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Comparison Across Domains in Delineation Semantics

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Abstract This paper presents a new logical analysis of quantity comparatives (i.e. *More linguists than philosophers came to the party.*) within the *Delineation Semantics* approach to gradability and comparison (McConnell-Ginet, 1973; Kamp, 1975; Klein, 1980), among many others. Along with the *Degree Semantics* framework (Cresswell, 1976; von Stechow, 1984; Kennedy, 1997, among many others), Delineation Semantics is one of the dominant logical frameworks for analyzing the meaning of gradable constituents of the adjectival syntactic category; however, there has been very little work done investigating the application of this framework to the analysis of gradability outside the adjectival domain. This state of affairs distinguishes the Delineation Semantics framework from its Degree Semantics counterpart, where such questions have been investigated in great deal since the beginning of the 21st century. Nevertheless, it has been observed (for example, by Doetjes (2011); van Rooij (2011c)) that there is nothing inherently adjectival about the way that the interpretations of scalar predicates are calculated in Delineation Semantics, and therefore that there is enormous potential for this approach to shed light on the nature of gradability and comparison in the nominal and verbal domains. This paper is a first contribution to realizing this potential within a Mereological extension of a simple version of the DelS system.

Keywords Delineation Semantics · Mereology · Comparatives · Plurality

1 Introduction

This paper presents a new logical analysis of **quantity** comparatives such as (1-a) and their relationship to adjectival or (what I will call) **quality** comparatives (1-b) within the *Delineation Semantics* (DelS) approach to gradability and comparison (McConnell-Ginet, 1973; Kamp, 1975; Klein, 1980), among many others.

(1) a. More linguists came to the party than stayed home to study.

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b. Sarah is taller than Mary.

Along with the *Degree Semantics* (DegS) framework (Cresswell, 1976; von Stechow, 1984; Kennedy, 1997, among many others), DelS is one of the dominant logical frameworks for analyzing the meaning of gradable constituents of the adjectival syntactic category; however, there has been very little work done investigating the application of this framework to the analysis of gradability outside the adjectival domain. This state of affairs distinguishes the DelS framework from its DegS counterpart, where such questions have been investigated in great deal since the beginning of the 21st century (Hackl, 2001; Bhatt and Pancheva, 2004; Rett, 2008; Wellwood et al, 2012, among many others). Nevertheless, it has been observed (for example, by Doetjes (2011); van Rooij (2011c)) that there is nothing inherently adjectival about the way that the interpretations of scalar predicates are calculated in DelS, and therefore that there is enormous potential for this approach to shed light on the nature of gradability and comparison in the nominal domains. This paper is a first contribution to realizing this potential within a Mereological extension of the DelS framework.

The paper is laid out as follows: in section 2, I outline the main ideas behind the Delineation approach to basic adjectival comparatives such as (2-a) and discuss the incorporation of an analysis of subcomparatives comparatives (such as (2-b)) into this system along the lines of van Rooij (2011b).

(2) a. Mary is more intelligent than John.
b. Mary is more intelligent than John is handsome.

Furthermore, in this section, I give a new DelS analysis of quality comparatives with attributive adjectives in both predicative position (3-a) and argument position (3-b).

(3) a. John is a taller man than Phil.
b. A taller man than Phil arrived.

Then, in section 3, I give a Mereological extension of the DelS system presented in section 2. I show how the main insights of the DelS analysis of gradability and comparison in the adjectival domain can be transposed to the nominal domain and how the proposed analysis captures the empirical properties of nominal comparatives that have been observed in the linguistics literature. In particular, I propose analyses for both count (4-a) and mass (4-b) comparatives.

(4) a. More beers are in the fridge than on the table.
b. More beer is in the fridge than on the table.

Section 4 concludes and provides some remarks concerning the parallels between the nominal and adjectival domains, and directions for future research.

2 Delineation Semantics for Quality Comparatives

This section presents a Delineation semantics for a variety of quality comparatives, including **simple** comparatives (5-a), absolute subcomparatives (5-b) and relative subcomparatives (5-c).

(5) Predicative Comparatives
 a. John is **tall**er than Bill (is).
 b. This table is **long**er than that table is **wide**.
 c. Sarah is more **intelligent** than she is **beautiful**.

In addition to predicative position (5), analyses will also be given for sentences with (sub)comparatives in attributive position, both when the pertinent noun phrases appear in predicative position (6-a) and in argument position (6-b).

(6) Attributive Comparatives
 a. John is a taller man than Bill is.
 b. A taller man won the 100m dash than won the 800m run.

2.1 Quality Comparatives in Predicative Position

The proposal that there exists an analytical relationship between context-sensitivity and gradability lies at the heart of the Delineation approach to the semantics of scalar predicates; in particular, in this framework, the orderings associated with adjectival predicates (what are often called their *scales*) are derived from looking at how the denotation of these predicates vary according to a contextually given comparison class. In other words, for a predicate like *tall*, we draw an important link between the empirical observation that a person can be considered tall in one context (when compared to jockeys, for example), while not being considered tall in a different context (when compared to basketball players), and the observation that we can order individuals based on their tallness.

Formally speaking, the semantics (for a language with constants $(a, a_1, a_2, a_3 \ldots)$ and adjectival predicates $(P, P_1, P_2, P_3 \ldots$, nominal predicates $N, N_1, N_2, N_3 \ldots$ and verbal predicates $(V, V_1, V_2, V_3 \ldots)))$ is set up as follows :

Definition 1 Model. A model is a tuple $M = \langle D, [\![\cdot]\!] \rangle$ where D is a non-empty domain of individuals, and $[\![\cdot]\!]$ is a function from pairs consisting of a member of the non-logical vocabulary and a comparison class (a subset of the domain) satisfying:

- For each individual constant a_1, $[\![a_1]\!] \in D$.
- ... (to be continued)

In this paper, I will follow Bresnan (1973)'s classic proposal, which has recently been revived and extended in works such as van Rooij (2011a) and Wellwood (2014), which holds that the syntax of even the basic use of the positive form of adjectives is a bit more complicated than it first appears. In particular, I propose that gradable adjectives combine with one of two **Q-adjectives**[1]: *much* or *little*.

[1] Along with *many* and *few*, *much* and *little* are called Q-**adjectives** because they can appear with degree modifiers (such as *very* and *so*) that otherwise only co-occur with expressions of the adjectival syntactic category.

(i) a. Very many linguists came to the party.
 b. So few philosophers stayed home.
 c. This much wine was drunk.

When the predicate combines with *much*, I assume that some version of Bresnan (1973)'s adjectival MUCH deletion rule (7) is operative in English.

(7) **Bresnan's MUCH deletion rule:**
$much \rightarrow \emptyset / [\ldots \_\_ \ A]_{AP}$
where A(P) = 'Adjective or Adverb (Phrase)'
(Bresnan, 1973, 278)

Furthermore, when the predicate combines with *little*, I assume that it is spelled out as its antonym. For example, the sequence *little tall* would be spelled out as *short*, the sequence *little beautiful* would be spelled out as *ugly*, etc.

(8) a. John is ~~much~~ tall.
b. John is ~~little tall~~ ⇒ short.

The remarks made above address questions of English syntax; however, for the purpose of our logic, scalar predicates will uniformly concatenate with MUCH/LITTLE in the language to form expressions of the form MUCHP_1, MUCHP_2, LITTLEP_1, LITTLEP_2, and so on.

In Delineation Semantics, the interpretations of gradable predicates and the formulas containing them are relativized to **comparison classes**. In classical instantiations of this framework (such as Klein (1980)), comparison classes are generally proposed to be simple subsets of the domain D; i.e. for each $X \subseteq D$ and for each predicate P, $[\![P]\!]_X \subseteq X$. In keeping with the more complicated syntactic assumptions that we are adopting, I follow (one of the ideas in) van Rooij (2011b) in proposing that comparison classes are sets of ⟨individual, adjective⟩ pairs. These sets of pairs aim to model the predicates that are pertinent in the context and the individuals who are relevant for determining the application of the pertinent predicates. The notion of 'pertinent predicates' in a context will be further elaborated in the next section; however, for the moment, we can define the set of comparison classes (CCs) of a model in Def. 2[2].

Definition 2 Comparison Classes (CCs). Let $M = \langle D, [\![\cdot]\!] \rangle$ be a model. The comparison classes (CCs) of M are all sets $X \subseteq D \times \mathbb{P}$, where $\mathbb{P}$ is the set of adjectival predicates in the language plus antonyms (predicates prefixed by LITTLE).

The interpretations of the Q-adjectives are relativized to comparison classes; that is, in their basic denotation, they denote subsets of a distinguished comparison class. The general idea behind this analysis is that MUCH[3] picks out those pairs whose first co-ordinates are individuals who have high amount of the property associated with the adjective, and LITTLE picks out those individuals who have a small amount of the property (as judged in the context).

d. Too little beer is left in the fridge.

[2] In this work, I assume that the predicates in comparison classes are simple adjectives (like *tall*), but, in principle, they could be more complex like *tall for a basketball player*.

[3] This semantic analysis follows rather closely van Rooij (2011b), who calls this function *Lots*, not MUCH. This analysis is also very similar to Wellwood (2014)'s analysis set within the Degree Semantics framework. Wellwood explicitly integrates her semantics with Bresnan's syntax, and therefore refers to this function as *much*. It is not clear from van Rooij's paper whether he has Bresnan's syntactic proposals in mind; therefore, I stress that this aspect of the proposal is my own (inspired by Wellwood).

Definition 3 Interpretation of Q-adjectives. For all comparison classes $X \subseteq D \times \mathbb{P}$,

1. $[\![\textsc{much}]\!]_X \subseteq X$.
2. $[\![\textsc{little}]\!]_X \subseteq X$.

When they appear in the adjectival domain, Q-adjectives combine with scalar adjectives, which serve to restrict the comparison class to only those pairs that have the adjective in question as their second co-ordinate, as shown in 4.

Definition 4 Interpretation of QPs. Let P_1 be an adjectival predicate and let $X \subseteq D \times \mathbb{P}$ be a comparison class. Then,

1. $[\![\textsc{much}P_1]\!]_X = \{\langle a, P\rangle \in [\![\textsc{much}P_1]\!]_X \ \&\ P = P_1\}$.
2. $[\![\textsc{little}P_1]\!]_X = \{\langle a, P\rangle \in [\![\textsc{little}P_1]\!]_X \ \&\ P = P_1\}$.

The truth of formulas containing adjectival predicates and Q-adjectives are likewise given with respect to a comparison class.

Definition 5 Interpretation of the Positive Form. For all models M[4], $a_1 \in D$, adjectival predicates P_1, and comparison classes $X \subseteq D \times \mathbb{P}$,

1. $[\![\textsc{much}P_1(a_1)]\!]_{X,M} = \begin{cases} 1 & \text{if } [\![a_1]\!]_M \in \{a : \langle a, P_1\rangle \in [\![\textsc{much}P_1]\!]_{X,M}\} \\ 0 & \text{if } [\![a_1]\!]_M \in \{a : \langle a, P_1\rangle \in [\![\textsc{little}P_1]\!]_{X,M}\} \\ i & \text{otherwise} \end{cases}$
2. $[\![\textsc{little}P_1(a_1)]\!]_{X,M} = \begin{cases} 1 & \text{if } [\![a_1]\!]_M \in \{a : \langle a, P_1\rangle \in [\![\textsc{little}P_1]\!]_{X,M}\} \\ 0 & \text{if } [\![a_1]\!]_M \in \{a : \langle a, P_1\rangle \in [\![\textsc{much}P_1]\!]_{X,M}\} \\ i & \text{otherwise} \end{cases}$

In this version of the system, we treat formulas that contain either borderline cases of a predicate or constants whose interpretation is not included in a pair in the comparison class as indefinite. Although I find this natural, it is not necessary, and there are other possible ways to pursue a semantics in the way that I suggest without making use of a third truth value.

The analysis described above is a very simple analysis of the use of sentences containing positive gradable adjectives like *John is tall* and *Mary is short*. This being said, at the moment, we have not put any constraints on how the denotations of Q-adjectives can vary across comparison classes, and so, as it stands, we would allow models in which, for example, we considered John tall and Mary short in one comparison class, and then, in another class, we consider Mary tall, and John short. Therefore, we must impose some extra constraints on the application of MUCH and LITTLE across classes.

The constraint set that I will adopt in this paper will be that of van Rooij (2011a)[5]. Van Rooij proposes the following four constraints (set in my notation):

For all predicates P_1, P_2, all comparison classes $X \subseteq D \times \mathbb{P}$, and all $a_1, a_2 \in D$,

[4] For readability considerations, I will often omit the model notation, writing only $[\![\cdot]\!]_X$ for $[\![\cdot]\!]_{X,M}$.

[5] Note that van Rooij proposes that this axiom set governs the context-sensitivity of relative adjectives like *tall, beautiful, expensive* etc., not Q-adjectives like *much.*

(9) **Contraries:**
$[\![\text{MUCH}]\!]_X \cap [\![\text{LITTLE}]\!]_X = \emptyset$.

(9) ensures that MUCH and LITTLE behave as contraries.

(10) **No Reversal:**
If $\langle a_1, P_1\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{LITTLE}]\!]_X$, then there is no $X' \subseteq D \times \mathbb{P}$ such that $\langle a_1, P_1\rangle \in [\![\text{LITTLE}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{MUCH}]\!]_X$.

(10) ensures that, if in one comparison class, a_1 is categorized as having much P_1 and a_2 is categorized as having little P_1, then there are no comparison classes in which this categorization is reversed.

(11) **Upward Difference:**
If $\langle a_1, P_1\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{LITTLE}]\!]_X$, then, for all $X' : X \subseteq X'$, there are some $\langle a_3, P_3\rangle, \rangle a_4, P_4\rangle$ such that $\langle a_3, P_3\rangle \in [\![\text{MUCH}]\!]_{X'}$ and $\langle a_4, P_4\rangle \in [\![\text{LITTLE}]\!]_{X'}$.

(11) says that, if, in one comparison class, it is reasonable to make a distinction between a_1 and a_2, then, in all larger comparison classes that contain $\langle a_1, P_1\rangle$ and $\langle a_2, P_2\rangle$, we must continue to make **some** distinction (although not necessarily the same one). This axiom can be thought of as a principle of contrast preservation in categorization.

(12) **Downward Difference:**
If $\langle a_1, P_1\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{LITTLE}]\!]_X$, then, for all $X' \subseteq X$, if $\langle a_1, P_1\rangle, \langle a_2 P_2\rangle \in X'$, then there is some $\langle a_3, P_3\rangle, \langle a_4, P_4\rangle$ such that $\langle a_3, P_3\rangle \in [\![\text{MUCH}]\!]_{X'}$ and $\langle a_4, P_4\rangle \in [\![\text{LITTLE}]\!]_{X'}$.

(12) is another principle of contrast preservation which states that, if we make a distinction between $\langle a_1, P_1\rangle$ and $\langle a_2, P_2\rangle$ in one comparison class, then in all smaller comparison classes that include $\langle a_1, P_1\rangle$ and $\langle a_2, P_2\rangle$, we must continue to make some distinction (although, again, not necessarily the same one).

In the Delineation approach to the semantics of scalar predicates, the gradability of an adjective is a direct consequence of its context-sensitivity. In particular, we can define (what I will call) **positive** or **negative** ordering relations ($\succ^+$ / $\succ^-$) and similarity relations ($\sim^+, \sim^-$) based on $\succ^{+/-}$ as follows, based on Klein (1980); van Benthem (1982); van Rooij (2011a):

Definition 6 Implicit comparative ($\succ$) **and similarity** ($\sim$). For all pairs $\langle a_1, P_1\rangle, \langle a_2, P_2\rangle \in D \times \mathbb{P}$,

Positive Implicit Comparative/Similarity:

1. $\langle a_1, P_1\rangle \succ^+ \langle a_2, P_2\rangle$ iff there is some $X \subseteq D \times \mathbb{P}$ such that $\langle a_1, P_1\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{LITTLE}]\!]_X$.
2. $\langle a_1, P_1\rangle \sim^+ \langle a_2, P_2\rangle$ iff $\langle a_1, P_1\rangle \not\succ^+ \langle a_2, P_2\rangle$ and $\langle a_2, P_2\rangle \not\succ^+ \langle a_1, P_1\rangle$, but there is at least one $X \subseteq D \times \mathbb{P}$ such that $\langle a_1, P_1\rangle, \langle a_2, P_2\rangle \in X$.

Negative Implicit Comparative/Similarity:

3. $\langle a_1, P_1\rangle \succ^- \langle a_2, P_2\rangle$ iff there is some $X \subseteq D \times \mathbb{P}$ such that $\langle a_1, P_1\rangle \in [\![\text{LITTLE}]\!]_X$ and $\langle a_2, P_2\rangle \in [\![\text{MUCH}]\!]_X$.

4. $\langle a_1, P_1\rangle \sim^- \langle a_2, P_2\rangle$ iff $\langle a_1, P_1\rangle \not\succ^- \langle a_2, P_2\rangle$ and $\langle a_2, P_2\rangle \not\succ^- \langle a_1, P_1\rangle$, but there is at least one $X \subseteq D \times \mathbb{P}$ such that $\langle a_1, P_1\rangle, \langle a_2, P_2\rangle \in X$.

Van Rooij shows that with the constraint set in (9)-(12), the $\succ$ relations is a *semi-order*: irreflexive, semi-transitive[6] relations that satisfy the interval order property[7]. A pleasant consequence of this is that, van Rooij argues, we immediately have an analysis of the properties of modes of comparison that do not involve special degree morphology. For example, constructions in languages like English such as (13), which Kennedy (2007) calls (following Sapir (1944)) *implicit comparatives*, appear to use these weaker orders.

(13) Mary is tall, compared to John.

As Kennedy and van Rooij observe, for (13) to be true, Mary cannot be just marginally taller than John[8]; she must be clearly or significantly taller than him, as predicted by the definition of $\succ^+$ (restricted to the predicate *tall*). Furthermore, it has been suggested (by, for example, Beck et al (2009); Kennedy (2011); Bochnak (2013)) that the scales associated with adjectival predicates in some languages (such as Samoan or Washo), which have little to no overt degree morphology, have the same properties as the orderings used in implicit comparatives in English. Thus, I propose that the scales associated with adjectival predicates cross-linguistically must minimally have a semi-order structure, and that such semi-orders can be derived in a simple and elegant way through looking at how the extensions of positive and negative Q-adjectives can vary across contexts.

With these constructions, we can show how the (semi-order) comparative relations with relative adjectival predicates could be derived from their context-sensitivity; however, these proposals only begin to scratch the surface of the constructions and structures associated with comparison in languages like English, which have a wide range of overt degree morphology. The first observation that we can make is that comparisons formed with the comparative morpheme *-er/more* (or *less*)(14) have different properties than comparisons that do not involve this morphology. Observe that, in contrast to (13), for (14-a) to be true, Mary only needs to be slightly taller than John, not noticeably or significantly so.

(14) a. Mary is **taller** than John.
b. This problem is **more difficult** than that one.
c. John is **less** tall than Mary.
d. That problem is **less** difficult that that one.

In order to reflect the difference in the order, van Rooij proposes that the orders that are relevant for evaluating the truth of sentences with explicit comparative morphology in English are stronger than the ones given by definition 6, namely, they are **strict weak orders**: irreflexive, transitive and almost connected[9] relations.

[6] A relation R is **semi-transitive** just in case, for all a_1, a_2, a_3, a_4, if a_1Ra_2 and a_2Ra_3, then a_1Ra_4 or a_4Ra_3.

[7] A relation R satisfies the **interval order property** just in case, for all a_1, a_2, a_3, a_4, if a_1Ra_2 and a_3Ra_4, then a_1Ra_4 or a_2Ra_3.

[8] In the literature following Kennedy, we saw that (13) prohibits *crisp judgments*.

[9] A relation R is **almost connected** just in case, for all a_1, a_2, if a_1Ra_2, then for all a_3, a_1Ra_3 or a_3Ra_2.

As shown by Luce (1956), for every semi-order, there is a unique most refined strict weak order, which we will notate $>$ (for the corresponding semi-order $\succ$), and this order can be constructed as follows (for both positive and negative comparative relations):

Definition 7 Explicit scale. ($>$) For all $\langle a_1, a_2 \in D$ and $P_1, P_2 \in \mathbb{P}$,

(15) $\langle a_1, P_1\rangle >^+ \langle a_2, P_2\rangle$ iff there is some $\langle a_3, P_3\rangle \in D \times \mathbb{P}$ such that:
1.$\langle a_1 P_1\rangle \sim^+ \langle a_3, P_3\rangle$ and $\langle a_3, P_3\rangle \succ^+ \langle a_2, P_2\rangle$ **or**
2.$\langle a_2, P_2\rangle \sim^+ \langle a_3, P_3\rangle$ and $\langle a_1, P_1\rangle \succ^+ \langle a_3, P_3\rangle$.

(16) $\langle a_1, P_1\rangle >^- \langle a_2, P_2\rangle$ iff there is some $\langle a_3, P_3\rangle \in D \times \mathbb{P}$ such that:
1.$\langle a_1 P_1\rangle \sim^- \langle a_3, P_3\rangle$ and $\langle a_3, P_3\rangle \succ^- \langle a_2, P_2\rangle$ **or**
2.$\langle a_2, P_2\rangle \sim^- \langle a_3, P_3\rangle$ and $\langle a_1, P_1\rangle \succ^- \langle a_3, P_3\rangle$.

I therefore propose to add to the logical language the expression ER, which combines with constants and adjectival predicates, and whose interpretation is given as in Def. 8.

Definition 8 Explicit Comparative. Let a_1, a_2 be constants and let P_1, P_2 be predicates. Then,

1. $[\![\text{ER}^+(a_1, P_1, a_2, P_2)]\!]_X = 1$ iff $\langle a_1, P_1\rangle >^+ \langle a_2, P_2\rangle$.
2. $[\![\text{ER}^-(a_1, P_1, a_2, P_2)]\!]_X = 1$ iff $\langle a_1, P_1\rangle >^- \langle a_2, P_2\rangle$.

In other words, we could think of the English sentences in (17-a), (18-a) and (19-a) as having the (pseudo) logical forms in (17-b),(18-b) and (19-b).

(17) a. John is taller than Mary.
b. ER$^+$(John, *tall*, Mary, *tall*)

(18) a. John is shorter than Mary.
b. ER$^+$(John, LITTLE*tall*, Mary, LITTLE*tall*)

(19) a. John is less tall than Mary.
b. ER$^-$(John, *tall*, Mary, *tall*)

2.2 (In)Commensurability

Although the definitions above make reference to comparing individuals based on possibly different predicates, the most natural case (as illustrated by the examples *Mary is tall compared to John* and *John is taller than Mary (is)*) is when all the pairs that appear in the same comparison classes have the same second co-ordinate. That is, all of the individuals in the comparison class are being compared with reference to the same predicate, for example, *tall*. This is how things are done in classical Delineation semantics, where the comparative relations themselves are relativized to particular predicates (20-a).

(20) a. **Classical DelS:** $a_1 >_{P_1} a_2$
b. **This paper:** $\langle a_1, P_1\rangle > \langle a_2, P_1\rangle$

Important note: Since the majority of this paper focusses on positive comparatives, for readability, if there is no $\pm$ diacritic on the ordering relation, I assume that we are referring to the positive ordering (i.e. $\succ = \succ^+$).

Although, comparison with respect to a single predicate may be the default case, comparatives involving more than one adjective (a.k.a. *subcomparatives*) are possible, as shown in (21).

(21) a. This boat is **long**er than it is **wide**.
b. Our Norfolk pine is **tall**er than our ceiling is **high**.
Based on (Kennedy, 1997, 16).

This is, of course, allowed in our system: the sentences in (21) would be translated into the logical language as formulas such as those in (22).

(22) a. $\textsc{er}^+(a_1, P_1, a_1, P_2)$
b. $\textsc{er}^+(a_1, P_1, a_2, P_2)$

The challenge for this general approach is explain the well-known empirical observation[10] that not all combinations of adjectives are always possible in subcomparative constructions.

A widespread idea in the literature[11] is that use of a pair of adjectives in the explicit comparative is limited to those adjectives that are *commensurable*, i.e. compare individuals along the same scale or dimension. For example, comparatives that relate individuals based on different kinds of properties are often very strange, as shown by the examples in (23).

(23) a. #Larry is more tired than Michael is clever.
b. #My copy of *The Brothers Karamazov* is heavier than my copy of *The Idiot* is old.
(Kennedy, 1997, 16)

This being said, it is not the case that all instances of interadjectival comparison are ruled out. For example, while the pairing of *tired* and *clever* in (23) (said out of the blue) is bizarre, a pairing of *beautiful* and *intelligent* seems quite natural, as shown in the example in (24-a), from Bartsch and Vennemann (1972). Other examples of acceptable interadjectival comparisons (taken from Bale and Barner (2009), discussed in Doetjes (2011)) are shown in (24-b)-(24-c).

(24) a. Marilyn is more beautiful than she is intelligent.
b. If Esme chooses to marry funny but poor Ben over rich but boring Steve . . . Ben must be funnier than Steve is rich.
c. Although Seymour was both happy and angry, he was still happier than he was angry.

In this paper, I follow Doetjes (2011) in assuming that the basis of (in)commensurability is context-dependence. In particular, as Doetjes argues, interadjectival comparison of the kind shown above "requires the two adjectives to be semantically or contextually associated to one another" (Doetjes, 2011, 259).

[10] See (Bartsch and Vennemann, 1972; Klein, 1980; Bierwisch, 1989; Klein, 1991; Kennedy, 1997; Bale, 2008; Doetjes, 2011, among many others).
[11] See Morzycki (in press) for a recent review.

For example, while there is no conventional relation between being tired and being clever (or being heavy and being old), there is one between being intelligent and being beautiful. Furthermore, Doetjes shows that, when the context becomes appropriate, subcomparatives can be formed with adjectives such as *heavy*, as shown in (25).

(25) a. We bought the last Hungarian peaches, 4 in 800 grams (and as **juicy** and **aromatic** as they are **heavy**).
b. Luckily, the meal was as **tasty** as it was **heavy**.
(Doetjes, 2011, 260) (translations of Dutch examples from the internet)

In sum, the generalization concerning (in)commensurability seems to be that interadjectival comparisons are possible just in case the predicates being used in them are salient in the context (because of convention or discourse). Cases of licensing of an interadjectival comparative by context can sometimes be quite extreme as shown in (26), where, according to Doetjes (p.260), this use of a relative comparative "insists on the silence of the willows by comparing it to a contextually salient property that is known to hold to a high degree."

(26) The willows are even more silent than they are bent.
(Doetjes, 2011, 260) (translation of a line from a poem by Gaston Burssens)

With this in mind, the analysis of (in)commensurability adopted in this paper is quite straightforward: the context determines which ⟨individual, predicate⟩ pairs appear in which comparison classes; that is, the set of comparison classes in the model is only a **principled subset** of $\mathcal{P}(D \times \mathbb{P})$. The basic idea is that if $\langle a_1, P_1\rangle$ and $\langle a_2, P_2\rangle$ are both in a comparison class X, this is because it makes sense (in the context) to treat P_1 and P_2 as sufficiently similar such that we can establish an ordering between $\langle a_1, P_1\rangle$ and $\langle a_2, P_2\rangle$ using the MUCH and LITTLE predicates. Thus, while $\langle a_1$, tired$\rangle$ may never appear in a comparison class with $\langle a_2$,clever$\rangle$, there may be comparison classes in which $\langle a_1$,beautiful$\rangle$ and $\langle a_2$,intelligent$\rangle$ cooccur, and MUCH and LITTLE make some distinction between them.

This analysis of (in)commensurability can also be applied to what are called *cross-polar nomalies* (Büring, 2007) such as (27).

(27) a. Unfortunately, the ladder was shorter than the house was high.
b. My yacht is shorter than yours is wide.
c. Your dinghy should be shorter than your boat is wide (otherwise you'll bump into the bulkhead all the time).
(Büring, 2007, 2)

However, we would still need an extra constraint on comparison classes to rule out the case where both a positive adjective and its direct antonym appear in the same comparison class, as in an example like (28)[12].

(28) # John is taller than Mary is short.

[12] Büring also makes the empirical proposal that cross-polar comparatives of the form $A^{+}er$ than A^{-} are impossible; however, I consider this to be more of a preference rather than a grammatical constraint, since, for example, (26) features a relative comparative with a positive (total) adjective (*silent*) paired with a negative (partial) adjective (*bent*).

In the rest of this section, we will restrict our attention to comparatives and subcomparatives involving a single adjectival predicate.

2.3 Quality Comparatives in Attributive Position

The previous sections dealt with quality comparison constructions in which the comparative is the main predicate of the sentence; however, the positive and comparative forms of a gradable adjective can also appear in attributive position, where they modify a noun (29).

(29)
a. John is a **tall** man.
b. John is a **short** man.
c. John is a **taller** man than Phil.
d. John is a **less tall** man than Phil.

In order to account for the sentence in (29-a), I propose that adjectives phrases (predicates of the $P, P_1, P_2 \ldots$ series prefixed by MUCH or LITTLE) combine with nouns (predicates of the $N, N_1, N_2 \ldots$ series) to form noun phrases (NPs) of the form $(\text{MUCH}P_1) \circ N_1$ and $(\text{LITTLE}P_1) \circ N_1$. These NP constituents can combine with constants to form formulas of the form $(\text{MUCH}P_1) \circ N_1(a_1)$ and $(\text{LITTLE}P_1) \circ N_1(a_1)$, which would be the translations of (29-a) and (29-b), respectively.

For the semantics, I propose that nominal predicates denote subsets of the domain (i.e. $[\![N_1]\!] \subseteq D$) [13]. Furthermore, I propose that combining an adjective phrase with a nominal predicate does two things. Firstly, it restricts the denotation of the adjective phrase to only those pairs whose first co-ordinate appears in the denotation of the noun. Secondly, it changes the content of the comparison class: it concatenates the appropriate nominal predicate to the predicate co-ordinate of the pairs in the comparison class.

Important Note: In what follows, for readability considerations, I will often give only the definitions for adjective phrases containing MUCH, under the understanding that the definitions for constituents containing LITTLE are parallel (modulo substituting LITTLE for MUCH).

First, we construct the NP comparison classes in the following way:

Definition 9 NP Comparison Classes. Let P_1, N_1 be adjectival and nominal predicates respectively, and let $X \subseteq D \times \mathbb{P}$ be an adjectival comparison class. Then, the corresponding NP comparison class (notated $X \circ N_1$) is constructed in the following way:

1. If $\langle a_1, P_1 \rangle \in X$ and $a_1 \in [\![N_1]\!]$, then $\langle a_1, P_1 \circ N_1 \rangle \in X \circ N_1$.
2. Nothing else is in $X \circ N_1$.

Then, we define the interpretation of noun phrases (i.e. *tall man*) as shown in Def. 10.

[13] In this paper, I assume for convenience that nouns are not gradable. This is clearly false and, indeed, I believe that the Delineation framework and the methods developed here would allow for an interesting application to the analysis of gradable nouns like *idiot, heap* and *disaster* (see Morzycki, 2009, for a recent DegS proposal). However, I leave this extension to future work.

Definition 10 Interpretation of NPs For all $X \subseteq D \times \mathbb{P}$, all adjectival and nominal predicates P_1, N_1 respectively.

(30) $[\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}$ is the set of pairs $\langle a_1, P_1 \circ N_1\rangle$ such that:
1. $\langle a_1, P_1 \circ N_1\rangle \in X \circ N_1$
2. $\langle a_1, P_1\rangle \in [\![\textsc{much}P_1]\!]_X$

(31) $[\![(\textsc{little}P_1) \circ N_1]\!]_{X \circ N_1}$ is the set of pairs $\langle a_1, P_1 \circ N_1\rangle$ such that:
1. $\langle a_1, P_1 \circ N_1\rangle \in X \circ N_1$
2. $\langle a_1, P_1\rangle \in [\![\textsc{little}P_1]\!]_X$

Finally, the interpretation of formulas containing predicative noun phrases is given in Def. 11.

Definition 11 Predicative Noun Phrases. Let $X \subseteq D \times \mathbb{P}$, let P_1, N_1 be adjectival and nominal predicates respectively, and let a_1 be a constant. Then,

$$[\![(\textsc{much}P_1) \circ N_1(a_1)]\!]_{X \circ N_1} = \begin{cases} 1 & \text{if } [\![a_1]\!] \in \{a : \langle a, P_1 \circ N_1\rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}\} \\ 0 & \text{if } [\![a_1]\!] \in \{a : \langle a, P_1 \circ N_1\rangle \in [\![(\textsc{little}P_1) \circ N_1]\!]_{X \circ N_1}\} \\ i & \text{otherwise} \end{cases}$$

$$[\![(\textsc{little}P_1) \circ N_1(a_1)]\!]_{X \circ N_1} = \begin{cases} 1 & \text{if } [\![a_1]\!] \in \{a : \langle a, P_1 \circ N_1\rangle \in [\![(\textsc{little}P_1) \circ N_1]\!]_{X \circ N_1}\} \\ 0 & \text{if } [\![a_1]\!] \in \{a : \langle a, P_1 \circ N_1\rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}\} \\ i & \text{otherwise} \end{cases}$$

To account for implicit and explicit comparatives formed with predicative noun phrases such as (32-a) and (32-b), we can define the orderings used in this construction in an exactly parallel way to the implicit comparative relations with simple predicative adjective phrases, as shown in Def. 12[14].

(32) a. John is a tall man, compared to Phil.
b. John is a taller man than Phil.

Definition 12 NP Comparative Relations ($\succ$ / $>$).

1. $\langle a_1, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$ iff there is some $X \subseteq D \times \mathbb{P}$ such that:

   $\langle a_1, P_1 \circ N_1\rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}$ and $\langle a_2, P_1 \circ N_1\rangle \in [\![(\textsc{little}P_1) \circ N_1]\!]_{X \circ N_1}$

2. $\langle a_1, P_1 \circ N_1\rangle > \langle a_2, P_1 \circ N_1\rangle$ iff there is some $\langle a_3, P_1 \circ N_1\rangle$ such that:
   (a) $\langle a_1 P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$ **or**
   (b) $\langle a_2, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_1, P_1 \circ N_1\rangle \succ \langle a_3, P_1 \circ N_1\rangle$.

Correspondingly, the interpretation of the explicit comparative construction (32-b) is shown in (33).

(33) $[\![\textsc{er}^+(a_1, P_1 \circ N_1, a_2, P_2 \circ N_1)]\!]_{X \circ N_1} = 1$ iff $\langle a_1, P_1 \circ N_1\rangle >^+ \langle a_2, P_2 \circ N_1\rangle$.

[14] Where similarity is defined as in Def. 6.

In addition for allowing for an analysis of both explicit and implicit comparatives, these definitions make certain predictions concerning the interpretations of these constructions compared to simple predicative uses of comparatives. For example, for two individuals to be compared with respect to being a *tall man*, they must both appear in the denotation of *man* (see Bresnan, 1973, among others); that is, (34) is strange (under the assumption that *Mary* names an individual who identifies as a woman).

(34) ?John is a taller man than Mary.

This inference is predicted by the analysis, as shown by Theorem 1[15].

Theorem 1 ***NP Restriction.***

$$\textit{If } [\![\text{ER}^+(a_1, P_1 \circ N_1, a_2, P1 \circ N_1)]\!]_{X \circ N_1} = 1, \textit{ then } \{a_1, a_2\} \subseteq [\![N_1]\!].$$

More generally, we see connections between the scales associated with adjectival predicates (modified by Q-adjectives) and scales associated with NPs. In particular, Theorem 2 holds[16].

Theorem 2 *If* $[\![\text{ER}^+(a_1, P_1 \circ N_1, a_2, P1 \circ N_1)]\!]_{X \circ N_1} = 1$, *then* $\langle a_1, P_1\rangle > \langle a_2, P_1\rangle$.

In other words, we correctly predict that if John is a taller man than Phil, then John is taller than Phil.

2.4 Quality Comparatives in Argument Position

In addition to appearing in predicative indefinite noun phrases, quality comparatives can also appear in existential determiner phrases (DPs) in argument position, such as (36)[17].

(35) A tall man arrived/won the 100m dash.

[15] Proof: Suppose $[\![\text{ER}^+(a_1, P_1 \circ N_1, a_2, P1 \circ N_1)]\!]_{X \circ N_1} = 1$. Then $\langle a_1, P_1 \circ N_1\rangle > \langle a_2, P_1 \circ N_1\rangle$. So there is some $\langle a_3, P_1 \circ N_1\rangle$ such that $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$ or $\langle a_2, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_1, P_1 \circ N_1\rangle \succ \langle a_3, P_1 \circ N_1\rangle$. Without loss of generality, suppose $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$. Then there is some X such that $\langle a_3, P_1 \circ N_1\rangle \in [\![(\text{MUCH}P_1) \circ N_1]\!]_{X \circ N_1}$ and $\langle a_2, P_1 \circ N_1\rangle \in [\![(\text{LITTLE}P_1) \circ N_1]\!]_{X \circ N_1}$. Since $\langle a_2, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle$ are in $X \circ N_1$, by Def. 9, $a_2, a_3 \in [\![N_1]\!]$. Likewise, since $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$, there is some comparison class $X' \circ N_1$ such that $\langle a_1, P_1 \circ N_1\rangle, \langle a_3, P_1 \circ N_1\rangle \in X' \circ N_1$. So, by Def. 9, $a_1 \in [\![N_1]\!]$. □

[16] Proof: Suppose $[\![\text{ER}^+(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)]\!]_{X \circ N_1} = 1$. Then $\langle a_1, P_1 \circ N_1\rangle > \langle a_2, P_1 \circ N_1\rangle$. So there is some $\langle a_3, P_1 \circ N_1\rangle$ such that $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$ or $\langle a_2, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_1, P_1 \circ N_1\rangle \succ \langle a_3, P_1 \circ N_1\rangle$. Without loss of generality, suppose $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$ and $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$. Since $\langle a_3, P_1 \circ N_1\rangle \succ \langle a_2, P_1 \circ N_1\rangle$, there is some comparison class X such that $\langle a_3, P_1 \circ N_1\rangle \in [\![(\text{MUCH}P_1) \circ N_1]\!]_{X \circ N_1}$ and $\langle a_2, P_1 \circ N_1\rangle \in [\![(\text{LITTLE}P_1) \circ N_1]\!]_{X \circ N_1}$. By Def. 10, $\langle a_3, P_1\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, P_1\rangle \in [\![\text{LITTLE}]\!]_X$. Since $\langle a_1, P_1 \circ N_1\rangle \sim \langle a_3, P_1 \circ N_1\rangle$, $\langle a_1\rangle \sim \langle a_3, P_1\rangle$. So $\langle a_1, P_1\rangle > \langle a_2, P_2\rangle$. □

[17] In this work, I will only discuss comparatives in existential DP subjects. The extension to other argument positions (such as the direct object position (i)) is straightforward.

(i) Mary saw a taller man than John.

(36) a. A taller man than John arrived.
b. A taller man won the 100m dash than won the 800m run.

Following the work done in the *Generalized Quantifier* framework (Barwise and Cooper, 1981; Keenan and Stavi, 1986, among many others), I assume that phrases in argument position denote *generalized quantifiers* (GQs): properties of properties, and that these GQs are constructed in sentences like (35) through the use of an existential determiner expression $\exists$. $\exists$ combines with an NP (containing a Q-adjective) to form a *determiner phrase* (DP) such as $\exists(\textsc{much}P_1)\circ N_1$, which then combines with members of a set of intransitive verbal predicates $(V, V_1, V_2, V_3 \ldots)$ to form formulas of the form $\exists(\textsc{much}P_1)\circ N_1(V_1)$. Now, how are these expressions interpreted?

First of all, I assume that, like nominal predicates, verbal predicates denote subsets of the domain (i.e. for all verbal predicates V_1, $[\![V_1]\!] \subseteq D$). As for the denotations of DPs, I propose that the grammar allows (at least) two options, for their interpretation: what we might call the *non-gradable* vs *gradable* interpretations of these constituents. On the non-gradable interpretation of a sentence like (35), it is (broadly speaking) asserted that the intersection of the set of individuals who are taller than John and the set of arrivers is non-empty; that is, that there is some man (who is taller than John) who arrived.

Definition 13 Non-gradable interpretation of DPs Let $X \subseteq D \times \mathbb{P}$ and let P_1, N_1 be adjectival and nominal predicates respectively. Then,

$$[\![\exists(\textsc{much}P_1)\circ N_1]\!]_{X\circ N_1} = \{V : V \cap \{a : \langle a, P_1 \circ N_1\rangle \in [\![(\textsc{much}P_1)\circ N_1]\!]_{X\circ N_1}\} \neq \emptyset\}$$

Truth of a formula on the non-gradable interpretation of the DP is given as in Generalized Quantifier Theory.

(37) $[\![\exists(\textsc{much}P_1)\circ N_1(V_1)]\!]_{X\circ N_1} = 1$ iff $[\![V_1]\!] \in [\![\exists(\textsc{much}P_1)\circ N_1]\!]_{X\circ N_1}$

In the gradable interpretation, the comparison classes associated with the Q-adjective are extended in a similar (but not identical way) to the comparison classes associated with NPs. In particular, I propose that the comparison classes associated with DPs are constructed with reference to the comparison classes associated with their embedded Q-adjective. In particular, we will use what Dowty et al (1987) call the *existential sublimation* of the comparison class X associated with the adjective: the family of properties that have a non-empty intersection with X.

(38) **Existential Sublimation**
Let $X \subseteq D$ be any set. Then the **existential sublimation** of X ($\bigvee X$) is the family of sets defined as:

$$\bigvee X = \{X_1 : X_1 \subseteq D \ \&\ X \cap X_1 \neq \emptyset\}$$

The construction of DP comparison classes (written $\exists X \circ N_1$, for some nominal predicate N_1) thus proceeds in two steps: 1) for every individual a in a pair in $X \circ N_1$, we take its existential sublimation ($\bigvee\{a\}$); 2) for every property in $\bigvee\{a\}$, we pair it with a's NP predicate prefixed with the existential symbol ($\exists P \circ N_1$).

Definition 14 DP Comparison Classes. Let $X \subseteq D \times \mathbb{P}$ and let P_1, N_1 be adjectival and nominal predicates respectively. Suppose $X \circ N_1$ is an NP comparison class. Then the corresponding DP comparison class (notated $\exists X \circ N_1$) is constructed as follows:

1. If $\langle a_1, P_1 \circ N_1 \rangle \in X \circ N_1$, then for all $V \in \bigvee\{a_1\}$, $\langle V, \exists P_1 \circ N_1 \rangle \in \exists X \circ N_1$.
2. Nothing else is in $\exists X \circ N_1$

Gradable interpretations of DPs are calculated using these comparison classes, as shown in Def. 15, and the truth of formulas under this interpretation is given in the natural way, as shown in Def. 16.

Definition 15 Gradable Interpretation of DPs. Let $X \subseteq D \times \mathbb{P}$ and let P_1, N_1 be adjectival and nominal predicates respectively.

(39) $[\![\exists(\textsc{much}P_1) \circ N_1]\!]_{\exists X \circ N_1}$ = the set of pairs $\langle V_1, \exists P_1 \circ N_1 \rangle$ such that:
1.$\langle V_1, \exists P_1 \circ N_1 \rangle \in \exists X \circ N_1$
2.$V_1 \cap \{a : \langle a, P_1 \circ N_1 \rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}\} \neq \emptyset$

(40) $[\![\exists(\textsc{little}P_1) \circ N_1]\!]_{\exists X \circ N_1}$ = the set of pairs $\langle V_1, \exists P_1 \circ N_1 \rangle$ such that:
1.$\langle V_1, \exists P_1 \circ N_1 \rangle \in \exists X \circ N_1$
2.$V_1 \cap \{a : \langle a, P_1 \circ N_1 \rangle \in [\![(\textsc{little}P_1) \circ N_1]\!]_{X \circ N_1}\} \neq \emptyset$

Definition 16 Gradable Interpretation of Formulas. Let $X \subseteq D \times \mathbb{P}$ and let P_1, N_1, V_1 be adjectival, nominal and verbal predicates respectively.

$$[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{\exists X \circ N_1} = 1 \text{ iff } [\![V_1]\!] \in \{V : \langle V, \exists P_1 \circ N_1 \rangle \in [\![\exists(\textsc{much}P_1) \circ N_1]\!]_{\exists X \circ N_1}\}$$

We now have two ways of interpreting existential DPs containing Q-adjectives in attributive position; however, we can show that these are equivalent, at least when it comes to basic sentences like *A tall man arrived.* This is stated as Theorem 3[18].

Theorem 3 $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{\exists X \circ N_1} = 1$ *iff* $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{X \circ N_1} = 1$

For a sentence like (41), we will use what I called the *non-gradable* interpretation, but first, we need a way of interpreting a comparative inside a DP restriction.

(41) A taller man than John arrived.

In order to do this, we will adopt the following notation and interpretation:

(42) **DP Internal Comparative Shift:**
Let $\textsc{er}^+(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)$ be a formula.
Then let $\textsc{er}^+(P_1 \circ N_1, a_2, P_1 \circ N_1)$ be a predicate such that:

$$[\![\textsc{er}^+(P_1 \circ N_1, a_2, P_1 \circ N_1)]\!]_{X \circ N_1} = \{a : [\![\textsc{er}^+(a, P_1 \circ N_1, a_2, P_1 \circ N_1)]\!]_{X \circ N_1} = 1\}$$

[18] Proof: $\Rightarrow$ Suppose $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{\exists X \circ N_1} = 1$. Then, by Def. 16, $\langle [\![V_1]\!], \exists P_1 \circ N_1 \rangle \in [\![\exists(\textsc{much}P_1) \circ N_1]\!]_{\exists X \circ N_1}$. So, by Def. 15, $[\![V_1]\!] \cap \{a : \langle a, P_1 \circ N_1 \rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}\} \neq \emptyset$. Therefore, by Def. 13, $[\![V_1]\!] \in [\![\exists(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}$, and so $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{X \circ N_1} = 1$. $\Rightarrow$ Suppose $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{X \circ N_1} = 1$. So $[\![V_1]\!] \in [\![\exists(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}$. By Def. 13, $[\![V_1]\!] \cap \{a : \langle a, P_1 \circ N_1 \rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}\} \neq \emptyset$. So there is some $a_1 \in [\![V_1]\!]$ such that $\langle a_1, P_1 \circ N_1 \rangle \in [\![(\textsc{much}P_1) \circ N_1]\!]_{X \circ N_1}$. Since $\{a_1\} \subseteq [\![V_1]\!]$ and $[\![V_1]\!] \in \bigvee\{a_1\}$. So, by Def. 14, $\langle [\![V_1]\!], \exists P_1 \circ N_1 \rangle \in \exists X \circ N$, and $\langle [\![V_1]\!], \exists P_1 \circ N_1 \rangle \in [\![\exists(\textsc{much}P_1) \circ N_1]\!]_{\exists X \circ N_1}$. Therefore, by Def. 16, $[\![\exists(\textsc{much}P_1) \circ N_1(V_1)]\!]_{\exists X \circ N_1} = 1$. $\square$

And now, using the non-gradable interpretation of the existential quantifier (the one that does not involve the existential sublimation transformation of comparison classes), we have a straightforward analysis for (41) using the formula $\exists(\text{ER}^+(P_1 \circ N_1, a_2, P_1 \circ N_1))(V_1)$. In other words, using a formula where the existential quantifier takes scope over the comparative.

(43) $[\![\exists(\text{ER}^+(P_1 \circ N_1, a_2, P_1 \circ N_1))(V_1)]\!]_{X \circ N_1} = 1$ iff
$\{a : [\![\text{ER}^+(a, P_1 \circ N_1, a_2, P_1 \circ N_1)]\!]_{X \circ N_1} = 1\} \cap [\![V_1]\!] \neq \emptyset$

On the other hand, in order to interpret a sentence like (44), we must use what I have called the *gradable* interpretation.

(44) A taller man won the 100m dash than won the 800m run.

Using Def. 15, we can assign scales to existential DPs in the same way that we assigned them to adjectives and NPs, as shown in Def. 17. The major difference is that instead of ordering pairs of individuals and adjectival (or NP) predicates, we are ordering properties and NP predicates.

Definition 17 DP Comparative Relations ($\succ$ / $>$). For all adjectival, nominal and verbal predicates P_1, N_1, V_1, V_2,

1. $\langle V_1, \exists P_1 \circ N_1\rangle \succ \langle V_2, \exists P_1 \circ N_1\rangle$ iff there is some $X \subseteq D \times \mathbb{P}$ such that: $\langle V_1, \exists P_1 \circ N_1\rangle \in [\![\exists(\text{MUCH}P_1) \circ N_1]\!]_{\exists X \circ N_1}$ and $\langle V_2, \exists P_1 \circ N_1\rangle \in [\![(\exists\text{LITTLE}P_1) \circ N_1]\!]_{\exists X \circ N_1}$
2. $\langle V_1, \exists P_1 \circ N_1\rangle > \langle V_2, \exists P_1 \circ N_1\rangle$ iff there is some $\langle V_3, \exists P_1 \circ N_1\rangle$ such that:
   (a) $\langle V_1, \exists P_1 \circ N_1\rangle \sim \langle V_3, \exists P_1 \circ N_1\rangle$ and $\langle V_3, \exists P_1 \circ N_1\rangle \succ \langle V_2, \exists P_1 \circ N_1\rangle$ **or**
   (b) $\langle V_2, \exists P_1 \circ N_1\rangle \sim \langle V_3, \exists P_1 \circ N_1\rangle$ and $\langle V_1, \exists P_1 \circ N_1\rangle \succ \langle V_3, \exists P_1 \circ N_1\rangle$.

With these definitions, we can translate a sentence such as (44) as $\text{ER}^+(V_1, \exists P_1 \circ N_1, V_2, \exists P_1 \circ N_1)$. The interpretation of formulas of this sort is parallel to the interpretation of other kinds of comparatives (45). The only difference is that now we are ordering properties. In other words, in a sentence like (44) the comparative morpheme taking scope over the existential quantifier.

(45) $[\![\text{ER}^+(V_1, \exists P_1 \circ N_1, V_2, \exists P_1 \circ N_1)]\!]_{\exists X \circ N} = 1$ iff
$\langle V_1, \exists P_1 \circ N_1\rangle > \langle V_2, \exists P_1 \circ N_1\rangle$

According to (45), if $[\![\text{ER}^+(V_1, \exists P_1 \circ N_1, V_2, \exists P_1 \circ N_1)]\!]_{\exists X \circ N} = 1$, then, there exist $a_1, a_2 \in D$ such that $a_1 \in [\![V_1]\!]$, $a_2 \in [\![V_2]\!]$, and $\langle a_1, P_1 \circ N_1\rangle > \langle a_2, P_1 \circ N_1\rangle$. In other words, if a taller man won the 100m than won the 800m, then some man won the 100m, some man won the 800m, and the first man is a taller man than the second.

2.5 Summary

In this section, I have given an analysis of a wide range of comparative constructions involving adjectives in predicative, attributive and argument positions. As a summary, the main data points captured, along with their translations into our logic, are shown in Table 1.

CONSTRUCTION	EXAMPLE	FORMULA
Predicative	John is taller than Phil.	$\text{ER}^{+}(a_1, P_1, a_2, P_1)$
	John is less tall than Phil.	$\text{ER}^{-}(a_1, P_1, a_2, P_1)$
	John is shorter than Phil.	$\text{ER}^{+}(a_1, \text{LITTLE}P_1, a_2, \text{LITTLE}P_1)$
	This table is longer than that one is wide.	$\text{ER}^{+}(a_1, P_1, a_2, P_2)$
Attrib. (Pred)	John is a taller man than Phil.	$\text{ER}^{+}(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)$
	John is a less tall man than Phil.	$\text{ER}^{-}(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)$
Attrib. (Arg)	A taller man than John arrived	$\exists(\text{ER}^{+}(P_1 \circ N_1, a_2, P_1 \circ N_1))(V_1)$
	A taller man won the 100m than won the 800m.	$\text{ER}^{+}(V_1, \exists P_1 \circ N_1, V_2, \exists P_1 \circ N_1)$

Table 1 Quality Comparatives in Delineation Semantics

3 Quantity Comparatives in Delineation Semantics

The next sections are devoted to extending my analysis of quality comparatives to **quantity** comparatives (examples like (46-a)) and their relationship with sentences like (46-b) within the *Mereological Delineation Semantics* framework, which I will develop in these sections.

(46) a. More linguists came to the party than stayed home to study.
b. Many linguists came to the party.

Since the goal of the second part of the paper is to show how we can pursue an analysis of quantity comparatives along the same lines as our analysis of quality comparatives, we will largely set aside adjectival predicates and Q-adjectives that apply to these constituents. As far as I can tell, the analysis that I will provide of sentences like (47-a), combined with the analysis that I have given of (47-b), can be extended to sentences like (47-c) without major problems.

(47) a. Many women arrived.
b. A tall woman arrived.
c. Many tall women arrived.

3.1 Mass-Count in Mereological Semantics

A crucial feature of sentences like *Many linguists came to the party* or *Much beer is in the fridge* is that they involve plural and mass noun phrases. We therefore need a semantics for plurals and mass nouns upon which we can set analyses of the semantics of quantity comparison. There are many theories of both the denotations of plurals and the mass-count distinction available in the literature; however, in this paper, I will adopt a mereological approach to the semantics of noun phrases in the style of Link (1983) combined with the analysis of the mass-count distinction of Bale and Barner (2009). Within these proposals, we can give an illustration of how the analysis of quality comparatives in the previous sections can be extended to the quantity domain; however, I expect that an appropriate extension might also be possible within other approaches to the semantics of mass-count.

3.1.1 The Basic Framework

Unlike in basic Delineation semantics, in which we supposed our domain to be an unordered set of individuals as in the models for first order logic, we now interpret the expressions of our language into a domain that encodes **mereological** (i.e. part-structure) relations between its individuals (which, following common terminology in the field, we will call *aggregates*). More precisely, we define the our model structures as follows:

Definition 18 Model Structure. A model structure $\mathcal{M}$ is a tuple $\langle D, \preceq \rangle$, where D is a finite set of aggregates, $\preceq$ is a binary relation on D[19].

Furthermore, we stipulate that $\langle D, \preceq \rangle$ satisfies the axioms of classical extensional mereology (CEM).[20] First, some definitions:

Definition 19 Overlap ($\circ$). For all $a_1, a_2 \in D$, $a_1 \circ a_2$ iff $\exists a_3 \in D$ such that $a_3 \preceq a_1$ and $a_3 \preceq a_2$.

Definition 20 Fusion (Fu). For $a_1 \in D$ and $X \subseteq D$, Fu(a_1, X) ('a_1 fuses X') iff, for all $a_2 \in D$, $a_2 \circ a_1$ iff there is some a_3 such that $a_3 \in X$ and $a_2 \circ a_3$.

We now adopt the following constraints on $\langle D, \preceq \rangle$:

1. **Reflexivity.** For all $a_1 \in D$, $a_1 \preceq a_1$.
2. **Transitivity.** For all a_1, a_2, a_3, if $a_1 \preceq a_2$ and $a_2 \preceq a_3$, then $a_1 \preceq a_3$.
3. **Anti-symmetry.** For all $a_1, a_2 \in D$, if $a_1 \preceq a_2$ and $a_2 \preceq a_1$, then $a_1 = a_2$.
4. **Strong Supplementation.** For all $a_1, a_2 \in D$, for all atoms a_3, if, if $a_3 \preceq a_1$, then $a_3 \circ a_2$, then $a_1 \preceq a_2$.
5. **Fusion Existence.** For all $X \subseteq D$, if there is some $a_1 \in X$, then there is some $a_2 \in D$ such that $Fu(a_2, X)$.

We can note that, in CEM, for every subset of D, not only does its fusion exist, but it is also unique (cf. Hovda (2008), p. 70). Therefore, in what follows, I will often use the following notation:

Definition 21 Fusion (notation) ($\bigvee$). For all $X \subseteq D$, $\bigvee X$ is the unique a_1 such that $Fu(a_1, X)$.

Finally, since we stipulated that every domain D is finite, every structure $\langle D, \preceq \rangle$ is atomic. Thus, the structures that we are interested in are those of atomistic CEM. We define the notion of an *atom* as follows[21]:

[19] Note this $\preceq$ symbol should not be confused with the $\succ$ symbols that notate the semi-order 'implicit scale' relations. $\preceq$ notates invariant, predicate independent relations that are part of the model structure. I apologize if this notation is confusing.

[20] This particular axiomatization is taken from Hovda (2008) (p.81). The version of *fusion* used here is what Hovda calls 'type 1 fusion'.

[21] Where identity and proper part are defined as follows:

Definition 22 Identical (=). For all $a_1, a_2 \in D$, $a_1 = a_2$ iff $a_1 \preceq a_2$ and $a_2 \preceq a_1$.

Definition 23 Proper part ($\prec$). For all $a_1, a_2 \in D$, $a_1 \prec a_2$ iff $a_1 \preceq a_2$ and $a_1 \neq a_2$.

Definition 24 Atom. $a_1 \in D$ is an atom iff there is no $a_2 \in D$ such that $a_2 \prec a_1$.

– We write $AT(D)$ for the set of atoms of $\langle D, \preceq \rangle$, and more generally $AT(X)$ for the set of atoms of a set $X \subseteq D$.

In other words, the expressions in our language will denote in structures that are complete atomic boolean algebras minus the bottom element, also known as **join semilattices**.

3.1.2 A Constructional Approach to Mass-Count

The noun phrases that we used in the examples in the sections concerning quality comparatives were all singular count nouns; however, our aim in this section is to account for both count comparatives (48-a) and mass comparatives (48-b) and the differences between them (to be discussed below).

(48) a. More beers are in the fridge.
b. More beer is in the fridge.

One of the well-known characterizing properties of nouns in number marking languages like English is that at least the majority of them show a certain amount of 'elasticity' (in the words of Chierchia (2010)) in whether they can appear with mass and/or count syntax. The sentences in (48) are a perfect example of this property: the lexical root *beer* can be either mass or count depending on the linguistic context that it appears in.

In some current syntactic frameworks (such as *Distributive Morphology* (Halle and Marantz, 1993, and many others) or Borer (2005)'s *Neo-constructionism*), lexical items start off as uncategorized *roots*, and acquire their particular morpho-semantic features through combining with functional syntactic heads in the syntax. More recently, the neo-constructionist-style approach to the semantics of mass-count has been given a model theoretic semantics by works such as Bale and Barner (2009). I will therefore adopt their proposals for the source of the mass-count distinction and how this relates to the construction of appropriate comparative relations.

Above, it was proposed that the interpretation of predicates is relativized to comparison classes containing pairs of singular aggregates and adjectival predicates. Now, since our domain has more structure, we need to make a precision: we will allow constants $(a_1, a_2, a_3 \dots)$ to denote in the entire domain (i.e. both singular and non-singular aggregates). Furthermore, I propose that nominal and verbal roots[22] denote subsets of the domain.

Definition 25 Model. A model is a tuple $\mathcal{M} = \langle D, \preceq, [\![\cdot]\!] \rangle$, where $\langle D, \preceq \rangle$ is a model structure and $[\![\cdot]\!]$ is a function satisfying:

1. If a is a constant, then $[\![a]\!] \in D$.
2. If N_1 is a nominal predicate, then $[\![N_1]\!]D$.
3. If V_1 is a verbal predicate, then $[\![V_1]\!] \subseteq D$.

[22] In real Distributive Morphology, roots do not even have a syntactic category; however, for convenience in our small logical language, we will suppose that there is a category distinction between N predicates and V predicates.

Furthermore, I assume that the denotations of nominal and verbal predicates are closed under the fusion operation; that is, they combine with a * operator, which generates all the individual fusions of members of the extension of N or V.

Definition 26 Closure Under Fusion (*). For all singular nominal predicates N and verbal predicates V,

1. $[\![N^*]\!] = \{a_1 : Fu(a_1, A),\ \text{for some } A \subseteq [\![N]\!]\}$
2. $[\![V^*]\!] = \{a_1 : Fu(a_1, A),\ \text{for some } A \subseteq [\![V]\!]\}$

Once they combine with the * operator, nominal (and verbal) predicates will denote join semi-lattices with minimal parts[23], defined as in Def. 27 (taken from (Bale and Barner, 2009, 236), set in my notation). Note that because $[\![N]\!]$ can contain non-atomic individuals, the minimal parts of $[\![N^*]\!]$ will not necessarily be atoms of D.

Definition 27 Minimal Part. An aggregate a_1 is a minimal part for a set of aggregates X iff

1. $a_1 \in X$
2. For any $a_2 \in X$ such that $a_2 \neq a_1$, $a_2 \not\preceq a_1$.

However, depending on what their original denotation was before closure under fusion, the minimal parts of $[\![N_1^*]\!]$ and $[\![N_2^*]\!]^*$ might have different properties. For example, some starred nominal denotations might denote *individuated semi-lattices*: semi-lattices composed of individuals, where the notion of an *individual* (taken from (Bale and Barner, 2009, 237), set in my notation) is shown in Def. 28.

Definition 28 Individual. An aggregate a_1 is an individual for a set of aggregates X iff

1. a_1 is a minimal part for X.
2. For all aggregates $a_2 \in X$, either $a_1 \preceq a_2$ or there is no $a_3 \preceq a_1$ such that $a_1 \preceq a_2$.

In other words, an individuated semi-lattice does not have any minimal parts that share an aggregate[24].

We now introduce two operators that combine with nominal predicates: $_M$ and $_C$. A predicate N^*_M will be a mass predicate and N^*_C will be a count predicate.

[23] Above we stipulated that the domain was finite, and therefore every predicate denotation (mass or count) must have some minimal elements. A common proposal (since at least Quine (1960)) is that the denotation of mass nouns does not have minimal elements. That is, in a mereological framework, this would boil down to saying that the denotation of mass predicates is a continuous join semi-lattice. The 'no minimal parts' hypothesis has notorious difficulty treating examples of mass predicates such as *footwear* or *furniture*, which clearly have minimal parts. I therefore assume that at least some mass predicates have these elements in their denotation. This being said, the proposals that I make here for mass quantity comparatives are compatible with both discrete and continuous lattices, so I leave it open whether we want to have mass predicates denote discrete or continuous lattices (or both).

[24] See Bale and Barner (2009) for pictorial representations of the differences between individuated and non-individuated lattices.

Following Bale and Barner (2009), I propose that the interpretation of the mass operator is simply the identity function on $[\![N^*]\!]$: it applies to a root (denoting either an individuated or non-individuated semi-lattice) and returns the same value[25].

The count operator $_C$ has a very different interpretation. Following Bale and Barner (2009), I propose that the count operator maps lexical roots that denote only non-individuated semi-lattices to denotations of individuated semi-lattices. Formally speaking, we add to the model a function i, whose domain includes only non-individuated semi-lattices and assigns them a corresponding individuated semi-lattice. In natural language, the definition of i can be quite complex and subject to various lexical idiosyncrasies. For example, i would map a non-individuated root like *beer* to a lattice generated by containers of beer; whereas, this function would map a root like *apple* to whole pieces of the apple fruit. From the formal perspective here, we just treat i as given in the model, and define the count and mass interpretations of nouns in Def. 29.

Definition 29 Count and Mass Distinction. For all nominal predicates N_1,

1. $[\![N^*_M]\!] = [\![N^*]\!]$.
2. $[\![N^*_C]\!] = i([\![N^*]\!])$.

With these preliminaries associated with the denotations of nominal and verbal predicates in place, we are now ready to give the analysis of quantity expressions.

3.2 Quantity Comparatives in Predicative Position

In line with the proposals made in section 2 (and recent work in the semantics of non-adjectival degree expressions such as (Rett, 2007, 2008; Solt, 2014; Wellwood, 2014; Rett, 2014, among others)), I propose that the explicit quantity comparative relations are built off the scales associated with the context-sensitive expressions *many*, *few* (for count comparatives), and *much, little* (for mass comparatives).

(49) a. **Many** linguists came to the party.
b. **Few** philosophers came to the party.
c. **Much** wine is on the table.
d. **Little** beer is left in the fridge.

As in the adjectival domain, MUCH and LITTLE are context-sensitive predicates that are evaluated with respect to comparison classes. Additionally, in the nominal domain, we now have count Q-adjectives MANY and FEW whose interpretations are also relativized to comparison classes. I assume that the classes are sorted based on mass or count predicates; that is, the CCs with respect to which MUCH and LITTLE are interpreted are sets of aggregates paired with mass predicates. Likewise, the CCs with respect to which MANY/FEW are interpreted are sets of aggregates paired with count predicates. These different kinds of classes are distinguished in Def. 30; however, for readability, if it is clear from the context which kind of comparison class we are talking about, I will omit the $_{M/C}$ on $X_{M/C}$.

[25] For example, an English mass term denoting a non-individuated lattice might be *water*; whereas, a mass term denoting an individuated semi-lattice might be *furniture*.

Definition 30 Interpretation of Q-adjectives. For all mass comparison classes $X_M \subseteq D \times \mathbb{N}^*_M$ and count comparison classes $X_C \subseteq D \times \mathbb{N}^*_C$,

1. $[\![\text{MUCH}]\!]_{X_M} \subseteq X_M$.
2. $[\![\text{LITTLE}]\!]_{X_M} \subseteq X_M$.
3. $[\![\text{MANY}]\!]_{X_C} \subseteq X_C$.
4. $[\![\text{FEW}]\!]_{X_C} \subseteq X_C$.

Furthermore, as with other predicates, I assume that the denotations of positive Q-adjectives are closed under fusion with other elements in the comparison class that share a second co-ordinate (as are the corresponding comparison classes), as shown in (50). (50) gives the axiom relative to the interpretation of MUCH, but I assume that versions of (50) hold for MANY as well.

(50) **Upward Closure under Fusion**:
For all $a_1 \in D$, nominal predicates N and $X \subseteq D \times \mathbb{N}^*_M$,
If $\langle a_1, N^*_M\rangle \in [\![\text{MUCH}]\!]_X$, then for all other pairs $\langle a_2, N^*_M\rangle \in X$, $\langle a_1 \vee a_2, N^*_M\rangle \in [\![\text{MUCH}]\!]_X$.

In addition to (50)[26], I propose that the same constraints guide the application of the Q-adjectives across nominal comparison classes as adjectival ones. They are repeated (with reference to the nominal domain) below for MUCH/LITTLE; however, I propose these constraints also hold for MANY/FEW.

For all predicates N^*_{1M}, N^*_{2M}, all comparison classes $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$, and all $a_1, a_2 \in D$,

(51) **Contraries:**
$[\![\text{MUCH}]\!]_X \cap [\![\text{LITTLE}]\!]_X = \emptyset$.

(52) **No Reversal**. If $\langle a_1, N^*_{1M}\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{LITTLE}]\!]_X$, then there is no $X' \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle a_1, N^*_{1M}\rangle \in [\![\text{LITTLE}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{MUCH}]\!]_X$.

(53) **Upward Difference:**
If $\langle a_1, N^*_{1M}\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{LITTLE}]\!]_X$, then, for all $X' : X \subseteq X'$, there are some $\langle a_3, N^*_{3M}\rangle, \rangle a_4, N^*_{4M}\rangle$ such that $\langle a_3, N^*_{3M}\rangle \in [\![\text{MUCH}]\!]_{X'}$ and $\langle a_4, N^*_{4M}\rangle \in [\![\text{LITTLE}]\!]_{X'}$.

(54) **Downward Difference:**
If $\langle a_1, N^*_{1M}\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{LITTLE}]\!]_X$, then, for all $X' \subseteq X$, if $\langle a_1, N^*_{1M}\rangle, \langle a_2 N^*_{2M}\rangle \in X'$, then there is some $\langle a_3, N^*_{3M}\rangle, \langle a_4, N^*_{4M}\rangle$ such that $\langle a_3, N^*_{3M}\rangle \in [\![\text{MUCH}]\!]_{X'}$ and $\langle a_4, N^*_{4M}\rangle \in [\![\text{LITTLE}]\!]_{X'}$.

With these definitions, we immediately have an analysis of sentences with predicative uses of count Q-adjectives such as (55)[27].

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[26] Actually, we might suppose that (50) holds also for adjectival MUCH/LITTLE; however, since the denotations of singular adjectival predicates do not have any mereological structure in them, its application is vacuous.

[27] Strangely, such sentences do not sound so good with *much* and mass terms, possibly because of competition with the expression *a lot* in English.

(i) a. #This beer is much.
b. This beer is a lot (to drink in one sitting).

(55) a. The linguists are many.
b. The philosophers are few.

Sentences like (55) are true just in case the aggregate denoted by the subject is included some pair in the denotation of MANY/FEW at a particular contextually chosen comparison class.

(56) a. $[\![\text{MANY}(a_1)]\!]_X = 1$ iff $[\![a_1]\!] \in \{a : \exists N^*_C : \langle a, N^*_C\rangle \in [\![\text{MANY}]\!]_X\}$
b. $[\![\text{FEW}(a_1)]\!]_X = 1$ iff $[\![a_1]\!] \in \{a : \exists N^*_C : \langle a, N^*_C\rangle \in [\![\text{FEW}]\!]_X\}$

In parallel to the adjectival domain, when Q-adjectives combine with plural noun phrases, they restrict the comparison class to only those pairs that have the plural NP in question as their second co-ordinate, as shown in Def. 31.

Definition 31 Interpretation of QPs. Let $N^*_{1M/C}$ be a (count or mass) predicate and let $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}/\mathbb{C}}$ be a (count or mass) comparison class. Then,

1. $[\![\text{MUCH}N^*_{1M}]\!]_X = \{\langle a, N^*_M\rangle : \langle a, N^*_M\rangle \in [\![\text{MUCH}]\!]_X \ \& \ N^*_M = N^*_{1M} \ \& \ a \in [\![N^*_M]\!]\}$.
2. $[\![\text{LITTLE}N^*_{1M}]\!]_X = \{\langle a, N^*_M\rangle : \langle a, N^*_M\rangle \in [\![\text{LITTLE}]\!]_X \ \& \ N^*_M = N^*_{1M} \ \& \ a \in [\![N^*_M]\!]\}$.
3. $[\![\text{MANY}N^*_{1C}]\!]_X = \{\langle a, N^*_C\rangle : \langle a, N^*_C\rangle \in [\![\text{MANY}]\!]_X \ \& \ N^*_C = N^*_{1C} \ \& \ a \in [\![N^*_C]\!]\}$.
4. $[\![\text{FEW}N^*_{1C}]\!]_X = \{\langle a, N^*_C\rangle : \langle a, N^*_C\rangle \in [\![\text{FEW}]\!]_X \ \& \ N^*_C = N^*_{1C} \ \& \ a \in [\![N^*_C]\!]\}$.

Thus, we can translate a sentence like (57) with a formula like $\text{MANY}N^*_{1C}(a_1)$ and interpret it accordingly.

(57) These women are many linguists.

Finally, in exactly the same way as we did with adjectival comparatives, we define the comparative relations associated with mass (and parallely count) predicates as follows:

Definition 32 Implicit scale ($\succ$) **and similarity** ($\sim$). For all $a_1, a_2 \in D$ and $N_1, N_2 \in \mathbb{N}$,

Positive Implicit Comparative/Similarity:

1. $\langle a_1, N^*_{1M}\rangle \succ^+ \langle a_2, N^*_{2M}\rangle$ iff there is some $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle a_1, N^*_{1M}\rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{LITTLE}]\!]_X$.
2. $\langle a_1, N^*_{1M}\rangle \sim^+ \langle a_2, N^*_{2M}\rangle$ iff $\langle a_1, N^*_{1M}\rangle \not\succ^+ \langle a_2, N^*_{2M}\rangle$ and $\langle a_2, N^*_{2M}\rangle \not\succ^+ \langle a_1, N^*_{1M}\rangle$, but there is some $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle a_1, N^*_{1M}\rangle, \langle a_2, N^*_{2M}\rangle \in X$.

Negative Implicit Comparative/Similarity:

3. $\langle a_1, N^*_{1M}\rangle \succ^- \langle a_2, N^*_{2M}\rangle$ iff there is some $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle a_1, N^*_{1M}\rangle \in [\![\text{LITTLE}]\!]_X$ and $\langle a_2, N^*_{2M}\rangle \in [\![\text{MUCH}]\!]_X$.
4. $\langle a_1, N^*_{1M}\rangle \sim^- \langle a_2, N^*_{2M}\rangle$ iff $\langle a_1, N^*_{1M}\rangle \not\succ^- \langle a_2, N^*_{2M}\rangle$ and $\langle a_2, N^*_{2M}\rangle \not\succ^- \langle a_1, N^*_{1M}\rangle$, but there is some $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle a_1, N^*_{1M}\rangle, \langle a_2, N^*_{2M}\rangle \in X$.

Definition 33 Explicit scale. ($>$) For all pairs $\langle a_1, N_2\rangle \in D \times \mathbb{N}^*$,

(58) $\langle a_1, N^*_1\rangle >^+ \langle a_2, N^*_2\rangle$ iff there is some $\langle a_3, N^*_3\rangle \in D \times \mathbb{N}^*$ such that:
1.$\langle a_1, N^*_1\rangle \sim^+ \langle a_3, N^*_3\rangle$ and $\langle a_3, N^*_3\rangle \succ^+ \langle a_2, N^*_2\rangle$ **or**
2.$\langle a_2, N^*_2\rangle \sim^+ \langle a_3, N^*_3\rangle$ and $\langle a_1, N^*_1\rangle \succ^+ \langle a_3, N^*_3\rangle$.

(59) $\langle a_1, N_1^* \rangle >^- \langle a_2, N_2^* \rangle$ iff there is some $\langle a_3, N_3^* \rangle \in D \times \mathbb{N}^*$ such that:
1.$\langle a_1 N_1^* \rangle \sim^- \langle a_3, N_3^* \rangle$ and $\langle a_3, N_3^* \rangle \succ^- \langle a_2, N_2^* \rangle$ **or**
2.$\langle a_2, N_2^* \rangle \sim^- \langle a_3, N_3^* \rangle$ and $\langle a_1, N_1^* \rangle \succ^- \langle a_3, N_3^* \rangle$.

With these constructions, we can translate both the count comparatives in (60)[28] and the mass comparatives in (61) as shown.

(60) a. These women are more linguists than philosophers.
$\text{ER}^+(a_1, N_{1C}^*, a_1, N_{2C}^*)$
b. These women are fewer linguists than philosophers.
$\text{ER}^-(a_1, N_{1C}^*, a_1, N_{2C}^*)$

(61) a. This cocktail is more juice than vodka.
$\text{ER}^+(a_1, N_{1M}^*, a_1, N_{2M}^*)$
b. This cocktail is less juice than vodka.
$\text{ER}^-(a_1, N_{1M}^*, a_1, N_{2M}^*)$

Finally, we can show that the comparative relations associated with plural and mass nouns have a special property that distinguishes them from comparative relations associated with adjectives (see Krifka, 1989; Higginbotham, 1994; Schwarzschild, 2002, 2006; Nakanishi, 2007, among others) : they are **monotonic** on the part-structure relation, as shown by Theorem 4 (for mass nouns, but the corresponding result also clearly holds for count nouns)[29].

Theorem 4 ***Monotonicity.*** *Let $a_1, a_2 \in D$ and let N_M^* be a mass predicate.*

(62) If $a_1 \preceq a_2$, then $\langle a_1, N_M^* \rangle \leq \langle a_2, N_M^* \rangle$.

3.3 Quantity Comparatives in Argument Position

As with quality comparatives, we can use quantity comparatives in argument position, as shown in (63).

[28] Note that we give an analysis only for the quantity interpretation of (60-a) (there are more linguists and philosophers within this set of women). We set aside the 'metalinguistic interpretation' that we see with *Sara is more linguist than philosopher*.
Note also that, again, in these constructions, we are faced with questions of (in)commensurability: while (60-a) is fine contrasting linguists and philosophers, its minimal pair (i) would require a very unusual context to be felicitous.

(i) #These women are more linguists than red-heads.

[29] Proof: Suppose $a_1 \preceq a_2$ and suppose for a contradiction that $\langle a_1, N_M^* \rangle > \langle a_2, N_M^* \rangle$. Since $\langle a_1, N_M^* \rangle > \langle a_2, N_M^* \rangle$, there is some $\langle a_3, N_M^* \rangle$ such that $\langle a_1, N_M^* \rangle \sim \langle a_3, N_M^* \rangle$ and $\langle a_3, N_M^* \rangle \succ \langle a_2, N_M^* \rangle$ **or** $\langle a_3, N_M^* \rangle \sim \langle a_2, N_M^* \rangle$ and $\langle a_1, N_M^* \rangle > \langle a_3, N_M^* \rangle$. Without loss of generality, suppose $\langle a_1, N_M^* \rangle \sim \langle a_3, N_M^* \rangle$ and $\langle a_3, N_M^* \rangle \succ \langle a_2, N_M^* \rangle$. Then there is some comparison class X such that $\langle a_3, N_M^* \rangle \in [\![\text{MUCH}]\!]_X$ and $\langle a_2, N_M^* \rangle \in [\![\text{LITTLE}]\!]_X$. So by Downward Difference (54), $\langle a_3, N_M^* \rangle \in [\![\text{MUCH}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_3, N_M^* \rangle\}}$ and $\langle a_2, N_M^* \rangle \in [\![\text{LITTLE}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_3, N_M^* \rangle\}}$. Now consider the comparison class $\{\langle a_2, N_M^* \rangle, \langle a_3, N_M^* \rangle, \langle a_1, N_M^* \rangle\}$. Since $\langle a_3, N_M^* \rangle \sim \langle a_1, N_M^* \rangle$, by applications of Upward Difference (53) and Downward Difference (54), $\langle a_1, N_M^* \rangle \in [\![\text{MUCH}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_1, N_M^* \rangle\}}$ and $\langle a_2, N_M^* \rangle \in [\![\text{LITTLE}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_1, N_M^* \rangle\}}$. Since $a_1 \preceq a_2$, $a_1 \vee a_2 = a_2$. Therefore, by (50), $a_2 \in [\![\text{MUCH}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_1, N_M^* \rangle\}}$. But by Contraries (51), $a_2 \notin [\![\text{MUCH}]\!]_{\{\langle a_2, N_M^* \rangle, \langle a_1, N_M^* \rangle\}}$ $\perp$ $\square$

(63) a. More linguists came to the party than stayed home to study.
b. More linguists than philosophers came to the party.
c. More beer is in the fridge than is on the table.
d. More beer than wine is in the fridge.

Again, we start from the semantics of sentences with bare Q-adjectives, which will be translated as formulas containing an existential quantifier: $\exists \textsc{many} N^*_C(V)$ or $\exists \textsc{much} N^*_M(V)$.

(64) a. Many linguists came to the party.
b. Much beer is in the fridge.

In the analysis of quality comparatives, we had two ways of interpreting existential DPs with Q-adjectives such as those in (65): one that used the scales associated with the NP *tall man*, which were used to interpret narrow scope comparatives such as (65-a), and one that used the scales associated with the full DP *a tall man*, which were used to interpret wide scope comparatives such as (65-b).

(65) A tall man arrived.
a. A taller man than John arrived.
b. A taller man won the 100m than won the 800m.

In the DP domain, the plural or mass noun plays the same semantic role as the gradable adjective did in the adjectival domain, so we no longer have these two options. We can only interpret the subject DP in the *gradable* way. This makes the prediction that we should not find comparatives of the form in (65-a) in the DP domain. As discussed in Grant (2013), this prediction is borne out. When we find definite expressions in the *than* clause inside a DP with a quantity comparative, the resulting construction is (what Grant calls) a *subset comparative*, rather than an attributive comparative like (65-a).

(66) a. More linguists than (just) the Ling100 class came to the party.
b. More beer than (just) the case that Bob brought is in the fridge.

As Grant observes, subset quantity comparatives are different from attributive quality comparatives in that 1) (66-a) has an entailment that (65-a) does not, namely that the Ling100 class also came to the party, and 2) unlike (65-a), in order for a subset comparative to be felicitous, it is strongly preferred to use the discourse particle *just*[30]. I therefore give only the gradable interpretation for DPs containing *much* or *many*[31].

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[30] A natural analysis for a subset comparative (which would capture the entailment that the Ling 100 class came to the party) would be using a (pseudo) formula such as $\textsc{er}^+(\text{came}, \exists\text{linguist}^*_C, \text{came}, \textsc{ling}100)$; however, we would need to say something about what it means for a pair like $\langle \text{came}, \textsc{ling}100\rangle$ to be in $[\![\textsc{little}]\!]_{\exists X}$. Perhaps *just* plays a role in allowing for the 'scalar' interpretation of *the Ling100* class. I therefore leave the analysis of subset comparatives to future work.

[31] This is not to say that the grammar only provides a single way of interpreting subject DPs. For example, Rett (2014) shows that DPs containing *many* (like other DPs that do not contain Q-adjectives) can have what she calls a 'degree interpretation' (i-b), in addition to an 'individual' interpretation (i-a).

(i) a. Many guests are drunk. Individual
b. Many guests is several more than Bill anticipated. Degree

We therefore extend the comparison classes associated with plural and mass nouns in the same way as we did in the adjectival domain, using the *existential sublimation* construction.

Definition 34 DP Comparison Classes. Let N^*_M be a nominal mass predicates respectively. Suppose $X \subseteq D \times \mathbb{N}^*_{\mathbb{M}}$ is a mass comparison class. Then the corresponding DP comparison class (notated $\exists X$) is constructed as follows:

1. If $\langle a_1, N^*_M \rangle \in X$, then for all $V \in \bigvee\{a_1\}$, $\langle V, \exists N^*_M \rangle \in \exists X$.
2. Nothing else is in $\exists X$.

And the interpretation of DPs containing *much* (such as *much beer*) and the corresponding interpretation of formulas translating sentences like *Much beer is in the fridge.* is shown in (67).

(67) Interpretation of DPs and formulas.

a. $[\![\exists(\text{MUCH}N^*_M)]\!]_{\exists X}$ = the set of pairs $\langle V_1, \exists N^*_M \rangle$ such that:
1.$\langle V_1, \exists N^*_M \rangle \in \exists X$
2.$V_1 \cap \{a : \langle a, N^*_M \rangle \in [\![\text{MUCH}N^*_M]\!]_X\} \neq \emptyset$

b. $[\![\exists\text{MUCH}N^*_M(V_1)]\!]_{\exists X} = 1$ iff
$[\![V_1]\!] \in \{V : \langle V, \exists N^*_M \rangle \in [\![\exists\text{MUCH}N^*_M]\!]_{\exists X}\}$.

Finally, to account for the use of quantity comparatives in argument position, we associate scales with DPs in the way that we have been doing in the rest of the paper:

Definition 35 Implicit scale ($\succ$) **and similarity** ($\sim$). For all $V_1, V_2 \in \mathcal{P}(D)$ and $N_1, N_2 \in \mathbb{N}$,

Positive Implicit Comparative/Similarity:

1. $\langle V_1, \exists N^*_{1M} \rangle \succ^+ \langle V_2, \exists N^*_{2M} \rangle$ iff there is some $X \subseteq \mathcal{P}(D) \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle V_1, \exists N^*_{1M} \rangle \in [\![\text{MUCH}]\!]_{\exists X}$ and $\langle V_2, \exists N^*_{2M} \rangle \in [\![\text{LITTLE}]\!]_{\exists X}$.
2. $\langle V_1, \exists N^*_{1M} \rangle \sim^+ \langle V_2, \exists N^*_{2M} \rangle$ iff $\langle V_1, \exists N^*_{1M} \rangle \not\succ^+ \langle V_2, \exists N^*_{2M} \rangle$ and $\langle V_2, \exists N^*_{2M} \rangle \not\succ^+ \langle V_1, \exists N^*_{1M} \rangle$.

Negative Implicit Comparative/Similarity:

3. $\langle V_1, \exists N^*_{1M} \rangle \succ^- \langle V_2, \exists N^*_{2M} \rangle$ iff there is some $X \subseteq \mathcal{P}(D) \times \mathbb{N}^*_{\mathbb{M}}$ such that $\langle V_1, \exists N^*_{1M} \rangle \in [\![\text{LITTLE}]\!]_{\exists X}$ and $\langle V_2, \exists N^*_{2M} \rangle \in [\![\text{MUCH}]\!]_{\exists X}$.
4. $\langle V_1, \exists N^*_{1M} \rangle \sim^- \langle V_2, \exists N^*_{2M} \rangle$ iff $\langle V_1, \exists N^*_{1M} \rangle \not\succ^- \langle V_2, \exists N^*_{2M} \rangle$ and $\langle V_2, \exists N^*_{2M} \rangle \not\succ^- \langle V_1, \exists N^*_{1M} \rangle$.

Definition 36 Explicit scale. ($>$)

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c. Four pizzas are vegetarian — Individual
d. Four pizzas is more than we need. — Degree
(Rett, 2014, 241)

In her 2014 paper, Rett proposes that the 'degree interpretation' of *many guests* is given by a null measure operator that can apply to all kinds of DPs (not just ones containing Q-adjectives). Such an operator could be easily integrated into my proposal (which concerns only the individual interpretation (i-a)) to extend this framework to account for examples like (i-b).

(68) $\langle V_1, \exists N_1^* \rangle >^+ \langle V_2, \exists N_2^* \rangle$ iff there is some $\langle V_3, \exists N_3^* \rangle \in \mathcal{P}(D) \times \exists \mathbb{N}^*$ such that:
1.$\langle V_1, \exists N_1^* \rangle \sim^+ \langle V_3, \exists N_3^* \rangle$ and $\langle V_3, \exists N_3^* \rangle \succ^+ \langle V_2, \exists N_2^* \rangle$ **or**
2.$\langle V_2, \exists N_2^* \rangle \sim^+ \langle V_3, \exists N_3^* \rangle$ and $\langle V_1, \exists N_1^* \rangle \succ^+ \langle V_3, \exists N_3^* \rangle$.

(69) $\langle V_1, \exists N_1^* \rangle >^- \langle V_2, \exists N_2^* \rangle$ iff there is some $\langle V_3, \exists N_3^* \rangle \in D \times \exists \mathbb{N}^*$ such that:
1.$\langle V_1, \exists N_1^* \rangle \sim^- \langle V_3, \exists N_3^* \rangle$ and $\langle V_3, \exists N_3^* \rangle \succ^- \langle V_2, \exists N_2^* \rangle$ **or**
2.$\langle V_2, \exists N_2^* \rangle \sim^- \langle V_3, \exists N_3^* \rangle$ and $\langle V_1, \exists N_1^* \rangle \succ^- \langle V_3, \exists N_3^* \rangle$.

With these constructions, we can associate the formulas in (70) with the appropriate quantity comparatives.

(70) a. More linguists came to the party than stayed home.
$[\![\text{ER}^+(V_1, \exists N_{1C}^*, V_2, \exists N_{1C}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1C}^* \rangle >^+ \langle V_2, \exists N_{1C}^* \rangle$
b. More beer is in the fridge than on the table.
$[\![\text{ER}^+(V_1, \exists N_{1M}^*, V_2, \exists N_{1M}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1M}^* \rangle >^+ \langle V_2, \exists N_{1M}^* \rangle$
c. Fewer linguists came to the party than stayed home.
$[\![\text{ER}^-(V_1, \exists N_{1C}^*, V_2, \exists N_{1C}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1C}^* \rangle >^- \langle V_2, \exists N_{1C}^* \rangle$
d. Less beer is in the fridge than on the table.
$[\![\text{ER}^-(V_1, \exists N_{1M}^*, V_2, \exists N_{1M}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1M}^* \rangle >^- \langle V_2, \exists N_{1M}^* \rangle$

We can also account for quantity comparatives within the DP as shown in (71).

(71) More linguists than philosophers came to the party.
$[\![\text{ER}^+(V_1, \exists N_{1C}^*, V_1, \exists N_{2C}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1C}^* \rangle >^+ \langle V_1, \exists N_{2C}^* \rangle$

Finally, we can also allow for both the main predicates and nominal restrictions to be different, as shown in (72).

(72) More linguists came to the party than philosophers stayed home.
$[\![\text{ER}^+(V_1, \exists N_{1C}^*, V_2, \exists N_{2C}^*)]\!]_{\exists X} = 1$ iff $\langle V_1, \exists N_{1C}^* \rangle >^+ \langle V_2, \exists N_{2C}^* \rangle$

I therefore conclude that the analysis of quality comparatives within the Delineation framework presented in section 2 can be naturally extended to the analysis of quantity comparatives.

3.4 Further Predictions

This final section discusses a few further predictions made by the analysis of quantity comparatives proposed above.

Firstly, the analysis captures a very important contrast in the interpretation of mass versus count comparatives (discussed in (Bale and Barner, 2009; Wellwood et al, 2012; Wellwood, 2014, among others)), namely that, while the truth of comparatives involving mass nouns can be determined using a variety of (monotonic) measures (such as cardinality of individuated minimal parts, volume or weight) (73-a)-(73-b), the truth of comparatives involving count nouns is determined uniquely by counting the individuated units in the noun's denotations (73-c).

(73) a. I have more coffee than Mary. (weight or volume)
b. I have more luggage than Mary. (pieces of luggage or weight)

c. I have more coffees than Mary. (cardinality: servings/kinds)

The 'counting' restriction on count comparatives follows straightforwardly my adoption of Bale and Barner (2009) analysis of this property. I proposed that the comparison classes according to which MANY and FEW are interpreted are limited to pairs containing nouns that combine with count syntax. By Def. 31, the individuals related to count pairs $\langle a_1, N^*_C\rangle$ that can find themselves in the denotation of MANYN^*_C will only be those that are the join of individuated minimal parts of that predicate. Combined with the requirement that the extension of MANY be closed under fusion, the result is that MANY and FEW must be monotonic with respect to the cardinality of individuated minimal parts. On the other hand, the comparison classes associated with MUCH and LITTLE are not so restricted: they can contain pairs composed of aggregates that are not individuated with respect to the predicate and, therefore, comparison can be made based on some other monotonic measure.

Although we get the 'counting' restriction correct, it is important to highlight that the semantics that I provide for count comparatives does **not** in fact predict that count comparison should be reduced to cardinality. Although we can prove monotonicity on the part-structure relation for the explicit scale ($>$) (see Theorem 4), there are (acceptable) models in which $>$ does not distinguish between $\langle a_1, N^*_C\rangle$ and $\langle a_2, N^*_C\rangle$, where the aggregates a_1 and a_2 that have a different number of individuated minimal parts with respect to N^*_C. In order for the comparative to track cardinality of individuated minimal parts exactly, we need to add an extra constraint on the interpretation of MANY across comparison classes, shown in (74).

(74) **Cardinality:**
Let N be a nominal predicate and let a_1, a_2 be aggregates. Suppose $|\{a : a \preceq a_1 \ \&\ a \in [\![N_C]\!]\}| > |\{a : a \preceq a_2 \ \&\ a \in [\![N_C]\!]\}|$, then there is some $X \subseteq D \times \mathbb{N}^*_{\mathbb{C}}$ such that $\langle a_1, N^*_C\rangle \in [\![\text{MANY}]\!]_X$ and $a_2 \in [\![\text{FEW}]\!]_X$.

(74) is a very strong constraint that forces us to make very fine distinctions between cases where a predicate holds of very similar numbers of individuated minimal parts; however, there are reasons to think that we might not always be so precise when we interpret comparative constructions. For example, there is a fair amount of evidence that children who are acquiring these constructions do not make such fine distinctions. For example, Odic et al (2013) and Wellwood et al (2013) show that, children (as young as 3 years old) understand and verify sentences with explicit comparative constructions not by counting, but by using the **Approximate Number System** (ANS, (see Dehaene, 1997, among very many others))[32]. A key property of the ANS is that, within this system, discrimination of numerosity depends not on the absolute difference between the cardinalities of the two sets that are being compared but on their ratio. In particular, children reliably discriminate between sets of 20 versus 10 objects (i.e. a ratio of 2), but their performance is worse between sets of 20 versus 18 (i.e. a ratio of 1.1).

[32] Additionally, there is a large body of work on the expression *most* which is generally analyzed as the superlative of either *many* (Bresnan, 1973; Hackl, 2009) or *more* (Bobaljik, 2012) that shows that the acquisition of the meaning of this expression is independent of counting ability (Halberda and Feigenson, 2008) and that both children and adults (in certain experimental settings) use their ANS system to evaluate sentences with *most* (Pietrosky et al, 2009).

Observe that, in the absence of very strong categorization constraints like (74), the ratio pattern is exactly what is predicted by the Delineation system outlined in this paper: while properties that show a large difference in the size of the aggregates that they affect will be distinguished by $\succ$ and $>$ (because one will be in the extension of MANY and the other will be in the extension of FEW in some context), properties for which there is a small difference in the size of the aggregates that they affect will not necessarily be distinguished, unless there is some constraint like (74) active in the grammar. Furthermore, Halberda and Feigenson (2008) have shown that discrimination of small numerical ratios improves with age, so a reasonable hypothesis might be that children start with constraints on predicate application with count noun DPs that are as weak or weaker than the ones proposed in the previous section, and refine them as they get older to include principles of categorization like (74). I therefore suggest that the Delineation approach to nominal comparatives offers an interesting perspective on change in the meanings assigned to comparative constructions in acquisition; however, I leave investigating this question further to future research.

4 Conclusion

This paper presented a new Delineation Semantics analysis of nominal comparatives of the form *More linguists than philosophers came to the party.* Although the potential of this framework for a theory of non-adjectival gradability had been previously identified, (to my knowledge) this work constitutes the first explicit presentation of a Delineation semantics for comparatives outside the adjectival domain. Therefore, this article fills an important gap in the linguistics and philosophical literatures associated with these kind of logical systems.

Within this architecture, I argued that it was possible to capture the very many parallels (and few differences) between adjectival and nominal count/mass comparatives in a simple and systematic way by integrating previous proposals by scholars in the field into a simple Delineation framework. In my analysis, we have a single comparative predicate ER whose meaning in the adjectival domain is exactly the same as in DP domain. The interpretation of formulas containing ER is calculated using scalar relations that are constructed from looking at how the denotations of Q-adjectives (MUCH, LITTLE, MANY, FEW) vary across comparison classes. I proposed that the application of MUCH and LITTLE is subject to the same basic constraints regardless of which domain it applies in; whereas, MANY/FEW in adult grammars differ only from their more general counterparts in being sensitive to the cardinality of the set of individuated minimal parts of the predicates in their comparison classes.

A quick summary of some of the main cross-domain empirical patterns captured by the proposal in this paper is shown in Table 2.

The work presented in this paper constitutes the first step in a greater investigation into cross-domain gradability and comparison within the Delineation framework. As such, there are many phenomena that were not covered in this work. For example, as mentioned in section 2, this paper set aside the question of gradable nouns such as *heap, idiot* and *disaster*, and the next step is to integrate this phenomenon into the system developed here.

Construction	Example	Formula
Quality		
Predicative	John is taller than Phil.	$\text{ER}^{+}(a_1, P_1, a_2, P_1)$
	John is less tall than Phil.	$\text{ER}^{-}(a_1, P_1, a_2, P_1)$
	John is shorter than Phil.	$\text{ER}^{+}(a_1, \text{LITTLE}P_1, a_2, \text{LITTLE}P_1)$
	This table is longer than that one is wide.	$\text{ER}^{+}(a_1, P_1, a_2, P_2)$
Attr. (Pred)	John is a taller man than Phil.	$\text{ER}^{+}(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)$
	John is a less tall man than Phil.	$\text{ER}^{-}(a_1, P_1 \circ N_1, a_2, P_1 \circ N_1)$
Attr. (Arg)	A taller man than John arrived	$\exists(\text{ER}^{+}(P_1 \circ N_1, a_2, P_1 \circ N_1))(V_1)$
	A taller man won the 100m than won the 800m.	$\text{ER}^{+}(V_1, \exists P_1 \circ N_1, V_2, \exists P_1 \circ N_1)$
Quantity		
Predicative	These women are more linguists than philosophers	$\text{ER}^{+}(a_1, N^*_{1C}, a_1, N^*_{1C})$
	These women are fewer linguists than philosophers	$\text{ER}^{-}(a_1, N^*_{1C}, a_1, N^*_{1C})$
	This cocktail is more juice than vodka	$\text{ER}^{+}(a_1, N^*_{1M}, a_1, N^*_{2M})$
Att. (Arg)	More linguists came to the party than stayed home	$\text{ER}^{+}(V_1, \exists N^*_C, V_2, \exists N^*_C)$
	More linguists than philosophers came to the party.	$\text{ER}^{+}(V_1, \exists N^*_{1C}, V_1, \exists N^*_{2C})$
	More linguists came than philosophers stayed home.	$\text{ER}^{+}(V_1, \exists N^*_{1C}, V_2, \exists N^*_{2C})$

Table 2 Quality and Quantity Comparatives in Delineation Semantics

Another relevant desirable extension of the proposed Delineation system concerns comparatives and degree modifiers in the verbal domain. As observed by Doetjes (1997); Caudal and Nicolas (2005); Wellwood et al (2012), not only can we form explicit comparative constructions with verb phrases such as (75), but the distribution and interpretation of these constructions again show enormous parallels to the nominal quantity comparatives analyzed in this paper.

(75) a. Mary danced more than John.
b. Mary danced less than John.

In sum, I suggest that the possibilities for further investigations within the Delineation framework are numerous and, and I conclude that, even in its current instantiation, it constitutes a coherent and versatile architecture for capturing not only the relationships between context-sensitivity and gradability associated with adjectives, but also the structural parallels between the meanings of linguistic constituents across syntactic domains.

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