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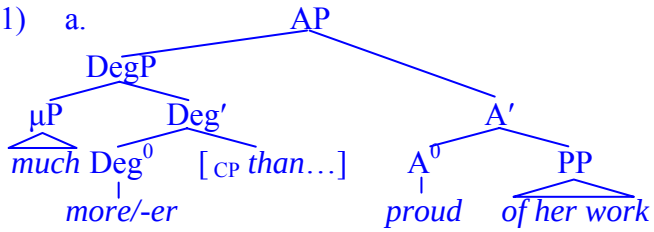
NO MORE NO LESS: EXISTENTIAL COMPARISON REVISITED

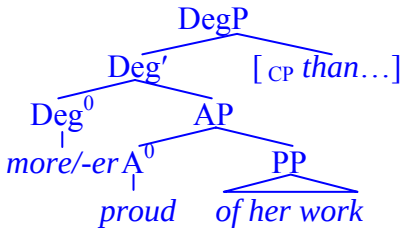
1. INTRODUCTION

Compositional semantics of comparatives and equatives has been much investigated in recent literature, and the results of this research tend to cluster around a movement approach: the degree operator moves covertly to the clausal level, yielding both the correct interpretation of comparison (what is compared is two degrees) and the interaction of degree operators with other operators, in particular, with intensional verbs. This approach necessarily presupposes a particular syntactic structure, illustrated in (1a) and advocated by Bowers 1975, Jackendoff 1977, Heim 2000, etc. Since in the tree (1a) the degree morpheme and its dependents are merged in the specifier of the AP, I will refer to this analysis as *the [Spec, AP] analysis*.

(1) a.



b.



However, as will be demonstrated below, the morphosyntax of comparatives (and to a lesser degree, equatives) argues for a different constituency, that shown in (1b). Since in this

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analysis the degree morpheme takes the AP as its complement and projects (Abney 1987, Bowers 1987, Corver 1990, 1991, 1997a, 1997b, etc.), I will refer to it as *the extended AP analysis*.

In this paper I will argue that this conflict between morphology and semantics can be resolved by appealing to the existential approach to comparatives (Seuren 1973 and Larson 1988), approximated in (2).

(2) a. Mary is cleverer than Bill.

b. ∃d [Mary is d-clever & ¬ (Bill is d-clever)]

The existential component in (2b) is shared between the two clauses and thus cannot be introduced by the comparative morpheme. But if it isn't the comparative morpheme itself that introduces existential quantification, the extended AP analysis in (1b) yields the constituency compatible with both the morphosyntax of comparatives and their semantics. I will also show that this view allows for a natural explanation of the interaction between the degree operator and quantified expressions in the comparative clause once it is assumed that two positions for degree negation are available there.

The simple existential approach with negation in the degree clause cannot, however, account for the full range of the data -- the degree clause must necessarily make reference to the maximal degree to which the predicate holds (von Stechow 1984, Rullmann 1995b, Heim 2000). I will show that once the necessary assumptions are made, both the semantics of equatives and the interpretation of measure phrases will follow. In essence, therefore, we will treat degree clauses like relative clauses: depending on the semantics of the relative clause, they can be definite or indefinite.

1.1. Elements of comparison

Since at least Kamp 1975 various attempts have been made to formalize the intuition that some adjectives but not others are vague: it is impossible to determine whether (3) is true without knowing in what context the evaluation is being made:

(3) This Lamborghini is quite cheap.

The vagueness of predicates such as *cheap*, *fool* or *out of control*, to name but a few, is coupled with another property: they can combine with degree operators:

(4) a. This Lamborghini is cheap**er than** the new Bugatti.

b. You're **such** a fool!

To account for these facts, it has been proposed that scalar predicates have an additional argument slot, that of degree (Seuren 1973, Cresswell 1976, Hellan 1981, von Stechow 1984, Heim 1985, 1995/1999, 2000, 2006a, Kennedy 1999, Bhatt and Pancheva 2004, etc.). As a result, a sample lexical entry for a scalar adjective, like *tall*, looks as follows:

(5) $[\![\text{tall}]\!] = \lambda d \in D_d . \lambda x \in D_e . x \text{ is tall to the degree } d$

An important property of scalar predicates is that they are downward monotonic: if an entity x has the property P to the degree d, x has the property P for every lesser degree d′, as illustrated below:

(6) A: You can enter only if you are 21 years old.

B: I am 21 years old. In fact, I'm 22 years old.

(7) Jane is as tall as Mike, and perhaps taller/*less tall.

Formally this property is expressed as follows:

(8) A function f of type ⟨d, ⟨e, t⟩⟩ is *downward monotonic* iff ∀x ∀d ∀d′ [f(d)(x) =1 & d′<d → f(d′)(x) =1)

Downward monotonicity of scalar predicates is extremely important because it entails that for any given subject there exists no unique degree for which a scalar predicate is true of it. Indeed, consider the following example:

(9) Jupiter is bigger than Mars.

Intuitively (9) says that the size of Jupiter exceeds that of Mars. However, downward monotonicity of scalar predicates means that there is no unique degree such that a particular item is big to that degree and no other. Size must therefore be defined as the maximal degree to which an entity is big, as in the following lexical entry for *more*/*-er*, due to Heim 2000 building on von Stechow 1984:

(10) $[\![\text{more}]\!] = \lambda g \in D_{\langle d, t\rangle} . \lambda f \in D_{\langle d, t\rangle} . \max(f) > \max(g)$

where $\max(P) = \iota d \in D_d . P(d) = 1$ and $\forall d' \in D_d [P(d') = 1 \rightarrow d' \leq d]$

In other words, degree operators constrain the relation between two maximal degrees -- those introduced by the degree predicates corresponding to the matrix clause and the degree clause. Incidentally, as the comparison clause is the first argument of the degree morpheme, this lexical entry is obviously more compatible with the [Spec, AP] analysis in (1a) (Bowers 1975, Jackendoff 1977, etc.) then with the extended AP analysis in (1b): the comparative clause is the first argument of *more* (on the assumption that it corresponds to a predicate over

degrees) and the matrix clause yields the second argument under certain assumptions to be discussed in section 2.

1.2. Some assumptions about morphology

The fact that a comparative can be expressed analytically (*more intelligent*) or synthetically (*smarter*) shows that it has two different syntactic terminals (A^0 and Deg^0) in its underlying structure. To discuss the derivation of synthetic comparatives I will adopt the Distributed Morphology framework (Halle and Marantz 1993, 1994). This view assumes that the tree-building operations of the narrow syntax also apply to bundles of semantic, syntactic and phonological features, and as a result, words, like phrases, have a hierarchical structure. The resulting feature bundles serve as targets for Vocabulary Insertion (Marantz 1993), an operation assigning phonological exponents to underlying abstract morphemes, which have no phonological features. When a given structure is subject to more than one rule of lexical insertion (e.g., the English past tense can be realized as zero, *-d* or as *-t*), the choice of the exponent is subject to the Subset Principle (Halle 1997): there more highly specified candidate is inserted before a less specified one. Following Embick and Marantz 2006, I assume that such contextual allomorphy involves competition within a single node, or, in Chomsky's terms, "morphology deals only with X^0 categories and their features" (Chomsky 1995:319).

One way of combining two syntactic nodes into one is head-movement (Travis 1984, Baker 1985, 1988, Harley 2005, among others): it is well-known that the result of head-movement is a syntactic constituent, subject to contextual allomorphy and moving as a unit. Affix-Hopping, a.k.a. Lowering (Embick and Noyer 1999, 2001), the syntactic operation putting two heads together, but top-down rather than bottom-up, has the same outcome.

As the [Spec, AP] structure in (1a) is incompatible with either head-movement or Affix-Hopping, the creation of one head out of two in such circumstances can be achieved as a result of one of the several post-syntactic merger rules operating on linearly adjacent heads that have been proposed in the literature. Morphological Merger (Bobaljik 1994), Local Dislocation (Embick and Noyer 1999, 2001, Embick 2007) and Merger Under Adjacency (Harley to appear) have slightly different formulations but they share the presupposition that a post-syntactic rule must apply after Vocabulary Insertion. I will argue that none of these rules can account for the synthetic comparative and superlative formation, and as a consequence, that the [Spec, AP] structure in (1a) cannot be adopted.

To summarize, in the Distributed Morphology approach, based as it is on syntactic tree-building operations, word-formation is strongly correlated with the underlying syntactic structure. As will be shown in section 3, the morphology of synthetic comparatives suggests that the comparative affix and the AP form a syntactic unit to the exclusion of the comparison phrase (as in (1b)). Morphology and semantics thus lead us to the opposite conclusions.

1.3. Outline

The paper is organized as follows. In section 2 we will discuss the semantics of comparatives and the evidence for movement that the comparative construction provides. As a result, it will become clear that if the standard degree QR approach is adopted, the underlying structure in (1a) must be assumed.

We will then turn to the morphosyntax of comparatives and in particular, to contextual allomorphy, including suppletion, and to the distribution of synthetic and analytic forms in English. It will be shown (section 3) that the morphology of comparatives is such that an in-situ analysis with the underlying structure in (1b) is obligatory.

In section 4 I will argue for reverting to the existential approach to comparatives in order to resolve this contradiction and provide some evidence for the presence of negation in the *than*-clause (cf. McConnell-Ginet 1973, Seuren 1973, Larson 1988). Section 5 shows how this view can be adjusted to deal with quantifiers in the degree clause. A further adjustment of the proposal (section 5) will be necessary to account for the fact that degree clauses are generally interpreted maximally. Finally, section 7 will summarize the paper and address the outstanding issues.

2. COMPARATIVE MOVEMENT

From the earliest analyses of comparatives (Chomsky 1965, 1977, Bresnan 1973, 1975, Milner 1978) the comparison clause has been assumed to involve syntactic transformations. Whereas Bresnan 1973, 1975 and Pinkham 1982 argue for an interpretative PF-deletion approach, it has now become standard to assume that *than*-clauses involve wh-movement of a null operator. Evidence for this movement and its interpretation will be provided below.

2.1. Evidence for null operator movement

As is well-known since Ross 1967 some syntactic configurations are islands for extraction. As Bresnan 1975 shows, the gap in the comparison clause, just like the degree wh-operator (*how*), cannot be located inside such an island:

(11) a. *How hard did you believe the claim that these problems would be? complex NP

b. *Wilt is taller than he knows a boy who is ___.

(12) a. *How hard do you consider these problems ___ and onerous? coordinate structure

b. *Wilt is taller than Bill is strong and ___.

(13) a. *How hard is [that they will be ___] likely? sentential subject

b. *Wilt is taller than [that he is ___] is generally believed.

Further evidence for overt movement of the null operator inside the comparison clause comes from French. As Milner 1978 shows, comparison clauses share with relatives and interrogatives the ability to license stylistic inversion (see Kayne and Pollock 1978, 2001, among others):

(14) a. l' homme a qui a téléphoné ton ami Kayne and Pollock 2001
the man to who has telephoned your friend
the man to whom your friend has telephoned

b. Qu' a dit Jean ?
what has said John
What did John say?

(15) a. Pierre a plus de livres que n' en a Paul. Milner 1978
Pierre has CMPR of books CMPZR NEG PART.CL has Paul
Pierre has more books than Paul does.

b. Il est aussi triste que l' était Jeanne hier.
he is EQ sad CMPZR PRED.CL was Jeanne yesterday
He is as sad as Jeanne was yesterday.

The (optional) insertion of the expletive negative particle *ne* in (15a) and in (16) (also from Milner 1978, p. 686) is also suggestive. (16), where the insertion of *ne* is not limited to

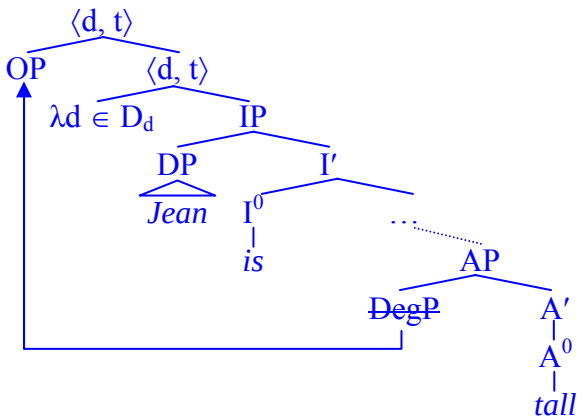
one clause, provides strong support for the successive-cyclic movement of the null operator in the comparison clause:

(16) Pierre est plus gentil qu' il ne semblait que tu ne disais que
Pierre is more nice that it_{EXPL} NEG seemed that you NEG said that

Paul ne l' était.
Paul NEG PRED.CL was
Pierre is nicer than it seems that you said that Paul is.

The semantics of the comparative clause also argues for the movement approach. As the comparison is done between degrees, it is necessary to convert the comparison clause into a definite description of a degree or, more commonly, a predicate over degrees, as below:

(17)



than Jean is ~~tall~~

Importantly, the lexical entry in (10) presupposes that the main clause is also converted into a predicate over degrees. In the next subsection we will see how this is achieved.

2.2. Degree QR

Let us assume without argument that, as is required by the lexical entry in (10), *more* and the comparative clause form a constituent whose interpretation is that of a generalized quantifier over degrees (Heim 2000).

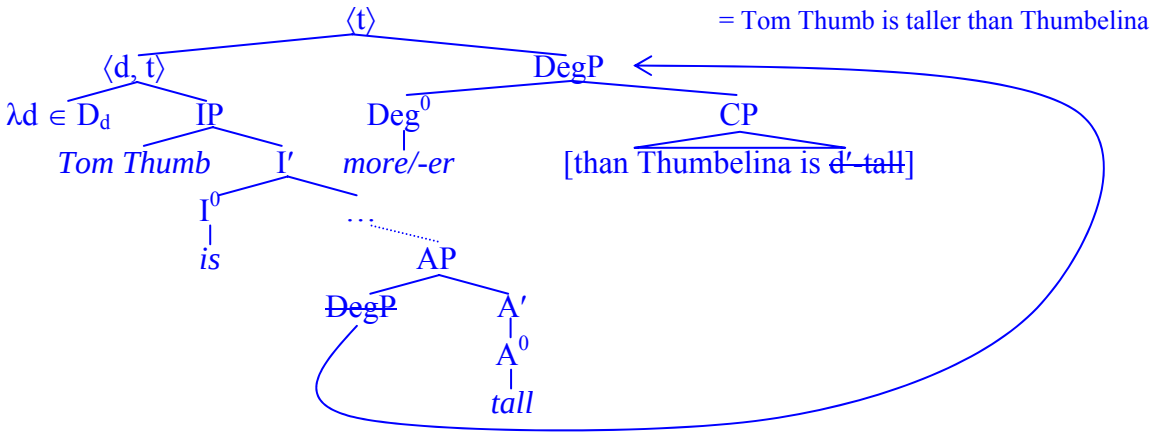
(18) $[\![\text{more than d}]\!] = \lambda f \in D_{\langle d, t\rangle} . \max(f) > d$ inserted after over degrees

Since a scalar adjective has the semantic type ⟨d, ⟨e, t⟩⟩, the comparative constituent in (18) cannot be interpreted *in situ* and must QR:

(19)

Disregarding all non-essential projections, we obtain the following structure:

(20)



The constituent consisting of the comparative morpheme and the comparative clause must raise at least as high as the first *t*-type node, where λ-abstraction over degrees ensures its interpretability. Is there any evidence for such movement?

2.2.1. Ellipsis resolution

Unsurprisingly, the VP in the main clause can function as an antecedent for VP-ellipsis in the comparative clause. As shown by Williams 1974 and Sag 1976, ellipsis resolution correlates with the scope of the comparison:

(21) **Sag-Williams Ellipsis-Scope Generalization**

The scope of a DegP containing elided material must contain the antecedent of the ellipsis.

This generalization is illustrated in (22):

(22) Mary's father tells her to work harder than her boss does.

a. Mary's father tells her: work harder than your boss does.

b. *Mary's father tells her: work harder than your boss tells you to.

c. Mary's father tells her to work d-hard; her boss works d′-hard; d > d′

d. Mary's father tells her to work d-hard; her boss tells her to work d′-hard; d > d′

It is easy to see that the semantics detailed above predicts the unavailability of (22b): the missing reading is the one where the VP in the comparison clause contains a gap (in the finite *tell*-VP) that is not present in the antecedent. On the other hand, in all grammatical readings the degree operator moves out of the VP and all the necessary gaps (i.e., traces in the base position and in all intermediate positions) are created in the antecedent (Heim 2000).

Additional evidence for movement in the main clause comes from Condition C (Bhatt and Pancheva 2004). A pronoun in the matrix clause can be coreferential with a name in an embedded degree clause only if the comparison takes scope over the matrix predicate:

(23) Jack tells her$_i$ to work harder than Mary$_i$'s boss does.

a. **tell*>*-er*: coreference imposible

b. *-er*>*tell*: coreference allowed

The fact that (23) is not ungrammatical shows that the degree clause can surface in a position where it is not c-commanded by the pronoun in the matrix. This surface position of the degree clause (and thus the possibility of coreference) correlates with the matrix scope of the comparative operator, providing further evidence for degree QR in the matrix clause.

Further support for the same conclusion comes from ACD. As is well-known, English quantified DPs may appear in apparent infinite regression structures:

(24) a. Fred has bought every book that Ned has.

b. Dora will see no movie that Nora has.

To obtain the antecedent for VP-ellipsis in the relative clause, it is suggested that the quantified DP moves to its scope position (Sag 1976, Larson and May 1990, etc.), leaving behind a trace:

(25) a. [every book that Ned has ___]$_i$ Fred has bought t$_i$. QR

b. [every book that Ned has ~~bought t$_j$~~]$_i$ Fred has bought t$_i$. ellipsis resolution

That QR is involved in ACD resolution is shown by the fact that bare plural NPs, which are known to be unable to QR, cannot license ACD:

(26) a. *Fred was climbing trees that Jill was.

However, bare plurals modified by a comparative, be it a comparative determiner or an adjective, can license ACD:

(27) a. Fred was climbing more trees than Jill was.

b. Fred was climbing higher trees than Jill was.

It is easy to account for this fact if comparative operators involve obligatory QR. One way of doing so by hypothesizing that degree operators move to the clausal level, creating the correct kind of antecedent for the comparison clause (Wold 1995 via Heim 2000, Bhatt and Pancheva 2004):

(28) [more than Jill was ~~climbing d-many trees~~] Fred was climbing d-many trees

We conclude that VP-ellipsis provides evidence for the treatment of comparatives in the terms of QR. The prediction that follows from this analysis is that degree operators must scopally interact with other quantifiers. In the next subsection we will evaluate whether this prediction holds.

2.2.2. Scope interactions with other quantifiers

As noted by Heim 2000, monotone degree operators show no detectable semantic effects of interaction with quantifiers. Moreover, examples constructed with such non-monotone degree operators as "exactly MP more than" make it possible to demonstrate that degree operators do not scope over universal or existential quantifiers (Kennedy 1999, Heim 2000):

(29) John is 5 feet tall. Every girl is exactly 1 inch taller than that.

a. $\forall > \textit{-er}$: $\forall x$ [girl(x) $\rightarrow$ max {d: tall(x,d)} = 5′ + 1"]

b. *$\textit{-er} > \forall$: max {d: $\forall x$ [girl(x) $\rightarrow$ tall(x,d)} = 5′ + 1"]

Under the attested reading, whose LF is provided in (29a), (29) is true iff for every girl her height (i.e., the maximal degree to which she is high) exceeds 5 feet by exactly one inch. The corollary is that every girl has the same height. The non-attested reading in (29b) is more complicated. To obtain it we first create the set of all degrees such that every girl is tall to at least that degree ({d: ∀x [girl(x) → tall (x, d)}) and then take the maximum of the set. Since scalar predicates are downward monotonic, this maximum gives us the height of the shortest girl in the set, and the comparative should mean that she is one inch taller than five feet (whereas other girls might be of the same height or taller). As is easy to ascertain, this reading is not available.

Furthermore, as shown by Heim 2000, this lack of the wide-scope reading for degree operators is quite general and extends to *less*-comparatives and equatives, as well as to other quantifiers, both for arguments and for adjuncts (such as temporal adverbials – see below):

(30) **Heim-Kennedy generalization** (Heim 2000):

If the scope of a quantificational DP contains the trace of a degree operator, it also contains that degree operator itself.

Kennedy 1999 concludes from this that degree operators do not move (or if they do, they reconstruct to the base position). However, Heim 2000 observes that degree operators do interact with intensional predicates, as shown by the ambiguity of (31):[1]

[1] As noted by François Recanati, p.c., however, exactly the same ambiguity between the maximal and the minimal requirements can be detected for other quantity expressions embedded under a modal:

(i) Mary is required to publish exactly two papers to get tenure.

a. maximal requirement: Mary cannot publish more than two papers (her colleagues are jealous).

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

a. *required* > *-er*: required [[exactly 5 pages -er than that][the paper be d-long]]

$\forall w \in Acc$: max $\{d: long_w (p, d)\}$ = 15 pages

b. *-er* > *required*: [exactly 5 pages -er than that] [required [the paper be d-long]]

max $\{d: \forall w \in Acc: long_w (p, d)\}$ = 15 pages

The reading in (31a), where the universal deontic modal (*is required*) scopes over the degree operator, can be paraphrased as follows: in every possible world compatible with what is required the maximal length of the paper is exactly 5 pages more than 10 pages. In other words, the paper cannot be longer or shorter than 15 pages.

The reading in (31b), where the degree operator outscopes the universal deontic modal, is true under different conditions. As before, we construct the set of all degrees such that the paper is long to these degrees in any possible world compatible with what is required, and then take the maximal such degree. This maximal degree, corresponding to the length of the shortest paper compatible with what is required, has to be 5 pages more than 10 pages. Under this reading, the *minimal* length of the paper is exactly 15 pages; it can be longer than that.

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b. minimal requirement: the requirement is exactly two papers, but there is no penalty for exceeding it.

The ambiguity of (i) sheds some doubts on the standard presupposition that the ambiguity of (31) results from the scope of the comparative operator, since it could just as well result from the same mechanism as that deriving the minimal and maximal readings of (i), applying to the measure phrase. Although Kennedy 2010 suggests that both phenomena result from the movement of a maximality operator, there are some reasons to believe that such is not the case (Matushansky and Ruys, work in progress).

Since the two readings can be derived from the different scopes that the degree operator takes with respect to the intensional verb, we can conclude that the interpretation of degree operators does indeed involve QR. Further evidence towards the same conclusion comes from the interaction of the scope of degree quantifiers and the surface position of the comparison clause.

2.2.3. Extraposition and scope

It is well-known that a quantified DP, with or without a relative clause, may scope above or below temporal adjuncts:

(32) I read [every book that John had recommended] before you did.

a. I read the entire set of books before you did. before > every book

b. For each book, I read it before you did. every book > before

As noted by Williams 1974:194-195 and Guéron and May 1984, if the relative clause appears discontinuously from the DP it is associated with, the DP in question cannot take scope below the surface position of the relative clause:

(33) I read every book before you did that John had recommended.

a. ×I read the entire set of books before you did. before > every book

b. For each book, I read it before you did. every book > before

Fox and Nissenbaum 1999, following Lebeaux 1988, propose an explanation for this effect: adjuncts, including relative clauses, need not be merged at the base position of the DP. Rather, they can be attached in any position that DP moves to. Since a quantified DP can QR, a relative clause can be merged with it in its scope position. In this situation the DP can be

pronounced in its base position, while its modifier appears in the position where the DP is interpreted. Obviously, such QR cannot reconstruct, because it would strand the modifier.

Bhatt and Pancheva 2004 claim that the same interpretational effect arises with degree expressions: the scope of a degree operator depends on the surface position of the comparison clause. In fact, for degree expressions the correlation is claimed to be even stronger: [2]

(34) **Williams' Generalization for degree expressions** (Bhatt and Pancheva 2004)
When a degree clause β is extraposed from a degree head α, the scope of α is *exactly as high* as the merger site of β.

The phenomenon can be demonstrated by once again considering the scope of a degree operator with respect to an intensional verb. Consider the following examples, where the locative PP *in a major journal* marks the right periphery of the embedded infinitival VP, whereas the purpose clause *to get tenure* does the same for the matrix VP.

In example (35) the comparison clause *than that number* stays within the embedded VP (as can be seen from the fact that the locative PP appears to its right). As a result, of the two possible interpretations of the comparative only one is available:

(35) John is required [to publish fewer papers this year [than that number] in a major journal] [to get tenure].

[2] Grosu and Horvath 2006 dispute this empirical generalization, claiming that the surface position of the comparative clause does not affect scope of the comparative. For the sake of the argument I will assume that Bhatt and Pancheva 2004 are right, but the approach developed below predicts that degree clauses should behave exactly as relative clauses.

a. $\forall w \in \text{Acc}_{\text{required}}$ max { d : PRO to publish d-many papers } < n *required > -er*

b. ×max { d : $\forall w \in \text{Acc}_{\text{required}}$ PRO to publish d-many papers } < n *-er > required*

The meaning in (35a) is the same as in (31a): the modal scopes over the comparative yielding the upper bound on the requirement: for every possible world compatible with what is required the maximal number of papers published in a major journal is lower than *n*. This reading is rather counterintuitive: John must not be too productive. According to Bhatt and Pancheva 2004, this counterintuitive meaning is the only one available where the degree morpheme takes narrow scope with respect to the intensional verb for the sentence in (35).

The meaning in (35b) is the same as in (31b): the modal scopes below the comparative and the end result is the lower bound of the requirement: we determine the maximal number such that that number of papers was published in a major journal in every possible world compatible with what is required (i.e., the minimal requirement on the number of papers). This number is less than *n*, i.e., the sentence is understood as a description of the minimal requirement. This meaning, where the comparative operator would be scoping below the surface position of the comparison clause, is not available for the sentence in (35).

The situation is reversed for examples where the surface position of the comparison clause is in the matrix: it clearly appears to the right of the purpose clause:

(36) John is required [to publish fewer papers this year in a major journal] [to get tenure] [than that number].

a. ×$\forall w \in \text{Acc}_{\text{required}}$ max { d : PRO to publish d-many papers } < n *required > -er*

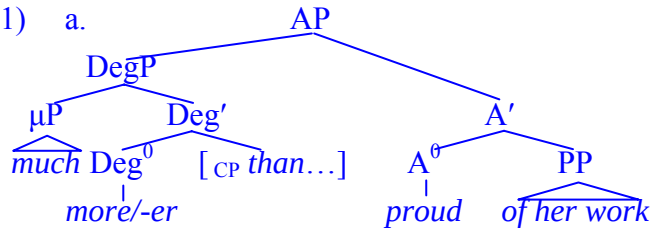
b. max { d : $\forall w \in \text{Acc}_{\text{required}}$ PRO to publish d-many papers } < n *-er > required*

To summarize, if, as claimed by Bhatt and Pancheva 2004, the surface position of the comparison clause affects the interpretation of the comparative, we have clear evidence for the QR approach to comparatives.

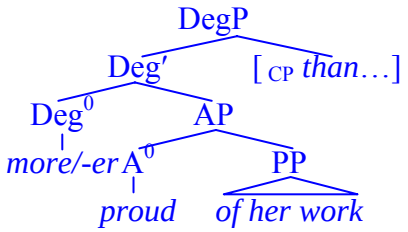
2.3. Constituency

If the degree morpheme QRs together with the comparative clause, it becomes necessary to choose the structure in (1a) over the structure in (1b):

(1) a.



b.



Indeed, as shown by the ambiguity of degree operators in intensional contexts (31) and successive-cyclic insertion of the negative expletive particle *ne* in French (16), the movement of the degree operator can be successive-cyclic. This alone rules out the extended AP analysis in (1b), since the degree morpheme, a head, cannot move so far from its base position without violating the Head-Movement Constraint (Travis 1984). Furthermore, for the semantic analysis above to make sense, the degree operator and the comparison clause must form a unit, either already in the base position of the degree operator, as in Heim 2000, or in the scope position (as suggested by Bhatt and Pancheva 2004). This means that the QR analysis outlined above requires for the degree operator to be contained in a maximal projection that

does not contain the AP, as in (1a). (1b), where the degree morpheme and the comparison clause cannot move leaving the AP behind, is incompatible with this analysis.[3]

Bhatt and Pancheva 2004 provide further evidence for the [Spec, AP] analysis in (1a) from co-occurrence facts: the comparative operators *more*/*-er* and *less* can only combine with *than*, whereas *as* is only compatible with the complementizer *as*. Given that the semantics of the degree clause is the same in both cases, this phenomenon looks like a classical case of l-selection. Since a head can only l-select the head of its complement (cf. Svenonius 1994, Holmberg 2000, Julien 2000, Matushansky 2006), the complement either choice facts strongly suggest that the maximal projection headed by *than/as* (i.e., the comparison clause) is the complement of the l-selecting head (i.e., of *more*/*less* or *as*). Such a structure is only compatible with the tree in (1a).

2.4. Summary

As we have seen in this section, evidence for a movement analysis of comparatives and other degree operators comes from both their syntax and their semantics.

For the comparison clause the evidence is unambiguous: the gap cannot be contained in a syntactic island, and optional stylistic inversion, as well as the expletive negative particle *ne*, provide overt evidence for the movement of the null operator at least in French.

For the main clause the evidence is more circumstantial but nevertheless very strong. Though comparatives and equatives do not interact with most quantifiers, in the complement of an intensional verb an ambiguity is detectable that follows from the proposed semantics of

[3] Heim 2006b proposes an alternative analysis where degree clauses are generalized quantifiers (type $\langle d, \langle t, t\rangle\rangle$). Although under this analysis the degree morpheme stays in situ and only the degree clause moves, it still requires the [Spec, AP] structure in (1a), since the first argument of *-er* has to be the degree clause.

the comparative/equative morpheme and its relative position with respect to the intensional verb. The effect of the surface position of the comparison clause on the scope of the degree operator, the interaction between the scope of the degree operator and VP-ellipsis resolution, and the effect of a comparative on the possibility of ACD also argue for a QR-based analysis of comparatives and equatives.

If the degree operator moves successive-cyclically, the [Spec, AP] analysis in (1a) must be adopted. However, as the next section will show, the morphosyntax of degree operators argues for exactly the opposite conclusion.

3. MORPHOSYNTAX

As mentioned above (section 1.2), morphological operations on morpheme combinations are subject to a heavy morphosyntactic constraint: vocabulary insertion (and therefore suppletion and contextual allomorphy in general) can only target heads. In order for a complex syntactic head to be created, the underlying syntactic configuration has to be very local, which in turn provides evidence for the structure in (1b). In addition, c-selectional constraints imposed by degree morphemes, lexical integrity and the absence of surface adjacency between the degree morpheme and the comparison clause also argue for the same conclusion, as we will shortly see.

3.1. Lexical integrity

A phonological or morphological word is usually assumed to be an island for syntactic operations (Lapointe 1980, Selkirk 1982, Di Sciullo and Williams 1987, among others), QR included. To see that this is indeed so, consider the following examples:

(37) a. Someone finally proposed an **all**-encompassing solution.

b. Everyone considered a different **possibil**ity.

Neither the universal quantifier in (37a) nor the existential modal in (37b) can scope out of the words they are contained in.

3.2. C-selection

Bhatt and Pancheva 2004 note that the degree morpheme c-selects what it combines with: *as*, *-er*, *so*, etc., only combine with adjectives, while *more* or *enough* are also compatible with NPs, VPs and PPs (see also Corver 1990, Doetjes 1997 and Doetjes, Neeleman and van de Koot 1998).[4] Since nothing in the semantics of the relevant degree morphemes would seem to require some but not others to combine exclusively with APs, the constraint would seem to be syntactic. This is a natural argument in favor of the structure in (1b), since c-selection is usually supposed to have the same locality conditions as head-movement (Svenonius 1994, Holmberg 2000, Julien 2000, Matushansky 2006, among others). As is easy to see, while in (1b) A^0 is the head of the complement of Deg^0, and can be c-selected by it, the structure in (1a) does not allow for Deg^0 to c-select what lexical category to combine with.

[4] Bresnan 1973 proposes that all comparatives should be reduced to the combination of the degree affix *-er* with an adjective: *more* really corresponds to the combination of *much* and *-er*, while *less* is a suppletive form for *little* + *-er*. Under such a view, *more* and *less* are irrelevant for the discussion, but *enough* isn't. However, examples such as (i) suggest that *enough* might be a nominal expression that should be treated on a par with measure phrases like *a little* and *a bit*. If this is correct, c-selection is irrelevant for the discussion.

(i) The world is not enough.

3.3. Surface adjacency

It is easy to see that the degree morpheme and the comparison clause can be surface-adjacent only accidentally (Bhatt and Pancheva 2004): in the general case it is at least the adjective that intervenes between the two:

(38) a. *Ralph is [more than Flora is] tall. clausal comparative
b. Ralph is taller than Flora is.
c. *Ralph has [more than Flora does] cars.
d. Ralph has more cars than Flora does.

(39) a. *Ralph is [more than her] tall. phrasal comparative
b. Ralph is taller than her.
c. *Ralph has [more than her] cars.
d. Ralph has more cars than her.

Since the [Spec, AP] structure in (1a) does not predict the attested surface word-order, it becomes necessary to assume either obligatory extraposition of the comparison clause or its counter-cyclic merge -- the latter problematic because a degree clause is an argument of the degree morpheme.[5] On the other hand, the extended AP structure in (1b) fits the observed word-order exactly.[6]

[5] Bhatt and Pancheva 2004 attribute the need for comparison clauses to merge counter-cyclically and in a high position to non-conservativity of degree operators, but Grosu and Horvath 2006 argue convincingly against this hypothesis.

[6] Note that both analyses have to assume the possibility for comparison clauses to extrapose, in order to account for examples like (i), where an in-situ degree clause would have violated the Head-Final Filter:

3.4. Pronominalization

As noted by Milner 1978 and Pinkham 1982, in French an overt pronoun rather than a gap may appear in the comparison clause in place of the predicate:

(40) a. Pierre a plus de livres que n' **en** a Paul.
Pierre has CMPR of books CMPZR NEG PART.CL has Paul
Pierre has more books than Paul does.

b. Il est aussi triste que **l'** était Jeanne hier.
he is EQ sad CMPZR PRED.CL was Jeanne yesterday
He is as sad as Jeanne was yesterday.

Since a pronoun corresponds to a maximal projection, it has to be assumed that what it replaces (the partitive NP in (41a), the adjective in (42b)) is also a maximal projection. While in (1a) such a maximal projection is not available, in (1b) the pronoun can be taken to replace the complement of Deg^0 (the AP) for (43b) and the partitive NP sister of the null counterpart of *(how) many* in (44a).

Exactly the same conclusion can be drawn from *so*-pronominalization in English:

(45) Alice is incredibly tall, and Beth is even more **so**.

(i) a. She is a better dentist **than her supervisor**.
b. Smarter people have failed this exam **than you might expect**.

The difference between the two proposals is that for the extended AP structure in (1b) extraposition is optional, just like relative and complement clause extraposition is.

What *so* replaces has to be a maximal projection -- an assumption compatible with the extended AP structure in (1b) but not with the [Spec, AP] structure in (1a).[7]

3.5. Lack of overt movement

Another syntactic argument against the [Spec, AP] structure in (1a) comes from the cross-linguistic lack of an overt counterpart for the covert movement of the degree operator.

Consider once again the examples in (46):

(46) a. Everyone has arrived t_i who was supposed to.

b. Everyone who was supposed to has arrived t_i.

Both the standard right-extraposition approach to the surface discontinuity of a DP and a relative clause modifying it in (46a) and the counter-cyclic merge view (Lebeaux 1988, Fox and Nissenbaum 1999) rely on the fact that the DP and the relative clause can also appear on the right periphery as a single constituent, as in (46b). Degree morphemes and their dependent clauses, however, are generally non-adjacent and never move overtly as a single constituent, which seems to argue against the [Spec, AP] structure in (1a).

(47) a. John is required [to publish fewer papers this year in a major journal] [to get tenure] [than that number].

[7] The question arises where the subject is merged, since by the same reasoning [Spec, AP] cannot be available. It is therefore necessary to assume that the subject is merged higher than DegP, either in [Spec, aP] or in the specifier of the functional head $Pred^0$ (Bowers 1993, 2001). Both hypotheses are compatible with the usually assumed ⟨d, ⟨e, t⟩⟩ type for scalar adjectives.

b. *John is required [to publish few papers this year in a major journal] [to get tenure] [more/-er than that number].

c. *John is required [to publish __ papers this year in a major journal] [to get tenure] [fewer than that number].

Even though QR is generally covert, some languages, such as Hungarian (Kiss 1991), have been argued to have overt QR. Nothing similar has ever been discovered for comparatives.

3.6. The morphology of synthetic forms

In both the [Spec, AP] analysis in (1a) and in the extended AP structure in (1b) the degree morpheme and the adjective are introduced into the derivation as separate heads. However, the existence of synthetic forms such as *taller* and suppletive forms such as *worse* shows that at some point of the derivation the two heads are turned into one. In this section I will argue that synthetic forms are derived via head-movement. Since head-movement is constrained to a very local environment (a head can only attract the head of its complement), the extended AP structure in (1b) has to be the underlying structure for comparatives. I will also show that the [Spec, AP] structure in (1a) would give rise to synthetic forms only as a result of a post-syntactic operation, such as Local Dislocation (Embick and Noyer 1999, 2001, Embick 2007),[8] which incorrectly predicts the impossibility of suppletion.

[8] Morphological Merger (Bobaljik 1994) and Merger under Adjacency (Harley to appear) all share with Local Dislocation the property of applying after spell-out. Objections raised below will, therefore, be valid for them as well.

3.6.1. Local Dislocation and its kin

As discussed above, I adopt the Distributed Morphology approach to word-formation, where words are created in syntax. One good reason for preferring this approach to the traditional one, with a special word-formation module of the grammar (lexicon) is the fact that where both synthetic and analytic comparatives are possible, semantic distinctions arise between the two forms: metalinguistic comparison (Bresnan 1973), comparative presupposition (Kiefer 1978), comparison of deviation (Kennedy 1999) and comparison of non-scalar adjectives (Matushansky 2001) are only possible with analytic forms. Since these semantic factors are not directly relevant for the choice between the [Spec, AP] structure in (1a) and the extended AP structure in (1b), we will not discuss them further here.

Head-movement is not the only way of word-formation in Distributed Morphology. In addition to the so-called Affix Hopping (Lowering), which also operates in the narrow syntax and differs from head-movement in the direction of application (down, rather than up), Embick and Noyer 2001 argue for the post-syntactic operation of "Local Dislocation".

Local Dislocation applies after Vocabulary Insertion and linearization, and affects both linear order and hierarchy. Suppose that the structure in (48a) is linearized as in (48b), where the asterisk denotes linear precedence and adjacency. Local Dislocation may apply to (48b), yielding (48c). Note that, as with Affix Hopping, the new complex head Z^0 is created in the lower position:[9]

[9] Locality conditions on Local Dislocation are different for Embick and Noyer 1999, 2001 and Embick 2007. Embick and Noyer postulate an additional constraint on Local Dislocation: it is only possible if X and Z are contained in one constituent and X is peripheral to it. In other words, X could be a non-branching specifier or a non-branching adjunct of ZP or ZP could be a complement of X. This locality constraint means that Local

(48) a. $[_{XP}\ X\ [_{YP}\ [_{ZP}\ Z]\ Y]]$

b. [X *[Z * Y]]

c. $[[_{Z}{}^{0}\ Z{+}X] * Y]$

Since Local Dislocation occurs after Vocabulary Insertion, it is sensitive to individual lexical items and can therefore derive the phonological constraint on synthetic comparative and superlative formation: phonologically heavy adjectives cannot be locally dislocated.

In the rest of this subsection I will argue that Local Dislocation is incompatible with synthetic comparative and superlative formation and therefore the [Spec, AP] structure (1a) cannot be adopted. Evidence comes from syntactic reduplication in comparatives (Jackendoff 2000) and from comparative contextual allomorphy (suppletion).[10]

Dislocation can apply in the extended AP structure in (1b), but not in the [Spec, AP] structure (1a). Under this formulation of Local Dislocation there is no syntactic or morphological operation that could possibly result in the [A-Deg] head in the [Spec, AP] structure (1a) and therefore (1a) cannot be the right structure for comparatives. This constraint is absent from Embick 2007, making Local Dislocation compatible with both structures in (1), just like the less stringently defined Morphological Merger (Bobaljik 1994) or Merger Under Adjacency (Harley to appear).

[10] Embick and Noyer 1999, 2001 and Embick 2007 argue against a head-movement analysis of synthetic comparatives noting that if an AP is modified by an adverb, it acts as an intervener, blocking synthetic comparative formation, as in (i). However, it is easy to show that this intervention effect is not due to the linear position of the adverb: PP modifiers behave the same, as shown by the comparatives in (ii). To the extent that (ii-a) is grammatical it means the same thing as (ii-b), namely, that it is amazing to what degree Jude is smarter than Joe. The reading that (ii-a) does not have is the one where the comparative morpheme takes scope over *smart to an amazing degree*. The only way of expressing that missing reading is as in (iii):

(i) a. Mary is the most amazingly smart person.

b. * Mary is the amazingly smartest person.

3.6.2. Curiouser and curiouser

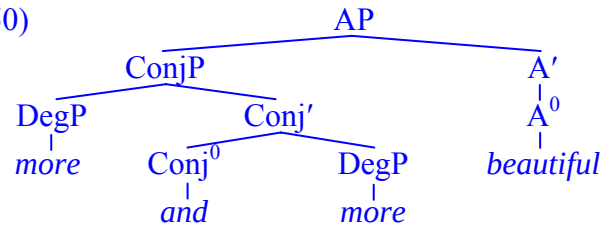
The construction in (49) was first noted by Jackendoff 2000. Presupposing the [Spec, AP] structure in (1a), Jackendoff 2000 demonstrates that (49) cannot be derived.

(49) a. more and more beautiful

b. prettier and prettier

Indeed, consider Jackendoff's structure in (50). While (49a) follows naturally, in (49b) it is unclear where the second adjective for the second comparative suffix to combine with comes from.

(50)



If the comparative suffix adjoins to the adjective (as a result of Affix Hopping or of Local Dislocation), there is only one target for adjunction, but two suffixes (or a conjunction of two suffixes). Likewise, if it is the adjective that attaches to the comparative suffix (as a result of head-movement), (49b) could only be created via some sort of Across-the-Board insertion, an operation that is not attested elsewhere.

(ii) a. Jude is smarter to an amazing degree than Joe.

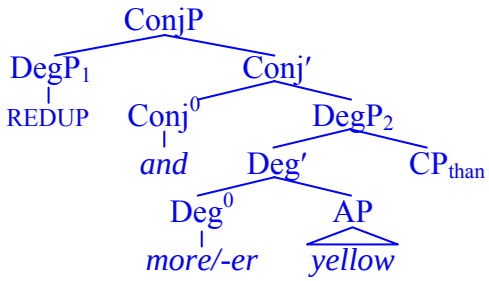
b. Jude is smarter than Joe to an amazing degree.

(iii) Jude is more [smart to an amazing degree] than Joe.

To explain this pattern I propose that the degree argument slot of the adjective has to be saturated *before* adverbial modification can occur (see Matushansky 2010b for details).

I concur with Jackendoff that the construction in (49) must be treated as conjunction of two DegPs, but with a different underlying structure, namely, the extended AP structure in (1b) rather than Jackendoff's [Spec, AP] structure in (1a). As a result, the construction in (49) can be derived by syntactic reduplication, as in (51). While the first of the two coordinated DegPs consists of a purely emphatic reduplicative morpheme,[11] the other one contains an AP complement:

(51)

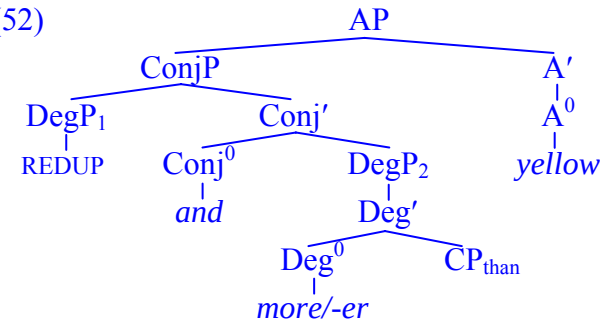


The structure in (51) derives both (49a), where reduplication results in the repetition of the degree morpheme, and (49b), where reduplication is preceded by head-movement of the adjective into Deg^0 yielding a complex head that serves as a source for the reduplicative morpheme. M-merger (Matushansky 2006) leads to the same result.

This analysis cannot be extended towards the [Spec, AP] structure in (1a). Suppose that we maintain the syntactic reduplication hypothesis, but, following Jackendoff 2000, place the DegP conjunction in [Spec, AP]:

[11] One peculiarity of the construction in (49) is that only the comparative morpheme can be reduplicated. The comparative semantics proposed in section 4, where *-er* is an emphatic marker, can be at the core of this restriction.

(52)



Neither head-movement nor Affix Hopping is compatible with the structure in (1a) (or in (52)), so Local Dislocation (as defined in Embick 2007) would be the only option for deriving the synthetic form.

However, it is easy to see that the comparative CP in (52) has to be linearized between the degree morpheme and the adjective. Since we never see the comparative CP in this position, it is equally obvious that it needs to extrapose. Such extraposition, however, violates the Coordinate Structure Constraint.

It could be objected that the comparative CP could be base-generated outside DegP, at the clausal level, as proposed by Bhatt and Pancheva 2004. This, however, does not solve the problem, since it would then be the movement of $DegP_2$ that would violate the Coordinate Structure Constraint. Assuming that the entire coordinate structure is moved would solve that problem, but give rise to a new one: with relative clauses or PP adjuncts such counter-cyclic merger into one of the conjuncts is clearly impossible, as shown by (53):

(53) A woman and a man came in that no one knew.

a. = [A woman and a man] that no one knew came in.

b. ≠ [A woman that no one knew] and a man came in.

c. ≠ A woman and [a man that no one knew] came in.

To summarize, Jackendoff's reduplication cases do not seem to be compatible with the [Spec, AP] structure in (1a), extended here to (52). The extended AP structure in (1b), on the other hand, derives the correct outcome after head-movement or m-merger on the assumption that $DegP_1$ consists of a reduplicative morpheme. Thus Jackendoff's construction provides strong evidence for the extended AP structure in (1b).

The same conclusion can be drawn from comparative contextual allomorphy.

3.6.3. Allomorphy and suppletion

It is well-known that the combination of an adjective and a comparative morpheme can yield a partially or fully suppleted form:

(54) a. *-er* + good → better English

b. *-er* + bad → worse

(55) a. *-eje* + *-plox-* 'bad' → *xuže* 'worse' Russian

b. *plus* + *bon* 'good' → *meilleur* 'better' French

Since Morphological Merger, Local Dislocation and Merger Under Adjacency are post-syntactic processes that necessarily occur after Vocabulary Insertion, they cannot account for comparative suppletion. Indeed, the context for suppletion, i.e., the syntactic head containing the comparative morpheme and the stem, is created only as a result of Local Dislocation, but by then Vocabulary Insertion has already occurred. Also, re-linearizing operations must be ordered after Vocabulary Insertion: since Local Dislocation applies to a linearized structure, it necessarily has to follow Vocabulary Insertion because linearization is crucially dependent on particular lexical items (e.g., *-ize-* is a suffix and *-anti-* is a prefix). In fact, Embick and

Noyer's major motivation for post-syntactic processes is the well-known prosodic constraint on synthetic comparative and superlative formation, which also requires Vocabulary Insertion to occur before linearization

Conversely, if synthetic comparatives are derived by the head-movement of A^0 to Deg^0, no such problem arises: the choice of allomorph is only made post-syntactically. However, as no actual roots are inserted at that point, their phonological form cannot be taken into account and prosodic effects are predicted not to exist (Embick and Noyer 1999, 2001).

To circumvent this issue I use the standard assumption that movement, head-movement included, involves a copying operation. Suppose, as is usually done, that the comparative *-er* (unlike the equative *as*) is an affix, a property that is usually assumed to be a syntactic feature visible in the narrow syntax. An affix must be supported and therefore A^0-to-Deg^0 movement becomes obligatory. As a result, after movement two copies of the A^0 head are present in the structure: in the base position and adjoined to Deg^0.

In the course of Vocabulary Insertion (including suppletion), the resulting structure is evaluated and the lexical properties of roots and affixes come into play. Thus *-er* imposes a prosodic constraint on the stem it attaches to: only "light" adjectives are allowed. Suppose that a "heavy" adjectival stem found in this position cannot be pronounced, which leads to the Last Resort operation of *much*-support. The need to spell out the phonological features of the adjective then forces the "heavy" stem to be pronounced in its base position, thus yielding an analytic form.

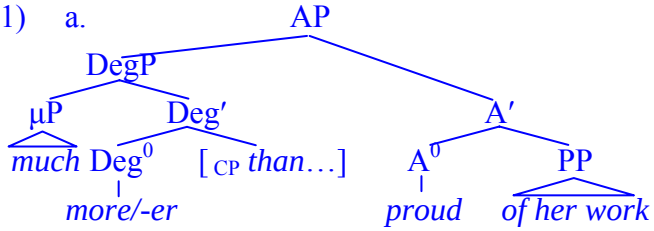
To summarize then, the fact that the comparative suffix *-er* triggers suppletion makes it impossible for the choice between the synthetic form and the analytic form to be done after Vocabulary Insertion. The [Spec, AP] structure in (1a) is then excluded because only Local Dislocation and its kin can create a single syntactic constituent out of the degree affix and the

adjective in this configuration. Head-movement and thus the extended AP structure in (1b) become then the only options.

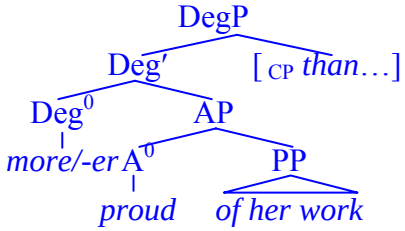
3.7. Argument ordering and superlative formation

An important distinction between the structure in (1a) and the structure in (1b) is argument ordering. While the structure in (1a) presupposes argument ordering in (10), repeated below, where the comparison clause is the first argument of the comparative morpheme, the structure in (1b) requires the reversal of argument ordering (along with some further adjustments):

(1) a.



b.



(10) $[\![\text{more}]\!] = \lambda g \in D_{\langle d, t\rangle} . \lambda f \in D_{\langle d, t\rangle} . \max(f) > \max(g)$

where $\max(P) = \iota d \in D_d . P(d) = 1$ and $\forall d' \in D_d [P(d') = 1 \rightarrow d' \leq d]$

Perhaps unsurprisingly, argument ordering is also relevant when superlative formation is considered. Several issues need to be taken into account.

First of all, it is well-known that semantically a superlative is a comparative combined with universal quantification (see Stateva 2002, 2003, among others). The cross-linguistic morphology of comparatives and superlatives also shows that the superlative form contains the comparative one, as demonstrated by Ultan 1972, Stateva 2002, 2003 and Bobaljik 2007 for both synthetic and analytic forms:

(56) a. olcsó-bb ‘cheaper’ Hungarian, Ultan 1972:140

b. leg-olcsó-bb ‘cheapest’

(57) a. Ivan je pametn-iji od Milene. Serbo-Croatian, Stateva 2003

Ivan is smart-er than Milena

Ivan is smarter than Milena.

b. Ivan je naj-pametn-iji.

Ivan is most-smart-er

Ivan is the smartest.

c. *Ivan je naj-pametan.

Ivan is most-smart

(58) a. graž-iau ‘more beautiful-NSG’ Lithuanian, Bobaljik 2007

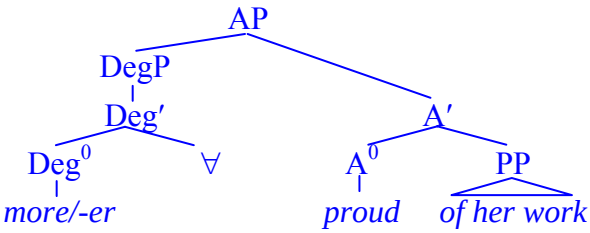
b. graž-iau-sia ‘most beautiful-NSG’

Bobaljik 2007 also observes that if the comparative form of an adjective is suppletive with respect to the basic (positive) form, then the superlative is also suppletive, which argues for exactly the same point: the superlative form is constructed on the basis of the comparative one.

How are these facts compatible with the lexical entry in (10) and, as a result, with the [Spec, AP] structure in (1a)? Unfortunately, not very much so. If the superlative morpheme supplies the universal quantification on top of the comparative one, i.e., if the superlative means ‘more than all’, then the most reasonable order of composition is to first combine the comparative morpheme with universal quantification over individuals, thus dealing with the

internal argument (corresponding to the degree clause), and only then attach the resulting complex to the adjective:

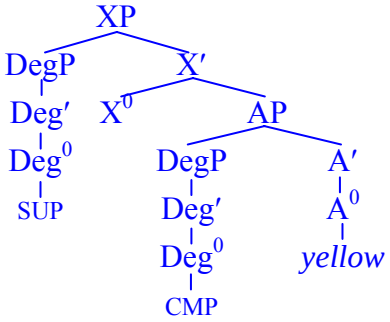
(59)



The resulting complex, however, leads to incorrect predictions: whichever syntactic or morphological mode of combination is assumed, it cannot derive the morpheme ordering in (57) or similar examples from other languages: the two morphemes cannot appear on the two different sides of the adjectival stem.

Suppose we disregard argument ordering, maintaining just the [Spec, AP] structure in (1a) as our basis for morphological composition. How does the superlative morpheme project in (1a)? If it appears inside DegP, as in (59), the superlative affix and the comparative affix are expected to appear on the same side of the adjective. If, on the other hand, the superlative morpheme is DegP-external (e.g., merged as a specifier of a functional head in the extended AP), then the locality conditions on Local Dislocation, the only operation that can combine the three morphemes together in this configuration, would seem to prevent it from applying to the superlative affix. Indeed, consider the structure in (60).

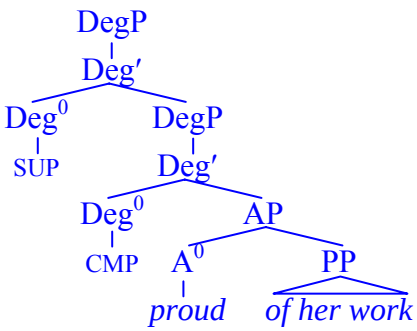
(60)



How does Local Dislocation apply? If the superlative affix and the comparative affix are combined first, the morpheme ordering in (57) cannot be derived. If the comparative affix attaches to the adjective first, the question arises why the functional head X^0, in whose Spec the superlative DegP appears, does not act as an intervener (given that elsewhere the presence of additional syntactic structure has that effect for Embick 2007, see also Matushansky 2010b). Only if the superlative morpheme is a head taking the AP as a complement can Local Dislocation apply, but then some explanation for why comparatives and superlatives, both being DegPs with an internal argument, should have such a different syntax is required.

Conversely, the structure in (61), which is the natural extension of the structure in (1b), leads to exactly the expected results if head-movement applies:

(61)



Successive movement of the adjective into the two degree heads yields a synthetic form that is compatible with the morpheme ordering in (57), (56) and (58), depending on whether the superlative morpheme is a prefix or a suffix.

3.8. Summary

The goal of this section was to demonstrate that the morphosyntax of comparatives favors the structure in (1b), where the AP is merged as the complement of Deg^0, rather than that in (1a), where DegP appears in [Spec, AP]. The reasoning underlying the entire discussion is that

head-movement, which is necessary for morphological processes to take place, is only compatible with the structure in (1b). As the structure in (1a) is incompatible with head-movement, a different mechanism, Local Dislocation, has to be appealed to in order to create synthetic forms but it makes incorrect morpho-syntactic predictions.

Needless to say, the structure in (1b) is incompatible with the standard QR analysis of comparatives. Since in (1b) the degree head, the comparison clause and the measure phrase do not form a constituent to the exclusion of the AP, they cannot move as a unit without pied-piping the AP that they are associated with. The hypothesis that the degree morpheme moves to the clausal level cannot therefore be realized: the movement of the degree morpheme itself (head-movement) would violate the Head-Movement Constraint (Travis 1984), while pied-piping the AP would lead to incorrect predictions from the semantic point of view.

Thus semantics and morphology lead us to different conclusions regarding the syntax of degree quantification. To solve this problem I propose that it is not the degree morpheme that undergoes QR in comparatives and equatives.

4. I SAY "YES", YOU SAY "NO"

In this section I will show that the contradiction arising between the conclusions reached in section 2 and those obtained in section 3 can be resolved. Indeed, what section 2 really argues for is *not* the hypothesis that the comparative morpheme (or any other degree operator, for that matter) moves to the clausal level. Rather it shows (a) that the comparative clause involves successive-cyclic movement of a null operator, (b) that the comparative clause itself can (and sometimes must) be interpreted at the clausal level, and (c) that the interpretation of the main clause involves QR. In this section I will argue that the same outcome is obtained if the movement involved is in fact the movement of an existential quantifier over degrees

whose restrictor is provided by the degree clause. Since this existential quantifier is base-generated in [Spec, DegP], it has nothing to do with the degree morpheme itself (Deg^0), which encodes polarity values. In subsequent sections I will show that on the basis of these assumptions not only can the semantics, syntax and morphology of degree operators be reconciled, but several other problems may be resolved as well.

I take as the basis for my analysis the proposal advocated by Ross 1969, McConnell-Ginet 1973, Seuren 1973, Klein 1980, Larson 1988, etc.) that treats comparatives as involving existential quantification combined with negation in the degree clause. Taking into consideration the downward monotonicity of scalar predicates (see section 0), the truth-conditions of (62a) can be informally expressed as in (62b) or (62c):

(62) a. John is more clever than Bill.

b. John is clever to an extent that Bill is not.

c. There exists a degree such that John is clever to that degree and Bill is not.

We can formalize this intuition as follows, setting aside for now the attachment site of the comparison clause and its internal structure:

(63) $\exists$d [John is d-clever & $\neg$ (Bill is d-clever)]

The question arises how Seuren's truth-conditions can be obtained compositionally.

4.1. *-er* as a positive verum marker

As noted by Kennedy 1999, all standard approaches to comparatives share the problem of attributing essentially the same semantics to positives (exceeding the contextually specified

degree) and comparatives (exceeding the degree provided by the comparative clause). The contribution of *more/-er* is therefore unclear.

At first sight, the existential take on comparison seems to be no different in this respect. Suppose, however, that the "degree morpheme" *-er* is in fact a positive verum marker, similar to *bien* in French or *wel* in Dutch. Its counterpart in the degree clause is the null negative verum marker.

(64) ∃d [Jane is YES d-tall and Bill is NOT d-tall]

The immediate result is that comparatives are now treated as different from positives. Though under the existential analysis the comparative morpheme does not contribute any meaning, it has a clear pragmatic effect emphasizing the contrast between the two clauses. This view receives additional confirmation from the fact that both equative and comparative markers may be null or optional. The former optionality is illustrated by English while the latter is exemplified by in Hebrew and Japanese:

(65) a. Her face was **mild as the heaven** and **beautiful as the dawn**. English

b. It's **dark as a dungeon** and **damp as the dew**.

c. She is **smart as a whip**.

(66) a. tel aviv gdola mi- yafo. Hebrew

Tel Aviv big-FSG from Jaffa

b. tel aviv **yoter** gdola mi- yafo.

Tel Aviv CMP big-FSG from Jaffa

Tel-Aviv is larger than Jaffa.

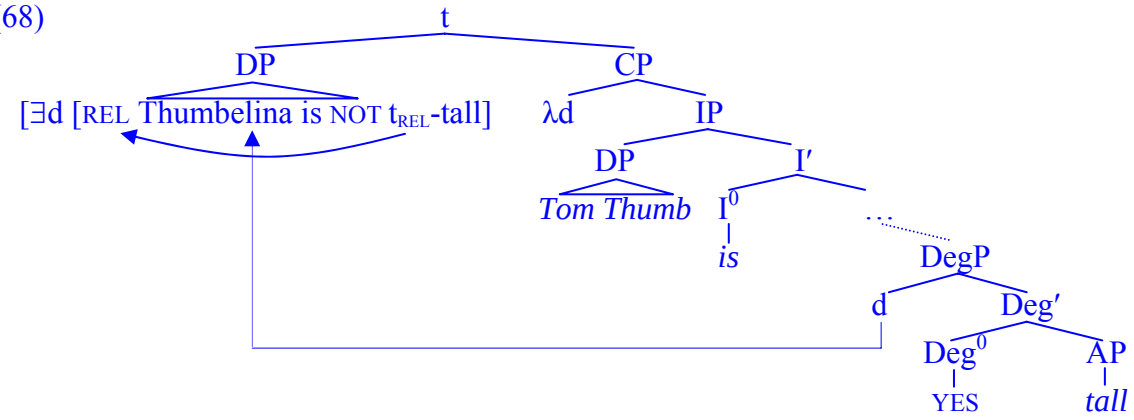
(67) a. kinoo -yori kyoo -ga atui desu -yo. Japanese
yesterday THAN today -NOM hot COP -ASRT
Today is hotter than yesterday.

b. kinoo -mo atukatta kedo kyoo -wa **motto** atui desu -yo.
yesterday -TOO hot-PAST but today -TOP CMP hot COP -ASRT
Yesterday was hot, but today is (even) hotter.

The lack of comparative marking in languages with null-derived comparatives can now be explained by the language-specific choice not to mark the positive value of Deg^0 in these languages.

No less importantly, the extended AP structure in (1b) is no longer an obstacle for QR: what moves is the existentially quantified degree expression in [Spec, DegP]. As by virtue of its position it has to be a maximal projection, it is not surprising that it moves as a phrase rather than as a head, even though the movement, being QR rather than overt movement, is still bound by the first finite CP. Conversely, the degree morpheme (*as*, *-er*, etc.) is base-generated as a head with an AP complement and can therefore behave as a head with respect to morphology. As a result, the conditions imposed by the semantics of comparatives (section 2) and those due to their morphology (section 3) are reconciled, as in the tree in (68). Note that the default position of the degree clause in English, to the right of the AP, is straightforwardly derived -- as it is a relative clause, it can be stranded in the right periphery, and keeping it in its base position would violate the Head Final Filter. Likewise, since the movement in the main clause involves QR, the Left Branch Condition is not relevant:

(68)



Furthermore, if [Spec, DegP] contains an existential quantifier over degrees, it is not totally unexpected that this existential quantifier should appear with an overt determiner, as in (69). The ungrammaticality of (69c) can be due to blocking: *some* does nothing that a null existential quantifier cannot do.

(69) a. Judith is **no** taller than Jess.

b. If the book is **any** less expensive than the journal, I will buy the book.

c. *The book is **some** more expensive.

If the comparison clause contains negation, the fact that NPIs occur there, while PPIs are not allowed to (von Stechow 1984) is naturally explained:[12]

(70) a. He would *(not) **lift a finger**. NPI

b. John's laziness was stronger than his willingness to **lift a finger**.

c. *John's willingness to **lift a finger** was stronger than his laziness.

[12] Giannakidou and Yoon to appear claim that comparatives don't license NPIs, which are then salvaged by an independently available mechanism. I will return to this issue in section 5.1.

(71) a. I have(*n't) **already** eaten. PPI

b. *He has got more support than you **already** have.

c. You have **already** got more support than he has.

Furthermore, as noted by Ultan 1972:129 and Stassen 1984, pp. 138-141, in many languages comparatives are expressed via negation in the comparison clause:

(72) kaw- ohra naha Waraka, kaw naha Kaywerye. Hixkaryana, Stassen 1984, p.35
tall not he.is Waraka tall he.is Kaywerye
Kaywerye is taller than Waraka.

Further cross-linguistic support for the presence of negation in the comparison clause can be drawn from the more familiar languages, such as French and Italian. As can be seen from the following examples, expletive morphemes may appear in the comparison clause that are normally used to indicate the presence of clausal negation or a negative quantifier:

(73) a. Jean est plus grand que je **ne** pensais. French
Jean is more tall than I NEG thought
Jean is taller than I thought.

b. Giovanni è più alto che **non** pensassi. Italian
Giovanni is more tall than NEG think-SBJ-1SG
Giovanni is taller than I thought.

Likewise, the Cockney dialect of English has the so-called *negation copying* effect in DE environments, where NPIs are expressed as their negative counterparts. The comparison

clause is an environment where this effect also occurs (Joly 1967, König 1970, Seuren 1984, 2001):

(74) a. He has never been no good to no woman, not never. Cockney English, Seuren 2001

b. There was hardly no money nor hardly no hope.

c. She did a better job than what I never thought she would.

Importantly, the negative adverbial never does not contribute the *than*-clause negation, but simply indicates its presence. Similar items may occur in the CP domain. Historically, as Joly 1967 shows, the English *than* is historically derived from a neuter (singular) relative pronoun in the instrumental case (*þon*) and a negation element (*ne*), which lends further support to the hypothesis that the comparative clause contains explicit negation. Similar effects are found in Polish (Pancheva 2006), Russian and Serbo-Croatian, where the comparative complementizer itself may contain negation:

(75) a. Anna jest wyższa **niż** Agnieszka. Polish
Anna is taller than Agnieszka
Anna is taller than Agnieszka.

b. Anna vyše čem/ **neželi** Boris. Russian
Anna taller than(=what-INSTR) than(=NEG-EMPH-Q) Boris
Anna is taller than Boris.

We conclude that the presence of negation in the *than*-clause is strongly supported by the cross-linguistic availability of negation-sensitive elements in this environment.

4.2. Summary

In this section I have argued that the existential analysis of comparatives is not only naturally compatible with their morphology, but can also account for the distribution of both degree morphemes and complementizers correlated with them. Under the hypothesis that *more/-er* and *as* make no semantic contribution, but merely correspond to differential markings of the positive verum focus in two distinct environments, these morphemes are not expected to move to the clausal level. Conversely, the hypothesis that the matrix [Spec, DegP] contains an existential quantifier over degrees, while the embedded one contains a null wh-operator, makes it possible to assume both QR in the matrix clause and operator movement in the embedded clause without violating any syntactic constraints. The presence of negation in the comparative clause and lack thereof in the equative clause accounts for the different choice of complementizers without any appeal to c-selection.

5. THE SCOPE OF NEGATION

In this section I will demonstrate that the existential approach to comparatives allows for a straightforward way of dealing with the varying behavior of quantifiers in the comparative clause, as well as with the interpretation of embedded modals (Schwarzschild and Wilkinson 2002) and the ambiguity manifested there by inferiority comparatives (Rullmann 1995a, 1995b).

5.1. NP quantifiers

As noted by von Stechow 1984, Seuren's negative semantics yields incorrect entailments with respect to quantification.[13] In particular, it makes wrong predictions about the behavior of all non-NPI quantifiers in the degree clause:

(76) a. Jane is taller than everyone (else). universal

b. $\exists$d [Jane is $\geq$ d-tall & $\forall$x $\neg$ [x is $\geq$ d-tall]] actual meaning

c. *$\exists$d [Jane is $\geq$ d-tall & $\neg$ $\forall$x [x is $\geq$ d-tall]] Seuren's semantics

(76b), where the universal quantifier scopes over negation, yields the right truth-conditions: there exists a degree of tallness such that no person other than Jane attains that degree. However, Seuren's semantics in (76b) means that Jane is taller than someone: it is not true that everyone is at least as tall as she is. The same effect can be observed for existential quantifiers:

[13] It should be noted that Seuren's approach to comparatives shares this problem with the more standard maximal degree comparison view (von Stechow 1984, Heim 2000), the universal quantification view (Cresswell 1976) and Russell's definite description view. Alternative solutions to the problems discussed in this subsection have been proposed by Schwarzschild and Wilkinson 2002, Schwarzschild 2004 and van Rooy 2008. Van Rooy's proposal is that of the two meanings made available by the relative scopes of negation and the quantifier the truth-conditionally stronger one is always selected. Thus, however cannot account for the interpretation of existential quantifiers. Conversely, the semantics espoused by Schwarzschild and Wilkinson 2002 and Schwarzschild 2004 and espoused by Heim 2006b, where the degree clause encodes the interval containing the projections of the entities brought into play by the quantifier onto the relevant scale, seems to predict that all such entities should project to the same interval (to handle cases like *Mary is 2 inches taller than everyone else is*), since comparatives without an overt measure phrase are handled as containing a covert measure phrase, meaning "some degree".

(77) a. Jane is taller than three people. existential

b. ∃d [Jane is ≥ d-tall & ∃x ¬ [|x| = 3 & x is ≥ d-tall]] actual meaning

c. *∃d [Jane is ≥ d-tall &¬ ∃x [|x| = 3 & x is ≥ d-tall]] Seuren's semantics

Seuren's semantics in (77c) clearly does not correspond to the actual truth-conditions of (77a): it asserts that there do not exist three people who are as tall as Jane or taller. We thus conclude that if quantifiers take the narrow scope with respect to the degree clause negation, this yields incorrect truth-conditions, except for the NPI existential quantifier *any*:

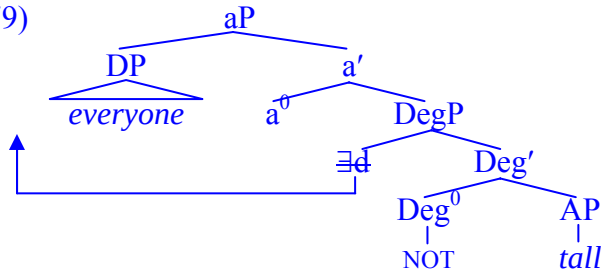
(78) a. Jane is taller than anyone. NPI

b. *∃d [Jane is ≥ d-tall & ∃x ¬ [x is ≥ d-tall]] actual meaning

c. ∃d [Jane is ≥ d-tall & ¬ ∃x [x is ≥ d-tall]] Seuren's semantics

To solve this problem Larson 1988 proposes that the degree clause involves a low negation. This hypothesis naturally fits in with our proposal: if *-er* is a positive verum focus marker in the main clause, than its counterpart in the *than*-clause should also be located in Deg^0. I adapt for this low negation the lexical entry proposed by Heim 2006a for *little*:

(79)



(80) $[\![\text{NOT}_{\text{Deg}}]\!] = \lambda f \in D_{\langle d, \langle e, t\rangle\rangle} . \lambda d \in D_d . \lambda x \in D_e . f(d)(x) = 0$

The proposal that the *than*-clause negation is located in Deg^0 also tallies in with the observation (Schwarzschild and Wilkinson 2002) that the wide scope of quantifiers in the

degree clause cannot be due to their QR. Also, quantifiers merged lower than the adjective are correctly predicted to have narrow scope with respect to the degree clause negation:

(81) New York is closer to a major airport than to a railway station.

a. ∃d [∃x [x is a major airport & New York is ≥ d-close to x] & ¬ ∃y [y is a railway station and New York is ≥ d-close to y]]

b. *∃d [∃x [x is a major airport & New York is ≥ d-close to x] & ∃y ¬ [y is a railway station and New York is ≥ d-close to y]]

Setting aside the specific reading of the indefinite NPs, their narrow scope gives rise to the correct truth-conditions: there exists a degree such that there exists a major airport such that New York is that close to it and it is not true that there exists a railway station such that New York is that close to it, as in (81a). The reason why the wide (non-specific) construal of the indefinite NPs is not available lies in the parallelism condition on ellipsis: since, for reasons of economy, the existential in the main clause doesn't QR over the non-quantificational subject (cf. Fox 1994), no such movement occurs in the degree clause either.

The hypothesis that the degree clause negation is located in DegP therefore explains why quantifiers in the subject position outscope it while a quantifier in the complement of the adjective takes scope under it. However, the question remains how a low negation can license subject NPIs, such as *anyone* in (78a), yielding the correct truth-conditions. To answer that question Larson 1988 proposes that *any* is not an existential quantifier but a universal one, and that this treatment can be extended to other NPIs. Giannakidou and Yoon to appear, on the other hand, argue that NPIs cannot be licensed in the comparative clause and are instead

salvaged by an independently available pragmatic mechanism.[14] Here I will assume without argument that in comparatives the negative agreement marker (in the complementizer *than* in English, cf. Joly 1967; the expletive negation in Romance, etc.) rather than the low degree negation may be interpreted (a mechanism for implementing mixed φ-feature agreement has been proposed by Matushansky 2010a).[15] For obvious reasons, this has to be a last resort operation: by default the position of negation in the degree clause should correspond to the position of the postulated positive verum marker *-er/more* in the main clause; the parallelism constraint on ellipsis ensures that if the contrastive polarity value is not found in this position, it should be located outside the ellipsis site.[16] As a consequence, a high negation can only be

[14] Giannakidou and Yoon's major piece of evidence against the availability of NPIs in comparative clauses for English comes from the fact that the only strong NPI in English, *either*, is ungrammatical there. However, the non-NPI counterpart of *either*, *too*, is equally impossible in comparative clauses (I thank Eddy Ruys for this observation). The reason for this is probably the same as for the ungrammaticality of *too* in questions:

(i) Susan is noticeably taller than John is *either/*too.

(ii) *How tall is John too?

Given the sensitivity of *too/either* to focus, as well as the typographical conventions suggesting that the strong NPIs in Giannakidou and Yoon's Greek examples are focused, I therefore hypothesize that strong NPIs are ruled out in comparatives for reasons not related to the presence of negation.

[15] The same pattern can be observed with clausal negation in a negative concord language like Russian: in the absence of negative quantifiers it indicates clausal negation, but when one or more negative quantifier is present or in certain other circumstances it becomes semantically vacuous.

[16] Schwarzschild and Wilkinson 2002 argue is that the wide scope of quantifiers in the degree clause is not due to their QR. In particular, quantified adverbials, which are usually supposed to be unable to undergo QR, clearly scope higher than negation (in our terms) or the maximality operator (in Heim's terms):

inserted as a last resort operation: by default the position of negation in the degree clause should correspond to the position of the postulated positive verum marker *-er/more* in the main clause.

With this machinery in place we can account for the interpretation of quantificational elements, such as conjunction, disjunction and modals. It is easy to see (Schwarzschild and Wilkinson 2002, van Rooy 2008) that conjunction outscopes the degree negation whereas disjunction generally takes scope under it:

(82) a. Alice is taller than Betsy and Charles.

b. Alice is taller than Betsy or Charles.

To explain this pattern we will appeal to the observation (Schwarzschild and Wilkinson 2002) that the true disjunctive reading outscoping our degree clause negation is also available and emerges most prominently in the presence of a measure phrase:

(83) It is 14° hotter here than it is in Madrid or Mexico City (but I don't know which).

(i) It is colder in Stony Brook today than it **usually** is in New Brunswick.

On the other hand, as example (ii) shows, NPIs cannot be salvaged by reconstruction and furthermore, the usual assumptions about the semantic type of scalar predicates ($\langle d, \langle e, t\rangle\rangle$) predict that the base position of the subject is higher than that of degree negation.

(ii) *Anyone is not here.

Finally, moving the degree negation from Deg^0 is also not an option: from the semantic point of view it would have to reconstruct and from the syntactic point of view raising a head to the clausal level would violate the standard assumptions about head movement (see section 3). I conclude with Giannakidou 1997 that the salvaging mechanism is not syntactic in nature, but assumed a different realization.

These data suggest the existence of the negative polarity *or* (cf. Larson 1988) forcing the high negation, just like *any*, alongside with the regular (or positive polarity) *or* taking surface (wide) scope with respect to the low negation.

I will now show that this approach directly entails both a straightforward treatment of modals in the degree clause and a movement-free analysis of inferiority comparatives, fully compatible with their morphology.

5.2. Scope-splitting

The hypothesis that two positions for negation are available in the degree clause naturally accounts for the behavior of modals in the degree clause (Schwarzschild and Wilkinson 2002, Schwarzschild 2004):[17]

(84) a. Jack is taller than he should be.

b. Jack is taller than he needs to be.

(84) illustrates the two possible behaviors of a modal in the degree clause. In (84a) Jack's height exceeds the maximal allowed height (Jack is violating a requirement), whereas in (84b) it is greater than the minimal required height. The two sentences correspond to the wide and the narrow scope of the modal with respect to negation, respectively:

(85) a. $\exists d$ [Jack is d-tall & $\forall w \in$ Acc $\neg$ [Jack is d-tall]] should

b. $\exists d$ [Jack is d-tall & $\neg \forall w \in$ Acc [Jack is d-tall]] need

[17] Scopal interaction of modals with negation, certain "complex determiners" and the degree clause is frequently referred to as "scope-splitting" (Heim 1999, Schwarzschild 2004).

A question immediately arises why each sentence only has one reading and moreover, why the reading with a high negation is available at all, if it can only surface as a last resort operation. It is clearly not incidental that the modals involved exhibit exactly the same scopal behavior with sentential negation:

(86) a. You should not be here. should > neg

b. You need not be here. neg > should

Possibility modals can also scope either above or below the *than*-clause negation:[18]

(87) a. The red book was more expensive than the blue book might have been.

b. The red book was more expensive than the blue book was allowed to be.

While the modal *might* scopes over negation (the price of the red book is compared to the minimal possible price of the blue book), the verb *allowed* scopes under it (the degree clause denotes the maximal price allowed).

(88) a. ∃d [the red book was d-expensive & ∃w ∈ Acc ¬ [the blue book was d-expensive in w]] might

[18] English deontic existential modals generally scope under negation, while epistemic existential modals may scope over it. The modal *may*, however, can have both readings:

(i) You may not go there under any circumstances.

(ii) You may not think so when you meet him, but he is actually a genius.

It turns out that the same ambiguity resurfaces in comparatives.

b. ∃d [the red book was d-expensive & ¬ ∃w ∈ Acc [the blue book was d-expensive in w]] allowed

Just like the universal modals, when appearing with matrix negation existential modals can scope above or below it, depending on the modal itself:

(89) a. The red book might not have been expensive. modal > neg

b. The red book was not allowed to be expensive. neg > modal

To sum up, a modal may be required to scope either above or below negation, which determines its behavior in the degree clause: the modals that don't outscope clausal negation also take narrow scope with respect to negation in the degree clause. While in the main clause the two positions for the modal are achieved as a result of V-to-T movement (Matushansky 2006), here negation may simply be interpreted in two different positions. The hypothesis that high negation is a last resort operation predicts that it will not be available for those modals that can outscope clausal negation and conversely, that some modals may not have negation in their immediate scope.[19]

5.3. Rullmann's ambiguity

The final puzzle to discuss in this section is the fact noted by Rullmann 1995a, 1995b that inferiority comparatives (*less*) and comparatives of negative adjectives show ambiguity with modals in the comparative clause:

[19] Homer 2009 and Iatridou and Zeijlstra 2010 claim that the pattern is exactly the opposite: those modals that have to outscope negation are PPIs, while others are obligatorily reconstructed.

(90) Lucinda is driving slower/less fast than is allowed on this highway.

a. Lucinda is not driving as fast as she is legally entitled to.

b. Lucinda's speed is impermissibly low.

Heim 2006a proposes to deal with Rullmann's ambiguity by assuming that *less*-comparatives contain degree negation (*little*), which may scope above or below the modal. Syntactically this means that *little* should be able to move to the clausal level, i.e., to move as a maximal projection to the exclusion of the adjective and of the null wh-operator. While this is not impossible with *little* (which together with a DegP could be argued to appear in a specifier of the extended AP headed by the adjective *little* combined with), such a constituency cannot be achieved with negative scalar adjectives, such as *slow*, which show the same ambiguity.

The existential approach to comparatives provides us with a straightforward way of achieving Heim's result. Rather than assume that it is the negative adjective *little* that takes scope, we will use the two scopes of the degree negation, independently motivated above: in the DegP, as in (91a), and in the CP, as in (91b):

(91) a. ∃d [Lucinda is driving d-*little* fast] & ∃w∈Acc [Lucinda is driving [¬ d-*little* fast] in w]

b. ∃d [Lucinda is driving d-*little* fast] & ¬ ∃w∈Acc [Lucinda is driving d-*little* fast in w]]

Assuming that *little* is encoded as in Heim 2006a, the two LFs can be simplified as follows, with the two negations in the *than*-clause canceling each other out:

(92) a. ∃d ¬ [Lucinda is driving d-fast] & ∃w∈Acc [Lucinda is driving d-fast in w]

b. ∃d ¬ [Lucinda is driving d-fast] & ∀w∈Acc [Lucinda is driving d-fast in w]]

The question arises why the modal *allowed*, which scopes below negation and therefore forces the last resort high negation, permits a low negation with negative comparatives. The reason lies in the presence of another negation, *little*. Suppose that some modals, such as *can* or *required*, are unable to scope over negation, which explains why they allow only one scope with positive comparatives. This is why the last resort higher negation becomes possible in (91b). On the other hand, however, negative adjectives such as *little* or *slow* may apparently be semantically decomposed into a negative component and a positive adjective, somehow allowing the negative component to "cancel out" the degree negation, creating a non-negative environment below the modal in (91a). No such strategy is obviously available for positive adjectives.

The modals that naturally scope above negation are correctly predicted to not permit such an ambiguity:

(93) Lucinda is driving slower/less fast than she might have been.

a. ∃d ¬ [Lucinda is driving d-fast] & ∃w∈Acc ¬ ¬ [Lucinda is driving d-fast in w]

b. ≠∃d ¬ [Lucinda is driving d-fast] & ¬ ∃w∈Acc ¬ [Lucinda is driving d-fast in w]]

The reading where the modal appears in the scope of semantic negation is missing: nothing precludes the low negation from appearing, which means that the last resort option of using a high negation is not available.

The existential approach to comparatives can therefore account for Rullmann's ambiguity of inferiority comparatives with a comparative clause containing a modal without

appealing to the problematic movement of a negative element. However, there exists an important difference in predictions between Heim's approach and mine: if, as I suggested above, it is not the adjective *little* (or the corresponding negative component of the meaning of negative adjectives) that takes scope above or below the modal, but rather the negation in the comparative clause, then we expect inferiority comparatives to not give rise to any ambiguity in the main clause. This prediction would seem to be wrong, since the following example (Heim 2006a) does in fact show the expected ambiguity:

(94) I can pay less than you just paid.

a. It is possible for me to pay less than what you just paid. can > less

b. I can't pay as much is what you just paid. less > can

Furthermore, Heim 2006a argues that the negative adjective *little* shows exactly the same kind of ambiguity in the context of a modal and attributes it to the optionality of pied-piping of the adjective in the QR involved in positive forms:

(95) a. We can grow very little.

b. I didn't realize how little I can pay.

c. I didn't realize how little I have to spend.

d. Paul ate less than was necessary.

I contend, however, that the ambiguity in (94) does not result from the movement of either the adjective *little* itself or of the entire DegP containing the comparative morpheme and the adjective *little*. Rather, the comparative *less* in (94) can scope above the modal because it is contained inside an NP with a null head noun (the object of the verb *pay*). As Heim's examples all involve NPs that can be interpreted either *de re* or *de dicto*, they cannot

tell us much about the movement of *little* itself. Conversely, when *less/little* is a predicate itself, part of an AP predicate or part of a genuine adverbial, no ambiguity arises:

(96) The difference can be very little.

a. It is possible that the difference is very little

b. ≠The difference cannot be large (cf. *The difference can only be very little*)

(97) I can be unhappier/less happy than that.

a. It is possible for me to be unhappier/less happy than that

b. ≠I cannot be this happy (cf. *I can only be unhappier/less happy than that*)

(98) Lucinda can drive slower/less fast than that.

a. It is allowed for Lucinda to drive slower than she is

b. ≠Lucinda cannot drive this fast (cf. *Lucinda can only drive slower than that*)

The existential approach to comparatives correctly predicts no ambiguity in these examples: in (96) there is no element to take scope over the modal, while in (97) and in (98) we only expect scope effects from the comparative, but, as Heim 2000 shows, no difference in truth-conditions ensues from a monotonic comparative scoping higher or lower than the modal.

We conclude that the existential approach to comparatives provides us with a straightforward syntactic mechanism for dealing with the scope of quantifiers, conjunction, disjunction and modals in the degree clause which is fully compatible with their morphology. The presence and the position of degree negation in the comparative clause also permits us to account for the ambiguity arising with negative adjectives (including *little*) in the comparative clause, but not in the main clause.

6. THE BOUNDS OF THE ANALYSIS

In this section I will discuss the compositional semantics of equatives. It is well-known that in order to obtain the right truth-conditions for them, it is necessary to appeal to something like a maximality operator in the *as*-clause. I will show that once this assumption is somewhat refined (the actual notion needed is that of the *greatest upper bound* of a set), it will provide us with a natural way of incorporating into our analysis both differentials and factor phrases. I will then demonstrate that the distribution of the relevant bound operator is constrained syntactically by the structure of the DegP in the main clause functioning as the antecedent for the elided DegP in the comparison clause.

6.1. Equatives

As is clear from the discussion above, under the analysis advocated here the degree clause associated with a comparative (a *than*-clause) does not have the same semantics as the degree clause associated with an equative (an *as*-clause): while the former contains degree negation, the latter doesn't. As a result, the complementizer choice can be linked to the semantics of the comparative clause and is only indirectly determined by the choice of the degree morpheme. This means that the fact that *-er* requires *than*, while *as* requires *as* is not due to l-selection and therefore cannot be used as an argument for a particular structure.

However, if we adapt the existential semantics of comparatives proposed above to equatives by simply removing the negation in the degree clause, the outcome will not yield the right truth-conditions. If to represent the truth-conditions of (99a) we replace the degree negation in the comparison clause with "degree affirmation" (and suitably adjust the positive

degree focus in the main clause),[20] we will obtain the equivalent of the wide-scope existential quantification in (99b):

(99) a. Batman is as tall as Robin (and perhaps taller).

b. ∃d [Batman is ALSO d-tall & Robin is YES d-tall]

What (99b) means is that Batman and Robin are both tall to some degree, which is trivially true. Instead, whereas the main clause of an equative, just like the main clause of a comparative, asserts that there exists a degree to which the main predicate holds, the assertion in the *as*-clause is stronger than that: it brings into play the *maximal* degree to which the embedded predicate holds (von Stechow 1984, Rullmann 1995b, Heim 2000):

(100) ⟦as Robin ~~is tall~~⟧ = λd ∈ D_d . d = max {d' : Robin is d'-tall}

Importantly, the main clause does not introduce a similar constraint:

(101) a. *Batman is as tall as Robin (and perhaps shorter).

b. *St. George has killed as many dragons as archangel Michael (and maybe less).

We conclude that the truth-conditions of an equative are best approximated as in (102). This in turn means that the *as*-clause should contain something like a maximality operator:[21]

[20] As discussed above, I hypothesize that in equatives and comparatives the main clause has the same semantics, but different pragmatics. Though in both cases the "degree morpheme" is a positive verum focus marker, for comparatives it is contrastive (*yes* vs. *no* in the comparison clause), while for equatives it is additive (*also* vs. *yes* in the embedded clause). An interesting confirmation of this hypothesis comes from French, where *as* is expressed by the same lexical item as *also* (*aussi*).

[21] As observed by Matushansky 2008, the *as*-clause associated with *same* is also maximal:

(102) Batman is tall to the maximal degree that Robin is tall to.

As noted by Schwarzschild and Wilkinson 2002, the first, most intuitive hypothesis, that the maximality operator forms part of the wh-operator moving to the periphery of the degree clause, is incorrect. To see that this is the case consider the following example:

(103) Alice is as clever as everyone else is.

a. $\exists d$ [Alice is d-clever & d = max { d' : $\forall$x: x is d'-clever}]

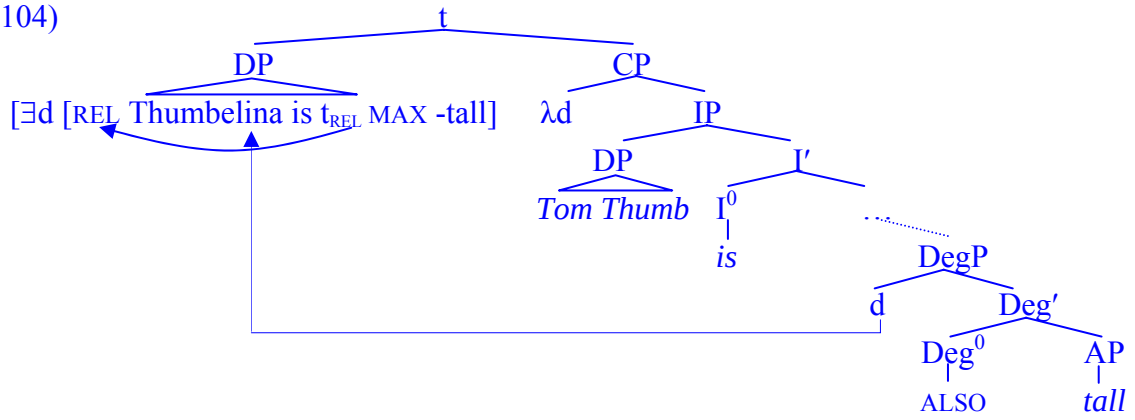
b. $\exists d$ [Alice is d-clever & $\forall$x: d = max {d' : x is d'-clever}]

While (103a), with the maximality operator in the degree clause taking wide scope, asserts that Alice is as clever as the least clever person among others (which does not correspond to the meaning of (103)), (103b), where the maximality operator remains in situ, presupposes that everyone else is clever to the same degree and asserts that Alice is at least as clever, which is in fact the correct semantics for (103). Compositionally this is achieved as follows:

(i) * The Protestant Bible has the same books as/that the Catholic Bible does, but the Catholic Bible has six more.

As example (i) shows, the maximality effect is not associated with the complementizer *as*, since they use of the complementizer *that* has the same consequences. The fact that the *same* DP can be treated as involving a wide scope existential (Matushansky 2008) suggests a connection between the two phenomena.

(104)



Importantly, since the maximality operator must be scopally dissociated from the null wh-operator, the question arises where it is merged and what motivates its presence. To answer this question we must address the issue of measure phrases.

6.2. Measure phrases

It would seem that the existential analysis has a huge disadvantage over the more traditional view, where the comparative morpheme explicitly compares two degrees: the latter but not the former can easily incorporate measure phrases. Thus in the standard maximality approach the meaning of (105a) can be approximated as in (105b), with the comparative morpheme taking three arguments (von Stechow 1984, Schwarzschild and Wilkinson 2002): the two degrees to compare and the difference between them.

(105) a. Jill is 2 inches taller than Jack.

b. The maximal degree such that Jill is tall to that degree exceeds by 2 inches the maximal degree such that Jack is tall to that degree.

This approach, however, is more problematic than it appears, as can be seen once we consider factor phrases. The default use of a factor phrase in English is with an equative, as in (106a), though some factor phrases also combine with a comparative, as in (106b):

(106) a. Jill is **twice as tall as** Jack.

b. Jill is **two times taller than** Jack.

c. The maximal degree such that Jill is tall to that degree is twice the maximal degree such that Jack is tall to that degree.

As is clear from (106c), the factor phrase, just like the differential, expresses a relation between two degrees and if the latter is an argument of the comparative morpheme, the former should be one as well. The problem is that if the relation between the three arguments is encoded in the comparative morpheme itself, it simply cannot be the same for the differential in (105a) and the factor phrase in (106b). It seems therefore that it is the measure phrase itself that expresses what the relation between the two degrees should be. This requires certain complications in both the semantics of the comparative morpheme (its third argument should be a relation between the first two) and the syntax of the comparative DegP (since the measure phrase alone does not specify this relation: whereas a factor phrase does encode multiplication in its compositional semantics, a differential is simply a numerical expression that must be added to the standard of comparison in order to provide the matrix degree). As it is also not altogether clear how the maximality approach deals with the availability of factor phrases in both equatives and comparatives, it appears that the syntax and semantics of measure phrases in this approach are still underdeveloped.

The existential approach to comparatives does not compare two degrees in a direct way and therefore the measure phrase cannot be introduced as an argument of the degree morpheme. However, the combination of the existential quantifier in the main clause and the

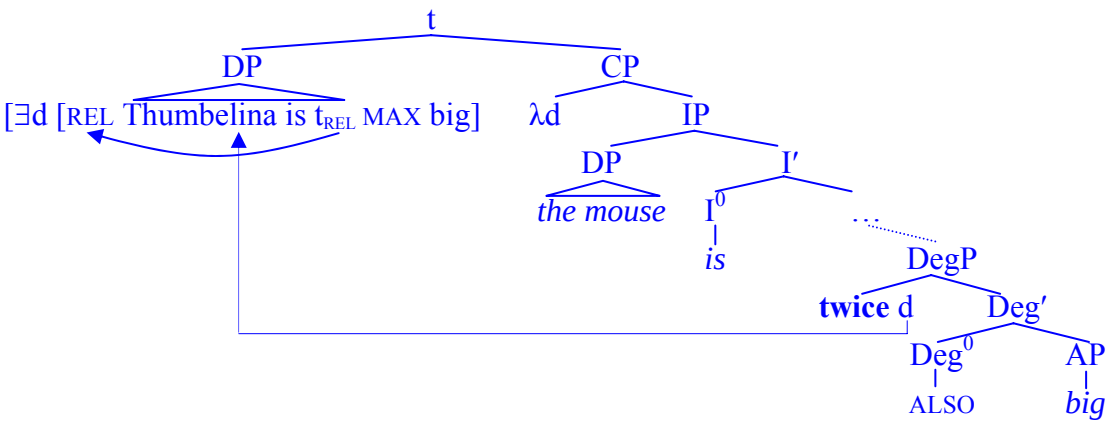
relative operator in the degree clause does provide us with a straightforward way of treating multiples (factor phrases) in equatives:[22]

(107) a. The mouse is twice as big as Thumbelina is.

b. ∃d [the mouse is 2d-big & d = max {d' : Thumbelina is d'-big}]

To achieve the LF in (107) the factor phrase can be introduced as an obligatorily stranded modifier of the existential quantifier over degrees in [Spec, DegP]:

(108)



The immediate advantage of this view is that it is the measure phrase (*twice*) that introduces multiplication, exactly as it does in other environments (e.g., *We knocked twice before entering* or *I will pay twice the price*). Conversely, the standard approach to equatives, illustrated in the following example, does not seem to provide a straightforward way of integrating a factor phrase into an equative:

[22] It is easy to see that the LF in (107) will always yield the minimal difference, which is indistinguishable from the "at least" reading of the numeral. Forcing the strict interpretation by the modifier "exactly" will give rise to the correct truth conditions: since "exactly" is interpreted as a conjunction of "at least" and "at most" (cf. Krifka 1999), inexact interpretations will be excluded pragmatically.

(109) a. Tom Thumb is as tall as Thumbelina is.

b. max {d' : Tom Thumb is d'-tall} ≥ max {d' : Thumbelina is d'-tall}

Since in the standard approach the equative morpheme encodes the "equal to or greater than" relation, there is no position available for the factor phrase. Furthermore, if such a position is introduced, the difference between the comparative and the equative would have to amount to the stipulation that the factor phrase cannot be equal to 1 for comparatives.

6.3. Suprema and infima

The previous discussion seems to have brought about another distinction between equatives and comparatives, besides the presence of negation and the concomitant complementizer *than* in the latter: whereas no maximality operator has been postulated for comparatives, failing to insert one for equatives would lead to the trivial or incorrect truth-conditions. Furthermore, without such an operator in the *than*-clause we won't obtain the right truth-conditions in the presence of a factor phrase or a differential:

(110) a. *∃d [Jill is 2d-tall & ¬ Jack is d-tall] (Jill is two times taller than Jack)

b. *∃d [Jill is 2"+d-tall & ¬ Jack is d-tall] (Jill is 2 inches taller than Jack)

If Jack is exactly 3 feet tall and Jill is exactly 6 feet tall, (110a) is predicted to be false, contrary to fact. Likewise, (110b) is predicted to be false, if Jack is exactly 6 feet tall and Jill is 6 feet 2 inches tall.

As is easy to see, the introduction of a maximality operator also yields incorrect truth-conditions, since for an open scale, such as the scale of tallness, there exists no maximal degree such that an individual is *not tall* to that degree:

(111) *∃d [Jill is 2"+d-tall & d = max {d' : ¬ Jack is d'-tall}]

Replacing the maximality operator in (111) with a minimality operator does not help, since there isn't and there cannot be the minimal degree to which Jack is not tall, either: for any degree d' such that Jack is not tall to that degree there will always be another degree d" (for instance, *d"=d'-(d'-Jack's height)/2*) such that Jack is not tall to that degree either. However, we can calculate the greatest lower bound, or *infimum*,[23] of the set of degrees that Jack is not tall to:

(112) a. ∃d [Jill is 2d-tall & d = inf { d' : ¬ Jack is d'-tall}]

b. ∃d [Jill is 2"+d-tall & d = inf { d' : ¬ Jack is d'-tall}]

As the greatest lower bound of this set is Jack's height, (112a) and (112b) correctly represent the truth-conditions of comparatives containing a factor phrase and a differential, respectively. An additional advantage of this view is that it requires no additional functional projections: both differentials and factor phrases are introduced into an equative exactly in the way a measure phrase combines with a noun phrase or with another measure phrase:

[23] The greatest lower bound, or infimum, of a subset S of a partially ordered set (P, ≤) is an element *a* of P such that

1. a ≤ x for all x in S, (*a* is a lower bound) and
2. for all y in P, if for all x in S, y ≤ x, then y ≤ a (*a* is larger than any other lower bound).

Conversely, the *least upper bound*, or *supremum*, is the least element of P that is greater than or equal to any element of S. As is obvious from the definition above, *a* doesn't have to be an element of S.

(113) a. Jack's height is six feet two inches.

b. San Francisco was two times the size of Oakland.

c. She's twice the man her father was.

In other words, a measure phrase can be merged directly with the existential quantifier in the same way it is merged with the NP in examples above. While factor phrases appear to contain the component ensuring multiplication as part of their lexical meaning (the suffix *-ce*, the noun *times*), the additive interpretation of differentials is achieved in the configuration of asyndetic coordination, exactly as proposed for cardinals and measure phrases by Ionin and Matushansky 2006.[24]

The question arises whether the compositional semantics provided for comparatives with measure phrases can be extended towards equatives, and the answer is yes. Since the maximum of a set (if it exists) is its least upper bound, or *supremum*, we can substitute the maximality operator used in equatives above with the supremum operator:

(114) ∃d [the mouse is 2d-big & d = sup {d' : Thumbelina is d'-big}]

In order to provide a fully unified solution that would yield suprema and infima in the right environments we will now define the notion of a *non-trivial bound*. As is easy to see, downward monotonicity of scalar predicates necessarily entails the existence of a *trivial interval*, defined as follows:

[24] A discussion of measure phrases in comparatives would be incomplete if I were to fail to mention measure phrases introduced by the preposition *by*:

(i) The mouse is bigger than Thumbelina **by 1 inch**.

Lacking intuitions as to the meaning of the preposition *by* in this environment, I leave the question open.

(115) For a scalar predicate *f* and the domain D of entities that f applies to, δ is a trivial interval iff $\forall d \in \delta\ \forall x \in D\ f(d)(x)$

The union of such trivial intervals corresponds either to the bottom of the scale (for predicates such as *tall*) or to its top (for predicates such as *not tall*).[25]

(116) d is the non-trivial bound (ntb) of the subset S of a partially ordered set $(P,\leq)$ iff

1. $d = \sup(S)$ and $d \neq \sup(\delta)$ or
2. $d = \inf(S)$ and $d \neq \inf(\delta)$

To put it differently, the greatest lower bound of the set of all degrees that an entity is tall to is "not interesting", because it characterizes any entity that is tall to any degree. Likewise, the least upper bound of the set of all degrees that an entity is *not tall* to (which would correspond to the height of the tallest entity) would be a degree that any entity is not tall to. There is no point in comparing anything to a trivial bound and therefore we can reasonably assume that it is the non-trivial bound of a set that is constructed in comparatives and equatives.

We will now check what happens in comparatives containing no measure phrase, such as those examined in section 5.

[25] Note that the trivial interval of negative scalar predicates, such as *short*, comprises lower heights; however, since negative scales are reversed with respect to their positive counterparts, their trivial interval corresponds to the top of the scale.

Importantly, closed-scale predicates, such as *open* or *empty*, also have trivial intervals.

6.4. Comparatives revisited

Applying the results obtained in the previous subsection we should conclude that the *than*-clause introduces the greatest lower bound on the set of degrees that Robin is not tall to, as in (117a), as opposed to our prior claim, represented in (117b):

(117) a. ⟦than Robin ~~is tall~~⟧= λd ∈ D_d . d = inf {d' : ¬ [Robin is d'-tall]}

b. ⟦than Robin ~~is tall~~⟧= λd ∈ D_d . ¬ [Robin is d-tall]

While for this simple case adding the infimum operator makes no significant difference, incorrect truth-conditions arise when the *than*-clause contains a quantifier in the subject position: as with equatives, a narrow scope infimum operator gives rise to the presupposition that all entities to which comparison is effected share the same height:

(118) a. *∃d [Jane is d-tall & ∀x [d = inf {d' : ¬ [x is d'-tall]}]]

b. there exists a height such that for every person it is the greatest lower bound on the set of heights that they don't have (i.e., it is every person's height) and Jane is tall to that height

(119) a. *∃d [Jane is d-tall & ∃x [|x|=3 & d = inf {d' : ¬ [x is d-tall]}]]

b. there exists a height such that there exist three people such that it is the greatest lower bound on the set of heights that they don't have (i.e., it is the height of three people) and Jane is tall to that height

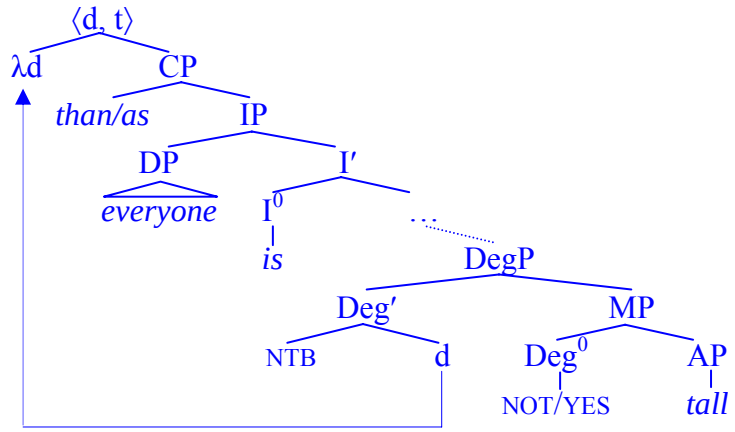
It is easy to see that no such presupposition holds for comparatives.

We now seem to have arrived at a contradiction: whereas in simple comparatives suprema and infima lead to incorrect truth-conditions, they are the only way of obtaining the

right truth-conditions in equatives and with measure phrases. I suggest that this is actually the desired result and resorting to upper and lower bounds is syntactically constrained: it is only possible when a syntactic position for the relevant operator is available.

Indeed, consider once again the syntactic tree assumed above for the degree clause. As is easy to see, the only position where the NTB (non-trivial bound) operator can be inserted without postulating additional functional projections is in [Spec, DegP], as a sister to the null degree operator:

(120)



The resultant semantics for the NTB operator is as follows:[26]

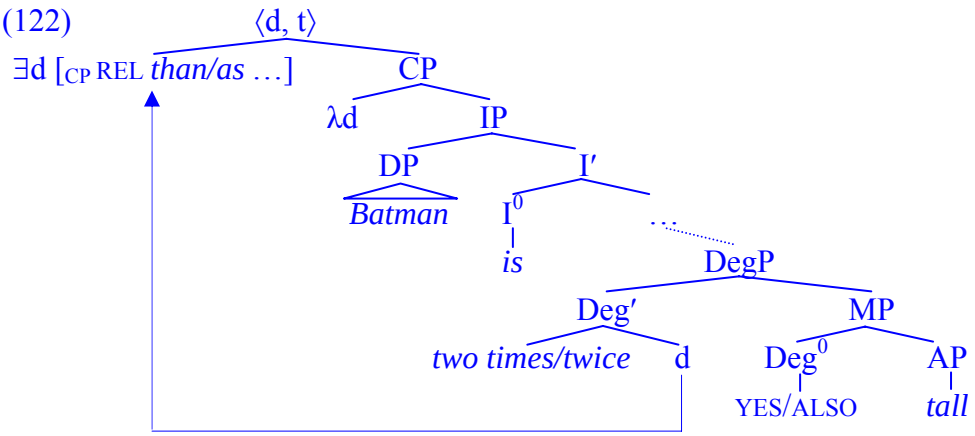
(121) $[\![\text{NTB}]\!] = \lambda d \,.\, \lambda f \in D_{\langle d, \langle e, t\rangle\rangle} \,.\, \lambda x \,.\, d = \text{ntb}\ \{d' : f(d')(x)\}$

It is now time to recall that the complex syntactic structure in (120) corresponds to an elided structure, reconstructed at LF from the antecedent VP in the main clause (or deleted at PF under identity with it). Unless a measure phrase is present, however, the main clause [Spec, DegP] is not branching and therefore cannot serve as an antecedent for the branching

[26] I presuppose here that scalar adjectives have the usually assumed ⟨d, ⟨e, t⟩⟩ type, which necessarily entails that the subject is merged higher than the degree argument (either in [Spec, aP] or in [Spec, PredP]). No particular problem would arise if this assumption were wrong.

[Spec, DegP] in (120). I contend that it is the presence of the measure phrase that provides the conditions necessary for reconstructing such a DegP:

(122)



The hypothesis that the presence of the NTB operator is correlated with the presence of a measure phrase correctly accounts for the behavior of comparatives, but predicts that in an equative without a measure phrase no NTB operator is present. As discussed above, this would yield incorrect truth-conditions:

(99) b. ∃d [Batman is ALSO d-tall & Robin is YES d-tall]

The proposition in (99b) is trivially true and therefore deviant. I propose that it is for that reason that an equative without an overt factor phrase necessarily contains a null measure phrase meaning "once". The presence of this measure phrase yields a branching [Spec, DegP] in the main clause and therefore a possible antecedent for a degree clause containing the NTB operator.[27]

[27] A wide scope infimum operator would yield the right truth-conditions for simple comparatives, but not for those containing a measure phrase. Since, however, hypothesizing different scopes of the NTB operator would not allow us to exclude the wrong interpretation of an equative, I maintain the analysis proposed above.

The existence of a null measure phrase "once" immediately explains why an overt "once" is ungrammatical in equatives. However, more interestingly, it also allows us to deal with the fact that in some languages equatives are incompatible with measure phrases:

(123) a. Maša v dva raza vyše Saši.
Masha in two times taller Sasha-GEN
Masha is twice as tall as Sasha.

b. Maša (*v dva raza) takaja že vysokaja kak Saša.
Masha in two times such EMPH tall how Sasha
Masha is as tall as Sasha.

Under the assumption that "once" forms part of the meaning of the equative morpheme in Russian and similar languages an overt measure phrase would be impossible.

To summarize, in this section we have examined the semantics of comparatives containing measure phrases and equatives. To obtain the right results it has turned out to be necessary to introduce an additional operator, whose purpose is to provide the maximal degree for comparison. In order to make this empirical necessity compatible with our analysis of *than*-clauses as involving negation, we have replaced the traditional maximality operator with the operator encoding the notion of the greatest lower bound (infimum) or the lowest upper bound (supremum) for comparatives and equatives, respectively. As a result, we obtain a natural way of incorporating measure phrases into the semantics of comparison.

7. CONCLUSION

In this paper I have argued for the resurrection of the existential analysis of comparatives and equatives (|McConnell-Ginet, 1973 #522|, Seuren 1973, Larson 1988) on both morphosyntactic and semantic grounds. Although the fact that comparatives and equatives involve syntactic movement in the main clause is usually analyzed as QR targeting the constituent consisting of the degree morpheme and the degree clause, the constituency required for such an analysis is incompatible with the morphosyntax of synthetic comparatives. I showed that the existential analysis can reconcile the two sets of data: if the main clause involves QR of the existential operator located in [Spec, DegP], this movement does not have to obey the locality conditions imposed on head movement. Conversely, if the degree morpheme does not correspond to the existential operator, it can form a syntactic head with the adjective as a result of head-movement.

The presence of negation in the degree clause does not by itself entail that it should be found in a particular position. I have argued that by postulating two different positions for the degree clause negation we can account for the scopal behavior of quantifiers, conjunction, disjunction and various modals without the need to appeal to QR of these elements, which seems to be independently disallowed for some of them.

Turning next to equatives and measure phrases, which necessitate the reference to the maximal degree to which the predicate involved holds of the remnant in the degree clause, I have demonstrated that the appeal to the notions of the greatest lower bound and the lowest upper bound successfully resolves both issues. The distribution of the necessary operators is syntactically constrained.

I conclude that since the existential analysis of comparatives can account for the same facts that the maximality analysis does and is in addition compatible with the morphosyntax of comparatives and the syntax of QR, it should at least be considered a viable rival theory.

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