (26) *modulo* cardinality being replaced by a measure function notated μ - is illegitimate (as indicated by #) because mass NPs denote non-atomic join semi-lattices [20] [18] and meet, which is required in (28), is not defined[11][12] on such a poor algebraic structure.

(28) $\#\ \mu\ (\{X: butter(X)\} \cap \{sour(X)\}) > \mu\ (\{X: butter(X)\} \cap \{not\text{-}sour(X)\})$

The unacceptability of (27) may thus be attributed to the fact that a condition of the type in (28) can be computed on count domains but not on mass domains. It is worth pointing out that the contrast between count and mass quantification is not related to the impossibility of counting. Cardinality is a particular measure function, and for the purposes of proportional quantification an unspecified measure function is sufficient (more on this below).

3.2 Entity-restrictor MOST

Turning now to the entity-restrictor MOST, I will assume that it denotes a relation between two entities [26] [21] [14], which are respectively supplied by the restrictor and by the maximal sum obtained by applying the $\sum$ operator to the predicate in the nuclear scope ($\sum$ is a nominalizing operator[13] that applies to a lattice structure and picks up the maximal element in that lattice)[14]. Given this analysis, (29) is true iff (30a) or (30b) is satisfied (which one of these is more appropriate is irrelevant here):

(29) Most of the milk in the fridge is sour.

(30) a. $\mu([[\text{the milk in the fridge}]] \cap \sum X.\ sour(X)) > 1/2\ \mu\ [[\text{the milk in the fridge}]]$

[10] This prediction is explicitly mentioned in Hackl [13] (footnote 9): 'Although I believe that the analysis of *most* given below can be straightforwardly extended to *much-est*, I will ignore proportional mass quantifiers here.' Hackl's [13] proposal is confronted with two further problems: (i) proportional *most* lacks *the* in English, whereas the relative superlative *most* requires *the*, e.g., *Who read the most books?* [15] [28] [6]; (ii) it cannot explain the fact that *le plus de NP* in French cannot take a proportional reading [6].

[11] This explanation is inspired by Szabolcsi & Zwarts [29], according to whom weak island violations are explained by the impossibility of performing the operations required by the weak island trigger on the domain of the extracted element. The general point is that a syntactically well-formed sentence is semantically unacceptable if computing it requires performing an operation on a structure for which the operation is not defined.

[12] The ban on quantifying over elements ordered by the part-of relation, which is currently invoked for quantification over situations (e.g., Kratzer [16]:169), can also be invoked [10] [7], but it merely restates the observation.

[13] Chierchia's 1998 Down operator strongly resembles Higginbotham's $\sum$ operator

[14] According to Higginbotham [14], the analysis in (30) explains the Homogeneity Constraint on mass quantification (e.g., **Most of this milk is heavy*) observed by Lønning [21]: the conditions in (30a-b) rely on the Sigma operator, which can apply to homogeneous predicates (*liquid*, *red*, etc.), because such predicates denote join semi-lattices, but not to non-homogeneous predicates (*heavy*, *cost 200 euros*, *intelligent*, etc.), because such predicates denote sets that are not ordered by the part-of relation, which do not have a supremum.

b. μ([[the milk in the fridge]] $\cap \sum$X. sour(X)) >
μ([[the milk in the fridge]] - [[the milk in the fridge]] $\cap \sum$X. sour(X))

The computations required in (30a-b) are legitimate because in these formulae meet applies to two mass entities (type e): [[the milk in the fridge]], i.e., the overall amount of milk in the fridge on the one hand and $\sum$X. sour(X), i.e., the maximal amount of sour stuff in the world.
As to the measure function μ on which (30a-b) rely, a particular choice of a measure unit (for the same dimension) does not affect truth conditions. We can even disregard canonical measure units (meters, liters, etc.) and use ratios in order to measure the parts of an object with respect to the object itself (this is possible because size is a ratio scale [19]): the measure of the whole (in this case [[the milk in this fridge]] is 1 and the measure of any part of the whole is a ratio r comprised between 0 and 1. In order to check whether (27) is true we need to calculate r = $\frac{\mathbf{vol}([[the-milk-in-this-fridge]] \cap \sum X.sour(X))}{vol([[the-milk-in-this-fridge]])}$; (27) is true iff r > $\frac{1}{2}$.
This type of computation is particularly useful for indeterminate/infinite entities such as kinds, which cannot be measured by using regular measure units. But since all we need is the measure of parts of kinds with respect to the kind itself, we can use ratios by taking the measure of the kind itself to be 1. Thus, (31) is true iff (32) is satisfied:

(31) Most milk from old goats is sour.

(32) r = $\frac{vol([[milk-from-old-goats]] \cap \sum X.sour(X))}{vol([[milk-from-old-goats]])}$ is bigger than $\frac{1}{2}$

4 Constraining the syntax-semantics mapping

My proposal confirms the view that mass quantifiers denote relations between entities rather than relations between sets. It is however worth stressing that the details of the analysis differ from previous implementations regarding the syntax-semantics mapping. Following Link [20], I have assumed that mass NPs denote non-atomic join semi-lattices, a type of denotation that is incompatible with set quantification (because meet is not defined on join semi-lattices). I have shown that examples of the relevant type, i.e., examples built with a mass NP in the complement position of MOST are unacceptable.
Such ungrammaticalities are expected neither on Lønning's [21] nor on Higginbotham's [14] assumptions regarding mass NPs. According to Lønning, mass NPs are peculiar in that they denote entities (type e) rather than sets of entities (type <e,t>), as count NPs do. This assumption predicts the crosslinguistic counterparts of MOST NP_{mass} to be acceptable, which is disconfirmed by the Romanian and Hungarian data examined in section 2. Inside English itself, examples of the type in (2), e.g., **Most milk in this fridge is sour*, are also incorrectly predicted to be acceptable: since according to Lønning [$_{NP}$*milk in this fridge*] denotes an entity (the overall amount of milk in this fridge), *most* should be able to denote the relation between this entity and the overall amount of sour stuff in the world.
According to Higginbotham [14], the sister of *most* is a mass NP (type <e,t>) that gets nominalized due to a default application of the Sigma operator:

(33) Most water is liquid.

(34) a. [[$_{NP}$water]] : the property of being water, i.e., the set of quantities of water (type <e,t>)
b. $\sum$ [[$_{NP}$water]] : the maximal sum of water (type e)

Although technically different from Lønning's assumptions regarding the syntax-semantics of mass NPs, Higginbotham's proposal is itself confronted with the problem of the crosslinguistic data in §2 and with the unacceptability of (2) in English: the default application of the Sigma operator in the restriction of MOST incorrectly predicts that mass quantification should always be acceptable.
In order to account for the observed unacceptabilities, type-shifting needs to be severely constrained:

(35) No type-shifting (no default application of $\sum$) in the restriction of quantifiers.

Given (35), the examples in (2) are unacceptable because mass NPs denote join semi-lattices and meet is not defined on join semi-lattices. Examples like (31) or (33) are on the other hand acceptable because they are built with kind-referring (type e) bare NPs and meet *can* apply to entities.

In sum, my analysis follows Lønning [21] and Higginbotham [14] in assuming that mass quantifiers denote relations between entities, but crucially differs from these authors regarding the syntax-semantics analysis of mass NPs and mass DPs. My proposal has the advantage of relying on the 'null hypothesis' regarding mass NPs: they are <e,t> type expressions that can be shifted to e-type denotation by applying a (overt or covert) Det[15].

What may seem unconstrained is the assumption of two types of MOST. I believe that the evidence is too compelling to avoid making this assumption. Besides the benefits invoked in the present paper, this hypothesis may shed new light on the analysis of other quantifiers, e.g., *all* and adverbs of quantification, including the GEN operator[16].

References

[1] A. Cardinaletti and G. Giusti. The syntax of quantified phrases and quantitative clitics. In Martin Everaert and Henk van Riemsdijk, editors, *The Blackwell Companion to Syntax*, volume V. Blackwell Publishing, 2006.

[2] GregN. Carlson. A unified analysis of the english bare plural. *Linguistics and Philosophy*, 1(3):413–457, 1977.

[3] Gennaro Chierchia. Reference to kinds across language. *Natural Language Semantics*, 6(4):339–405, 1998.

[4] Luka Crnic. On the (non-) cumulativity of cumulative quantifiers. In *Proceedings of Sinn und Bedeutung*, volume 14, pages 117–133, 2009.

[5] Carmen Dobrovie-Sorin. On the genericity of mass (in)definites. In CUNY, editor, *LSRL abstract*, New-York, 2013.

[6] Carmen Dobrovie-Sorin. Strong indefinites are not quantificational: proportional many vs most. *Revue roumaine de linguistique*, 2013.

[7] Carmen Dobrovie-Sorin and Claire Beyssade. *Redefining indefinites*, volume 85. Springer, 2012.

[8] Carmen Dobrovie-Sorin and Brenda Laca. Generic bare nps. *Unpublished manuscript*, 1996.

[9] Carmen Dobrovie-Sorin and Brenda Laca. La généricité entre la référence à l'espace et la quantification générique. In P. Sauzet, editor, *Langues et Grammaire*, volume 3, chapter Syntaxe, pages 163–177. Presses Universitaires de Vincennes, Saint-Denis, 1999.

[10] Carmen Dobrovie-Sorin, Alda Mari, et al. Generic plural indefinites: sums or groups? In *PROCEEDINGS-NELS*, volume 37, page 205, 2008.

[11] Donka F Farkas and Henriëtte De Swart. Article choice in plural generics. *Lingua*, 117(9):1657–1676, 2007.

[12] Brendan S Gillon. Towards a common semantics for english count and mass nouns. *Linguistics and philosophy*, 15(6):597–639, 1992.

[13] Martin Hackl. On the grammar and processing of proportional quantifiers: most versus more than half. *Natural Language Semantics*, 17(1):63–98, 2009.

[14] Jim Higginbotham. Mass and count quantifiers. *Linguistics and Philosophy*, 17(5):447–480, 1994.

[15] Sveta Krasikova. Definiteness in superlatives. In *Logic, language and meaning*, pages 411–420. Springer, 2012.

[16] Angelika Kratzer. Stage-level and individual-level predicates. *The generic book*, 125:175, 1995.

[17] William Ladusaw. Semantic constraints on the english partitive construction. In *Proceedings of WCCFL*, volume 1, pages 231–242, 1982.

[18] Fred Landman. *Structures for semantics*. Springer, 1991.

[19] Daniel Lassiter. Measurement and modality: The scalar basis of modal semantics. *New York: New York University dissertation*, 2011.

[20] Godehard Link. The logical analysis of plurals and mass terms: A lattice-theoretical approach. *Formal semantics: The essential readings*, pages 127–146, 2002.

[21] Jan Tore Lønning. Mass terms and quantification. *Linguistics and philosophy*, 10(1):1–52, 1987.

[22] Lisa Matthewson. Quantification and the nature of crosslinguistic variation. *Natural Language Semantics*, 9(2):145–189, 2001.

[15] I have left aside mass indefinite DPs, e.g., *much water*, *some water*, *one liter of water*, which are necessarily weak (in the sense of Milsark 1977) and are best analyzed as generalized existential quantifiers over amounts ([7]: 61-63).

[16] According to Dobrovie-Sorin ([7], [5]), Q-adverbs are entity-quantifiers when they take bare plurals or definite plurals in their restriction and set-quantifiers when they are built with singular indefinites or with inherently plural indefinites [10] [7].

[23] Andrzej Mostowski. On a generalization of quantifiers. *Studies in Logic and the Foundations of Mathematics*, 93:311–335, 1979.

[24] Nicholas Rescher. Plurality quantification. *The Journal of Symbolic Logic*, 27:373–374, 1964.

[25] Dorian Roehrs. *Demonstratives and definite articles as nominal auxiliaries*, volume 140. John Benjamins, 2009.

[26] Peter Roeper. Semantics for mass terms with quantifiers. *Noûs*, 17(2):251–265, 1983.

[27] Anna Szabolcsi. Compositionality without word boundaries:(the) more and (the) most, 2012.

[28] Anna Szabolcsi. Wordless compositionality: case studies in quantification, 02 2012.

[29] Anna Szabolcsi and Frans Zwarts. Weak islands and an algebraic semantics for scope taking. *Natural language semantics*, 1(3):235–284, 1993.