A Superlative Theory of Amount Relatives

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1. Data and proposal

Based on a number of syntactic restrictions that some relative clauses share, Carlson (1977) identified amount relatives as a third, typologically heterogeneous, class of relative clauses, in addition to the traditional restrictive and appositive relatives. The puzzle raised by amount relatives, however, is that the interpretation that earned them their name is not shared by all the relatives in this class, and shows a very limited distribution. In this paper I try to shed some light on the reason for this state of affairs and provide an account for both the syntactic restrictions on these relatives and the distribution of the amount reading.

Focusing on just *there*-relatives and ACD relatives, (1) and (2) show two of the syntactic restrictions that formed Carlson's motivation. *Wh*-relativizers are disallowed in the *there*-relative in (1a) and so are relative clause heads accompanied by indefinite determiners, as shown in (2a). The (b) examples show the same for ACD amount relatives.

(1)   a.   I took with me every book that/*which there was on the table.

         b.   Marv put in his pocket everything (that)/*which he could.

(2)   a.   I took with me every/*some book that there was on the table.

         b.   Marv put in his pocket everything/#something that he could. (OK on non-amount reading)

Since I will be arguing that not all types of relatives that have been assumed in the literature to be amount relatives do in fact belong to that class, I will use quotes around the word "amount" when referring to the label that has been applied to a certain class of relatives. When I am referring explicitly to an amount interpretation, I will omit the quotes.

Compare now the readings available to the two types of "amount" relatives introduced above. The ACD relative in (1b) has the characteristic amount reading in (3b). This is in addition to the restrictive reading in (3b'). The *there*-relative in (1a), on the other hand, does not have the amount reading in (3a), but only the individual reading in (3a').

(3)   a.   I took with me the/a plural individual consisting of as many books as there were on the table.

         a'.   I took with me the largest plural individual consisting of books that were on the table.

         b.   Marv put in his pocket the maximal plural individual X such that the cardinality of X is the maximal degree d such that Marv could put d-many things in his pocket.

         b'.   For all x, such that Marv could fit x in his pocket, Marv put x in his pocket.

McNally (2006) argues, based, among other things, on the unavailability of the amount reading in *there*-insertion relatives, that they should not be considered "amount" relatives at all. The proposal that I make, just like McNally's, does not assume a uniform treatment of the two kinds of relatives. However, I make the opposite claim, which is that *there*-relatives do in fact involve quantification over degrees, which is what being an "amount" relative means to me. However, they also contain a covert superlative

morpheme which absorbs the degree variable and is therefore responsible for the absence of the amount reading. On the other hand, I argue that ACD "amount" relatives do not involve degree quantification at all, and that they get their characteristic interpretation via an E-type restrictive relative semantics.

This paper is organized as follows. First, I argue against the basis for adopting a uniform approach to "amount" relatives. In particular, I argue for a (degree-based) superlative theory of *there*-insertion relatives that explains the lack of amount readings and the syntactic restrictions. In the second part of the paper, I show that ACD relatives with amount readings are not "amount" relatives, i.e. do not involve degree quantification, and propose an E-type restrictive semantics that can account for the restricted availability of the amount reading.

2. Sorting out "amount" relatives

Given that "amount" relatives are typologically heterogeneous and that the presence of degree quantification is one of the shared properties, it is worth taking a look at the original motivation for postulating a degree variable in "amount" relatives.

Carlson (1977) and Heim (1987) both argue that "amount" relatives involve quantification over degrees, despite the lack of the predicted amount reading in *there*-relatives (as noted first by Grosu and Landman 1998). The reason for adopting this unifying analysis is the parallelism with the well-known fact that strong noun phrases are ungrammatical in *there*-sentences, while weak noun phrases are allowed, as shown below:

(4)   a.   * There was every book on the table.
        b.   There were some books on the table.

Abstraction over individuals in a *there*-relative would produce a variable of type $<e>$ in a *there*-insertion context, which should result in ungrammaticality, contrary to fact, as illustrated by the grammatical version of (1a). To account for this fact, Heim (1987) proposes that "amount" relative clauses denote sets of degrees, as in (5) for the relative clause in (1a).

(5)   λd.there were d-many books on the table

Her proposal is based on the idea that *d-many books* is a weak noun phrase despite the fact that the individual variable is strong on its own, by parallelism with the following contrast between a DP with a strong determiner and a DP with a strong determiner embedding a degree expression:

(6)   a.   * There was THAT horse in the pasture.
        b.   There were THAT *many* horses in the pasture.

The central problem with her proposal, however, is that it offers no explanatory account of the absence of the amount reading in (3) or of the limited distribution of the amount reading in (3).

2.1. Two approaches to the problem

The existing literature on "amount" relatives contains two general approaches to the problem outlined above. The uniformity approach assumes that *there*-relatives are a special case of "amount" relatives. For example, Grosu and Landman (1998) postulate a richer notion of degree, which they call DEGREE, that also keeps track of the kind of thing measured and its cardinality. As example (7) below illustrates, the new degree is actually a triple consisting of the cardinality of the plural individual x, the sortal predicate P, and the plural individual x itself.

(7)   For all plural individuals x: $\text{DEGREE}_P(x) = <|x|, P, x>$

Assuming that numerals have essentially the semantics of modifiers, we obtain the semantics below for *three books*:

(8)   For all plural individuals x: DEGREE$_{BOOKS}$(x)=$< |x| = 3, BOOKS, x >$

Two other operations are needed for their analysis to work: a maximalization operation, which applies at the level of the CP for degree relatives with the effect of selecting "out of a set the unique triple all of whose coordinates are maximal", and a "SUBSTANCE" operation that turns a set of degree triples into a set of individuals. Maximalization restricts the set of degrees that is the meaning of the amount relative to a singleton set containing the maximal degree, if there is one. The SUBSTANCE operation applies as a default to give the set of third elements of the triples, i.e. the substances in (9b).

Consider the following example from Grosu and Landman:

(9)   (books) that there were _ on the table (on the table = O)
   a. $\{< |\sqcup\{x\in BOOK:ON\text{-}TABLE(x)\}|, BOOKS, \sqcup\{x\in BOOK:ON\text{-}TABLE(x)\}>\}$
   b. $\{\sqcup\{x\in BOOK:O(x)\}\}$, where $|\sqcup\{x\in BOOK:O(x)\}|=max\}$

At the CP level (9) receives the semantics in (9a). The SUBSTANCE operation applies on this complex DEGREE and gives the substance, as shown in (9b).

One problem with Grosu and Landman's approach is that it does not have the tools to derive the distribution of the amount reading in ACD relatives.

The second approach, which I call the split approach, holds that not all so-called "amount" relatives are degree relatives. In particular, McNally (2006) argues that *there*-relatives are not "amount" relatives at all, but plain restrictives. According to McNally, the lack of amount reading indicates lack of degree relativization. However, I argue below that an unexpected restriction on unmodified definite singulars, illustrated in (10), constitutes evidence against treating *there*-relatives as purely restrictive relatives.

(10)   a.   * I took with me the book that there was on the table.
         b.   I took with me the newest book that there was on the table.

Moreover, based on the grammaticality of examples like (11), she argues that the determiner restriction on *there*-relatives is not real.

(11)   For instance, they can observe that there's a difference between reasons <u>there are</u> to believe P - where these include reasons not now available to you - and reasons <u>you have</u> to believe P. For example, one reason there is to believe you'll soon be sick is the fact that you just drank poison. (James Pryor, 'Is There Non-Inferential Justification?', ms., Princeton University, emphasis original)

Both approaches presented here can account for the lack of an amount reading in *there*-relatives, but fail to account for the distribution of the amount reading in ACD relatives. The covert superlative proposal which I make for *there*-insertion relatives accounts for the absence of the amount reading, and the E-type semantics for ACD relatives explains the limited distribution of the amount reading.

2.2. *Arguments against the uniformity approach*

First, the difference in semantics between *there*-relatives and ACD "amount" relatives which I have outlined in section 1 argues against a uniform treatment. Recall that (1a) lacks the reading in (3), which is what the amount reading presumably would be.

Moreover, indefinite determiners in ACD relatives as in (13) do not cause ungrammaticality like in the case of *there*-insertion relatives in (12), but they merely make the amount reading unavailable or indistinguishable from the restrictive reading, an issue I return to in section 5.

(12)   * I took with me some book that there was on the table.

(13)   Marv put in his pocket something that he could. (no distinguishable amount reading)

A third argument comes from the lack of a correlation between the presence of the amount reading and the impossibility of *wh*-relativizers. Romanian relativizers are all *wh*-words, but ACD is only possible with the relativizer *ce* (what), and not with *care* (which), as illustrated below.

(14)   Marv a   pus în buzunar tot   ce   a   putut.
         Marv has.aux put in pocket   everything what has-aux can.past.

         'Marv put in his pocket everything he could.'

(15)   * Marv a   pus în buzunar toate lucrurile pe care   le-a   putut.
         Marv has.aux put in pocket   all   things   PE which them.acc.cl-has.aux can.past

         '*Marv put in his pocket everything which he could.'

Since the use of the relativizer *ce* is restricted, and English uses the relativizer *which*, it would be useful to find an amount reading in a relative clause that uses *care* in Romanian. Fortunately, the full version of (15), with the ACD gap spelled out, is grammatical as shown by (16). Moreover, it can display an amount reading, i.e. it is grammatical in a context where Marv only filled his pocket to capacity despite the existence of other things which could have been put in the pocket.

(16)   Marv a   pus în buzunar toate lucrurile pe care   le-a   putut   pune.
         Marv has.aux put in pocket   all   things   PE which them.acc.cl-has.aux can.past put.inf

         '#Marv put in his pocket everything which he could put.'

Finally, there is no correlation between the presence of the amount reading and a raising analysis of relative clauses. Hulsey and Sauerland (2006) argue that in relative clauses where a raising analysis is forced, such as those where the head is part of an idiom, extraposition is impossible. This is shown by examples (17a) and (17b), borrowed from Hulsey and Sauerland's work.

(17)   a.   * Mary praised the headway last year that John made.

         b.   * I was shocked by the advantage yesterday she took of her mother.

However, (18) shows that extraposition is possible in Romanian relatives with an amount reading, which, according to Hulsey and Sauerland's argument, indicates the absence of raising.

(18)   Ion a   pus   toate bomboanele în buzunar pe care   le-a   putut   pune.
         John has.aux put.pp all   candy.the   in pocket   PE which them.cl-has.aux could.pp put.inf

         'John put all the candy in his pocket that he could.'

2.3.   *An argument against* there-*relatives as restrictive relatives*

As mentioned above, an unmodified definite singular is bad in *there*-relatives, as noted by Carlson (1977), which is surprising if *there*-relatives are merely restrictive relatives, since restrictive relatives do not show such a restriction, as shown by the grammaticality of (19).

(19)   I took with me the book that was on the table.

(20)   * I took with me the book that there was on the table.

(21)   I took with me the longest book that there was on the table.

2.4.   *The proposal: A modified version of the split approach*

I argue that *there*-relatives are the real "amount"/degree relatives, involving a covert superlative morpheme which absorbs the degree and yields an individual. However, as far as ACD relatives with amount readings are concerned, I show that their properties can be explained by treating them as purely restrictive relatives obtained via an E-type interpretation.

3.   Motivating the superlative theory

In addition to the two types of relative clauses we discussed here, Heim (1987) addresses another type of relative clause that features an amount reading. (22) has two readings: the restrictive interpretation yields the absurd reading that we would drink champagne off the floor, while the amount interpretation merely requires that we drink the same amount of champagne as was spilled.

(22)   It will take us the rest of our lives to drink the champagne they spilled that evening.

While I do not address this type of "amount" relative here, McNally (2006) notices that *only* blocks the amount reading in the co-occurring relative clause.

(23)   It will take us the rest of our lives to drink the only champagne they spilled that evening. (McNally's 41a)

Notice that McNally's observation can be extended to superlatives and other superlative-like elements, which have the same effect in ACD relatives. For instance, (24) *can* be used in a context where the pocket is filled, but the pocket cannot be filled with a set of random marbles out of a set of contextually determined "nicest marbles", which is what the amount reading would presumably be.

(24)   Marv put in his pocket the nicest marbles that he could.

Also, as seen above, superlatives rescue definite singulars in *there*-relatives, as shown by the contrast between (25) and (26).

(25)   #I took with me the (long) book that there was on the table.

(26)   I took with me the longest book that there was on the table.

This behavior of the superlative in ACD "amount" relatives suggests a possible reason why *there*-relatives never evince an amount reading. The superlative morpheme has the property of combining with a degree expression of type $<d, <e,t>>$ and returning a set of individuals, which is precisely the meaning of the *there*-relative. Therefore, I propose that *there*-relatives contain a covert superlative morpheme which is responsible for the absence of the amount reading.

Since *there*-relatives are ungrammatical with definite singulars, let us consider first the semantics for the overt plural superlative, where C is a domain argument and d is a standard:

(27) $-est^{pl}$(X,R,**C**,d) $\Leftrightarrow$ for all x such that x$\in$C and x$\leq$X, R(x,d) and for all y such that y$\in$C and y$\not\leq$X, $\neg$ R(y,d) , where
(i) R is downward monotonic,
(ii) C is a set of atomic individuals,
(iii) d is a standard supplied by the context, and
(iv) X is a plural individual such that for all atomic x such that x$\leq$X, x$\in$C

(28)   R is downward monotonic iff for all degrees d and d' and individuals x: if R(d)(x) = True and d'$<$d, then R(d')(x) = True (cf. Heim 1999). Thus, Emma is four feet tall entails Emma is three feet tall.

Applying the semantics in (27) above to the example in (29a) yields (29b).
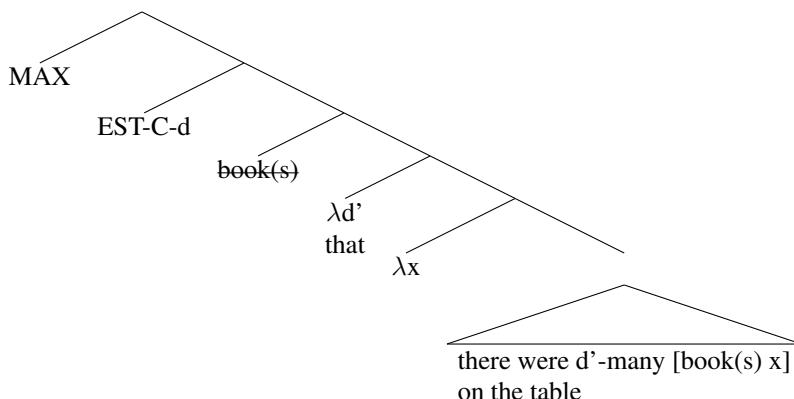
(29)   a.   The principal praised the best students.
        b.   The principal praised the maximal plural individual X such that for all x such that x$\leq$X and x$\in$C, x is a d-good student and for all y such that y$\not\leq$X and y$\in$C, $\neg$ [y is a d-good student]

I assume that the covert superlative has the same semantics as the (overt) plural superlative in (27) except it combines exclusively with numerical degrees. Then the semantics of the *there*-relative in (30a), using the covert superlative, is as in (30d).

(30)   a.   the/every book/books that there was/were on the table

b.   [MAX [EST^{pl}-C-d] λd'.λx.there were d'-many([λy.book/books(y) & y=x]) on the table]

c.

```
              MAX
                   EST-C-d
                        book(s)
                             λd'
                             that
                                  λx

                                       there were d'-many [book(s) x]
                                       on the table
```

d.   The maximal plural individual Y such that for all y such that y$\leq$Y and y$\in$C, there were d-many book(s) y on the table, and for all z such that z$\in$C and z$\not\leq$Y, it is not the case that there were d-many book(s) z on the table.

Here, I am borrowing the intuition of Fox (2002) that traces can embed variables, but not his idea that they have to be accompanied by a definite article. The result of applying the semantics in (27) is a plural individual *the books on the table*. Since the degree d is always forced to be 1 by the requirement that y be an atomic individual, we have to consider every individual in the relevant context. Of course, this is not the case when we are dealing with a non-numerical degree as in the case of *the tallest students*.

This use of the degree, where d does not correspond to the cardinality of the set of books on the table, allows us to use the covert superlative to bind the degree variable that Heim (1987) argues should be present in *there*-relatives. Notice also that the structure in (30c) is not very different from Heim's, except in containing abstraction over an individual variable in addition to the degree variable.

In the next section I show how this proposal fares with respect to the syntactic restrictions on "amount" relatives.

4.   Accounting for the restrictions
4.1.   *The puzzle of the definite singular*

One of the most intriguing restrictions on *there*-relatives is Carlson's definite singular. Why is (31) bad?

(31)   #I took with me the (long) book that there was on the table.

Consider first the distinctions between the singular and the plural superlative. An overt singular superlative, like *the smartest boy*, has a cancelable implicature that there is more than one boy, and the plural, *the smartest boys*, has an implicature that not all the relevant boys are smart up to the contextual standard d. This is shown by the oddity of the following discourses:

(32)   Sam is the smartest boy in his class.
       #In fact, he is the only boy in his class. All the other students in his class are girls.

(33)   Sam and Tom are the smartest boys in their class.
       #In fact, they are the only boys. All the other students in their class are girls.
       #In fact, all the boys in their class are equally smart.

In the case of the plural superlative, given the ambiguity in the set picked out by *best students* in (29a), i.e. straight A students, students with an average of B or higher, etc., we need the standard to be created contextually. On the other hand, in the case of the singular superlative, *best student* would unambiguously pick out the student with the highest degree of "goodness"; therefore the degree does not need to be an argument of the superlative, and is merely existentially quantified over as in (34).

(34)　*Singular superlative*: $-est^{sg}(x,R,C) \Leftrightarrow \exists d(R(x,d)$ and $\forall y\ [y\in C, y\neq x \rightarrow \neg R(y,d)])$, where
　　　　(i) R is downward monotonic,
　　　　(ii) C is a set of atomic individuals, and
　　　　(iii) $x\in C$

Consider now the covert superlative cases. With numerical EST, in the plural case, the degree is not established contextually as is the case with *-est*, but rather semantically. The fact that the semantics in (27) forces d to be 1 for the covert superlative cancels the relevant implicature that not all the individuals are considered, which is active in the case of the overt plural superlative.

However, in the case of the covert singular, the degree is not an argument of the superlative, as shown in (34); therefore the implicature of the overt singular superlative is active with the covert singular superlative as well. The atomicity and the downward monotonicity of R force d to be 1, but since we are dealing with a singular, there is only 1 individual to consider, which causes the badness of (25) in the same way that the existence of only one relevant boy would cause *the smartest boy* to be infelicitous.

4.2.　Restricting the numerical degree d

Before we move on to the "indefiniteness" restriction on the determiner, let us discuss what would go wrong if the degree d had a value higher than 1 in (30). First we should reconsider the status of presuppositions (ii) and (iv) in (27), which require that C is a set of atomic individuals. Consider, for example, a situation in which there are four books in the relevant context (a, b, c, d), three of which are on the table (a, b, and c) and one of which is on the floor (d). Assuming that d=2, we have three cases to consider: (a) C is not restricted to atomic individuals, but is allowed to contain them, (b) C is restricted to just plural individuals, and (c) C *is* restricted to a set of atomic individuals.

If C is not restricted to atomic individuals as in (a) and (b), then the individuals y which satisfy the condition that there be d-many books y on the table y are a+b, a+c, b+c, and, by monotonicity, a+b+c. This apparently gives us the desired result, since the maximal Y would be a+b+c. However, (a) allows for atomic individuals in C which are subparts of Y and which cannot obey the cardinality condition, for example a, b, and c.

On the other hand, if we restrict C to a set of plural individuals as in (b), we seem to get the right result for (30d). This is because the offending atomic individuals a, b, and c are removed from consideration. This restriction on C causes problems in the case of plural superlatives. Take the following scenario:

(35)　　John is 4', Fred is 3'5" and Bill is 3'2" tall. The contextually determined standard is d=3'5".

Let us now think about what the semantics of R(d,x) is when x is plural and d is a non-numerical degree. Either we require each atomic individual that is a subpart of a plural individual to have the degree d or we require only one of the atomic individuals to have the degree d. The first case is equivalent to reintroducing the presupposition that C contains only atomic individuals. In the second case, on the other hand, the existence of at least one atomic individual who is tall up to the contextual standard d would entail that all plural individuals containing it will also have the d degree of tallness. To use the example above, the set of individuals consisting of John, Fred and Bill will be the set of *tallest students* despite the fact that Bill is not tall up to the contextual standard d. This is, of course, undesirable, in light of the oddness of (36) in the context in (35) above (see also (33)).

(36)　　John, Fred, and Bill are the tallest students.

Finally, if C is restricted to a set of atomic individuals as in (c) above, there is no individual y which is a book on the table such that there are d-many books y on the table, if d>1. Therefore (30a) would always denote an empty set of individuals.

To summarize, in the absence of the requirement that C contain only atomic individuals, if d>1, (30a) can be made to denote the right set of individuals, but this comes at the cost of obtaining the wrong result in other cases involving superlatives. If we maintain the relevant presupposition, a d which is higher than 1 always yields an empty set. Therefore, the only situation that leads to the right result is when C is a set of atomic individuals, and d is forced to be 1.

4.3. The "indefiniteness" restriction

One potential source of the indefiniteness restriction is the incompatibility of superlative morphemes with indefiniteness. However, this cannot be always true: overt indefinite superlatives are possible in the right context (see Herdan and Sharvit 2006). Consider (37a) and (37b) in the scenario that follows them.

(37) a. The dean praised the best student.
      b. The dean praised some best student (or other).

   Scenario: Every class in the college has a student who is better than any other student in that class.

(37a) implies (on its most salient reading) that the dean praised the best student in the college. (37b) implies (on its most salient reading) that she praised, in some class, the best student in that class.

Moreover, (37b) improves when continued as in (38).

(38) The dean praised some best student. He happened to be the best student in the class of 2005. The best students in the other classes were not praised at all.

Even though I do not have an explanation for this part of the determiner restriction, it is relevant that even overt non-definite superlatives are disallowed in *there*-relatives.

(39) ?? The dean praised some best student that there was at the ceremony.

Therefore, non-definites in *there*-insertion contexts may be excluded by an incompatibility with the context required to license an indefinite superlative.

Note also that if McNally (2006) is right that the determiner restriction on *there*-relatives is not real, this proposal does not make any strong conflicting predictions since the overt superlative morpheme is not always incompatible with indefiniteness.

4.4. The relativizer restriction

Finally, as far as the relativizer restriction is concerned, degree relativization in *there*-insertion sentences is still responsible for the incompatibility with *which*, which Carlson (1977) and Heim (1987) assume to be restricted to binding individual variables. Since the individual variable in a *there*-relative is existentially bound, the relativizer *which* cannot find an appropriate variable to quantify over, resulting in ungrammaticality.

In the next section I turn to an account of the distribution of amount reading in ACD relatives that does not assume degree relativization, but relies instead on an E-type strategy of interpreting the ACD relative clause.

5. Amount readings without degrees

Unlike *there*-relatives, which I have assumed to involve degree relativization along the lines of Carlson and Heim, I argue that ACD relatives do not involve degree relativization. As I have shown

in section 2.2 above, the amount reading does not cross-linguistically correlate with the relativizer restriction. Moreover, the amount readings can be obtained from a restrictive, E-type semantics as in (41), without recourse to degree relativization.

(40)   Marv put in his pocket everything he could.

(41) $\forall x$ such that Marv could put x in his pocket at a time f(x), Marv put x in his pocket at the time f(x) (when he could put x in his pocket)

Notice also that, as mentioned before, the determiner restriction in ACD "amount" relatives is only apparent. The presence of the indefinite determiner *some* in (42) does not lead to ungrammaticality in the same way it would in its *there*-relative counterpart. If the head of the relative clause is not a definite or a universal, the E-type semantics merely cannot distinguish between the amount reading and a restrictive reading. Using the E-type semantics, (42) would presumably have the semantics in (43a), whose effects are indistinguishable from those of the run-of-the-mill restrictive semantics in (43b).

(42)   Marv put in his pocket some marbles that he could.

(43)   a. $\exists x$, x a marble, such that Marv could put x in his pocket at a time f(x) and Marv put x in his pocket at the time f(x) (when he could put x in his pocket)

        b. $\exists x$, x a marble, such that Marv could put x in his pocket and Marv put x in his pocket.

Other restrictions on the availability of the amount reading can also be explained away on the grounds of the impossibility to distinguish the amount reading from the restrictive reading.

In addition, if the ACD sentences which show amount readings do not have to be obtained through degree relativization, as suggested by the Romanian data in (16) above, then the relativizer restrictions observed in English ACDs must be explained independently of the presence of the amount reading.

6.   Conclusions

In this paper I have argued that a split approach to "amount" relatives allows us to account for the differences as well as the similarities between the members of this heterogeneous class. Assuming the presence of a covert superlative in *there*-relatives (the true "amount" relatives, involving degree quantification) provides us with a way to explain the complete absence of the amount reading as a result of the superlative absorbing the relevant degree variable.

In addition, I argue that ACD relatives with amount readings do not involve quantification over degrees at all. Adopting a non-degree, E-type restrictive semantics of the type I propose in section 5 allows us to derive the limited distribution of the amount reading in ACD sentences. The reason for the apparent restriction is the fact that in all but a handful of sentences the amount reading is indistinguishable from the run-of-the-mill restrictive relative reading.

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