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DegP scope revisited

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Abstract The semantic literature takes degree operators like the comparative, but also measure phrases, the equative, the superlative and so on, to be quantifiers over degrees. This is well motivated by their semantic contribution, but leads one to expect far more scope interaction than is actually observed. This paper proposes an alternative-semantic analysis of certain degree constructions, in particular constructions with *little* and other negative antonyms. Restrictions on scope can then be explained as intervention effects.

Keywords Comparatives · Intervention effects · Antonyms

1 Introduction

Semantic analysis generally takes comparison operators to be quantifiers over degrees. The comparative has received the largest amount of discussion in this respect (compare already von Stechow 1984 and earlier works discussed there). The claim that the comparative is quantificational is widespread. What is unclear, however, is the way this quantification enters into semantic composition.

Some analyses handle the quantification over degrees lexically (prominently, Kennedy 1997). The comparative is not a syntactic quantifier, in the sense that it has a QRable semantic type and is syntactically mobile, able to raise at LF. Quantification over degrees happens in the lexicon, similar perhaps to quantification over possible worlds with intensional verbs. These analyses predict that there is little scope interaction in comparatives. Alternatively, comparative operators have been taken to be straightforward generalized quantifiers (over degrees instead of individuals) able to undergo all the usual scope mechanisms in the syntax

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(prominently, Heim 2001). The latter analyses lead one to expect pervasive scope interaction. The relevant facts are laid out in Heim (2001); notably, they are not straightforwardly accounted for by either type of analysis. There is some scope interaction (with certain intensional verbs) but it is not pervasive (other intensional verbs, and nominal and adverbial quantifiers, do not seem to interact). Key data from Heim (2001) are given in (1) and (2): comparatives involving a comparative DegP headed by *less*, and differential comparatives with *exactly*-phrases. (1) and (2) exhibit ambiguity and hence plausibly scope interaction in the matrix clause, between the comparative DegP and the intensional verb.

(1) This draft is 10 pp long.
The paper is required to be [$_{\text{DegP}}$ exactly 5 pp longer than that].
a. The minimum length required for the paper is 15 pp.
b. The following is required: that the paper be exactly 15 pp long.

(2) This draft is 10 pp long.
The paper is required to be [$_{\text{DegP}}$ less long than that].
a. The minimum length required for the paper is less than 10 pp.
b. The following is required: that the paper be less than 10 pp long.

In this paper, I reexamine the scope data. I propose a new analysis of the crucial facts with *less* in interaction with matrix clause quantifiers. The analysis employs an alternative semantics in the style of Rooth (1985, 1992) for *less*-comparatives. Alternatives are triggered by *little* and other negative antonyms, which play a role similar to NPIs in my analysis. Constraints on scope follow from the alternative semantics.

In Sect. 2, I introduce the empirical and theoretical issue and lay out the particular questions addressed in this paper. The first focus of the paper, in Sect. 3, is the analysis of DegPs with *little* and negative antonyms of adjectives, exemplified in (3). Their relevance for the issue of the scope of DegPs can be seen in (4), whose ambiguity parallels the one in (2). An analysis is proposed that captures in particular the scopal possibilities of DegPs with *little*.

(3) a. Ida weighs [$_{\text{DegP}}$ that little].
b. Ida is [$_{\text{DegP}}$ that short].

(4) Ida is required to weigh [$_{\text{DegP}}$ that little].
a. The minimum weight required for Ida is “that”.
b. The following is required: that Ida weigh “that” little.

Section 4 extends the analysis to other comparison constructions based on *little*, including *less*-comparatives. In Sect. 5 I address the issue of *exactly*-DegPs, without however being able to give a complete analysis. Section 6 concludes the paper.

2 The issue

Section 2.1 provides a more detailed explanation of the issue of scope in comparatives. The constraints observed are reminiscent of intervention effects, and hence those and their alternative-semantic analysis are presented in Sect. 2.2. In Sect. 2.3. I explain the strategy I pursue in the remainder of the paper.

2.1 The comparatives data

Heim (2001) argues, in part contra Kennedy (1997), that there are genuine quantifiers over degrees in languages like English, and that the comparative morpheme is one of them. Two types of example are crucial for her to make this point: comparatives with *exactly*-differentials and a modal (cf. (1)), and comparatives with *less* and a modal (cf. (2)).

(1) This draft is 10 pp long.
The paper is required to be exactly 5 pp longer than that.

(2) This draft is 10 pp long.
The paper is required to be less long than that.

Both examples are ambiguous. Heim's LFs and interpretations are given below:

(1′) a. $\max(\lambda d.\forall w'[R(@,w') \text{ -> the paper is d-long in } w']) = 10\text{ pp} + 5\text{ pp}$
= the length the paper reaches in all relevant worlds is 15 pp
= the minimum length required for the paper is 15 pp
b. $\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') = 10\text{ pp} + 5\text{ pp}]$
= in all relevant worlds, the paper's length is 15 pp
= the following is required: that the paper be exactly 15 pp long

(1″) a. [[DegP exactly 5 pp -er than that] [1[required [the paper be t1 long]]]]
b. [required [[DegP exactly 5 pp -er than that] [1[the paper be t1 long]]]]

(5) a. [[-er]] = $\lambda d.\lambda d'.\lambda D.\max(D) \geq d + d'$
b. [[exactly 5 pp -er than that]] = $\lambda D.\max(D) = 10\text{ pp} + 5\text{ pp}$ (type <<d,t>,t>)

(2′) a. $\max(\lambda d.\forall w'[R(@,w') \text{ -> the paper is d-long in } w']) < 10\text{ pp}$
= the length that the paper reaches in all relevant worlds is below 10 pp
= the minimum length required for the paper is less than 10 pp
b. $\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') < 10\text{ pp}]$
= in all relevant worlds, the paper's length is below 10 pp
= the following is required: that the paper be less than 10 pp long

(2″) a. [[DegP less than that] [1[required [the paper be t1 long]]]]
b. [required [[DegP less than that] [1[the paper be t1 long]]]]

(6) a. [[less]] = $\lambda d.\lambda D.\max(D) < d$
b. [[less than that]] = $\lambda D.\max(D) < 10\text{ pp}$ (type <<d,t>,t>)

The examples show, according to this analysis, that the comparative DegPs *[exactly 5 pp -er than that], [less than that]* enter into a scopal ambiguity with modal verbs. Either a wide scope or a narrow scope reading of the DegP relative to the modal is possible. Of particular interest is the reading in which the DegP takes scope over the modal, because this indicates that the DegP is an upwardly mobile quantifier. The important conclusion from this is that a comparative DegP (by this I mean a DegP headed by a comparative operator, *-er* or *less*) can undergo QR, thereby changing scope relations and thus acting as a syntactically visible quantifier. Note that we are concerned here with the scope of the DegP relative to same-clause operators; that is, we are investigating scope interaction in the matrix clause of comparatives. Another complex issue is quantification in the first argument of the comparison operator, the *than*-constituent, especially *than*-clauses (Schwarzschild and Wilkinson 2002; Heim 2006; Beck 2010, among others). Although there seem to be some interesting connections (Beck 2011; Krasikova 2010), I will not address *than*-clause quantifiers in this paper. Instead I concentrate on DegPs and their clause-mates.

The same basic facts regarding scope ambiguity that we observed in (1) and (2) for necessity modals hold for (suitable) possibility modals:

(7) The paper is allowed to be exactly 5 pp longer than that.

(7′) a. max(λd.∃w′[R(@,w′) & the paper is d-long in w′]) = 10 pp + 5 pp
= the maximum length allowed for the paper is 15 pp
b. ∃w′[R(@,w′) & max(λd.the paper is d-long in w′) = 10 pp + 5 pp]
= the following is permitted: that the paper be exactly 15 pp long

(7″) a. [[DegP exactly 5 pp -er than that] [1[allowed [the paper be t1 long]]]]
b. [allowed [[DegP exactly 5 pp -er than that] [1[the paper be t1 long]]]]

(8) The paper is allowed to be less long than that.

(8′) a. max(λd.∃w′[R(@,w′) & the paper is d-long in w′]) < 10 pp
= the maximum length allowed for the paper is less than 10 pp
b. ∃w′[R(@,w′) & max(λd.the paper is d-long in w′) < 10 pp]
= the following is permitted: that the paper be less than 10 pp long

(8″) a. [[DegP less than that] [1[allowed [the paper be t1 long]]]]
b. [allowed [[DegP less than that] [1[the paper be t1 long]]]]

Despite the data in (1), (2), (7), and (8), some uncertainty remains. A fact that severely limits our empirical basis is that a truth-conditionally visible ambiguity appears only in relatively complicated examples with certain differentials (among them *exactly*, but not *at least*) and *less*-comparatives. Heim shows that an ordinary, simple comparative like (9a) does not allow us to distinguish the readings that the two conceivable LF structures give rise to. Thus (9b) and (9c) amount to the same thing. Compare Heim (2001) for a comprehensive description of the facts.

(9) a. The paper is required to be longer than that.
b. [[DegP -er than that] [1[required [the paper be t1 long]]]]
c. [required [[DegP -er than that] [1[the paper be t1 long]]]]

(9′) a. $\max(\lambda d.\forall w'[R(@,w') \rightarrow \text{the paper is d-long in } w']) > 10$ pp
= the minimum length required for the paper is above 10 pp
b. $\forall w'[R(@,w') \rightarrow \max(\lambda d.\text{the paper is d-long in } w') > 10 \text{ pp}]$
= it is required that the paper be over 10 pp long

There is a second, more serious problem. Comparative DegPs for the most part do not in fact enter into scopal interaction with other operators. Data in which a truth-conditional difference is observable show that the modals in the data above are an exception; cf. e.g. the unambiguous (10). Only a reading in which the nominal quantifier takes wide scope is available. A reading with wide scope of the comparative (a 'smallest instance' reading according to which (10) talks about the shortest girl, analogous to the 'minimal requirement' reading above) is impossible. This means that the LF in (10″a) must somehow be ruled out in order to prevent us from deriving a reading that is intuitively unavailable. Other nominal quantifiers and adverbial quantifiers are like *every* in not permitting any scope interaction (and nor do certain modals like *might* and *should*). See again Heim for a thorough discussion of the data.

(10) John is 6′.
Every girl is less tall than that.

(10′) a. # $\max(\lambda d.\forall x[\text{girl}(x) \rightarrow x \text{ is d-tall}]) < 6'$
The shortest girl is shorter than 6′.
b. $\forall x[\text{girl}(x) \rightarrow \max(\lambda d.x \text{ is d-tall}) < 6']$
Every girl is below 6′ tall.

(10″) a. * [[DegP less than that] [1[every girl is t1 tall]]]
b. [[every girl] [2[[DegP less than that] [1[t2 is t1 tall]]]]]

The net result is that the empirical foundation for regarding comparative DegPs as syntactic degree quantifiers is slim. As far as I know, the only direct semantic evidence consists of the type of data illustrated by (1), (2), (7), and (8). By contrast, the data type illustrated by (10) presents an open question in that some additional constraint will have to rule out the wide scope reading of the comparative. Heim (2001) speculates briefly that the relevant constraint could be an intervention effect (Beck 1996; Pesetsky 2000). That is, the DegP would not be able to take scope over an intervening quantifier.

(11) * [DegP ... [QP [... t_{DegP} ...]]...]
| |
scope position surface position
of DegP of DegP

The next subsection will explain why the connection to intervention effects suggests itself.

2.2 Intervention effects and an alternative-semantic analysis

In (12) below I give an example of an intervention effect in a wh-question. The observation is that under certain circumstances a quantifier intervening between two wh-phrases leads to ungrammaticality. The unacceptable (12a-c) should be contrasted with the acceptable baseline, (12d).

(12) a. * Which boy did no teacher introduce which girl to _ ?
b. # Which boy did every teacher introduce which girl to _ ? (only pair list)
c. * Which boy did only Susan introduce which girl to _ ?
d. Which boy did Susan introduce which girl to _ ?

The effect has been characterized in terms of the quantifier blocking the path of a wh-phrase to the position in which it ought to be interpreted (Beck 1996; Pesetsky 2000; Beck 2006, among others). This characterisation brings out a first similarity to the comparatives scope data.

(13) * [Q$_i$ ... [QP [... wh$_i$ ...]]...]
| |
scope position surface position
of wh of wh

A second, more important similarity is the fact that while nominal and adverbial quantifiers give rise to intervention effects, modals do not[1]:

(14) a. Which boy does John need to introduce which girl to _?
b. Which boy is John allowed to introduce which girl to _?

There is therefore good reason to look for an explanation in terms of intervention for the comparatives data: in both cases, quantifiers produce a locality effect for scope. Furthermore, nominal and adverbial quantifiers may not be scoped over, while other operators, in particular certain modals, are unproblematic. Intervention is thus different from other locality constraints, such as restrictions on movement.

Let us next examine the explanation given for the intervention effect in terms of an alternative semantics—the explanation that I will adopt in this paper. The basic idea in Beck (2006, 2007) is that the mechanism by which a wh-element is interpreted is the same mechanism responsible for the interpretation of focus: alternatives in the sense of Rooth (1985, 1992). According to Rooth's theory, a focused element like *Molly* in (15) contributes a set of alternatives to its ordinary meaning—an alternative-semantic value. Certain operators are sensitive to alternative-semantic values, particles like *only* among them. A Rooth-style analysis

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[1] To be more precise, modals in general do not seem to trigger an intervention effect. (ia,b) with *might* and *should* also seem fine. This means that the failure of these modals to take narrow scope relative to a comparative DegP does not follow from intervention, and should be traced to some other factor. See von Fintel and Iatridou (2003) and Iatridou and Zeijlstra (2010) for relevant discussion and suggestions (on scope constraints on epistemic modals in the first case, and on positive polarity modals in the second).

(i) a. Which boy might John introduce which girl to _ ?
b. Which boy should John introduce which girl to _ ?

of (15) is sketched below. Focus triggers the introduction of alternatives, as in (16a). Alternatives are passed on compositionally in the larger structure, as in (16b). Finally, they are evaluated by the operator $\sim$. The $\sim$ defined in (17) assigns to the focus anaphor C the alternative semantics of its sister; this value is used in the semantics of the particle *only* as the domain of quantification, as shown in (16c,d). The $\sim$ operator evaluates all alternatives triggered in its scope and causes them not to be passed on further in the structure. (Below, I write $[[\alpha]]_o$ for the ordinary semantic value of an expression and $[[\alpha]]_{Alt}$ for its alternative-semantic value.)

(15) a. Ellen only invited MOLLY.
|_____________|
b. $\forall x \in D$: $x \neq$ Molly -> Ellen didn't invite x.
c. [[[only C] [~C[Ellen invited Molly$_F$]]]

(16) a. $[[\text{Molly}_F]]_o = \text{Molly}$
$[[\text{Molly}_F]]_{Alt} = \{x\text{: } x \in D\}$
b. $[[\text{Ellen invited Molly}_F]]_o$ = that Ellen invited Molly
$[[\text{Ellen invited Molly}_F]]_{Alt}$ = {that Ellen invited x | $x \in D$}
c. $[[\text{only}]] = \lambda C.\lambda p.\forall q \in C$: $\neg$(p -> q) -> $\neg$q (simplified)
d. $[[[\text{only C}] [\sim \text{C[Ellen invited Molly}_F]]]] = 1$ iff
$\forall q \in C$: $\neg$(that Ellen invited Molly -> q) -> $\neg$q iff
$\forall x \in D$: $x \neq$ Molly -> Ellen didn't invite x

(17) a. $[[[\sim \text{C XP}]]]_o$ is only defined if $[[\text{C}]]_o \subseteq [[\text{XP}]]_{Alt}$.
If defined, $[[[\sim \text{C XP}]]]_o = [[\text{XP}]]_o$
b. $[[[\sim \text{C XP}]]]_{Alt} = \{[[[\sim \text{C XP}]]]_o\}$ (Rooth 1992)

A wh-phrase, like focus, introduces alternatives into the composition; I call these expressions alternative triggers. The alternatives triggered by a wh-expression want to be evaluated by a question operator Q in order to give rise to a question meaning, as sketched in (18). Intervention effects in wh-questions arise when another alternative-evaluating operator is located between the alternative trigger (the wh-phrase) and its evaluating operator (the Q operator). The intervening operator, the $\sim$ operator, accidentally evaluates the alternatives triggered by the wh-phrase. The result is an undefined meaning of the question. See Beck (2006) for details.

(18) a. Who left?
b. [Q [who left]]
|___|
c. {that x left | $x \in D$ }

(19) a. * Which boy did only Susan introduce which girl to _ ?
b. * [Q [which boy [only C [~C[Susan introduce which girl to _]]]]]
|____|

This understanding of intervention effects leads to the following expectations. Due to Rooth's meaning of the $\sim$ given in (17), an alternative evaluating $\sim$ operator may not intervene between an alternative trigger and its evaluating operator; cf. (20)

below. This constraint derives from the fact that a ∼ evaluates all the alternatives introduced in its scope ϕ. Simultaneously, it resets the alternative-semantic value to a singleton set. Alternatives in the scope of a ∼ are not accessible to alternative-evaluating operators higher in the structure. This entails that no ∼ should be able to occur between Q and a wh-phrase, for instance. The General Minimality Effect should show up in all those constructions that make use of an alternative semantics. According to my knowledge, these include wh-questions, alternative questions, association with focus, and NPI licensing, all of which do indeed exhibit intervention effects (Beck 2006, 2007; Beck and Kim 2006; Linebarger 1987; Chierchia 2006; Guerzoni 2006; Beck and Vasishth 2009; among others).

(20) *General Minimality Effect MIN:*
The evaluation of alternatives introduced by an XP cannot skip
an intervening ~ operator.
* [Op ... [~C [$_\phi$ ...XP...]]]
|_____________|

Since the ∼ itself is invisible, problematic interveners will be elements that are accompanied by a ∼ operator. What linguistic items constitute problematic interveners is an empirical question; it seems to vary somewhat from language to language. Interveners can be identified by considering constructions involving alternative semantics, for instance wh-questions. For English and German, it has been shown (Beck 1996; Pesetsky 2000; Beck 2006, among others) that problematic interveners include focus particles and nominal and adverbial quantifiers. Modals, on the other hand, are not problematic interveners; compare (14) above. Accordingly, nominal and adverbial quantifiers have been suggested to come with a ∼ operator, while modals do not. See Beck (2006, 2007) for a detailed discussion. The General Minimality Effect is a locality constraint particular to alternative evaluation and very characteristic in its pattern, identifying nominal and adverbial quantifiers as problematic. In our model it is responsible for intervention as a constraint on scope.

2.3 Look-ahead

The characteristic pattern of scope interaction in comparatives–nominal and adverbial quantifiers vs. modals—makes it tempting to connect the quantifier effects in comparatives to intervention. But although this is tempting, it is not obvious how to do so. As we saw, intervention effects are expected to arise when alternatives are triggered in an embedded position and evaluated at a distance. The relation between alternative triggering and alternative evaluation is sensitive to intervention. In order to make the desired connection to comparatives, we need to identify a plausible alternative trigger in comparison constructions. No established semantic analysis that I am aware of does that.

In the following, I am going to push a strategy that locates an alternative trigger in the semantics of negative antonyms of adjectives, including *little*. I borrow from insights into NPI licensing to make this plausible. This move comes with a decomposition analysis of negative antonyms. It helps with describing the meanings of constructions based on *little*. Importantly, it also introduces the desired alternative semantics for the purposes of scope interaction. The analysis of *little* can be extended to *less*-comparatives and to other comparison constructions, like equatives with antonyms, for example. The discussion of those ‘negative’ comparison constructions will make up the bulk of the paper in Sects. 3 and 4. In Sect. 5 I come back to the *exactly*-data we have seen above and discuss how they might fit in.

Since alternative triggering is blamed on negative antonyms, its effects should show up in simpler constructions with *little* than comparatives. Accordingly, we begin in Sect. 3 with direct measure constructions with *little*.

3 Direct measure *little*-phrases

Section 3.1 lays the empirical foundation by motivating a decompositional analysis of negative antonyms, including *little,* and by showing that direct measure constructions exhibit parallel scope effects to comparatives. This motivates an alternative-semantic analysis presented in Sect. 3.3, which owes a fair amount of inspiration to alternative-semantic accounts of NPI licensing (reported briefly in Sect. 3.2).

3.1 *Little* data

3.1.1 Decomposition

As a first step, we will consider the meanings of sentences like (21). The data combine two ingredients. First, they are direct measure constructions, i.e. constructions with the unmarked form of the adjective (or adverb) in combination with a measure expression. The measure expression in our examples is a referential pronoun (*that, so*). These may well be the semantically simplest comparison constructions of all. Second, the adjective is the negative member of a pair of antonyms (<*much, little*> , <*tall, short*> in our examples). (21a,b) are what I call direct measure *little*-phrases.

(21) a. Ida weighs that little.
b. Ida is that short.

I propose that (21a,b) mean (22a,b); that is, they express that the subject’s measure on the scale introduced by the gradable predicate is at most as high as the degree pronoun. The data in (23a) and (23b) provide the reasons for my suggestion, with (23a) showing that the measure referred to by the degree pronoun is included and (23b) showing that the subject may stay below it (see Heim 2007, 2008 and references therein for discussion of the meanings of negative antonyms, though not in direct measure constructions).

(22) a. $\text{Weight(I)} \leq [[\text{that}]]$
b. $\text{Height(I)} \leq [[\text{that}]]$

(23) a. Context: I am making paneer. My cookbook says to weight down the fresh cheese with exactly 7 kg overnight.
SB: 325 g are missing. Do we have a can that weighs so little?
Thilo: Yes, this can of beans weighs exactly 325 g.
b. Sonja: The group needs someone who weighs maximally 52 kg.
SB: My niece weighs that little. Ida even only weighs 50 kg.

How is this interpretation derived? I take the negative antonym to operate on the same scale as the positive member of the pair (Bierwisch 1989; Heim 2007). Furthermore, I take it that the pronoun refers to the contextually given value on the scale (see Tiemann et al., to appear, for this analysis of pronominal direct measure constructions). An example of the direct measure construction with positive antonyms is analysed below; the analysis is semantically simple in that it consists merely of function application of the adjective meaning to the degree pronoun and the subject. Compared to this analysis, we should ask ourselves how the reversal of the ordering relation expressed by the 'negative' construction comes about, i.e. how the 'at least' meaning in (24) and (25) is turned into an 'at most' meaning in (21) and (22).

(24) a. Ida is that tall (perhaps taller).
b. $\text{Height(I)} \geq [[\text{that}]]$
c. $[[\text{tall}]] = \lambda d.\lambda x.\text{Height}(x) \geq d$
d. $[[[\_ \text{ is } [\text{AP Ida [that tall]]]]]} = 1$ iff
$[[\text{tall}]]([[\text{that}]])([[\text{Ida}]]) = 1$ iff
$\text{Height(I)} \geq [[\text{that}]]$

(25) a. Ida weighs that much (perhaps more).
b. $\text{Weight(I)} \geq [[\text{that}]]$

A lexical analysis of antonyms can be explored where this step occurs as part of the meaning of the negative antonym (example analysis given in (26), (27)).

(26) a. Ida is that short (perhaps shorter).
b. $\text{Height(I)} \leq [[\text{that}]]$
c. $[[\text{short}]] = \lambda d.\lambda x.\text{Height}(x) \leq d$
d. $[[[\_ \text{ is } [\text{AP Ida [that short]]]]]} = 1$ iff
$[[\text{short}]]([[\text{that}]])([[\text{Ida}]]) = 1$ iff
$\text{Height(I)} \leq [[\text{that}]]$

(27) Let α be an adjective with meaning $[[\alpha]]$ of type $< d, < e,t \gg$. Then the negative antonym of α, α', has the meaning $[\lambda d.\lambda x.\max(\lambda d'.[[\alpha]](d')(x)) \leq d]$.

By contrast, I will pursue a decomposition analysis of negative antonyms (Heim 2007, 2008; Büring 2007). Such an analysis takes the meanings of positive and negative antonyms to be identical, and isolates a meaning component that occurs separately in the composition to give us the 'negative' meaning (i.e. the reversal of the direction of scalar inferences) of the overall sentence with the negative antonym. I sketch these assumptions below. The negative antonym shows up as *Adj*-ANT in the structure to indicate that it has the meaning of *Adj*, but is the negative polar adjective. The question we need to ask under this approach is what the meaning of the separate, higher component, called OP_{ANT} below, is.

(28) a. Ida is that short (perhaps shorter).
b. Height(I) $\leq$ [[that]]
c. [[short]] = [[tall-ANT]] = λd.λx.Height(x) $\geq$ d
d. [_ is OP_{ANT} [AP Ida [that tall-ANT]]]

We get the right truth conditions for the sentence if the operator has the meaning of 'at most', as shown in (29). I talk about (capital, abstract) AT MOST because the operator is not overt.

(29) a. [[AT MOST that] [1[AP Ida [t1 tall-ANT]]]]
b. [[AT MOST]] = λd.λD.max(D) $\leq$ d
c. [[[1[AP Ida [t1 tall-ANT]]]]] = λd.Height(I) $\geq$ d
d. [[AT MOST]]([[that]])([[[1[AP Ida [t1 tall-ANT]]]]]) = 1 iff
max(λd.Height(I) $\geq$ d) $\leq$ [[that]] iff
Height(I) $\leq$ [[that]]

A motivation for the decomposition analysis discussed by the scholars who proposed it are scope data like the ones to be introduced in the next subsection. Let me give a first bit of motivation here, though. The sentence in (30) is, according to my intuition, equivalent to the one in (21b), and in German is actually preferred. We would, of course, wish to give *only* its usual meaning (simplified version repeated in (31)). This meaning will yield the right truth conditions for the overall sentence if *short* means *tall*. As the reader may verify, if *short* had the meaning in (26c) instead, the sentence would wrongly be predicted to mean that Ida is at least 'that' tall. Hence the decomposition analysis allows a nice simple analysis of data which combine *only* with negative antonyms. Instead of the covert operator AT MOST we have the overt *only*. German seems to have a preference for an overt operator.

(30) Ida ist nur so klein. [German]
'Ida is only that short.'

(31) [[only]] = λC.λp.$\forall$q $\in$ C: $\neg$(p -> q) -> $\neg$q

(32) a. [[only C] [$\sim$C[AP Ida [that_{F} tall-ANT]]]]
b. [[[AP Ida [that tall-ANT]]]] = Height(I) $\geq$ [[that]]
c. C = {Height(I) $\geq$ d | d $\in$ D}
d. [[[[only C] [$\sim$C[AP Ida [that_{F} tall-ANT]]]]]] = 1 iff
$\forall$q $\in$ {Height(I) $\geq$ d | d $\in$ D}: $\neg$(Height(I) $\geq$ [[that]] -> q) -> $\neg$q iff
$\forall$d[d > [[that]] -> $\neg$Height(I) $\geq$ d] iff
Height(I) $\leq$ [[that]]

I take this data at face value and derive from it the following assumptions:

(33) *Antonyms:*
The basic semantic contribution of *short* is the same as that of *tall*, and similarly for other pairs of antonyms. *Little* means *much* and *much* is vacuous.

(34) *Operators:*
The 'negative' meaning aspects of sentences with negative antonyms derive from the sentence context that the negative antonym is embedded in. We conjecture a higher operator that is responsible for the 'negative' component, for example AT MOST or *only*.

(35) *Licensing:*
We need to make sure that such an operator is present when the negative antonym occurs in a structure (and, presumably, that it does not occur when there is no negative antonym). That is, we need to establish a licensing mechanism between antonym Adj-ANT and operator OP_{ANT}.

I will anticipate here a descriptive aspect of the licensing relation that will become relevant later on. I propose that the negative antonym must occur in an upward scalar context. Repeated in (36)–(38) below are Beck and Rullmann's (1999) definitions of the scalarity properties of degree predicates.

(36) *Downward scalar predicates:*
A predicate P <d,t> is downward scalar iff
for any d, d′: $d > d'$ & $P(d) \Rightarrow P(d')$.

(37) *Upward scalar predicates:*
A predicate P <d,t> is upward scalar iff
for any d, d′: $d' > d$ & $P(d) \Rightarrow P(d')$.

(38) *Non-scalar predicates:*
A predicate P <d,t> is non-scalar iff
it is neither upward scalar nor downward scalar.

Notice that the most common degree predicates are downward scalar:

(39) a. Ida is that tall.
b. $\lambda d.\mathrm{Height}(I) \geq d$

(40) Let 'that' refer to 1.70 m.
$\mathrm{Height}(I) \geq 1.70\ \mathrm{m} \rightarrow$ for any d′: $1.70\ \mathrm{m} > d' \rightarrow \mathrm{Height}(I) \geq d'$
If Ida reaches a height of 1.70 m, then she reaches the heights below 1.70 m.

The 'negative' flavour of *little* constructions and negative antonyms alluded to above comes from the fact that scalarity is reversed; our examples are upward scalar.

(41) a. Ida is that short.
b. $\lambda d.\mathrm{Height}(I) \leq d$

(42) Let 'that' refer to 1.70 m.
$\mathrm{Height}(I) \leq 1.70\ \mathrm{m} \rightarrow$ for any d′: $1.70\ \mathrm{m} < d' \rightarrow \mathrm{Height}(I) \leq d'$
If Ida is no taller than 1.70 m, then she is no taller than the heights above 1.70 m.

The hypothesis I pursue is that Adj-ANT needs to be in an upward scalar context, hence $\mathrm{OP}_{\mathrm{ANT}}$ must be a scale reverser. This is true of both AT MOST and *only*. We will see more support for this generalization below.

3.1.2 Scope interaction

Heim (2007) investigates *little* as a degree quantifier. She introduces data like (43), which are ambiguous. Heim argues that the ambiguity arises from different scopes that the *little*-phrase can take relative to the modal. Her LFs of (43a) are sketched in (44). They give rise to the interpretations in (45).

(43) a. We can grow very little.
b. It's a shame that they let the students write so little!
c. So wenig intelligent muss man sein. [German]
so little intelligent must one be
'One's intelligence has to be that small.'

(44) a. [can [very little [1[we grow t1 (much)]]]]
b. [very little [1[can [we grow t1 (much)]]]]

(45) a. It is possible for us to do this: grow very little.
b. The maximum growth possible for us is very small.

Necessity modals also give rise to ambiguity; an example is given in (46).

(46) a. John needs to eat that little
… to maintain his weight.
… to stick to the terms of the diet.
b. It is not necessary for John to eat more than 'that'.
c. It is necessary for John to eat at most 'that'.

The data show that the 'negative' part of the *little*-phrase interacts with the modal. I illustrate in more detail with the analysis of (43b). This is an example which combines a direct measure construction with a modal. Let us suppose that the length of writing under discussion is 20 pp. Then (43b) can bemoan either that students can get away with such short papers, or that students are so limited in how much they may write. The first reading corresponds to LF (47a) on my assumptions, and the second to LF (47b). My LFs differ from Heim's in that instead of Heim's degree quantifier *little*, I employ the covert operator AT MOST from above. Where Heim has a movement relation between adjective/adverb and operator (cf. (44)), I must have a more abstract licensing connection, shown in (47). For both of us, the adjective *little* in base position is *much*-ANT, which is semantically vacuous. That is, I agree with Heim's understanding of the modal data insofar as for both of us the meaningful part of the *little*-phrase may take wide or narrow scope relative to the modal. I differ with respect to how the connection is made between where the *little*-phrase shows up at the surface and where the meaningful part occurs at LF.

(47) a. [they let [[AT MOST so] [1[students write t1 much-ANT]]]]
b. [[AT MOST so] [1[they let [students write t1 much-ANT]]]]

(48) [[AT MOST so]] = $\lambda D.\max(D) \leq 20$ pp type≪d,t>,t>

(49) a. [[[1[students write t1 much-ANT]]]] = $\lambda d.Writing(S)(w) \geq d$
[[[AT MOST so] [1[students write t1 much-ANT]]]]
= $\lambda w.Writing(S)(w) \leq 20$ pp
[[(47a)]] = $\exists w[wR@ \ \& \ Writing(S)(w) \leq 20$ pp]
'It is permitted for students to write 'so' little.'
b. [[[1[they let [students write t1 much-ANT]]]]]
= [$\lambda d.\exists w[wR@ \ \& \ Writing(S)(w) \geq d]$]
[[(47b)]] = $\max(\lambda d.\exists w[wR@ \ \& \ Writing(S) \geq d]) \leq 20$ pp
'The maximum length permitted for students' writing is 'so' small.'

Thus we see that the meaningful ingredient of a *little*-phrase (the operator AT MOST according to the present analysis) scopally interacts with modal verbs. It can take either wide or narrow scope relative to the modal. This motivates a decomposition analysis. Moreover, there is a parallel to what we observed in comparatives, with a degree operator taking scope either above or below a modal. The ambiguity of (43b) is parallel to the ambiguity in (8).

To round off the empirical picture, let's ask whether direct measure *little*-phrases can take variable scope relative to nominal and adverbial quantifiers. Some examples are given below. Suppose that the context for (50a) is a paper length of 10 pp, and for (51a) a weight of 15 kg. The semantics given above predicts the readings (52a,b) and (53a,b), respectively.

(50) a. Everyone wrote that little.
b. Jeder ist so wenig intelligent.
Everyone is so little intelligent
'Everyone's intelligence is so small.'

(51) a. One of Kordula's children weighs so little.
b. I sometimes weigh that little.

(52) a. $\forall x: Writing(x) \leq 10$ pp
'Everyone stayed below 10 pp.'
b. # $\max(\lambda d. \ \forall x: Writing(x) \geq d) \leq 10$ pp
'Not everyone wrote more than 10 pp.'

(53) a. $\exists x : Weight(x) \leq 15$ kg
'There is one child of K.'s who weighs at most 15 kg.'
b. # $\max(\lambda d.\exists x[Weight(x) \geq d) \leq 15$ kg
'All of K.'s children weigh at most 15 kg.'

It is clear that readings in which the operator would take scope over a nominal or adverbial quantifier are impossible; none of the examples is ambiguous. As we saw above, *little*-phrases do scopally interact with modals (Heim's motivation for a scope-bearing *little*-phrase). So the constraints we observe in (50) and (51) are unexpected given the semantics assumed so far. Nothing seems wrong with the LF in (54a) which would derive the non-existing reading of (50a).

(54) a. [[AT MOST that] [1[XP everyone [wrote t1 much-ANT]]]]
b. # $\max(\lambda d.\ \forall x\colon \text{Writing}(x) \geq d) \leq 10$ pp

This picture agrees with the comparative data; that is, the direct measure construction shows the same scope constraints as *less*-comparatives. This encourages an attempt to connect scope possibilities in *less*-comparatives to the scope of *little*-phrases, or more accurately: to the scope of the operator OP_{ANT} that comes with the negative antonym.

Before we proceed to develop an analysis of these findings, a remark on an empirically unclear point. It is an open question to what extent antonyms other than *little* participate in the same interaction. Heim (2007) argues that they do not. (55a,b) are not intuitively ambiguous. They lack the reading that would correspond to wide scope of OP_{ANT}. Heim also notes, however, that German data with added *nur* ('only') very easily permit the reading missing in (55), cf. (56). I would also like to point out that with certain negative antonyms the relevant reading seems fairly easy to get in English; cf. (57). (Beck et al. (2004) make a related observation.)

(55) a. We can grow very slowly. (not ambiguous)
b. It's a shame that they let people drive so slowly. (not ambiguous)

(56) a. Es ist ein Skandal, wie wenig
it is a scandal how little
schnell man hier fahren darf. (ambiguous)
fast one here drive may
b. Es ist ein Skandal, wie langsam
it is a scandal how slowly
man hier fahren darf. (not ambiguous)
one here drive may
c. Es ist ein Skandal, wie langsam
it is a scandal how little fast
man hier nur fahren darf. (ambiguous)
one here only drive may

(57) a. It's a shame that we can hire so few people. (ambiguous)
b. It's a shame that we can hire such a small number of people. (ambiguous)

I must leave the exact nature of the data as an open question and note only that the wide scope reading of OP_{ANT} is not generally impossible with negative antonyms other than *little*.

I derive from the above discussion the following points:

(58) Little-*intervention:*
Direct measure constructions with negative antonyms exhibit intervention effects (scope interaction with modals, but not with nominal or adverbial quantifiers).

(59) *Alternative-semantic licensing:*
The relationship between the negative antonym and the embedding sentence context must be mediated by an alternative semantics.

3.2 A parallel: NPIs

The preceding subsection has set us the task of defining a relation between negative antonyms and embedding sentence contexts. A negative adjective like *short* means *tall*, but requires a context that makes the containing sentence reverse the direction of scalar inferences, from an 'at least' meaning to an 'at most' meaning. The connection ought to be made with the help of alternatives.

I turn to NPI licensing for an analogy, and in particular to a version of Krifka's (1995) analysis of the licensing of weak NPIs. The familiar pattern is repeated in (60): NPIs like *anything* are licensed in downward monotonic contexts (Ladusaw 1979). Negation is an operator that reverses the inferential properties of a sentence. It turns 'normal', upward monotonic (61a) into downward monotonic (61b). The NPI *anything* is allowed in (60b) but not (60a).

(60) a. * I saw anything.
b. I didn't see anything.

(61) a. I saw a raven. -> I saw a bird.
b. I didn't see a bird. -> I didn't see a raven.
c. $[[\text{raven}]] \subset [[\text{bird}]]$

Krifka sets himself the goal of explaining how NPIs come to impose such a requirement on their sentence context. The first key ingredient to his analysis concerns the semantics of the NPI. For Krifka the NPI has an ordinary semantic value which is very weak—the weakest element on an inferential scale. It also triggers the introduction of alternatives into the calculation, all of which are semantically stronger than the NPI itself. The alternatives project to the sentence level in the usual manner.

(62) a. $[[\text{anything}]]_o = \lambda P.[[\text{thing}]] \cap P \neq \emptyset$
b. $[[\text{anything}]]_{Alt} = \{\lambda P.Q \cap P \neq \emptyset \mid Q \subset [[\text{thing}]]\}$

(63) a. $[[\text{I saw anything}]]_o$ = that I saw a thing
b. $[[\text{I saw anything}]]_{Alt} = \{\text{that I saw a } Q \mid Q \subset [[\text{thing}]]\}$

The second key ingredient to Krifka's analysis is the assumption of an operator generating scalar implicatures, ScalAssert. I give its semantics below (following Krifka 1995; more modern versions are available that differ regarding the status of the operator, e.g. Chierchia 2006; Fox 2006; Chierchia et al., to appear). It says that all semantically stronger alternatives to the asserted ordinary meaning are false. The operator is part of the structure. In the case of (60a), it is predicted that the implicatures systematically contradict the assertion. This is Krifka's reason for the unacceptability of the example.

(64) [[ScalAssert]] ([[XP]]$_{Alt}$) ([[XP]]$_o$) = 1
iff [[XP]]$_o$ = 1 & $\forall$q $\in$ [[XP]]$_{Alt}$: $\neg$([[XP]]$_o$ -> q) -> $\neg$q
'XP is true and all more informative alternatives to XP are false.'

(65) [[[ScalAssert [I saw anything]]]] = 1
iff I saw a thing & $\forall$q $\in$\{that I saw a Q | Q $\subset$ [[thing]]\}:
$\neg$(I saw a thing -> q) -> $\neg$q
iff I saw a thing & there is no particular thing that I saw.
> *contradiction!*

Something has to distinguish the acceptable example (60b) from the unacceptable example (60a). This is where the inference-reversing operator NOT comes into play. The alternatives of the structure with negation are as in (66). These alternatives are now less informative than the assertion. The ScalAssert operator is basically harmless in this case.

(66) a. [[[NOT [I saw anything]]]]$_o$ = that I didn't see a thing
b. [[[NOT [I saw anything]]]]$_{Alt}$ = \{that I didn't see a Q | Q $\subset$ [[thing]]\}

(67) [[[ScalAssert [NOT [I saw anything]]]]] = 1
iff I didn't see a thing &
$\forall$q $\in$ \{that I didn't see a Q | Q $\subset$ [[thing]]\}: $\neg$(I didn't see a thing -> q) -> $\neg$q
iff I didn't see a thing.

Thus we have an analysis of why NPIs require special contexts. The reason lies in the interaction of the somewhat pathological alternatives triggered by the NPI with the ScalAssert operator. Given that the analysis is in terms of an alternative semantics, we expect intervention effects. It is well known that there are such effects (e.g. Linebarger 1987; Chierchia 2006; Guerzoni 2006). (68) is an example: *most* cannot intervene between the NPI and its licensor.

(68) Mary didn't wear most earrings to any party.
* NOT $\gg$ most $\gg$ any:
* It is not the case that most earrings are such that Mary wore them to a party.

To sum up:

(69) *NPI licensing:*
The licensing of (weak) NPIs relies on three components: (i) alternative triggering by the NPI, where the alternatives (compared to focus alternatives) are pathological and lead to unacceptability in ordinary contexts; (ii) an embedding operator that prepares the pathological alternatives for acceptable evaluation; (iii) an alternative-evaluating expression that processes the alternatives triggered by the NPI, ScalAssert.

(70) *NPI intervention:*
The relation between trigger (NPI) and evaluating expression (ScalAssert) is sensitive to intervention.

3.3 An alternative-semantic analysis of *little*-phrases

3.3.1 The basic analysis

I proceed to develop a parallel analysis of the licensing of negative antonyms, also based on alternatives. The antonym Adj-ANT will play a role parallel to the NPI as an alternative trigger, the operator OP_{ANT} will perform a reversal of the direction of scalar inferences in analogy to monotonicity-reversing operators like negation, and I will retain the ScalAssert operator (almost as introduced above) for the final step of evaluating alternatives.

To look at a concrete example, what forces the presence of the invisible AT MOST in (71a)? If the operator weren't there, we would predict the meaning in (72b), on the basis of the structure in (72a). This is not possible.

(71) a. Ida is that short (perhaps shorter).
b. $\text{Height}(I) \leq [[\text{that}]]$

(72) a. [_ is [AP Ida [that tall-ANT]]]]
b. $\text{Height}(I) \geq [[\text{that}]]$
c. $[[\text{short}]] = [[\text{tall-ANT}]] = \lambda d.\lambda x.\text{Height}(x) \geq d$

I propose to exclude (72a) as an LF of (71a) in the following way. Structures with antonyms are also assumed now to include the ScalAssert operator, to whose semantics I add the requirement that some alternative be true (called 'some C' by Abusch (2002)). The addition doesn't change anything said so far. It should be seen as a presupposition, although I will not mark it as such explicitly. I further propose that negative antonyms introduce alternatives into the calculation which, like an NPI's alternatives, are somewhat pathological: all alternatives are stronger than the assertive content. The conjunction of these two assumptions makes the structure in (72a) express a contradiction (quite parallel to the *I saw anything* case above).

(73) $[[\text{ScalAssert}]]\ ([[\text{XP}]]_{\text{Alt}})\ ([[\text{XP}]]_{\text{o}}) = 1$
iff $[[\text{XP}]]_{\text{o}} = 1$ &
$\forall q \in [[\text{XP}]]_{\text{Alt}}: \neg([[\text{XP}]]_{\text{o}} \text{ -> } q) \text{ -> } \neg q$ &
$\exists q \in [[\text{XP}]]_{\text{Alt}}: q = 1$
'XP is true, all of the more informative alternatives to XP are false, but some alternative is true.'

(74) a. [ScalAssert [_ is [AP Ida [that tall-ANT]]]]
b. $[[\text{AP}]]_{\text{o}} = \text{Height}(I) \geq [[\text{that}]]$
c. $[[\text{AP}]]_{\text{Alt}} = \{\text{Height}(I) \geq d \mid d > [[\text{that}]]\}$

(75) [[[ScalAssert [_ is [AP Ida [that tall-ANT]]]]]] = 1
iff $\text{Height(I)} \geq [[\text{that}]]$ &
$\forall q \in \{\text{Height(I)} \geq d \mid d > [[\text{that}]]\}: \neg(\text{Height(I)} \geq [[\text{that}]] -> q) -> \neg q$ &
$\exists q \in \{\text{Height(I)} \geq d \mid d > [[\text{that}]]\}: q = 1$
iff $\text{Height(I)} \geq [[\text{that}]]$ &
$\forall d[d > [[\text{that}]] -> \neg\text{Height(I)} \geq d]$ &
$\exists d[d > [[\text{that}]]\ \&\ \text{Height(I)} \geq d]$
> *contradiction!*

Let us now make sure that the same set of assumptions makes good predictions for the structure that includes AT MOST. The AT MOST operator causes the degree pronoun *that* to express an upper limit, instead of a lower bound, in the ordinary semantics as well as in the alternatives. It turns a downward scalar predicate of degrees into an upward scalar predicate. Replacing the value of *that* with larger degrees now yields weaker statements. Just as in the example *I didn't see anything*, the ScalAssert operator is now practically harmless because the alternatives are all weaker.

(76) [[[[ScalAssert [AT MOST that] [1[AP Ida [t1 tall-ANT]]]]]] = 1
iff $\text{Height(I)} \leq [[\text{that}]]$ &
$\forall q \in \{\text{Height(I)} \leq d \mid d > [[\text{that}]]\}: \neg(\text{Height(I)} \leq [[\text{that}]] -> q) -> \neg q$ &
$\exists q \in \{\text{Height(I)} \leq d \mid d > [[\text{that}]]\}: q = 1$
iff $\text{Height(I)} \leq [[\text{that}]]$

The analysis makes the following prediction:

(77) *Prediction:*
Adj-ANT is well-formed in upward scalar contexts, i.e. in the scope of scale-reversing operators.

In (78) I provide an updated analysis of the example with *only* that takes into account present assumptions. The role of ScalAssert plus AT MOST is taken over by *only*.

(78) a. Ida only weighs that little.
b. $\text{Weight(I)} \leq [[\text{that}]]$
c. [only_C [$\sim$ C[AP Ida [weighs that much-ANT]]]]
d. $\forall q \in \{\text{Height(I)} \geq d \mid d > [[\text{that}]]\}: \neg(\text{Height(I)} \geq [[\text{that}]]-> q) -> \neg q$ iff
$\forall d[d > [[\text{that}]] -> \neg\ \text{Height(I)} \geq d]$ iff
$\text{Height(I)} \leq [[\text{that}]]$

Before we turn to the intervention effects—important motivation for this particular analysis of antonyms—I briefly address two further questions. The first is whether an operator like AT MOST can be in a structure without a negative antonym, and the second is how exactly the desired alternatives enter into the composition. Both questions are somewhat sideways of the main issue, but need to be considered.

Regarding the first question, we need to consider the range of interpretations permitted by sentences like (79). I take it for granted that the meanings in (80a) and (strengthened) (80b) are possible. The pertinent question is whether (80c) is also a meaning of the sentence.

(79) Ida is that tall.
a. … perhaps taller.
b. … no more, no less.
c. ?? … perhaps shorter.

(80) a. $\text{Height(I)} \geq [[\text{that}]]$
b. $\text{Height(I)} = [[\text{that}]]$
c. $\text{Height(I)} \leq [[\text{that}]]$

See Geurts (2006), Krasikova (2010) for discussion. An example following Krasikova is (81a), which she argues allows the interpretation in (81b).

(81) a. Mary can spend \$100.
b. It is possible for Mary to spend no more than \$100.

If we take (80c) to be a possible reading, the distribution of AT MOST need not be formally constrained. However, if AT MOST were constrained in where it can occur, we should envision a restriction like (82):

(82) *Agreement:*
An operator OP_{ANT} needs to have an occurrence of ANT in its scope.

Such restrictions are not unprecedented; see e.g. Penka (2010) and Zeijlstra (2004) for a modelling of the distribution of covert negative operators vis-à-vis negative morphology in terms of syntactic agreement. I will not pursue the precise nature of the prospective agreement between Adj-ANT and OP_{ANT} further at this point. We will see below that (82) is required regardless of what we believe about (79) and (80), when we turn to other OP_{ANT} operators besides AT MOST.

Regarding the second question, recall that I made the following assumptions about the ordinary and alternative-semantic value of AP:

(83) a. [AP Ida [that tall-ANT]]
b. $[[\text{AP}]]\text{o} = \text{Height(I)} \geq [[\text{that}]]$
c. $[[\text{AP}]]_{\text{Alt}} = \{\text{Height(I)} \geq d \mid d > [[\text{that}]]\}$

These semantic values must arise compositionally from the meanings of Adj-ANT, the degree pronoun, and the subject. Let us see in more detail how that works. I face the technical difficulty of wanting to vary the alternatives in the place of the degree argument of the gradable predicate, which at the same time also needs to get bound by degree operators (like the DegP *[AT MOST that]*). I solve this difficulty by assuming the following ordinary and alternative-semantic contribution for the negative antonym:

(84) a. $[[\text{tall-ANT}]]_{o} = \lambda d.\lambda x.\text{Height}(x) \geq d$
b. $[[\text{tall-ANT}]]_{\text{Alt}} = \{\lambda d.\lambda x.\text{Height}(x) \geq d + d' \mid d' \in D_{<d>} \;\&\; d' > 0\}$

For the AP, this leads to the same result as described above:

(85) b. $[[\text{AP}]]_o = [[\text{tall-ANT}]]\text{o}\ ([[\text{that}]])(\text{I}) = \text{Height}(\text{I}) \geq [[\text{that}]]$
c. $[[\text{AP}]]_{\text{Alt}} = \{f([[\text{that}]])(\text{I}) \mid f \in [[\text{tall-ANT}]]_{\text{Alt}}\}$
$= \{\text{Height}(\text{I}) \geq [[\text{that}]] + d' \mid d' \in D_{<d>} \,\&\, d' > 0\}$
$= \{\text{Height}(\text{I}) \geq d \mid d > [[\text{that}]]\}$

And for the structure that includes AT MOST, we also get an outcome that is the same as what I had assumed:

(86) a. $[\text{AT MOST that}]\ [_{\delta}1[\text{AP Ida } [\text{t1 tall-ANT}]]]]$
b. $[[[1[\text{AP Ida } [\text{t1 tall-ANT}]]]]]_{\text{Alt}} = \{\lambda d.\text{Height}(\text{I}) \geq d{+}d' \mid d' \in D_{<d>} \,\&\, d' > 0\}$
c. $[[[\text{AT MOST that}]\ [1[\text{AP Ida } [\text{t1 tall-ANT}]]]]]]_{\text{Alt}}$
$= \{[[\text{AT MOST that}]](D) \mid D \in [[\delta]]_{\text{Alt}}\}$
$= \{\max(D) \leq [[\text{that}]] \mid D \in [[\delta]]_{\text{Alt}}\}$
$= \{\max(\lambda d.\text{Height}(\text{I}) \geq d + d') \leq [[\text{that}]] \mid d' \in D_{<d>} \,\&\, d' > 0\}$[2]
$= \{\text{Height}(\text{I})) \leq [[\text{that}]] + d' \mid d' \in D_{<d>} \,\&\, d' > 0\}$
$= \{\text{Height}(\text{I})) \leq d \mid d > [[\text{that}]]\}$

The admittedly unorthodox assumption about the alternatives introduced by Adj-ANT allows me to derive the desired alternatives for AP and so on while sticking to all the normal mechanisms for the calculation of alternatives. The outcome is the same as what I sketched less confusingly above: a set of alternatives all of which are stronger than the assertive content in a ‘normal’ downward scalar sentence context, and weaker in an upward scalar context.

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[2] Here is the proof for the next step in general terms:

To show: $\max(\lambda d.\text{Meas} \geq d{+}n) \leq m$ iff $\text{Meas} \leq m{+}n$

(i) $\max(\lambda d.\text{Meas} \geq d{+}n) \leq m \Rightarrow \text{Meas} \leq m{+}n$:
Suppose $\text{Meas} > m{+}n$. Then $\text{Meas} = m{+}n + x$ for some $x > 0$.
Then: $\max(\lambda d.m + n{+}x \geq d{+}n) \leq m$ iff
$\max(\lambda d.m + x{\geq}d) \leq m$.
Since $\max(\lambda d.m + x{\geq}d) = m{+}x$:
$m + x{\leq}m$ contradiction.

(ii) $\text{Meas} \leq m{+}n \Rightarrow \max(\lambda d.\text{Meas} \geq d{+}n) \leq m$:
Suppose $\text{Meas} = m{+}n$.
Then: $\max(\lambda d.\text{Meas} \geq d{+}n) \leq m$ iff
$\max(\lambda d.m + n{\geq}d + n) \leq m$ iff
$\max(\lambda d.m \geq d) \leq m$ iff
$m \leq m$.
Suppose $\text{Meas} < m{+}n$. Then $\text{Meas} = m{+}n{-}x$ for some $x > 0$.
Then: $\max(\lambda d.\text{Meas} \geq d{+}n) \leq m$ iff
$\max(\lambda d.m + n{-}x \geq d{+}n) \leq m$ iff
$\max(\lambda d.m{-}x \geq d) \leq m$ iff
$m{-}x \leq m$.

q.e.d.

3.3.2 Intervention and little*-phrases*

Let us now make sure that this analysis is able to derive wide scope readings of AT MOST over a modal while ruling out parallel readings with quantifiers as intervention effects. In the modal case, the AT MOST quantifier takes scope over the modal to derive the desired truth conditions. Since the compositionally calculated alternatives are weaker than the ordinary semantics, the ScalAssert operator has no effect. We make the same predictions as anticipated with the simpler semantics in Sect. 3.1.[3]

(87) a. (It's a shame that) they let students write so little.
b. [ScalAssert [[AT MOST so] [1[they let [students write t1 much-ANT]]]]

(87′) a. $[[[\text{students write t1 much-ANT}]]]_o = \text{Writing(S)(w)} \geq d$
b. $[[[1[\text{they let [students write t1 much-ANT}]]]]]_o$
$= [\lambda d.\exists w[wR@ \ \& \ \text{Writing(S)(w)} \geq d]]$
$[[[\text{AT MOST so}] [1[\text{they let [students write t1 much-ANT}]]]]]o$
$= \max(\lambda d.\exists w[wR@ \ \& \ \text{Writing(S)} \geq d]) \leq 20 \text{ pp}$
'The maximum length permitted for students' writing is 'so' small.'
c. $[[[\text{AT MOST so}] [1[\text{they let [students write t1 much-ANT}]]]]]_{Alt}$
$= \{\max(\lambda d.\exists w[wR@ \ \& \ \text{Writing(S)} \geq d]) \leq d' \mid d' > 20 \text{ pp}\}$

The ScalAssert operator and the alternatives do make a difference when we have an intervening quantifier instead. As we said, nominal quantifiers, like *everyone* in the example below, come with an accompanying ∼ operator. If the quantifier occurs in between the negative antonym and its evaluating operator, as in (88′), the ∼ operator will per force evaluate the alternatives triggered by the negative antonym.

(88) Everyone wrote that little.
a. $\forall x: \text{Writing}(x) \leq 10 \text{ pp}$
'Everyone stayed below 10 pp.'
b. # $\max(\lambda d. \forall x: \text{Writing}(x) \geq d) \leq 10 \text{ pp}$
'Not everyone wrote more than 10 pp.'

(88′) [ScalAssert [[AT MOST that] [1[everyone [∼C [wrote t1 much-ANT]]]]]

---

[3] I show below that the mechanism of Alt-triggering just introduced predicts alternatives equivalent to the ones in the text, for a more general case.

To show: $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) \leq m$ iff $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d]) \leq m+n$

(i) $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) \leq m \Rightarrow \max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d]) \leq m+n$
Suppose $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d) > m+n$
Then: $\exists w[wR@ \ \& \ \text{Meas}_w > m+n]$ and
$\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) > m$
But: $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) \leq m$ contradiction.
(ii) $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d]) \leq m+n \Rightarrow \max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) \leq m$
Suppose $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d+n]) > m$
Then: $\exists w[wR@ \ \& \ \text{Meas}_w > m+n]$ and
$\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d) > m+n$
But: $\max(\lambda d.\exists w[wR@ \ \& \ \text{Meas}_w \geq d]) \leq m+n$ contradiction.

q.e.d.

It is clear that (88′) instantiates the General Minimality Effect MIN: a ∼ operator occurs between an alternative trigger, *much*-ANT, and its evaluating operator, ScalAssert. So ScalAssert will never be able to access the alternatives introduced by the negative antonym. We must suppose that there is something wrong with that.

To elaborate: The structure in (88′) has the sister of ScalAssert provide a singleton set as an alternative-semantic value, because all genuine alternatives are already evaluated. I propose that this causes a problem. An operator introduced into the structure to evaluate scalar alternatives presupposes that there are such alternatives, so the operator ScalAssert should presuppose that [[XP]]Alt contains more than one element. For our particular case, the presupposition 'some C' should include that there be at least one *genuine* alternative.

(89) $\exists q \in [[\mathrm{XP}]]_{\mathrm{Alt}}: q = 1 \;\&\; q \neq [[\mathrm{XP}]]_{o}$

The structure in (88′) is thus predicted to be ungrammatical, violating the presupposition (89) of ScalAssert.[4] The relevant reading of (88), (88b), is predicted to be unacceptable if this is the structure that leads to it. That will be enforced if we can suppose that ScalAssert must be part of the structure. I suggest that ScalAssert is always in the structure when alternatives on a scale are triggered by ANT. To get the NPI data right, the same has to hold; cf. Chierchia (2006) for discussion and an implementation.

In short, this analysis predicts that negative antonyms will only be licensed in a context that contains an operator that reverses scalar inferences, and that no problematic intervener may occur between the antonym and its evaluating context. This captures the scope effects observed for *little*-phrases.

4 Extending the analysis

The alternative semantics described in the preceding section is introduced by *little* and other negative antonyms. Therefore we expect it to be there in other comparison constructions with *little*, including the *less*-comparatives that were the starting point of the present enterprise. We also expect all such comparison constructions to be sensitive to intervention. This section follows up on these expectations. Section 4.1 spells out the analysis of comparatives. Section 4.2 considers other comparison constructions with negative antonyms.

4.1 *Less*-comparatives and comparatives with antonyms

4.1.1 Basic negative polar comparatives

The data in (90)–(92) exemplify the basic issues I want to consider in this subsection. I examine comparatives with *less* and comparatives with *-er* plus

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[4] An LF for the reading that is actually available (ib), is given in (ia). The ScalAssert operator occurs in embedded position in this LF. See Chierchia et al. (to appear) for recent discussion of this issue.

(i) a. [everyone [2[∼ [ScalAssert [AT MOST that [2[t1 wrote t2 much-ANT]]]]]]
 b. $\forall x$:Writing(x) $\leq$ 10 pp.

negative antonyms (subsumed under negative polar comparatives). The semantics we want to predict for the examples is as indicated.

(90) a. Ida weighs less than that.
b. Weight(I) $<$ [[that]]

(91) a. Ida is less tall than that.
b. Height(I) $<$ [[that]]

(92) a. Ida is shorter than that.
b. Height(I) $<$ [[that]]

In addition to the analysis of antonyms and *little* laid out in the previous section, I need to have an analysis of the comparative. I assume (93) about *-er* (following Heim 2001; see also von Stechow 1984 and Beck 2011 for recent discussion).

(93) a. $[[\text{-er}_{\text{simple}}]] = \lambda d.\lambda D.\max(D) > d$
b. $[[\text{-er}_{\text{diff}}]] = \lambda d.\lambda d'.\lambda D.\max(D) \geq d + d'$

About *less*, I assume that it is essentially the inverse operator to *-er*, turning $>$ into $<$. I talk about *-er*$_{\text{ANT}}$ instead of *less* to distinguish between morphology and semantics. The reader will notice that I pursue a strategy of assigning a simple type to comparative operators, with a first argument of type $<d>$. This corresponds to the assumptions in Heim (2001) and is in line with other work of mine on *than*-clauses (Beck 2010, 2011, 2012). It necessitates two comparative operators *-er* and *-er*$_{\text{ANT}}$ (unlike for instance Heim's (2007) uniform subset semantics for the comparative).

(94) $[[\text{less}]] = [[\text{-er}_{\text{ANT}}]] = \lambda d.\lambda D.\max(D) < d$

Putting together the analysis of the comparative with the analysis of antonyms, we derive the following structures for my examples. (96a) and (97a) have the same LF.

(95) a. Ida weighs less than that.
b. [ScalAssert [[DegP er$_{\text{ANT}}$ than that] [1[VP Ida weighs t1 much-ANT]]]]

(96) a. Ida is less tall than that.
b. [ScalAssert [[DegP er$_{\text{ANT}}$ than that] [1[AP Ida t1 tall-ANT]]]]

(97) a. Ida is shorter than that.
b. [ScalAssert [[DegP er$_{\text{ANT}}$ than that] [1[AP Ida t1 tall-ANT]]]]

I assume that an occurrence of *little* or the negative antonym leads to ANT-marking within the phrase that contains this occurrence (the AP in (96) and (97)). The word *less* must count as an occurrence of *little* (in line with Heim's analysis, for example). Things will go well if the structure then contains a scale-reversing operator *-er*$_{\text{ANT}}$ and ScalAssert. I demonstrate below.

(98) a. [ScalAssert [ϕ [DegP er$_{\text{ANT}}$ than that] [1[AP Ida t1 tall-ANT]]]]
b. $[[\text{AP}]]\text{o} = \text{Height(I)} \geq d$
$[[\text{AP}]]_{\text{Alt}} = \{\text{Height(I)} \geq d + d' \mid d' \in D_{<d>} \ \& \ d' > 0\}$
c. $[[\text{DegP}]]\text{o} = \lambda D.\max(D) < [[\text{that}]]$
d. $[[\phi]]\text{o} = [[\text{DegP}]]\text{o}\ (\lambda d.\text{Height(I)} \geq d) = \text{Height(I)} < [[\text{that}]]$
$[[\phi]]_{\text{Alt}} = \{\max(\lambda d.\text{Height(I)} \geq d + d') < [[\text{that}]] \mid d' \in D_{<d>} \ \& \ d' > 0\}$[5]
$= \{\text{Height(I)} < [[\text{that}]] + d' \mid d' \in D_{<d>} \ \& \ d' > 0\}$
$= \{\text{Height(I)} < d \mid d > [[\text{that}]]\}$
e. $[[(98\text{a})]] = 1$
iff $[[\text{ScalAssert}]]\ ([[\phi]]_{\text{Alt}})\ ([[\phi]]_{\text{o}}) = 1$
iff $\text{Height(I)} < [[\text{that}]]$ &
$\forall q \in \{\text{Height(I)} < d \mid d > [[\text{that}]]\}: \neg(\text{Height(I)} < [[\text{that}]] \text{ -> } q) \text{ -> } \neg q$ &
$\exists q \in \{\text{Height(I)} < d \mid d > [[\text{that}]]\}: q = 1$
iff $\text{Height(I)} < [[\text{that}]]$

We should make sure that the following structure, which contains normal *-er* instead of *-er*$_{\text{ANT}}$ (i.e. *less*), is not acceptable:

(99) a. Ida is less tall/shorter than that.
b. [ScalAssert [[DegP er than that] [1[AP Ida t1 tall-ANT]]]]
c. $\text{Height(I)} > [[\text{that}]]$

In this case, as the calculation below demonstrates, the alternatives remain stronger than the ordinary meaning and the ScalAssert operator derives a contradiction.

(99′) a. [ScalAssert [ϕ [DegP er than that] [1[AP Ida t1 tall-ANT]]]]
d. $[[\phi]]_{\text{o}} = \text{Height(I)} > [[\text{that}]]$
$[[\phi]]_{\text{Alt}} = \{\max(\lambda d.\text{Height(I)} \geq d + d') > [[\text{that}]] \mid d' \in D_{<d>} \ \& \ d' > 0\}$
$= \{\text{Height(I)} > [[\text{that}]] + d' \mid d' \in D_{<d>} \ \& \ d' > 0\}$
$= \{\text{Height(I)} > d \mid d > [[\text{that}]]\}$
e. $[[(99'\text{a})]] = 1$
iff $[[\text{ScalAssert}]]\ ([[\phi]]_{\text{Alt}})\ ([[\phi]]_{\text{o}}) = 1$
iff $\text{Height(I)} > [[\text{that}]]$ &
$\forall q \in \{\text{Height(I)} > d \mid d > [[\text{that}]]\}: \neg(\text{Height(I)} > [[\text{that}]] \text{ -> } q) \text{ -> } \neg q$ &
$\exists q \in \{\text{Height(I)} > d \mid d > [[\text{that}]]\}: q = 1$
$>$ *contradiction!*

We see that having a negative antonym in the structure necessitates the scale-reversing operator. The operator *-er*$_{\text{ANT}}$ can be indicated by the presence of *less*, i.e. the antonym *little*, or the presence of a negative polar adjective.

For completeness, a comment on comparatives with *than*-clauses. I assume that *than*-constituents like those in (100a) or (101a) are larger structures containing an ellipsis (recent references include Lechner (2004), Bhatt and Takahashi, to appear). This applies to comparatives with negative antonyms in the same way as to ordinary comparatives.

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[5] The proof from footnote 2 carries over. That is, in moving from ‘little’ to ‘less’ the ‘$\leq$’ changes to ‘$<$’, but the same proof can be made.

Ellipsis resolution at LF is sketched in (100b) and (101b). In order for (101b) to be interpretable, a degree has to be derived from the property of degrees provided by the *than*-clause. I assume (101c) for present purposes (see Beck 2010, 2011) for more detailed discussion). This allows us to predict the truth conditions in (101e).

(100) a. Ida is less tall than Jonas.
b. [DegP er$_{\text{ANT}}$ than [CP Jonas ~~is _ tall~~] [1[AP Ida t1 tall-ANT]]
c. Height(I) $<$ Height(J)

(101) a. Ida is taller than Jonas.
b. [DegP er than [CP Jonas ~~is _ tall~~] [1[AP Ida t1 tall]]
c. [DegP er than [max [1[CP Jonas ~~is t1 tall~~]]] [1[AP Ida t1 tall]]
d. [[[max [1[CP Jonas ~~is t1 tall~~]]]]] = Height(J)
e. Height(I) $>$ Height(J)

A complete LF of example (100) with the negative antonym is given in (102). Compared to the simpler example analysed in (98) above, the only change is that instead of the degree pronoun *that* we have a clause from which we need to derive a degree as the first argument of the comparative operator. That degree will be Jonas's height. This makes no difference for the calculation in (98) (replace *[[that]]* with *Height(J)*).

(102) [ScalAssert [ϕ [DegP er$_{\text{ANT}}$ than [max [1[CP Jonas ~~is t1 tall~~]]]]
[1[AP Ida t1 tall-ANT]]]]

Before we proceed to the discussion of intervention effects, we should consider once more the distribution of operators in relation to the negative antonyms. I have demonstrated that if there is a negative antonym in the structure, there is a semantic licensing requirement that there be a scale-reversing operator. But what about the other way around? Since (103a) means (103b) and not (103c), the structure in (104b) must be excluded as a possible LF.

(103) a. Ida is taller than that.
b. Height(I) $>$ [[that]]
c. # Height(I) $<$ [[that]]

(104) a. [[DegP er than that] [1[AP Ida t1 tall]]]
b. * [[DegP er$_{\text{ANT}}$ than that] [1[AP Ida t1 tall]]]

I come back to the prospective constraint (105) discussed in Sect. 3:

(105) *Agreement:*
An operator OP$_{\text{ANT}}$ needs to have an occurrence of ANT in its scope.

Comparatives show that this restriction is required. We can remain agnostic about the question whether AT MOST should count as an OP$_{\text{ANT}}$ and be subject to this restriction or not. But generally, we need (105) to capture the distribution of operators *vis-a-vis* antonyms.

4.1.2 Intervention in negative polar comparatives

We are now equipped to deal with the data that are at the heart of this paper, namely the intervention effects in the matrix clause of *less*-comparatives. Remember that we want to predict an ambiguity in (2), but no ambiguity in (10). More precisely, we want to predict the acceptability of an LF like $(2''\text{a})$ in which the comparative DegP takes scope over the modal verb, as opposed to the unacceptability of an LF like $(10''\text{a})$ in which the comparative DegP takes scope over a nominal quantifier (LFs repeated from Sect. 2, according to the theory in Heim 2001).

(2) This draft is 10 pp long.
The paper is required to be less long than that.

$(2')$ a. $\max(\lambda d.\forall w'[R(@,w') \text{ -> the paper is d-long in } w']) < 10 \text{ pp}$
= the length that the paper reaches in all relevant worlds is below 10 pp
= the minimum length required for the paper is less than 10 pp
b. $\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') < 10 \text{ pp}]$
= in all relevant worlds, the paper's length is below 10 pp
= the following is required: that the paper be less than 10 pp long

$(2'')$ a. [[DegP less than that] [1[required [the paper be t1 long]]]]
b. [required [[DegP less than that] [1[the paper be t1 long]]]]

(10) John is $6'$.
Every girl is less tall than that.

$(10')$ a. # $\max(\lambda d.\forall x[\text{girl}(x) \text{ -> x is d-tall}]) < 6'$
'The shortest girl is shorter than $6'$.'
b. $\forall x[\text{girl}(x) \text{ -> } \max(\lambda d.\text{x is d-tall}) < 6']$
'Every girl is below $6'$ tall.'

$(10'')$ a. * [[DegP less than that] [1[every girl is t1 tall]]]
b. [[every girl] [2[[DegP less than that] [1[t2 is t1 tall]]]]]

What does the present analysis have to say about the LFs of this pair of examples? Let us first consider the modal. The LF according to my analysis should be refined to (106). Whether the addition of the ScalAssert operator makes any difference depends on the alternative-semantic value of its sister. (107) demonstrates that, as is to be expected thanks to the presence of the scale-reversing operator, the alternatives are weaker and the interpretation of the LF is the same as before.

(106) [ScalAssert [ϕ [DegP er_{ANT} than that] [1[required [the paper be t1 long]]]]

(107) a. $[[\phi]]_o = \max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{Length}(w')(P) \geq d]) < 10 \text{ pp}$
b. $[[\phi]]_{\text{Alt}} =$
$\{\max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{Length}(w')(P) \geq d + d']) < 10 \text{ pp} \mid$
$d' \in D_{<d>} \ \& \ d' > 0\} =$[6]
$\{\max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{Length}(w')(P) \geq d]) < 10 \text{ pp} + d' \mid d' \in$
$D_{<d>} \ \& \ d' > 0\} =$
$\{\max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{Length}(w')(P) \geq d]) < d \mid d > 10 \text{ pp}\}$
e. $[[(106)]] = 1$
iff $[[\text{ScalAssert}]] ([[\phi]]_{\text{Alt}}) ([[\phi]]_o) = 1$
iff $\max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{Length}(w')(P) \geq d]) < 10 \text{ pp}$

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[6] We can give a proof of this step for the example with the universal modal that is parallel to the proof for the example with the existential modal from footnote 3.

Thus the difference made by the present proposal lies not in the meanings that arise when all is well, but merely in the fact that things can go wrong. Alternatives bring about the possible complication of intervention effects, and this is what happens when we revise the relevant LF of (10), (10″a), in a parallel manner.

(108) * [ScalAssert [ϕ [DegP er_{ANT} than that] [1[every girl [$\sim$C[is t1 tall-ANT]]]

The LF in (108), like (88′) above, instantiates the General Minimality Effect MIN. The $\sim$ operator that accompanies the nominal quantifier evaluates prematurely all alternatives triggered in its scope, and the ScalAssert operator has nothing left to evaluate. This is the same intervention effect as demonstrated for the direct measure *little* construction.

In sum, letting negative antonyms introduce alternatives into the semantics allows us to construe the scope data in the matrix clause of *less*-comparatives as intervention effects.

4.2 Other *little* comparison constructions

This subsection briefly considers how to extend the analysis of antonyms and the analysis of the comparative that goes with it to other comparison constructions. Its main purpose is to illustrate the systematic nature of the relationship between operators and positive vs. negative polar adjectives.

4.2.1 Equative

Below is the set of equatives data that the analysis should minimally cover. The semantics of the equative differs from the semantics of the comparative essentially in that the '$>$' or '$<$' relation expressed by (simple) comparative sentences is changed to a '$\geq$' or '$\leq$' semantics.

(109) a. Ida is as tall as Jule (perhaps taller).
b. Height(I) $\geq$ Height(J)

(110) a. Jule is as short as Ida (perhaps shorter).
b. Height(J) $\leq$ Height(I)

(111) a. Jule weighs as little as Ida.
b. Weight(J) $\leq$ Weight(I)

(112) a. Karl-Theodor is as little intelligent as Angela.
b. IQ(K) $\leq$ IQ(A)

I am going to treat the equative in a completely parallel manner to the comparative (see von Stechow 1984). Whether this is ultimately correct will only be revealed by a more detailed study of the equative (see especially Bhatt and Pancheva (2004) and Rett (2008) for recent analysis, as well as references therein); I do it here for convenience. An example of a simple 'positive polar' equative is analysed in (113) and (114). Combining this with my assumptions about negative antonyms leads to the analysis in (115) and (116) for the 'negative polar' equative.[7]

(113) $[[\text{as}]] = \lambda d.\lambda D.\max(D) \geq d$

(114) a. Ida is as tall as Jule.
b. [[DegP as [max [Jule ~~is _ tall~~]]] [1[Ida [t1 tall]]]
c. $\text{Height}(I) \geq \text{Height}(J)$

(115) $[[\text{as little as}]] = [[\text{as}_{\text{ANT}}]] = \lambda d.\lambda D.\max(D) \leq d$

(116) a. Jule is as short as Ida.
b. [ScalAssert [ϕ [DegP as$_{\text{ANT}}$ [max [Ida ~~is _ tall~~]]] [1[Jule [t1 tall-ANT]]]
c. $[[\phi]]_o = \text{Height}(J) \leq \text{Height}(I)$
$[[\phi]]_{Alt} = \{\max(\lambda d.\text{Height}(J) \geq d + d') \leq \text{Height}(I) \mid d' \in D_{<d>}$ $\& \; d' > 0\}$
$= \{\text{Height}(J) \leq \text{Height}(I) + d' \mid d' \in D_{<d>} \; \& \; d' > 0\}$
$= \{\text{Height}(J) \leq d \mid d > \text{Height}(I)\}$
d. $[[(116b)]] = 1$
iff $[[\text{ScalAssert}]] \; ([[\phi]]_{Alt}) \; ([[\phi]]_o) = 1$
iff $\text{Height}(J) \leq \text{Height}(I) \; \&$
$\forall q \in \{\text{Height}(I) > d \mid d > [[\text{that}]]\}: \neg(\text{Height}(I) > [[\text{that}]] \rightarrow q) \rightarrow \neg q \; \&$
$\exists q \in \{\text{Height}(I) > d \mid d > [[\text{that}]]\}: q = 1$
iff $\text{Height}(J) \leq \text{Height}(I)$

Things would go wrong if instead of OP$_{\text{ANT}}$ we were to use OP, which does not reverse scalarity. The reasoning is identical as for the direct measure construction and will not be repeated here. As with the comparative, we can only have OP$_{\text{ANT}}$ if there is an Adj-ANT in its scope. We see the systematic nature of OPs and OP$_{\text{ANT}}$'s in relation to positive and negative polar adjectives.

4.2.2 Positive, superlative, and others

A set of data parallel to the one just discussed for the equative is given for the positive below. I adopt von Stechow's (2005) semantics for the positive; the truth conditions stated below the examples correspond to his analysis. L_c is the neutral interval in the context c, e.g. the interval on the scale that would count as neither tall nor short. The positive says that an individual's measure on the relevant scale is above the neutral interval. The 'negative', i.e. the positive with a negative antonym, says that an individual's measure on the relevant scale is below the neutral interval. This is captured by the twin operators in (121) and (122).

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[7] It is interesting that *as*$_{\text{ANT}}$ has the same semantics as AT MOST. The precise connection between the measure construction and the equative seems an interesting question to be pursued on some future occasion.

(117) a. Ida is tall.
b. $\forall d \in L_c$: Height(I)$\geq$d
c.

```
|-------------|/////////////|----------------x-------------->
                    Lc                  Height(I)
```

(118) a. Ida is short.
b. $\forall d \in L_c$: Height(I)$\leq$d
c.

```
|------------x-------------------|/////////////|-------------->
          Height(I)                    Lc
```

(119) a. Ida weighs little.
b. $\forall d \in L_c$: Weight(I) $\leq$ d

(120) a. Karl-Theodor ist wenig intelligent. [German]
'Karl-Theodor is little intelligent.'
b. $\forall d \in L_c$: IQ(K) $\leq$ d

(121) a. $[[\text{POS}]] = \lambda L_c.\lambda D.\forall d \in L_c: \max(D) \geq d$
b. $[[\text{NEG}]] = [[\text{POS}_{\text{ANT}}]] = \lambda L_c.\lambda D.\forall d \in L_c: \max(D) \leq d$

At this point, we could continue sketching a similar picture for other comparison operators like the superlative, or intensional comparisons with *too* and *enough*. The minimally relevant points for the superlative are given below (see in particular Szabolcsi (1986), Heim (2001) for the semantics of the superlative).

(122) a. Ida is the tallest.
b. $\forall y \in C$: y $\neq$ I -> Height(I) $>$ Height(y)

(123) a. Ida is the least tall.
b. Ida is the shortest.
c. $\forall y \in C$: y $\neq$ I -> Height(I) $<$ Height(y)

(124) a. $[[\text{-est}]] = \lambda C.\lambda D.\lambda x.\forall y \in C: y \neq x$ -> $\max(D(x)) > \max(D(y))$
b. $[[\text{least}]] = [[\text{-est}_{\text{ANT}}]] = \lambda C.\lambda D.\lambda x.\forall y \in C: y \neq x$ ->
$\max(D(x)) < \max(D(y))$

We can informally state a generalization about comparison operators OP and their counterparts OP_{ANT} as follows (note that any explicit semantic rule relating the two operators faces the problem that the various comparison operators have rather different semantic types, given the standard analyses I have adopted here):

(125) *Operator pairs:*
If OP is a comparison operator whose semantics involves an ordering relation R, then OP_{ANT} is a comparison operator with the same semantics except that R is replaced by the inverse relation R^{-}.

Moreover, all comparison constructions involving negative antonyms should share the comparative's sensitivity to intervention. I illustrate with the superlative. Example (126) is taken from Heim (2001) (see also Stateva 2000, 2002). It has the minimum requirement reading in (126b,c). The negative polar superlative in (126′) shares the availability of a minimum requirement reading. The examples illustrate wide scope of the superlative DegP relative to a modal (but see Sharvit and Stateva (2002) for a different analysis). We expect that a parallel reading is not possible when we replace the modal by a nominal or adverbial quantifier. (126″) is a pertinent example. The reading parallel to the minimum requirement reading is not possible. A similar observation holds for the pair of equatives in (127), (127′).

(126) a. John needs to drive the fastest.
b. $\forall y \in C: y \neq$ John -> max(λd. for all worlds w, John drives d-fast in w) $>$ max(λd. for all worlds w, y drives d-fast in w)
c. The minimum requirement speed of John exceeds the minimum requirement speed of everyone else.

(126′) a. John needs to drive the least fast.
b. $\forall y \in C: y \neq$ John -> max(λd. for all worlds w, John drives d-fast in w) $<$ max(λd. for all worlds w, y drives d-fast in w)
c. The minimum requirement speed of John is below the minimum requirement speed of everyone else.

(126″) a. John always drove the least fast.
b. # $\forall y \in C: y \neq$ John -> max(λd. for all times t, John drove d-fast at t) $<$ max(λd. for all times t, y drove d-fast at t)
c. # The maximum speed that John reached on all occasions (John's personal slowest performance) is below everyone else's lowest performance.

(127) a. John needs to weigh as little as Mary.
b. John's minimum required weight is no more than Mary's minimum required weight.

(127′) a. Every boy weighs as little as Mary.
b. * The weight of the lightest boy is no more than Mary's weight.

Thus it seems that intervention effects show up as expected. A more thorough investigation of the relevant data would of course be desirable. I will not pursue the issue further right now. Instead, here is an interim summary. This section and the preceding one have been concerned with comparison constructions containing negative antonyms including *little*: their meaning, its composition, and resulting constraints on scope. I have proposed a compositional analysis that derives intuitively correct interpretations. Unexpectedly, it does so by employing alternatives in the composition. The motivation for this aspect is scope constraints characteristic of intervention effects. The analysis gets those right. The implementation in terms of alternatives looks odd, but I hope to have convinced the reader that even aside from intervention, it is at least systematic and gives us a principled view of the role of negative antonyms in comparison constructions. They emerge as a kind of degree polarity item, indicating the presence of a scale-reversing operator. Comparison operators accordingly come in pairs.

5 *Exactly*-DegPs

I now return to the other type of DegP that is crucial for scope interaction in comparatives, *exactly*-DegPs. The view on *exactly*-differentials in comparatives from the literature is reconsidered in Sect. 5.1, and the relevant data discussed more extensively in Sect. 5.2. I develop an analysis on this basis in Sect. 5.3, which covers some but not all of the relevant data.

5.1 A closer look at the issue

5.1.1 Review: Heim's (2001) observations

It is now time to remind ourselves that negative antonyms including *little* were only the first half of the data set that triggered this investigation. Remember *exactly*-phrases in the shape of (1) from Heim's (2001) paper and Sect. 2.

(1) This draft is 10 pp long.
The paper is required to be exactly 5 pp longer than that.

(1′) a. max(λd.∀w′[R(@,w′) -> the paper is d-long in w′]) = 10 pp + 5 pp
= the length the paper reaches in all relevant worlds is 15 pp
= the minimum length required for the paper is 15 pp
b. ∀w′[R(@,w′) -> max(λd.the paper is d-long in w′) = 10 pp + 5 pp]
= in all relevant worlds, the paper's length is 15 pp
= the following is required: that the paper be exactly 15 pp long

(1″) a. [[DegP exactly 5 pp -er than that] [1[required [the paper be t1 long]]]]
b. [required [[DegP exactly 5 pp -er than that] [1[the paper be t1 long]]]]

(3) [[exactly 5 pp -er than that]] = λD.max(D) = 10 pp + 5 pp (type ≪ d,t >, t >)

This derivation of the ambiguity in (1) (from Heim 2001) brings with it the question of why a parallel derivation appears to be impossible in (128), where the nominal quantifier replaces the modal verb. Parallel to the 'minimum requirement' reading in (1′a) would be a reading we might call the 'smallest instance' reading in (128′a)—in this case a comparison to the shortest girl—in which the comparison takes scope over the nominal quantifier. This reading is reported to be impossible.

(128) John is 6′.
Every girl is exactly 2″ taller than that.

(128′) a. # max(λd.∀x[girl(x) -> x is d-tall]) = 6′ + 2″
The shortest girl is 6′ + 2″.
b. ∀x[girl(x) -> max(λd.x is d-tall) = 6′ + 2″]
Every girl's height is exactly 6′2″.

(128″) a. * [[DegP exactly 2″ -er than that] [1[every girl is t1 tall]]]
b. [[every girl] [2[[DegP exactly 2″ -er than that] [1[t2 is t1 tall]]]]]

Since a scope constraint parallel to the *less*-comparatives shows up, the *exactly*-data too should be analysable in terms of intervention. This section reviews in how far this is possible. I begin by reporting an observation due to Toshiko Oda that (1) may not be about the scope of the comparative.

5.1.2 Oda's (2008) point

Oda (2008) points out that there is an alternative analysis of example (1) that does not rely on the comparative taking scope over the intensional verb. She discusses the behaviour of the difference degree argument of the comparative in Japanese vs. English. Her discussion includes the following derivation of the truth conditions of the 'minimum requirement' interpretation of (1), repeated below, in which von Stechow′s (2005) analysis of the measure phrase 'exactly 5 pp' in (131) is used.

(1) This draft is 10 pp long.
The paper is required to be exactly 5 pp longer than that.

(129) [[exactly 5 pp] [2[required [[DegP t2 -er than that] [1[the paper be t1 long]]]]

(130) $[[[1[\text{the paper be t1 long}]]]] = \lambda d.\text{the paper is d-long in w}$
$[[\text{-er}]] = \lambda d.\lambda d'.\lambda D.\max(D) \geq d + d'$
$[[[2[\text{required }[[\text{DegP t2 -er than that}]\ [1[\text{the paper be t1 long}]]]]]] =$
$\lambda d'.\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') \geq 10 \text{ pp} + d']$
$[[(129)]] = \max(\lambda d'.\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') \geq 10 \text{ pp} + d']) = 5 \text{ pp}$
'the largest degree d′ such that the paper is d′-much longer than 10 pp in every relevant world is 5 pp' =
'the minimum difference to 10 pp required is 5 pp'

(131) $[[\text{exactly 5 pp}]] = \lambda D.\max(D) = 5 \text{ pp}$ type $\ll d,t>,t>$

Notice that the comparative is interpreted within the scope of the modal. The differential measure phrase *[exactly 5 pp]* alone takes scope over the modal. This suffices to give us truth conditions equivalent to (1′a). According to Oda's analysis, it is the scope of the *exactly*-phrase that is at issue here, not the scope of the comparative DegP. The point of Oda's observation for us is that comparatives with *exactly*-differentials involve two scope-bearing elements, not one.

I conclude that we need to take another look at *exactly*-phrases and how they may scopally interact. Here is a preview of what is to come: Sect. 5.2 provides a more complete picture of the relevant data. We will see that direct measure *exactly*-phrases scopally interact with modals, but not with other quantfiers. They give the picture characteristic of intervention effects. A closer look at comparatives with *exactly*-differentials reveals that interaction with potential interveners exists—contrary to the view in the literature—but is subject to structural constraints. In Sect. 5.3 I propose an analysis of *exactly*-phrases in terms of alternatives, explaining why they are sensitive to intervention. The analysis derives the direct measure *exactly*-phrase data. An analysis of the *exactly*-differentials data needs to combine structural constraints on scope with the intervention constraint. While I think I understand how this works out in German differential comparatives, an empirical and theoretical gap remains regarding English differential comparatives.

5.2 A closer look at the data

5.2.1 Direct measure exactly*-phrases*

In examples (132) and (133) below, the *exactly*-phrase shows up as a direct measure phrase rather than a differential. The examples are ambiguous; their meanings are given in (132″) and (133″) respectively. Their analyses according to von Stechow's semantics of such measure phrases are given in (132′) and (133′). They show that the *exactly*-phrase can take wide or narrow scope relative to the modal verb. It can be regarded as a degree quantifier of its own, as the von Stechow semantics in (131) predicts.

(132) You are allowed to write exactly 5 pp.

(132′) a. [allowed [[exactly 5 pp] [1[you write t1 (much)]]]]
b. [[exactly 5 pp] [1[allowed [you write t1 (much)]]]]

(132″) a. $\exists w'[R(@,w') \ \&\ \max(\lambda d.\text{you write d-much in } w') = 5 \text{ pp}]$
'It is permitted for you to write exactly 5 pp.'
b. $\max(\lambda d.\exists w'[R(@,w') \ \&\ \text{you write d-much in } w']) = 5 \text{ pp}$
'The maximum you're allowed to write is 5 pp.'

(133) The paper has to be exactly 5 pp long.

(133′) a. [have to [[exactly 5 pp] [1[the paper be t1 long]]]]
b. [[exactly 5 pp] [1[have to [the paper be t1 long]]]]

(133″) a. $\forall w'[R(@,w') \text{ -> } \max(\lambda d.\text{the paper is d-long in } w') = 5 \text{ pp}]$
'It is required that the paper be exactly 5 pp long.'
b. $\max(\lambda d.\forall w'[R(@,w') \text{ -> } \text{the paper is d-long in } w']) = 5 \text{ pp}$
'The minimum requirement length for the paper is 5 pp.'

These data lend some support to an analysis like Oda's of the crucial example (1). It is possible for the *exactly*-phrase alone to take wide scope. Understanding (1) in terms of the scope of *exactly* would be preferable if it offered an insight into the range of data that do or do not permit scope ambiguities. The next question we will ask ourselves, therefore, is: Can *exactly*-phrases take variable scope relative to nominal and adverbial quantifiers when they are direct measure phrases (instead of differentials)? Consider the data below. (134a,b) are universal quantifiers and (134c,d) existentials.

(134) a. Everyone wrote exactly 5 pp.
b. Every paper is exactly 5 pp long.
c. One child weighs exactly 20 kgs.
d. I sometimes weigh exactly 65 kgs.

It is easy to see that (134a) means (135a) but not (135b). A parallel point can be made for (134d); cf. (136). None of these examples is ambiguous.

(135) a. $\forall$x: max(λd.x wrote d-much) = 5 pp
‘Everyone did the following: write exactly 5 pp.’
b. # max(λd.$\forall$x: x wrote d-much) = 5 pp
‘Everyone wrote at least 5 pp.’

(135′) a. [everyone [2[[exactly 5 pp] [1[t2 write t1 (much)]]]]
b. * [[exactly 5 pp] [1[everyone [2[t2 write t1 (much)]]]]

(136) a. $\exists$t: max(λd. I weigh d-much at t) = 65 kg
‘There are times at which I weigh 65 kg.’
b. # max(λd.$\exists$t: I weigh d-much at t) = 65 kg
‘The most I ever weigh is 65 kg.’

The data show that direct measure *exactly*-phrases cannot take scope over nominal and adverbial quantifiers. They do interact scopally with modals, as we saw above. Given (131), it is not clear why (134a–d) are not ambiguous in a way parallel to (132) and (133). The semantics of *exactly*-phrases that we have adopted for now would predict ambiguity for all of these examples; in particular it would predict a ‘smallest instance’ reading along with a ‘minimum requirement’ reading, e.g. via the LF in (135′b). Since the constraint showing up in the direct measure *exactly*-data has the characteristics of an intervention effect, we will look for an alternative-semantic analysis of *exactly*. But before we do so, we will look more closely at the comparatives data.

5.2.2 Exactly-*comparatives reconsidered*

I am not certain that the relevant ‘smallest instance’ reading in comparatives is always impossible (and an anonymous reviewer for *NALS* makes a related remark). For my intuitions, intonation and structural position make a difference. I illustrate this with the German data in (137). Capitalization indicates stress in the examples below.

(137) a. Jedes Brett ist genau zehn cm länger.
every board is exactly ten cm longer
b. Genau ZEHN cm länger ist JEdes Brett.
exactly TEN cm longer is EVery board
‘Every board is exactly ten cm longer.’

(137′) max(λd.$\forall$x[board(x) -> Length(x) $\geq$ d) = d_c + 10 cm
‘The shortest board is exactly 10 cm longer than d_c.’

The relevant situation for the ‘smallest instance’ reading (137′) is given in (138). The shortest board is exactly 10 cm longer than whatever contextual length we compare to. The other boards are longer than the shortest board. I would judge (137a) with a normal intonation false in this situation—and this is the judgment reported for English (128) above, so I am in agreement with the judgments from the literature so far. But I’m fairly sure that (137b) is true in situation (138).

(138)

```
|-----------------|                                    contextually given length d_c
                  |------------|                       10 cm

|------------------------------|                       B1
|---------------------------------------|              B2
|---------------------------------------------------|  B3
```

This means that it depends on the formal details of the differential comparative sentence whether or not the comparison can scope over the nominal quantifier.

A slightly easier example in terms of intuitions is (139), with *etwa* 'approximately' instead of *genau* 'exactly'.[8] For me, (139b) clearly has the 'smallest instance' reading in (140) ((139a) does not).

(139) a. Alle anderen Vorträge waren etwa vier Minuten länger.
all other talks were approximately four minutes longer
b. Etwa VIER Minuten länger waren ALle anderen Vorträge
approximately FOUR minutes longer were ALL other talks
(manche sogar acht Minuten).
(some even eight minutes)
'All other talks were approximately four minutes longer (some even eight minutes).'

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[8] Regarding a differential introduced by *etwa/about*, I assume that it is an expression similar to *like* indicating that what follows is to be taken with a degree of leeway (Lasersohn 1999, Siegel 2002). I think that it is an applicable test for the scope issue because its semantics is a modified *exactly*-semantics, and not an *at least*-semantics. Under an *at least*-semantics of a differential, the two scope possibilities are indistinguishable; see (i) below. As we showed, they are distinguishable with an *exactly*-differential; see (ii) below. They are also distinguishable with an *etwa/about*-differential – provided that we take care the differences do not fall within the vagueness range of *etwa/about* (see (iii), (iv), (v)). I take it that in (139), 8 min does not count as about 4 min, so if (139b) is acceptable, that is evidence for the smallest instance reading.

(i) (John is 1.70 m.) Every girl is at least 10 cm taller than that.
a. For every girl x: Height(x) $\geq$ 10 cm + 1.70
'Every girl reaches a height of 1.80 m.'
b. max(λd.for every girl x, Height(x) $\geq$ d) $\geq$ 10 cm + 1.70
'The shortest girl reaches a height of 1.80 m.'
(ii) (John is 1.70 m.) Every girl is exactly 10 cm taller than that.
a. For every girl x: Height(x) = 10 cm + 1.70
'Every girl's height is 1.80 m.'
b. max(λd.for every girl x, Height(x) $\geq$ d) = 10 cm + 1.70
'The shortest girl's height is 1.80 m.'
(iii) (John is 1.70 m.) Every girl is about 10 cm taller than that.
a. For every girl x: Height(x) $\approx$ 10 cm + 1.70
'Every girl's height is about 1.80 m.'
b. max(λd.for every girl x, Height(x) $\geq$ d) $\approx$ 10 cm + 1.70
'The shortest girl's height is about 1.80 m.'
(iv) a. Susan is at least 1.70 m tall. In fact, she is 1.80.
b. Susan is exactly 1.70 m tall. ??In fact, she is 1.72.
c. Susan is about 1.70 m tall. In fact, she is 1.72/ 1.68/ ??1.80
(v) [[etwa/about]] = λd.λD.max(D) $\approx$ d.

(140) $\max(\lambda d.\forall x[talk(x)\text{-}> Length(x) \geq d) \approx d_c + 4$ min
‘The shortest other talk was about 4 min longer than d_c.’

These examples are best in a context in which the difference degree is in some sense ‘topical’. (141) below is another example, with a context that makes the sentence more natural.

(141) Sally is teaching a semantics class this semester. Her TA is Tom. The class got an assignment last week to write an essay on the acquisition of quantification. Tom wrote a sample essay, which is very good but also very concise and hence short, having only 8 pp. Sally expects the students to be unable to be as concise as Tom, and believes that they will all write 10 pp at the very least. Tom, however, thinks that essays below 10 pp in length might also be handed in. They decide to have a bet on this. The loser has to grade the essays. This morning the essays were due.

Sally: Wie lang sind die Essays im Vergleich zu Deinem?
How long are the essays, compared to yours?

Tom:	Genau	ZWEI	Seiten	länger	sind	ALle	Essays,
	exactly	two	pp	longer	are	ALL	essays,
	und	manche	sind	auch	5	Seiten	länger.
	and	some	are	also	5	pp	longer

I have been able to replicate these judgments in English to some extent, although I’ve had a harder time figuring out relevant factors in English. The following sentence was judged acceptable in the context indicated:

(142) I am teaching a class for which I have a TA, Sally. There is an assignment to write a paper. The students and Sally have to submit the paper. Sally wrote a 10-page paper.
About 5 pages more than that were written by every student, and some wrote up to 20 pages.

The English version (143) of (141), in the same context, was judged unacceptable with *exactly* but acceptable with *about.*

(143) Sally: So how long are the essays, compared to yours?

Tom: All the essays are {about/*exactly} 2 pp longer, and some of them are as much as 5 pp longer.

What I can say about English at the moment is that the ‘smallest instance’ reading of differential comparatives is probably not as uniformly unacceptable as we previously thought.

Let us compare the differential comparatives data to parallel data with direct measure *exactly*-phrases. The ‘smallest instance’ reading of (144) is given in (144$'$). I am not convinced that I get this reading for (144b) (and, matching the data reported in Sect. 5.2.1, I certainly don’t get it for (144a)). Similarly, both (145a) and (145b) for me claim that all talks were about four minutes long, and not (145$'$), that the shortest other talk was about four minutes long. I’m not entirely sure that (145b) cannot mean that, but I find it very difficult.

(144) a. Jedes Brett war genau zehn cm lang.
every board was exactly ten cm long
b. Genau ZEHN cm lang war JEdes Brett.
exactly TEN cm long was EVery board
'Every board was exactly ten cm long.'

(144′) $\max(\lambda d.\forall x[\mathrm{board}(x) -> \mathrm{Length}(x) \geq d) = 10\ \mathrm{cm}$
'The shortest board was exactly 10 cm long.'

(145) a. Alle anderen Vorträge waren etwa vier Minuten lang.
all other talks were approximately four minutes long
b. Etwa VIER Minuten lang waren ALle anderen Vorträge
(?* manche sogar 8).
approximately FOUR minutes long were ALL other talks (some even 8)
'All other talks were approximately four minutes long.'

(145′) $\max(\lambda d.\forall x[\mathrm{talk}(x) -> \mathrm{Length}(x) \geq d) \approx 4\ \mathrm{min}$
'The shortest other talk was about 4 min long.'

Finally, since I have cast some doubt on our empirical basis regarding *exactly*-comparatives, let us also reexamine *less*-comparatives. (146) is parallel to (137), and the question is whether (146b) makes comparison with the shortest board—reading (146′)—more available. I do not think that it does. So our view of *less*-comparatives is unaffected by this closer look at the *exactly*-data. *Less*-comparatives and *exactly*-comparatives, interestingly, diverge empirically in that the smallest instance reading is always unavailable with *less* but, depending on structural factors, sometimes available with *exactly*.

(146) a. Jedes Brett war weniger lang.
every board was less long
b. ? WEniger lang war JEdes Brett.
LESS long was EVery board
'Every board was less long.'

(146′) $\max(\lambda d.\forall x[\mathrm{board}(x) -> \mathrm{Length}(x) \geq d) < d_c$
'The shortest board was less long than d_c.'

I must admit that the data are rather subtle. But if my description of them is accurate, which is what I will assume, then we need a theory that does not allow direct measure *exactly*-phrases to take scope over nominal and adverbial quantifiers. At the same time, comparatives with *exactly*- and *about*-differentials must be able under the right circumstances to take wide scope. The next subsection begins to develop an analysis with those properties.

5.3 An analysis of *exactly*-phrases

5.3.1 Direct measure exactly*-phrases: an alternative-semantic analysis*

In order to analyse the scope effects with *exactly* as intervention effects, we need an analysis of *exactly* in terms of alternatives. Such an analysis already exists. Krifka (1999) develops a semantic theory according to which the elements *exactly, at least,* and *at most* involve an alternative semantics. A version of Krifka's analysis is exemplified below with (147). The element that *exactly* associates with, *five* in the example, introduces alternatives—here: alternative numbers of books that I read. The sentence asserts that the maximum number which makes a true assertion is the one given, five.

(147) I read exactly five_F books.

(148) $[[\text{I read five}_F \text{ books}]]_o = \exists x[\text{books}(x) \ \& \ \text{card}(x) = 5 \ \& \ \text{I read } x]$
$[[\text{I read five}_F \text{ books}]]_{Alt} = \{\exists x[\text{books}(x) \ \& \ \text{card}(x) = n \ \& \ \text{I read } x]: n \in N\}$

(149) $[[(147)]] = 1$
iff $[[\text{I read five}_F \text{ books}]]_o = 1 \ \& \ \forall q \in [[\text{I read five}_F \text{ books}]]_{Alt}$:
$\neg([[XP]]_o \text{ -> } q) \text{ -> } \neg q$
iff $\exists x[\text{books}(x) \ \& \ \text{card}(x) = 5 \ \& \ \text{I read } x]$
$\& \ \forall n[n > 5 \text{ -> } \neg\exists x[\text{books}(x) \ \& \ \text{card}(x) = n \ \& \ \text{I read } x]]$
iff $\max(\lambda n.\exists x[\text{books}(x) \ \& \ \text{card}(x) = n \ \& \ \text{I read } x]) = 5$

The most informative true proposition of the form 'I read n books' is 'I read five books'.

Krifka goes on to suggest that the word *exactly* is not in fact the operator that evaluates focus. That operator, the familiar ScalAssert operator, occurs at a structurally higher position and evaluates the alternatives marked by *exactly*. My version of this suggestion of Krifka's is given below. (Krifka's analysis is much more sophisticated; I concentrate on those aspects that have a bearing on the issue at hand.) I put asterisks around elements in the LF that don't contribute to the interpretation, but indicate the presence of another element that does.[9] The more elaborate analysis predicts the intuitively correct truth conditions for the example. (I repeat here Krifka's ScalAssert semantics; adding the 'some C' requirement would in this case be harmless.)

(150) [ScalAssert [XP I read *exactly* fiveF books]]

(151) $[[\text{ScalAssert}]]([[XP]]_{Alt})([[XP]]_o) = 1$
iff $[[XP]]_o = 1 \ \& \ \forall q \in [[XP]]_{Alt}: \neg([[XP]]_o \text{ -> } q) \text{ -> } \neg q$

(152) $[[\text{I read five}_F \text{ books}]]_o = 1 \ \& \ \forall q \in [[\text{I read five}_F \text{ books}]]_{Alt}: \neg([[XP]]_o \text{ -> } q)$
$\text{-> } \neg q$
iff $\max(\lambda n.\exists x[\text{books}(x) \ \& \ \text{card}(x) = n \ \& \ \text{I read } x]) = 5$

This means that (in contrast to the view reported in Sect. 5.1) the quantificational effects of *exactly*-phrases do not come about via syntactic mechanisms of quantification. They come about via an alternative semantics. The following derivation of one of our wide-scope *exactly*-phrase readings shows how the relevant 'minimum requirement' reading is derived without QR, using alternative semantics instead.

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[9] A reviewer for *NALS* points out that the connection between ScalAssert and the *exactly*-phrase is obligatory, something that is not technically spelled out in the presentation in the text. See once more Chierchia (2006) (discussed in Sect. 4.1 above) for an implementation of such a connection.

(153) a. The paper has to be exactly 10 pp long.
b. [ScalAssert [XP have to [the paper be *exactly* 10 ppF long]]]]

(154) $[[\text{XP}]]_o = \forall w[wR@ \text{ -> the paper is 10 pp long in } w]$
$[[\text{XP}]]_{Alt} = \{\forall w[wR@ \text{ -> the paper is n pp long in } w]: n \in N\}$

(155) $[[\text{XP}]]_o = 1 \ \& \ \forall q \in [[\text{XP}]]_{Alt}: \neg([[\text{XP}]]_o \text{ -> } q) \text{ -> } \neg q$ iff
the paper has to be 10 pp long & $\forall n \in N: n > 10$ -> $\neg$the paper has to be n pp long
iff max(λn.the paper has to be n pp long]) = 10
The most informative true proposition of the form ‘The paper has to be n pp long’ is ‘The paper has to be 10 pp long’.

This change in perspective regarding *exactly*-phrases, while preserving the meaning we derive, predicts different empirical constraints on wide scope *exactly*-phrases. According to the alternative semantics introduced in this section, ordinary constraints on QR do not restrict the relation between ScalAssert (the element evaluating alternatives) and **exactly* fiveF*, the element introducing alternatives. Instead, we expect the relation between ScalAssert and *exactly* to be of the kind that is sensitive to intervention. No ∼ operator should be able to occur between ScalAssert and **exactly* fiveF*. Nominal and adverbial quantifiers come with a ∼ operator, while modals do not. Thus (153b) is fine, but in (156) the nominal quantifier blocks the focus connection between ScalAssert and its associate. This means that the combination of Oda’s observation that the scope of the *exactly*-phrase itself is an issue and Krifka’s alternative semantics for *exactly* allows us to understand the quantifier scope data in direct measure *exactly*-constructions. Like the *little* data, they boil down to well-known intervention effects.

(156) a. Every paper is exactly 10 pp long.
b. $\max(\lambda d.\forall x[\text{paper}(x) \text{ -> Length}(x) \geq d]) = 10$ pp
c. * [ScalAssert [every paper [∼ [is *exactly* 10 ppF long]]]]]]

Regarding the German data in (144)/(145) above: if my judgments stand, then they indicate that the *exactly*-phrase is always interpreted in its base position (so overt movement is reconstructed). The structure in (157) below could never be the input to interpretation, and we always get an intervention effect. Should other speakers get the ‘smallest instance’ reading with the fronted *exactly*-phrase, that would indicate that they interpret the *exactly*-phrase in its surface position, where the intervention effect is circumvented by overt movement. Thus the structure in (157) would be available to them as the result of overt movement.

(157) [ScalAssert [[DegP *exactly* 10 ppF] [1[every paper [∼[is t1 long]]]]]]

Since the non-fronted *exactly*-phrase is definitely unacceptable on the ‘smallest instance’ reading, the direct measure *exactly*-phrase cannot QR but must take scope via an alternative semantics in both English and German (so (157) cannot arise from covert movement). This indicates that an element that is interpreted via an alternative semantics does not at the same time have access to QR as a mechanism of non-local interpretation. Alternative semantics *replaces* syntactic quantification. This fits with Beck and Vasishth’s (2009) findings on multiple focus configurations, which indicate that a focus cannot QR. The constraint on focus interpretation they observe would not be predicted if focus could raise covertly. Beck (2006) also makes this observation. Interim summary: An alternative-semantic analysis can be successfully applied to direct measure *exactly*-phrases and explains their scope constraints as intervention effects.

Before we move on to *exactly*-phrases as differentials in comparatives, a word on the difference between *little*-phrases and *exactly*-phrases. The movement/no movement issue arises here and not in the *little*-data because the position of the alternative trigger is different. The negative antonym, which is the alternative trigger in the case of the *little*-data (*long-ANT* in (158a) below), is interpreted in the base position of the adjective, and it is unequivocally in that position that the alternatives are introduced. The *exactly*-data are different in that the trigger is in the *exactly* DegP (*exactly 5 pp* in (158b) below), hence in a category that may in principle move about. Thus this issue is more complicated here than it was in the preceding sections.

(158) a. The paper is that short.
The paper is [AP that [A' long-ANT]]
b. The paper is exactly 5 pp long.
The paper is [AP [DegP exactly 5 pp] [A' long]]

5.3.2 Exactly-*differentials in comparatives*

The above considerations have shown that movement of degree phrases may interact with alternative semantics in these data, and this is especially relevant for comparative DegPs, as we will see in a moment.

It is easy to extend Krifka's analysis to the case of (1), as demonstrated below. (159) combines Oda's observation with an alternative-semantic analysis of *exactly*. It does not matter that the *exactly*-phrase is a differential rather than a direct measure phrase; the alternative semantics employed here derives the 'minimum requirement' reading.

(1) The paper is required to be exactly 5 pp longer than that.

(159) [ScalAssert [XP required [*exactly* 5 ppF -er than that [1[the paper be t1 long]]]]]
$[[XP]]_o = \forall w[wR@ \text{->} \text{Length}(P)(w) \geq 5 \text{ pp} + 10 \text{ pp}]$
$[[XP]]_{Alt} = \{\forall w[wR@ \text{->} \text{Length}(P)(w) \geq n \text{ pp} + 10 \text{ pp}]: n \in N\}$
$[[(1)]] = 1$ iff
$[[XP]]_o = 1\ \&\ \forall q \in [[XP]]_{Alt}: \neg[[XP]]_o \text{->} q \text{->} \neg q$ iff
the paper has to be $10 + 5$ pp long & $\forall n \in N$: $n > 5$ -> $\neg$(the paper has to be $10 + n$ pp long)

In (160) a 'smallest instance' reading is unavailable. A parallel derivation to (159) is not possible in (160) because the nominal quantifier acts as an intervener in (162).

(160) John is $6'$.
Every girl is exactly $2''$ taller than that.

(161) a. # $\text{max}(\lambda\text{d}.\forall\text{x}[\text{girl(x) -> x is d-tall}]) = 6' + 2''$
‘The shortest girl is $6' + 2''$.’
b. $\forall\text{x}[\text{girl(x) -> max}(\lambda\text{d.x is d-tall}) = 6' + 2'']$
‘Every girl’s height is exactly $6'2''$.’

(162) [ScalAssert [XP every girl [∼ [2[*exactly* 2″F -er than that
[1[t2 is t1 tall]]]]]]

Thus, an alternative-semantic analysis can be given to the *exactly*-phrase that explains the scope of the *exactly*-phrase relative to various quantificational elements. The analysis not only applies to *exactly*-phrases in their uses as direct measure phrases, but can be extended to differentials in comparatives.

Next, however, we must consider movement of the comparative DegP. If the DegP headed by *-er* in (160)—*[*exactly* 2″ -er than that]*—were able to occur at LF above *every girl*, we would still derive a minimal height/smallest instance reading. (163) is not an intervention effect because raising the comparative DegP carries the differential with it. (Since the *exactly*-phrase itself is not QRed, it also does not violate the condition that an alternative trigger not be raised.) (163) would give rise to the smallest instance reading (in a way parallel to Heim’s original analysis of these examples).

(163) [ScalAssert [[DegP*exactly* 2″F -er than that] [1[every girl [∼ [2[t2 is t1 tall]]]]]]

If we want to exclude the smallest instance reading for (160), something must rule out (163) as an LF of (160). Such a constraint is needed in addition to the alternative-semantic analysis of the *exactly*-phrase. What kind of constraint might that be?

First, note that I have assumed throughout the paper that comparative DegPs may undergo QR. This assumption is specifically supported by ellipsis facts, as Heim (2001) points out. She reminds us of ellipsis data from Williams (1974) that indicate raising of a comparative DegP. The example below is an instance directly relevant to the present discussion.

(164) John needs to drive exactly 5 mph faster than Mary does _.
John needs to drive exactly 5 mph faster than Mary does ~~need to drive _ fast.~~

(165) The minimum speed required of John is 5 mph higher than the minimum speed required of Mary.

Ellipsis indicates that the *than*-clause should be moved beyond the matrix verb *need*. A standard analysis of this example accomplishes this by QR of the comparative DegP:

(166) [[DegP exactly 5 mph -er] [than Mary does ~~need to drive _ fast~~]]
[John needs to drive t fast]

Processing data also support a QR analysis of comparative DegPs; cf. Breakstone et al. (2011). I will take it for granted, then, that a comparative DegP is in principle mobile at LF.

Second, note that the German data (repeated in (167)) show that the smallest instance reading is possible. (167) also shows that the comparative DegP can move overtly, and when it does, the reading emerges in which it takes scope over a nominal quantifier. The relevant LF is given in (168).

(167) a. Genau ZEHN cm länger ist JEdes Brett.
exactly TEN cm longer is EVery board
'Every board is exactly ten cm longer.'
b. $\max(\lambda d.\forall x[\text{board}(x) \text{ -> } \text{Length}(x) \geq d) = d_c + 10$ cm
'The shortest board is exactly 10 cm longer than d_c.'

(168) [ScalAssert [[DegP*genau* 10 cm_F -er d_c] [1[jedes Brett [$\sim$
[2[AP t2 t1 lang]]]]]

This LF is available if the DegP has already raised overtly past the potential intervener, the nominal quantifier. The LF is not possible if the movement has to be covert. It is a known constraint in German that the relative scope of quantifiers is preferably indicated by their overt positions (Jacobs 1982, 1989; Höhle 1991; Pafel 1991; but also Frey 1989). It is not particularly surprising that this constraint should surface in this context. The combination of an alternative semantics for *exactly* with an independent well-known scope constraint explains the German data reported in this section quite well, as far as I can see.

Thirdly and finally, let us come back to English. The data in (160) reported by Heim (2001) contrast with (169) and with the *about*-version of (170) from above, in which the smallest instance reading was judged available.

(169) About 5 pages more than that were written by every student.

(170) All the essays are {about/*exactly} 2 pp longer.

At this point, I cannot offer a generalization as to when a smallest instance reading may be available in English. In terms of analysis, I see two directions to explore. On the one hand, replacing a movement analysis of intervention effects (Beck 1996) with an alternative-semantic analysis has left a residue of cases that the former covers but the latter doesn't (see for example Sauerland and Heck 2003 and Beck 2006 for discussion). It may be worth considering (160) vs. (169) and (170) in this light. The goal would be to find a constraint on QR to supplement intervention constraints in order to derive the English data. Additionally or alternatively, the element *exactly* may affect possible scope readings in a particular way, differently from other differentials including *about*, as (170) suggests. This means that we should look at other differentials in more detail.

In sum, though, this is the part of the problem that I have not yet been able to solve: Why is QR of a comparative DegP frequently impossible across a nominal quantifier in English? While the alternative-semantic analysis of *exactly*-phrases seems plausible enough, I have not been able to come up with a complete analysis that covers all of the relevant facts. I must leave this as an open question.

6 Conclusions

6.1 DegP scope

We have seen an analysis of the scope possibilities of direct measure *exactly*- and *little*-phrases in terms of intervention. Alternative semantics replaces LF movement as the means of creating wide scope interpretations. It is striking that the scope data in comparatives involve precisely *exactly* and *little* as well. The analysis of *little*-phrases could be extended straightforwardly to *less*-comparatives. However, in the case of *exactly*, the attempt to reduce scope in comparative main clauses to the scope of the *exactly*-differential clashes with facts that indicate movement of the comparative DegP—ellipsis, processing, and the German data. We still need to find constraints on LF movement to supplement the focus semantic analysis of *exactly,* in order to account for the scope effects in differential comparatives. A gap remains in the analysis as an explanation of scope in comparative main clauses.

6.2 Negative antonyms

An alternative-semantic analysis of negative antonyms as proposed here identifies them as a kind of degree polarity item. Like NPIs, they introduce pathological alternatives into the derivation which need to occur in a particular kind of semantic context in order to give rise to sensible meanings. The context here is reversed scalarity, i.e. the scope of a scale reversing operator. This is a version of a decomposition analysis of negative antonyms that has not been considered before, which makes the connection between antonym and scale reversing operator more indirect than in movement analyses. Further aspects of the analysis to be explored include which gradable predicates have antonyms in this sense, whether they all have the same scope options, and so on.

6.3 The comparative

This paper further develops a plot that I have begun to pursue in Beck (2010, 2011, 2012): that the comparative should receive a simple relational meaning and that the *than*-constituent should be of type $< d >$, a degree. With regard to the data investigated here, this position leads one to postulate pairs of comparison operators like *-er* and *-er*$_{\text{ANT}}$, *as* and *as*$_{\text{ANT}}$. It is not immediately visible which operator is contained in a given structure; a connection between morphology and semantics needs to be made. This view contrasts with Heim's (2007) uniform subset semantics of the comparative.

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References

Abusch, Dorit. 2002. Lexical alternatives as a source of pragmatic presupposition. In *Proceedings of SALT 12*, ed. B. Jackson, 1–19. Ithaca NY: CLC Publications.

Beck, Sigrid: 1996. Wh-constructions and transparent logical form. PhD diss., Universität Tübingen. http://www2.sfs.nphil.uni-tuebingen.de/Alumni/Dissertationen/beck.pdf.

Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14: 1–56.

Beck, Sigrid. 2007. The grammar of focus evaluation. In *'Interfaces + Recursion = Language'? Chomsky's minimalism and the view from syntax and semantics*, ed. Uli Sauerland, and Hans-Martin Gärtner. New York: Mouton de Gruyter.

Beck, Sigrid. 2010. Quantifiers in than-clauses. *Semantics and Pragmatics* 3: 1–72.

Beck, Sigrid. 2011. Comparison constructions. In *Handbook of semantics*, ed. Claudia Maienborn, Klaus von Heusinger, and Paul Portner, 1341–1389. Berlin: de Gruyter.

Beck, Sigrid. 2012. Lucinda driving too fast again—the scalar properties of ambiguous than-clauses. *Journal of Semantics* doi:10.1093/jos/ffr011.

Beck, Sigrid, and Shin-Sook Kim. 2006. Intervention effects in alternative questions. *Journal of Comparative Germanic Linguistics* 9: 165–208.

Beck, Sigrid, Toshiko Oda, and Koji Sugisaki. 2004. Parametric variation in the semantics of comparison: Japanese vs. English. *Journal of East Asian Linguistics* 13: 289–344.

Beck, Sigrid, and Hotze Rullmann. 1999. A flexible approach to exhaustivity in questions. *Natural Language Semantics* 7: 249–298.

Beck, Sigrid, and Shravan Vasishth. 2009. Multiple focus. *Journal of Semantics* 26: 159–184.

Bhatt, Rajesh, and Roumyana Pancheva. 2004. Late merger of degree clauses. *Linguistic Inquiry* 35: 1–45.

Bhatt, Rajesh, and Shoichi Takahashi. To appear. Reduced and unreduced phrasal comparatives. *Natural Language and Linguistic Theory.*

Bierwisch, Manfred. 1989. The semantics of gradation. In *Dimensional adjectives*, ed. M. Bierwisch, and E. Lang, 71–261. Berlin: Springer.

Breakstone, Micha Y., Alexandre Cremers, Danny Fox, and Martin Hackl. 2011. Processing degree operator movement: Implications for semantics of differentials. Paper presented at SALT 2011, New Brunswick, NJ.

Büring, Daniel. 2007. When *less* is *more* (and when it isn't). Paper presented at the Chicago Linguistic Society Meeting, Chicago.

Chierchia, Gennaro. 2006. Broaden your views: Implicatures of domain widening and the "logicality" of language. *Linguistic Inquiry* 37: 535–590.

Chierchia, G., D. Fox, and B. Spector. To appear. The grammatical view of scalar implicatures and the relationship between semantics and pragmatics. In *Handbook of semantics*, ed. C. Maienborn, P. Portner, and K. von Heusinger. Berlin: de Gruyter.

Elena, Guerzoni. 2006. Intervention effects on NPIs and feature movement: Towards a unified account of intervention. *Natural Language Semantics* 14(2): 359–398.

Fintel, Kai von, and Sabine Iatridou. 2003. Epistemic containment. *Linguistic Inquiry* 34(2): 173–198.

Fox, Danny. 2006. Free choice and the theory of scalar implicatures. Ms., MIT.

Frey, Werner. 1989. Syntaktische Bedingungen für die Interpretation. PhD diss., Universität Stuttgart.

Geurts, Bart. 2006. Take 'five': The meaning and use of a number word. In *Non-definiteness and plurality*, ed. Svetlana Vogeleer, and Liliane Tasmowski. Amsterdam: Benjamins.

Heim, Irene. 2001. Degree operators and scope. In *Audiatur Vox Sapientiae: A Festschrift for Arnim von Stechow*, ed. Caroline Féry, and Wolfgang Sternefeld, 214–239. Berlin: Akademie.

Heim, Irene. 2006. Remarks on comparative clauses as generalized quantifiers. Manuscript, MIT. http://www.semanticsarchive.net.

Heim, Irene. 2007. Little. In *Proceedings of SALT 16*, ed. M. Gibson, and J. Howell. Ithaca, NY: CLC Publications.

Heim, Irene. 2008. Decomposing antonyms? In *Proceedings of Sinn & Bedeutung 2007*, ed. A. Gronn, 212–225. Oslo: ILOS.

Höhle, T. 1991. On reconstruction and coordination. In *Representation and derivation in the theory of grammar*, ed. H. Haider, and K. Netter, 139–198. Dordrecht: Kluwer.

Iatridou, Sabine, and Zeijlstra, Hedde. 2010. Modals, negation and polarity. Presented at Sinn und Bedeutung 15, Saarbrücken.

Jacobs, Joachim. 1982. *Syntax und Semantik der Negation im Deutschen*. München: Fink.

Jacobs, Joachim. 1989. Skopus und Kohärenz. Manuscript, Universität Wuppertal.

Kennedy, Christopher. 1997. Projecting the adjective: The syntax and semantics of gradability and comparison. PhD diss., UC Santa Cruz.

Krasikova, Svetlana. 2010. Modals in comparatives. PhD diss., Universität Tübingen.

Krifka, Manfred. 1995. The semantics and pragmatics of polarity items. *Linguistic Analysis* 25: 209–257.

Krifka, Manfred. 1999. At least some determiners aren't determiners. In *The semantics/pragmatics interface from different points of view*. Current Research in the Semantics/Pragmatics Interface, vol. 1, ed. K. Turner, 257–291. Amsterdam: Elsevier.

Ladusaw, W.A. 1979. Polarity sensitivity as inherent scope relations. PhD diss., University of Texas at Austin.

Lasersohn, Peter. 1999. Pragmatic haloes. *Language* 75: 522–551.

Lechner, Winfried. 2004. *Ellipsis in comparatives*. Berlin: de Gruyter.

Linebarger, Marcia. 1987. Negative polarity and grammatical representation. *Linguistics and Philosophy* 10: 325–387.

Oda, Toshiko. 2008. Degree constructions in Japanese. PhD diss., University of Connecticut.

Pafel, Jürgen. 1991. Zum relativen Quantorenskopus im Deutschen. Arbeitspapiere des Sonderforschungsbereichs 340, Bericht Nr. 5, Universität Tübingen.

Penka, Doris. 2010. *Negative indefinites*. Oxford Studies in Theoretical Linguistics No. 32. Oxford: Oxford University Press.

Pesetsky, David. 2000. *Phrasal movement and its kin*. Cambridge: MIT Press.

Rett, Jessica. 2008. *Evaluativity and antonymy*. Proceedings of SALT 17, 210–227. Ithaca, NY: CLC Publications.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1: 75–116.

Rooth, Mats. 1985. Association with focus. PhD diss., University of Massachusetts at Amherst.

Sauerland, Uli, and Fabian Heck. 2003. *LF intervention effects in pied-piping*. Proceedings of NELS 2002, 347–366. Amherst: GLSA.

Schwarzschild, Roger, and Karina Wilkinson. 2002. Quantifiers in comparatives: A semantics of degree based on intervals. *Natural Language Semantics* 10: 1–41.

Sharvit, Yael, and Penka Stateva. 2002. Superlative expressions, context, and focus. *Linguistics and Philosophy* 25: 453–504.

Siegel, M. 2002. Like: The discourse particle and semantics. *Journal of Semantics* 19: 35–71.

Stateva, Penka. 2000. In defense of the movement theory of superlatives. In *Proceedings of ESCOL 1999*, ed. Rebecca Daly, and Anastasia Riehl, 215–226. Ithaca, NY: CLC Publications.

Stateva, Penka. 2002. How different are different degree constructions? PhD diss., University of Connecticut.

Stechow, Arnim von. 1984. Comparing semantic theories of comparison. *Journal of Semantics* 3: 1–77.

Stechow, Arnim von. 2005. Different approaches to the semantics of comparison. Ms., University of Tübingen.

Szabolcsi, Anna. 1986. Comparative superlatives. In *MIT working papers in linguistics*, ed. Naoki Fukui, Tova R. Rapoport, and Elisabeth Sagey, 245–265. Cambridge: MIT.

Tiemann, Sonja, Vera Hohaus, and Sigrid Beck. To appear. Crosslinguistic variation in comparison: Evidence from child language acquisition. *Proceedings of Linguistic Evidence 2010*, Tübingen.

Williams, Edwin. 1974. Rule order in syntax. PhD diss., MIT.

Zeijlstra, H. 2004. Sentential negation and negative concord. PhD diss., University of Amsterdam.