

Much support and *more*

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Abstract. This paper examines the semantics of *much* when it occurs as a dummy element, in so-called *much* support (*Fred is diligent; in fact he is too much so*) and *more* comparatives (*more intelligent*, where *more* = *much* + *-er*). It is shown that far from being anomalies, *much* support and *more* comparatives provide a clue to the correct analysis of *much* more generally: *much* is essentially contentless, serving only as a carrier of degree morphology. In short, *much* always acts as *much* support. These findings provide support for a theory of quantity adjectives (*many*, *few*, *much* and *little*) as predicates of scalar intervals, with the remainder of the content traditionally ascribed to them contributed instead by null syntactic elements and operations. The vacuous nature of *much* itself is also argued to account for its infelicity in unmodified form in many contexts (e.g. ?? *We bought much rice*).

1 Introduction

1.1 The Problem

A curiosity about *much* is its ability to act as a dummy element. *Much* otherwise has uses as a quantifier meaning ‘a large quantity of’ (1), and as an adverbial element meaning ‘to a high degree’ (2):

- (1) a. Much alcohol was consumed last night
- b. Much office work is tedious
- c. We don’t have much rice
- (2) a. I much prefer wine to beer
- b. Isabelle doesn’t work much

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But consider cases such as (3), an example of what Corver (1997) refers to as *much* support. If *so* is a pronominal copy of the adjective *diligent* (or of some projection of the adjective), which is modified by the degree modifier *too*, *much* does not appear to make any semantic contribution at all.

- (3) John is diligent; in fact, he is too much so

A similar issue is posed by comparatives formed with *more*. In (4), *more intelligent* and *smarter* seem parallel in interpretation, involving the comparative forms of *intelligent* and *smart*, respectively. This would suggest that the comparative morpheme *-er* and *more* are semantically equivalent. But *more* in its quantificational uses has been analyzed as the comparative of *much* (and *many*) (5) (cf. Bresnan 1973). If this approach is extended to cases such as (4a) (i.e. *more intelligent* = *much* + *-er* + *intelligent*), we again have an extra *much* without apparent semantic content.

- (4) a. Sue is more intelligent than Fred
b. Sue is smarter than Fred
- (5) I have more [much + -er] rice than I need

1.2 Previous Treatments

Within the literature, there are two prominent approaches to the facts outlined above. On the one hand, Bresnan (1973) posits an underlying *much* in adjectival projections generally, such that the adjective phrase in (6a) is underlyingly (6b). In pre-adjectival contexts, *much* is then deleted via a rule of *much*-deletion (7):

- (6) a. Mary is too intelligent
b. [AP_{QP} too much] intelligent]
- (7) $\text{much} \rightarrow \emptyset$ [AP... --- A]

In this way, a parallel can be reestablished between cases such as (4a), where *much* is present (in its comparative form *much* + *-er* = *more*), and (4b), where *much* has been deleted via (7).

Corver (1997), on the other hand, distinguishes two *much*'s: the lexical contentful *much* of examples such as (2) and the 'dummy' *much* of *much* support (3). The former is an adjectival element that introduces its own degree argument; the latter is a dummy element that is inserted as a last resort to establish a local relationship between a degree operator (e.g. *too* in (3)) and the degree argument of the pro-form *so*. While Corver's analysis has been challenged (notably by Doetjes 1997, to be discussed further below), the notion of a separate dummy *much* has been adopted by later authors, including Kennedy & McNally (2005) and Rett (2006).

But both of these approaches – Bresnan's *much* deletion and Corver's posited ambiguity – add complexity to the grammar. I argue here that when *much* itself receives the correct analysis, neither is in fact necessary.

1.3 Main Claim

The central proposal developed in this paper is that there is nothing anomalous about the *much* of *much* support and *more* comparatives. *Much* in these contexts has precisely the same semantics as it does in the apparently contentful cases (1) and (2). Specifically, *much* in its lexical semantics is essentially contentless, serving only as a carrier of degree morphology, which can be inserted as needed for morphological or syntactic reasons, without affecting the compositional semantics.

To be clear, I do not intend to claim that a sentence including *much* has the same meaning as the equivalent sentence without *much*. That is obviously not the case: (8a), for example, means something different than (8b), and (9a) allows a different answer than (9b).

- (8) a. We didn't buy much rice
b. We didn't buy rice
- (9) a. Did you buy much rice?
b. Did you buy rice?

Rather, the claim is that to the extent that there is a difference in meaning in the pairs above, none of the extra meaning present in the (a) examples can be attributed to the content of *much* itself. *Much* instead serves merely to support or signal the presence of other contentful elements, which may be phonologically null. Put differently, *much* in essence is always *much* support.

2 Proposal

2.1 The Decomposition of *much*

The broader context for the present analysis is a theory according to which the adjectives of quantity (Q-adjectives) *many*, *few*, *much* and *little* are taken to denote predicates of scalar intervals, an approach that builds on Schwarzschild (2006) and Heim (2006). This is independently motivated by the need to account for their differential uses, as in (10) and (11), where they occur as modifiers in comparatives.

- (10) a. We have much more than 10 kg of rice
b. We have little more than 10 kg of rice
c. We have much less than 10 kg of rice
- (11) a. John is much shorter than Fred
b. John is much younger than Fred

Q-adjectives are most commonly analyzed as quantifying determiners (Barwise & Cooper 1981), as in (12a). Alternately, building on analyses of cardinal numerals as cardinality predicates (e.g. Landman 2004), one might analyze them as predicates over groups or portions of matter (12b) (along these lines, see ParTEE 1989 for a predicative treatment of *many* and *few*).

- (12) a. $\llbracket \text{much}_{\text{quant}} \rrbracket = \lambda P \lambda Q. \exists x [P(x) \wedge Q(x) \wedge \mu_{\text{DIM}}(x) > d_{\text{Std}}]$
 b. $\llbracket \text{much}_{\text{pred}} \rrbracket = \lambda x. \mu_{\text{DIM}}(x) > d_{\text{Std}}$
 where $\mu_{\text{DIM}}(x)$ is a measure function that associates a portion of matter with a degree on some dimension DIM (e.g. weight, volume, etc.) and d_{Std} is a context-dependent standard of comparison

However, neither of the entries in (12) can be applied to examples such as (10) and (11). Here *much* and *little* first of all cannot be analyzed as quantifying determiners (per (12a)), in that there are not two predicates that could serve as arguments. But they also cannot be analyzed as predicates of portions of matter (per 12b)). In (10a), we might be tempted to say that *much* is predicated of that portion of the rice we have in excess of the first 10 kg; but in (10c), there is no equivalent portion of rice of which *much* could be predicated. This same issue applies even more clearly in the case of (11), where there is no stuff of any sort that could provide an argument for the Q-adjective.

Instead, from an intuitive perspective, *much* and *little* in these cases describe the gap between two values or degrees on a scale (cf. Klein 1982). That is, (10c) specifies that the gap between the amount of rice we have and 10 kg is large; (11b) specifies that the gap between John's age and Fred's is large. This can be formalized as follows: First, the gap between two scalar values is represented as a scalar interval, that is, a convex set of degrees (13). *Much* and *little* are then taken to denote predicates of scalar intervals. As a first approximation, this may be represented as in (14), where *much* is true of an interval if its length exceeds some context-dependent standard, while *little* is true of an interval if its length falls short of some (possibly different) standard.

- (13) A set of degrees $I_{\langle dt \rangle}$ is an interval iff
 $\forall d, d', d'' \text{ such that } d < d' < d'', (d \in I \wedge d'' \in I) \rightarrow d' \in I$
- (14) a. $\llbracket \text{much} \rrbracket = \lambda I_{\langle dt \rangle}. \text{length}(I) > d_{\text{Std}}$
 b. $\llbracket \text{little} \rrbracket = \lambda I_{\langle dt \rangle}. \text{length}(I) < d_{\text{Std}}$
 where $\text{length}(I) = \max(I) - \min(I)$

With this in place, differential examples such as (10) and (11) now receive a straightforward analysis. For example:

- (15) $\llbracket (10c) \rrbracket = 1$ iff $\llbracket \text{much} \rrbracket(\{d : \text{amount of rice we have} \leq d \leq 10 \text{ kg}\})$
 iff $\text{length}(\{d : \text{amount of rice we have} \leq d \leq 10 \text{ kg}\}) > d_{\text{Std}}$

Thus to accommodate the differential uses of *much* and other Q-adjectives, some of the semantic content typically ascribed to these terms (as in (12)) must be stripped away. Specifically, *much* and *little* as defined in (14) do not introduce quantification over individuals; and second, *much* and *little* do not in their lexical semantics include a measure function, that is, a function that associates portions of matter with degrees (cf. (12)). This would seemingly leave the entries in (14) unable to handle the use of Q-adjectives as quantifiers, as in (1). But these too can be accommodated with the interval-based semantics given above,

by attributing the missing semantic content to other elements. To this end, I first propose that quantificational force arises via existential closure. Second, I follow Schwarzschild (2006) (and less directly Kayne 2005) in proposing that the measure function role is played by a functional head *Meas* (for ‘measure’), in whose specifier position the quantifier phrase headed by quantificational *much* or *little* occurs. *Meas* has the semantics in (16):

$$(16) \quad \llbracket \text{Meas} \rrbracket = \lambda x \lambda d. \mu_{DIM}(x) = d$$

To work out a relevant example, (1a) has the surface structure in (17a). But *much* cannot be interpreted in situ due to a type mismatch, so raises at LF (17b), leaving a trace of type d in its base position. The semantic derivation proceeds as in (18).

- (17) a. SS: $\llbracket [\text{DP}_{QP} \text{ much}] \text{ Meas alcohol} \rrbracket$ was consumed]
 b. LF: $[\text{QP} \text{ much}]_1 \llbracket [\text{DP } t_1 \text{ Meas alcohol}] \text{ was consumed} \rrbracket$

$$(18) \quad \begin{aligned} & \llbracket \text{much}_1 \rrbracket (\llbracket t_1 \text{ Meas alcohol was consumed} \rrbracket) \\ &= \llbracket \text{much}_1 \rrbracket (\lambda d_1. \exists x [\text{alcohol}(x) \wedge \text{consumed}(x) \wedge \mu_{DIM}(x) = d_1]) \\ &= \text{length}(\{d : \exists x [\text{alcohol}(x) \wedge \text{consumed}(x) \wedge \mu_{DIM}(x) = d]\}) > d_{Std} \end{aligned}$$

The end result in (18) specifies that length of the interval from 0 to the degree corresponding to amount of alcohol consumed exceeds d_{Std} (or in simpler terms, that the amount of alcohol consumed exceeds d_{Std}).

Note also that while the examples discussed here involve *much* and *little*, the same approach can be extended to their count counterparts *many* and *few*, by taking the degrees in question to be degrees of cardinality.

However, the analysis outlined here is not, in the present form, quite adequate. *Much* and *little* are gradable expressions, able to combine with degree modifiers (*too much*, *so much*, *as much as*, etc.). In their modified forms, they do not have the ‘greater than standard’ interpretation that characterizes the positive (i.e. unmodified) form (for example, ‘I have as much rice as Fred’ does not entail ‘I have much rice’). This is not captured by the entries in (14), in which the standard of comparison d_{Std} is part of the lexical semantics of *much* and *little*.

Within the literature on gradable adjectives (e.g. Cresswell 1977, Heim 2000), which is extended to Q-adjectives in particular by Hackl (2000), the usual approach to this issue is to remove the standard of comparison from the semantics of the positive form itself. Instead, the gradable expression is given a degree argument as its first argument, which may be saturated or bound by a degree modifier (e.g. by *too* or *as*). In the case of the bare positive form, where there is no overt degree morphology, a phonologically null degree operator POS (for ‘positive’) plays this role.

Marrying this approach with the interval-based semantics for Q-adjectives developed above, we can give *much* and *little* the revised entries in (19), with (20) (taken from von Stechow 2006) representing a possible semantics for the null positive morpheme POS:

- (19) a. $\llbracket \text{much} \rrbracket = \lambda d \lambda I_{\langle dt \rangle}. d \in I$
 b. $\llbracket \text{little} \rrbracket = \lambda d \lambda I_{\langle dt \rangle}. \neg d \in I$

(20) $\llbracket \text{POS} \rrbracket = \lambda I_{\langle dt \rangle}. N_S \subseteq I$

Here POS introduces as a standard of comparison the range N_S consisting of values that would be considered neither large nor small with respect to the context.¹

According to the revised definitions in (19), *little* is interpreted as degree negation (a conclusion argued for on independent grounds by Heim 2006), associating an interval with the degrees not contained within it. But *much* simply associates an interval with the degrees within it. The result is that it functions essentially as an identity function on intervals. This becomes evident through an example. With the semantics for *much* and POS introduced above, (1a) has the revised LF in (21), where both *much* and POS have raised from their DP-internal surface positions for type-driven reasons. The semantic derivation proceeds as in (22):

(21) LF: $[_{\text{DegP}} \text{POS}]_2 [_{\text{QP}} t_2 \text{much}]_1 [_{\text{DP}} t_1 \text{Meas alcohol}] \text{ was consumed}$

(22) $\llbracket \text{POS}_2 \rrbracket (\llbracket t_2 \text{much}_1 \rrbracket (\llbracket t_1 \text{Meas alcohol was consumed} \rrbracket))$
 $= \llbracket \text{POS}_2 \rrbracket (\llbracket t_2 \text{much}_1 \rrbracket (\lambda d_1. \exists x [\text{alc}(x) \wedge \text{consumed}(x) \wedge \mu_{\text{DIM}}(x) = d_1]))$
 $= \llbracket \text{POS}_2 \rrbracket (\lambda d_2. \exists x [\text{alcohol}(x) \wedge \text{consumed}(x) \wedge \mu_{\text{DIM}}(x) = d_2])$
 $= N_S \subseteq \{d : \exists x [\text{alcohol}(x) \wedge \text{consumed}(x) \wedge \mu_{\text{DIM}}(x) = d]\}$
 ‘The amount of alcohol consumed exceeds N_S ’

Here, *much* takes as argument the set of degrees (interval) formed by lambda abstraction over the trace of type d in its base position. Subsequently, lambda abstraction over the trace of POS again produces a set of degrees. But as can be verified above, the second set of degrees is identical to the first. Under this analysis, *much* is essentially semantically inert, simply mapping a set of degrees (interval) to itself. It makes no other contribution to the semantics of the sentence.

Thus in analyzing *much* as a gradable expression, yet more of its content must be stripped away, and transferred instead to POS, leaving *much* itself as a pure identity element. Put differently, *much* has no content of its own, but serves only as a carrier of degree morphology (in the case above, of POS).

There is an obvious question that follows: if *much* is semantically contentless, why is it required in at all? For instance, in an example such as (21), why can the DegP headed by POS not combine directly with Meas, eliminating the QP layer (and thus *much*) entirely. Here I follow Doetjes (1997), who considers a similar set

¹ Nothing in the analysis that follows hinges on the specific definition of POS in (20); what is crucial is that *much* have the semantics in (19a). Note also that with the definition of POS in (20), differential cases such as (10) and (11) must be handled slightly differently than above. This can be accomplished by defining the comparative morpheme *-er* in such a way to produce an interval of the same length as the original gap, but lower bounded by 0. This is worked out in detail in Solt (2009).

of facts from a more syntactic perspective, and take the reasons to be selectional in nature. Specifically, degree modifiers (*-er*, *too*, POS, etc.) are restricted to combining with gradable terms (gradable adjectives and Q-adjectives); to occur in the extended noun phrase they must first compose with *much*, creating a QP that has more flexible selectional properties.

2.2 Applied to *much* Support and *more* Comparatives

Having concluded that *much* is transparent to semantic composition, we should not be surprised that it is able to function as a dummy element. An analysis of *much* support and *more* comparatives now follows quite simply.

I begin with *much* support. With regards to the syntactic structure, I assume that in the case of a degree modifier plus gradable adjective (e.g. *too diligent*), the degree modifier constitutes a Degree Phrase (DegP) located in the specifier position of the adjective phrase AP (Heim 2000). I take *so* to be a pro-form standing in for the AP, such that SpecAP is not available as a position for a degree modifier. To remedy this, *much* is inserted, in the form of a QP headed by *much* in the specifier position of a higher functional projection of the adjective:

- (23) a. He is [AP [DegP *too*] diligent]
 b. He is [FP [QP [DegP *too*] *much*] F⁰ [AP *so* diligent]]

However, due to the transparent nature of *much*, the resulting interpretation is semantically equivalent to what would obtain if *much* were not present:

- (24) $\llbracket \text{too}_2 \rrbracket (\llbracket \text{t}_2 \text{ much}_1 \rrbracket (\lambda d_1 . \text{he is } d_1 \text{ diligent}))$
 $= \llbracket \text{too}_2 \rrbracket (\lambda d_2 . \text{he is } d_2 \text{ diligent})$

More comparatives can be treated similarly. Adjectives that form *more* comparatives (e.g. *intelligent*) cannot compose directly with the comparative morpheme *-er* (presumably for morphological reasons). I propose that while *-er* comparatives feature a DegP *-er* in SpecAP, *more* comparatives feature a QP *more* (i.e., [QP [DegP *-er*] *much*]), again located in the specifier position of a higher functional projection FP.

- (25) a. Sue is [AP [DegP *-er*] smart]
 b. Sue is [FP [QP [DegP *-er*] *much*] F⁰ [AP intelligent]]

But as in the case with *much* support, the interpretation is parallel to that which would obtain without *much*:

- (26) $\llbracket \text{-er}_2 \rrbracket (\llbracket \text{t}_2 \text{ much}_1 \rrbracket (\lambda d_1 . \text{Sue is } d_1 \text{ intelligent}))$
 $= \llbracket \text{-er}_2 \rrbracket (\lambda d_2 . \text{Sue is } d_2 \text{ intelligent})$

Thus in both cases, *much* can be inserted to host degree morphology (e.g. *too* or *-er*), without affecting the compositional semantics (cf. Doetjes 1997 for a related conclusion).

2.3 Summary

In summary, *much* support and *more* comparatives are not anomalies at all. We do not require a separate semantics for *much* in these cases, nor is it necessary to posit an underlying *much* in constructions where it is not overtly realized. Instead, the same semantic analysis that is required for apparently contentful uses of *much* – one which renders it essentially vacuous – allows *much* to also function as a dummy element.

3 The Infelicity of Bare *much*

It has often been noted that bare *much* is only marginally acceptable in many contexts (see Zwicky 2006a, 2006b for discussion). The (carefully chosen) original example (1a) is itself somewhat awkward; and other examples of unmodified quantifier *much* are typically quite bad (27a). By contrast, in the same contexts, *much* in combination with an overt degree morpheme (*-er*, *too*, *that*, etc.) is perfectly felicitous (27b-e).

- (27) a. ??I bought much rice
b. I bought more rice than I needed
c. I bought as much rice as I could
d. I bought too much / so much / that much rice
e. How much rice did you buy?

The present analysis suggests an account for this. *Much* is semantically vacuous; its primary role is as a carrier of degree morphology. As such, it is infelicitous in the absence of an overt degree morpheme. In combination with the null morpheme POS, whose interpretation is entirely context dependent, *much* does not have enough content to stand on its own. This is particularly the case because *much* does not even specify a dimension of measurement (e.g. *too much rice* could be an excessive amount in terms of weight, volume, etc.).

The picture is, however, somewhat more complicated, in that bare *much* is not always infelicitous. Specifically, *much* in its unmodified form is awkward (if not outright ungrammatical) in quantificational use (27a), (28a,b), as a post-verbal modifier (28c) and in *much* support (28d). But by contrast, it is quite acceptable in the differential use (29a,b), in partitives (29c) and headless nominals (29d), as a pre-verbal adverb with a small group of verbs (29e), and as a modifier of deverbal adjectives (29f) and two ordinary adjectives, *alike* and *different* (29g).

- (28) a. ??Much wine is left
b. ??Sue lost much money in the stock market crash
c. ??John slept much
(cf. John slept too much; John slept as much as he wanted)
d. ??I'm tired; in fact, much so
(cf. ...in fact, too much so to go to the party)

- (29)
- a. We have much more/much less than 10 kg of rice
 - b. John is much taller/much shorter than Fred
 - c. Sue lost much of her money in the stock market crash
 - d. Much of what has been written about the topic is wrong
 - e. I much prefer wine to beer
 - f. a much improved effort; a much loved teacher
 - g. Mice and moles are much alike/much different

Is this pattern evidence that there are in fact two *much*'s, contra the unified account developed in this paper? Corver (1997) uses data such as these as support for his proposed distinction between dummy and lexical *much*: the former must occur with degree morphology (in that its role is to establish a local relationship between a degree operator and the degree argument of another element), while the latter, being itself contentful, may occur bare. However, a closer look at the data in (28) and (29) shows that the distribution of bare *much* does not in any obvious way line up with a contentful versus dummy divide. For example, as noted above, bare *much* is typically awkward in when it occurs as a quantifier (28a,b); yet it seems implausible to align the quantifier *much* to the dummy category. The contrast between *much* as a pre-verbal versus post-verbal adverbial ((29e,f) vs. (28c)) would also be puzzling on this analysis. Note also that in the contexts where unmodified *much* is infelicitous in positive sentences (29), it is perfectly acceptable in the equivalent negative sentences (e.g. *I didn't buy much rice*; *John didn't sleep much*). This suggests that *much* in contexts such as (28) has the status of an NPI (cf. Zwicky 2006b), and that the infelicity of the positive examples cannot be attributed simply to the absence of a degree operator.

If the contrast exemplified above does not reflect the existence of two distinct *much*'s, how can it be accounted for? While I do not have a conclusive explanation for these facts, two (not necessarily incompatible) possibilities suggest themselves. First, consider a headless nominal such as (29d). Here *much* is required to give the noun phrase phonetic content. This points to the possibility that in other of the acceptable cases (e.g. the partitive and differential), bare *much* is allowed by virtue of making a layer of syntactic structure overt. Second, a comparison of the quantificational (28c) to the partitive (29c) suggests that bare *much* is more felicitous when its interpretation is more constrained. What counts as *much money* is entirely context dependent. But partitives are interpreted proportionally; *much of her money* means a large proportion of her money, an interpretation which is much less free than that available in the quantificational case. Differential uses of *much* are also constrained in interpretation. While only the context determines what counts as *much rice* (27a), in the case of *much more than 10 kg of rice* (29a), the difference must be significant in comparison to 10 kg (i.e. the extra amount required to count as *much more than 10 kg* is different than that needed to count as *much more than a ton*). I leave the relative role of these two factors, and their potential to explain other of the contrasts between (28) and (29), as a topic for future research.

4 Conclusions

In this paper, I have argued that there is nothing particularly anomalous about *much* support and *more* comparatives. Rather, these constructions provide a clue to the true nature of *much*: a semantically contentless carrier of degree morphology, which may be inserted as needed as a dummy element, and which is (in many contexts) infelicitous in the absence of an overt degree morpheme. This analysis thus provides further support towards a theory of Q-adjectives as predicates of scalar intervals, with much of the content typically ascribed to them instead contributed by phonologically null elements and semantic operations.

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