BECK EFFECTS IN THE COMPARATIVE[1]

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Abstract

This paper defends a "classical" quantificational view on the semantics of comparatives. Building on a proposal in Heim (2000), I examine the role of syntax in scope interactions between the comparative operator and other scope bearing elements. I reevaluate Heim's interface constraint, known as *Kennedy's generalization* and propose to reduce it to a more general constraint about intervention effects of quantifiers, independently motivated in Beck (1996a). My proposal also sheds light on long known puzzles in the *than*-clause of comparatives.

1 DegP: a degree quantifier or not?

1.1 Background assumptions

Research on the semantics of comparatives is impressively extensive. Among the various proposals, two major approaches are currently competing: one which treats the comparative construction as a quantificational structure (cf. Seuren (1973), Cresswell (1976), Hoeksema (1983), Hellan (1984), Stechow (1984), Heim (1985), Heim (1998), Heim (2000), Rullmann (1995), Lerner and Pinkal (1995), Beck (1997), Hackl (2000), Schwarzschild and Wilkinson (2002), etc.), and another which treats them as non-quantificational (cf. McConnell-Ginet (1973), Bartsch and Vennemann (1972), Klein (1980), Klein (1982), Kennedy (1999), etc.).

The former approach views the degree word *–er/less* as an operator that binds a degree variable introduced by a scalar predicate: adjective, adverb, or a verb. The ability of the degree operator to bind a variable in its scope, leads one to expect that the operator, being in that sense a quantificational element, can interact with other scope bearing elements. However, evidence for such interactions, as argued by Kennedy (1999), are hard to find. Our main goal here is to offer one such piece of evidence and thus argue for the quantificational theory of comparatives. But before we are able to do that, let us lay out the essentials of that theory.

We specify the basic assumptions of the quantificational theory of comparatives following mostly Heim (2000). Adjectives are assumed to relate individuals and degrees/extents/intervals (depending on different ontological views) on a scale. Therefore, the lexical entries for adjectives like *old* look like (1):

(1) $[[\text{old}]] := [\lambda x \in D_d .[\lambda y \in D_e .\text{old}(d)(y)]]$ where *e* is a type for individuals, and *d* is a type for degrees

The comparative operator quantifies over parts of a scale. It takes two arguments: two sets of degrees. The first one, the restriction on the operator, is the set of those degrees which satisfy the *than*-clause. Consider (2), for example:

(2) a. Scott is taller than Keith is.
b. Scott is taller than Keith.

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The set of degrees that satisfy the *than*-clause are those to which Keith is tall: *λd: tall(d)(Keith)*. This set is not a singleton on the assumption that adjectives are monotone functions in the sense of (3):

(3) A function R of type <d,et> is monotone iff
$\forall x,d,d_1[\ d > d_1 \ \& \ R(d)(x) \rightarrow R(d_1)(x)]$ (after Gawron (1995))

There are, however, *than*-clauses like the one in (4) whose reference is a degree, rather than a set of degrees.

(4) Scott is taller than 190cm.

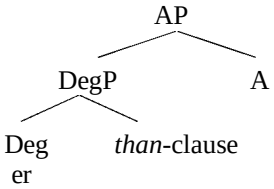
For these cases, it is assumed that there is a comparative operator of the appropriate type: it is a function whose first argument is a degree.

The second argument of the comparative operator is a set of degrees provided by the main clause. In (2), this would be the set of degrees to which Scott is tall: *λd: tall(d)(Scott)*. The denotation of the comparative *–er* applied to its to arguments gives *True* just in case the "biggest" degree that satisfies the main clause is greater than the "biggest" degree satisfying the *than*-clause. With *less*, the relation is reversed. (5) and (6) list the respective lexical entries:

(5) a. $[[er_1]]:= \lambda P: P \in D_{<d,t>} .[\lambda R: R \in D_{<d,t>} .[max(\lambda d.P(d)) < max(\lambda d.R(d))]]$
b. $[[er_2]]:= \lambda d_1 : d_1 \in D_d .[\lambda R: R \in D_{<d,t>} .[d_1 < max(\lambda d.R(d))]]$

(6) a. $[[less_1]]:= \lambda P: P \in D_{<d,t>} .[\lambda R: R \in D_{<d,t>} .[max(\lambda d.P(d)) > max(\lambda d.R(d))]]$
b. $[[less_2]]:= \lambda d_1 .[\lambda R: R \in D_{<d,t>} .[d_1 > max(\lambda d.R(d))]]$
where max: $= \lambda P \in D_{<d,t>} .$ [[the]] $(\lambda d. [P(d) \ \& \ \forall d_1[P(d_1) \rightarrow d_1 \leq d]])$

The theory is dependent on a particular syntactic assumption: that the comparative operator and the *than*-clause form a constituent at LF (see Bresnan (1973), Lechner (1999)).[2] This constituent is what Heim (2000) assumes to be the DegP in comparatives.



The comparative construction comes in two varieties, clausal, as in (2a) and phrasal as in (2b). We do not take a stand here on a long going debate whether these two types of comparatives are transformationally related. For reasons of simplicity, however, we will pretend until *Section 4* that they are. We believe that this assumption, though highly questionable, does not affect the issue about the quantificational status of the comparative morpheme with which we are concerned here.

Let us illustrate the quantificational theory with an example. Consider again (2a), repeated as (7a). (7b) gives the D-structure of the sentence which feeds its LF:[3]

(7) a. Scott is taller than Keith is.

[2] This assumption, though widely followed has been questioned and criticized (see, for example, Lerner and Pinkal (1995), Kennedy (1999)).
[3] The assumption is that the *than*-clause is reconstructed at LF.

b. $[_{IP}$ Scott is $[_{AP}[_{DegP}$ -er than Keith is $\sigma[_{A'}$ tall]]]]

DegP contains the *than*-clause and with it an ellipsis site but ellipsis resolution is impossible in the base position of DegP since the antecedent in the AP includes the ellipsis site. To overcome the difficulty, following a standard solution to the problem of antecedent contained deletion (ACD), DegP is adjoined to IP by Quantifier Raising (QR), leaving behind a trace of type *d*.[4] The movement creates a binder for the trace which is attached on the sister of the moved element (Heim and Kratzer (1998)). Now the antecedent of the elided AP is free of infinite regress and can be copied into the ellipsis site. The trace that is left from the movement of DegP is semantically a variable. It is bound in the main clause but in the *than*-clause the copied degree variable needs a binder, too. The quantificational theory uses a proposal from Chomsky (1977) that there is a *wh*-operator in the CP-domain of the *than*-clause. That operator is assumed to bind the degree variable in the *than*-clause. With these assumptions, we arrive at (8a), as the LF of (7a), which feeds the semantic component. (8b) gives the corresponding semantic derivation:[5]

(8) a. $[_{IP2}[_{DegP}$ -er $[_{CP}$~~than~~ wh_1 Keith is d_1 -tall]]$[_{IP1}2[_{IP}$ Scott is $[_{AP}$ d_2-tall]]]]

b. $[[AP]] = \lambda y{:}y \in D.tall(d_2)(y)$
$[[IP_1]] = \lambda d_2{:}d_2 \in D_d.tall(d_2)(Scott)$
$[[CP]] = \lambda d_1{:}d_1 \in D_d.tall(d_1)(Keith)$
$[[Deg]] = \lambda P{:}\ P \in D_{<d,t>}.[\lambda R{:}\ R \in D_{<d,t>}.[max(\lambda d.P(d)) < max(\lambda d.R(d))]]$
$[[DegP]] = \lambda R{:}R \in D_{<d,t>}.[max(\lambda d.tall(d)(Keith)) < max(\lambda d.R(d))]$
$[[IP_2]] = 1$ iff $max(\lambda d.tall(d)(Keith) < max(\lambda d.tall(d)(Scott))$

[[Scott is taller than Keith is]] =1 iff The "biggest" degree to which Keith is tall is smaller than the "biggest" degree to which Scott is tall.

The derived interpretation closely reflects the intuitions one has about the meaning of (7a).

As Heim observes, under this view, the comparative operator looks very similar to quantificational elements in DPs. The latter have a restriction which is a function from individuals to truth values and a nuclear scope of the same type. The comparative operator, on the other hand, is restricted by a function from degrees to truth values and takes as a second argument a function of the same type. Individuals and degrees are similar basic types. There's a natural analogy then between the <et,t>-type generalized quantifiers and DegP, which is highlighted by the quantificational theory of comparison: $<\alpha t,t>$ is a type of a quantifier (where α = d *or* e).

1.2 Kennedy's observation and the non-reductionist view of Heim (2000)

If *–er/less* has quantificational force, it should interact with other scope bearing elements, as Kennedy (1999) notes. Detecting ambiguities involving a DegP, however, is quite difficult as Heim (2000) shows. Heim (2000) shows that in many cases, the available degree theories, in fact, do not predict truth conditional differences between the comparison operator and a quantified DP, and therefore the lack of ambiguity cannot be taken as an argument against

[4] The proposals for ellipsis resolution in ACD constructions are executed mainly by LF-copying (May (1985), etc.). However, as Lasnik (1993), Lasnik (1999) show, ACD in many cases can also be resolved through PF-deletion.

[5] The preposition *than* is assumed to be semantically vacuous.

them. We have analogous situations with sentences like (9), which certainly involve more than one quantifier:

(9) Every professor interviewed every applicant.

(9) is associated with two possible LFs, but they lead to the same truth conditions. The lack of ambiguity is correctly predicted. (10) is a parallel (in the relevant sense) case involving a comparative:

(10) Every student is taller than Mary is.

If the comparative degree word is a quantificational element, we expect it to take scope either under or over the universally quantified DP. The corresponding LFs are those in (11a) and (11b), respectively. However, they lead to (logically) equivalent truth conditions.

(11) a. [[every student] [1 [[-er than wh_3 Mary is d_3-tall] [2 [t_1 is d_2-tall]]]]]
a'. [[Every student is taller than Mary is]] = 1 iff
$\forall x[student(x) \rightarrow max(\lambda d.tall(d)(Mary)) < max(\lambda d.tall(d)(x))]$

b. [[-er than wh_3 Mary is d_3-tall] [2 [[every student] [1 [t_1 is d_2-tall]]]]]
b'. [[Every student is taller than Mary is]] = 1 iff
$max(\lambda d.tall(d)(Mary) < max(\lambda d \forall x[student(x) \rightarrow tall(d)(x)])$

The set of truth conditions in (11a') amounts to requiring that each student is such that she is taller than Mary. The conditions in (11b') require that the shortest of the students be taller than Mary. But the situations in which the conditions from (11a') will be fulfilled are those situations in which the conditions from (11b') will be fulfilled. (10) is judged to be unambiguous, and the degree theories predict that.

A second problem with detecting the scopal properties of comparison operators, which Heim (2000) discusses is that in many cases the truth conditions derived from the compared LFs are not equivalent, but there is an independent reason for one of the LFs to be ill-formed. Again, the empirical facts that we do not detect any ambiguity in such sentences coincide with the prediction of the quantificational theory.

It is then more instructive to look at those examples, for which the quantificational theory predicts an ambiguity. One of them, discussed by Heim, is (12):

(12) Every student is less tall than Mary is.

The sentence is unambiguous. Given the assumptions made so far, we expect to find two readings in (12). We have two well-formed LFs from which we derive two unequivalent sets of truth conditions, as in (13).

(13) a. [[every student] [1 [[less than wh_3 Mary is d_3-tall] [2 [t_1 is d_2-tall]]]]]
a'. [[Every student is taller than Mary is]] = 1 iff
$\forall x[student(x) \rightarrow max(\lambda d.tall(d)(Mary)) > max(\lambda d.tall(d)(x))]$

b. [[less than wh_3 Mary is d_3-tall] [2 [[every student] [1 [t_1 is d_2-tall]]]]]
b'. [[Every student is taller than Mary is]] = 1 iff
$max(\lambda d.tall(d)(Mary) > max(\lambda d \forall x[student(x) \rightarrow tall(d)(x)])$

(13a') represents the attested reading of (12), according to which the sentence is true only if it is true of each student that she is shorter than Mary. (13b'), however, allows its truth conditions to be met only if the shortest student is shorter than Mary. But these are inadequate truth conditions: such a reading does not exist.

It looks like some explanation is needed to account for the overgenerated reading of (12) in order to save the quantificational theory. Careful examination of different types of data lead Heim to formulate a syntactic condition on the well-formedness of LFs involving a DegP. This condition rules out (13b) and makes the quantificational theory consistent with the facts. Heim (2000) refers to this condition as the *Kennedy generalization*:

(14) If the scope of a quantificational DP contains the trace of a DegP, it also contains DegP itself.

It follows from the above discussion that if DegPs have significant scopal properties, we should not expect them to be revealed in just any linguistic context in which we find another scope bearing element. On the assumption that scope interaction involves movement, restrictions on DegP movement could prevent us from getting (otherwise expected) well-formed LFs. We need, then, to expand the domain of inquiry and look for configurations that circumvent Kennedy's generalization. This is what we offer in the next section.

2 A puzzle: ambiguity in comparative conditionals

The generalization in (14) accounts for the missing reading of the German sentence (15).

(15) (Frank kommt in unsere Laden einmal pro Woche.) Viele Rentner kommen öfter.
(Frank comes in our shop once a week) many retirees come more-often
'(Frank comes to our shop once a week.) Many retirees show up more often than that.'

(15) contains the comparative quantifier *öfter* and a quantificational DP *viele Rentner*. It is judged to be unambiguous. It can only have the interpretation in (16a) which results from having DegP take narrower scope than the DP. The interpretation in (17a), which reflects the reverse scopal order is unavailable.

(16) a. Many retirees x are such that x shows up more often than once a week.
b.[[many retirees] [1 [[-er than once a week] [2 [t_1 show up d_2-often]]]]]
QP **DegP** $\mathbf{t_{DegP}}$
c. for many retirees x, max(λd.x comes d-often) > once a week

(17) a. #The frequency of having many retirees is greater than once a week.
b. [[er than once a week] [2 [[many retirees] [1 [t_1 show up d_2-often]]]]]
DegP **QP** $\mathbf{t_{DegP}}$
c. max(λd.d-often, many retirees come) > once-a-week

(17a) is created by an illegitimate, from the point of view of Kennedy's generalization, configuration *DegP quantificational DP* t_{DegP}. What this generalization does not explain, however, is why there are two readings in (18), informally represented in (19):

(18) Je mehr Sonderangebote wir haben, umso öfter kommen viele Rentner
the more special-offers we have the more-often come many retirees
'The more special offers we have, the more often many retirees show up.'

(19) a. $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we do at t_1, then many retirees show up more often at t_2 than they show up at t_1]

b. $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we do at t_1, then we have more often many retirees showing up at t_2 than we have many retirees at t_1]

(19b) results from a LF, which is similar to the illegitimate (17b) in that it utilizes the configuration *DegP quantificational DP* t_{DegP}, as we will show promptly. If indeed we are right in claiming that, two important questions will arise. First, is Kennedy's generalization flexible enough to make a difference between (17b) and (19b)? And second, what is the property that distinguishes the two LFs? That property must be blamed for the different acceptability status of the readings that correspond to the respective LFs.

Before we ask these questions, let us first show how (19a) and (19b), the two readings of the comparative conditional (CC) sentence in (18) are derived. We follow Beck (1997)'s proposal for analyzing comparative conditionals.

We start with the essentials of her proposal. CCs are genuine conditional sentences. One of the clauses is viewed as an antecedent, the other – as a consequent. Like in other conditional sentences, Beck proposes that there is an implicit adverb of universal quantification. It binds a pair of world/time variables. Let us look at one of her examples:

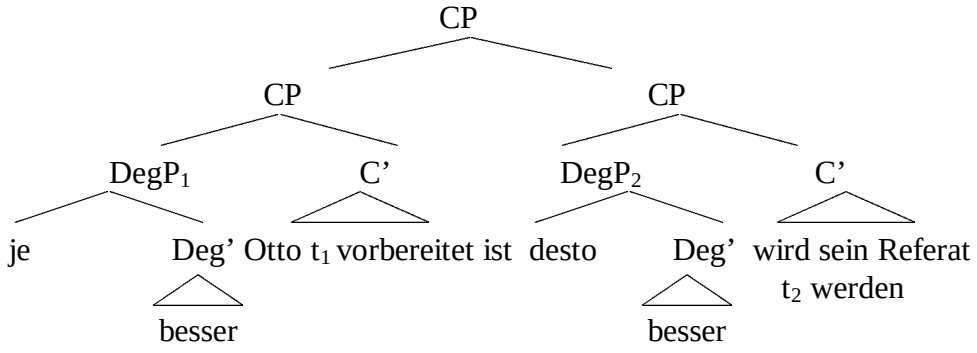
(20) Je besser Otto vorbereitet ist, desto besser wird sein Referat werden.
The better Otto prepared is the better will his talk become
'The better Otto is prepared, the better his talk will be.'

The intuitive truth conditions of (20), given in (21), involve a universal quantification over a pair of worlds in which Otto has a different degree of preparedness:

(21) $\forall w_1,w_2$ [$w_1 \in$ Acc & $w_2 \in$ Acc & if Otto is better prepared in w_1 than he is prepared in w_2 then Otto's talk is better in w_1 than it is in w_2]

(22) is the proposed syntactic structure underlying (20):

(22)



The DegP in the antecedent and the consequent is fronted to the respective [Spec, CP]. The consequent is the main clause. The antecedent is adjoined to it.

Beck notices that in both the antecedent and the consequent there is a part of the clause that is used twice in the interpretation. Again informally, such are the incomplete clauses *Otto is prepared d-well* and *Otto's talk is d-good*. But then it follows that everything except for *je/umso/desto* and *–er* is used twice. Beck draws two conclusions: (i) either *je/desto* or *-er* must be blamed for using the interpretation of each of these clauses twice. Her proposal is that *je/desto* are defined to do that. This is a case of what Heim (2000) calls

semantic ellipsis: an instruction in the semantics of a lexical item that requires an argument to which that item applies to be used more than once in a semantic derivation. (ii), the adverb from each DegP which appears fronted along with the comparative morpheme in its surface position must be reconstructed to its base position at LF in order to create the appropriate incomplete clause which is recycled in the interpretation procedure. *Je/umso/desto* is suggested to occupy the syntactic position of the missing than-clause in the construction and is defined as in (10):

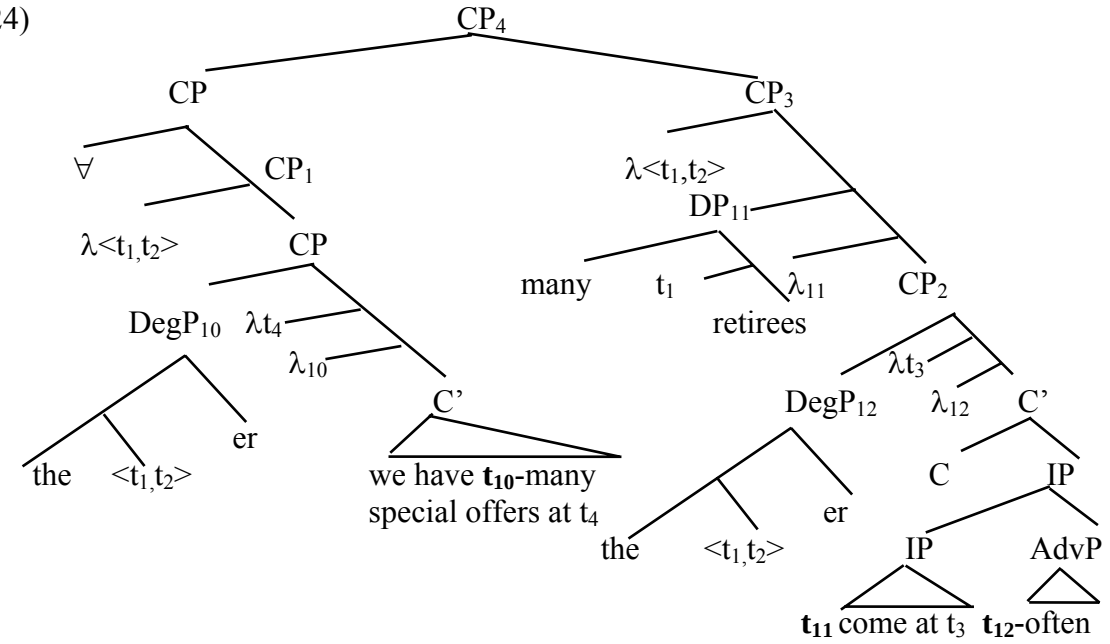
(10) $[[\text{je/umso}]](\langle w_1,w_2\rangle)([[\text{er}]])(D_{\langle s,\langle d,t\rangle\rangle}) = 1$ iff $[[\text{er}]](D(w_2))(D(w_1))$

-*Er* and *je/umso/desto* form a constituent at LF, DegP, whose denotation combines with the denotation of the antecedent/consequent clause, D, (i.e. a set of degrees) after DegP is fronted. These assumptions allow for CCs to be interpreted compositionally. (20) has the interpretation in (23) which correctly represents the intuitive meaning given in (21).

(23) $\forall w_1,w_2,[w_1 \in \text{Acc} \ \& \ w_2 \in \text{Acc} \ \& \ [\max(\lambda d.[\textit{well}(d)(\lambda x.\textit{prepared}(x) \text{ in } w_2)](\textit{Otto})) < \max(\lambda d.[\textit{well}(d)(\lambda x.\textit{prepared}(x) \text{ in } w_1)](\textit{Otto}))] \Rightarrow [\max(\lambda d.[\textit{good}(d)(\textit{Otto's\_talk}) \text{ in } w_2]) < \max(\lambda d.[\textit{good}(d)(\textit{Otto's\_talk}) \text{ in } w_1])]]$

Let us now go back to (18) and see how the two intuitively present readings of the sentence can be compositionally derived. Beck's semantics of CCs, coupled with the quantificational theory of comparatives offers the desired account of the ambiguity in CCs. By assumption, the comparative operator is a scope bearing element, so given that there is another scope bearing element in the consequent clause, we can represent that clause by two LFs: one in which the DP *viele Rentner* has the comparative operator in its scope, and another, with the reverse scopal ordering. (24) represents the first option.

(24)



(25) gives the semantic interpretation derived by this LF. Note that the gradable adverb with which the comparative operator is associated is reconstructed to its base position at LF:[6]

[6] $t_{1,\ldots n}$ are variables over periods of time. $\mathbf{t_{1,\ldots n}}$ are traces of moved elements.

(25) antecedent clause CP_1

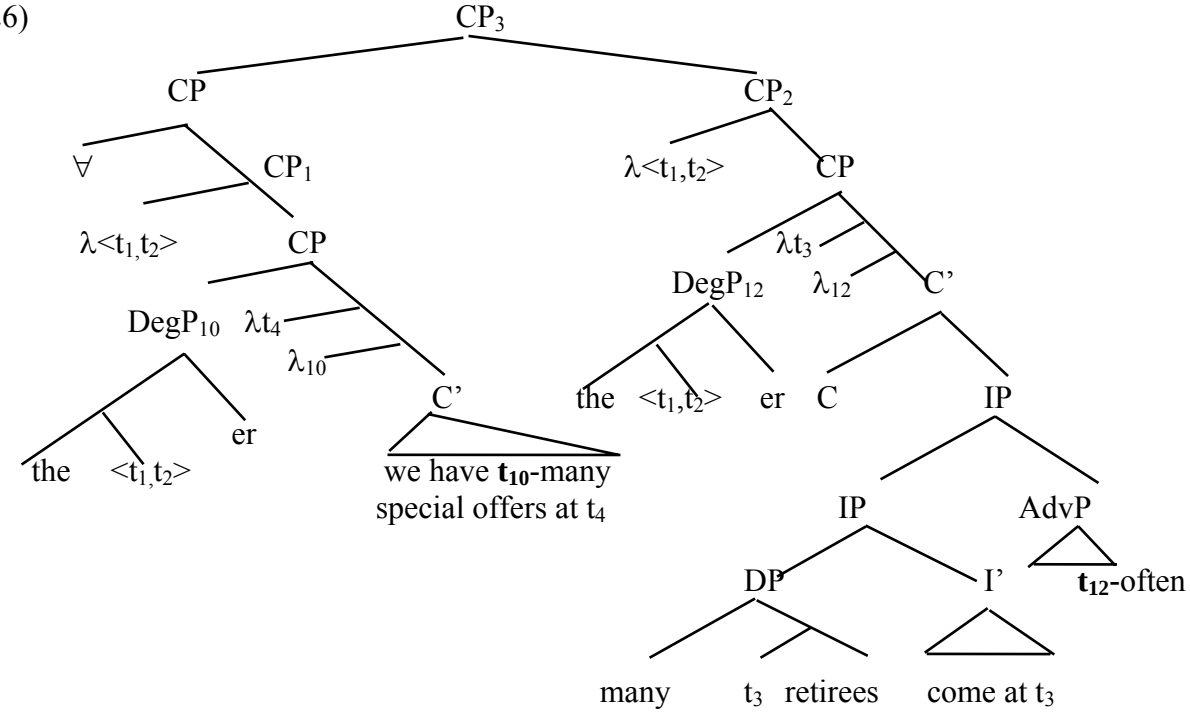
$[[DegP_{10}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$
$[[CP_1]] = \lambda t_1.\lambda t_2.[max(\lambda d.$we have d-many special offers at $t_1) <$
$max(\lambda d.$we have d-many special offers at $t_2)]$

consequent clause CP_3
$[[DegP_{12}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$
$[[CP_2]] = max(\lambda d.$d-often, x comes at $t_1) < max(\lambda d.$d-often, x comes at $t_2)$
$[[CP_3]] = \lambda t_1.\lambda t_2.$for many retirees$(t_1)$ x, $max(\lambda d.$d-often, x comes at $t_1) <$
$max(\lambda d.$d-often, x comes at $t_2)$

CP_4
$[[CP_4]] = 1$ iff $\forall(t_1,t_2)$ [$max(\lambda d.$we have d-many special offers at $t_1) <$
$max(\lambda d.$we have d-many special offers at $t_2)] \Rightarrow$
for many retirees(t_1) x, $max(\lambda d.$d-often, x comes at $t_1) <$
$max(\lambda d.$d-often, x comes at $t_2)$

The truth conditions that we derived by scoping the quantified DP in the consequent clause above its respective DegP predict (18) to be true when for all pairs of time periods t_1 and t_2, if the number of special offers at t_2 exceeds the number of special offers at t_1 then for many retirees x the number of visits of x (to our shopping center) at t_2 exceeds the number of visits of x at t_1. These truth conditions correspond to one of the intuitive readings we associated (18) with, (19a). It remains to be seen whether the truth conditions derived from the LF representing the reverse scopal configuration involving DegP and the DP will adequately represent the second reading of the sentence, (19b). (26) gives the relevant LF.

(26)



Here are the truth conditions derived by this LF:

(27) antecedent clause CP_1

$[[DegP_{10}]] = \lambda D.[max(\lambda d.D(d)(t_1)) < max(\lambda d.D(d)(t_2))]$

$[[CP_1]]$ $= \lambda t_1.\lambda t_2.[\max(\lambda d.$we have d-many special offers at $t_1) <$
$\max(\lambda d.$we have d-many special offers at $t_2)]$

consequent clause CP_3
$[[DegP_{12}]] = \lambda D.[\max(\lambda d.D(d)(t_1)) < \max(\lambda d.D(d)(t_2))]$
$[[CP_2]] = \lambda t_1.\lambda t_2.\max(\lambda d.$d-often, many retirees$(t_1)$ come at $t_1) <$
$\max(\lambda d.$d-often, many retirees(t_2) come at $t_2)$
CP_3
$[[CP_3]] = 1$ iff $\forall(t_1,t_2)$ $[\max(\lambda d.$we have d-many special offers at $t_1) <$
$\max(\lambda d.$we have d-many special offers at $t_2)] \Rightarrow$
$\max(\lambda d.$d-often, many retirees(t_1) come at $t_1) <$
$\max(\lambda d.$d-often, many retirees(t_2) come at $t_2)$

According to these truth conditions, derived from (26), the sentence should be true when for all pairs of time periods *t_1* and *t_2*, if the number of special offers at *t_2* exceeds the number of special offers at *t_1*, then more frequently at *t_2* than at *t_1* the shop gets many retirees as customers. These are adequate truth conditions for (18) because they represent the intuitive second reading of the sentence.

These new data shed light on the debate about the adequacy of the quantificational theory of comparatives. The observed ambiguity in CCs is easily explained on the assumption that the quantified DP in (18) interacts scopally with DegP, while any non-quantificational theory would stumble here.[7] We conclude then that ambiguity in CCs present an argument for the "classical" quantificational theory.

We are now also ready to face the two questions we posed earlier. The first one is whether Kennedy's generalization is descriptively adequate. Obviously, it is not fine grained as needed to make a difference between (17b) and (19b) and rules the latter out on a par with the former. This calls for a revision. The property that distinguishes (17b) and (19b) is the timing of DegP movement. The observation that we can make on the basis of CCs is that whenever DegP movement is overt, DegP and it trace can be separated by a quantified expression; if DegP movement is covert, quantified expressions that intervene make the LF ill-formed. We thus propose to modify Kennedy's generalization. We suggest the formulation in (28):

(28) If the scope of a quantificational expression contains the **LF** trace of a DegP, it also contains DegP itself.

That formulation raises a question about the status of the constraint related to Kennedy's generalization. Is it an independent principle of grammar? As an interface condition, (28) is

[7] One might be concerned whether we correctly identified the source of ambiguity in (18). Could it be that the sentence is ambiguous not because the quantified DP in the consequent clause interacts with *-er* but because it interacts with the adverb which is part of *öfter*. We have two arguments against such a view. First, if this were true, then the wide scope reading of *viele Rentner* should be derived by raising it above the adverb but lower than the comparative head. The resulting interpretation for (18) would be as in (i):

(i) $\forall t_1,t_2$ [where t_1 and t_2 are relevant periods of time, if we have more special offers at t_2 than we have t_1, then the lowest degree d such that many retirees visit us d-frequently is greater at t_2 than it is at t_1.

This reading is unavailable. So, on the one hand, one of the available readings of (18) cannot be derived at all, and on the other, a non-existing reading is predicted if we assume that the adverb in *öfter*, rather than the comparative operator is responsible for the ambiguity.

Second, (17), recall, is not ambiguous. The "missing" wide scope DegP reading is to be attributed to Kennedy's generalization. That account is unavailable under the alternative hypothesis considered here.

strongly reminiscent of Beck (1996b)'s Minimal Quantified Structure Constraint (MQSC), given in (29):

(29) If an LF trace β is dominated by a Quantifier-Induced Barrier (= the first node that dominates a quantifier, its restriction, and its nuclear scope) α, then the binder of β must also be dominated by α.

MQSC is formulated as a more general interface principle about intervention effects induced by a quantified expression, while (28) covers a smaller empirical domain which falls under it. We propose then, that Kennedy's generalization be reduced to MQSC. In the next section, we briefly review the independent evidence for MQSC.

3 Independent evidence for the constraint on LF-movement

Beck (1996b) discusses four cases from German, related to *wh*-movement, that motivate MQSC. All of them point to the conclusion that LF movement is more constrained than overt movement. A quantified expression intervening between a moved element and its trace leads to ungrammaticality or loss of ambiguity. But this is true only if traces result from LF movement. Let's look at some data. Beck considers the following constructions: scope-marking questions, exemplified in (30a), multiple wh-questions, exemplified in (30b), the *wh-alles* construction in (30c) and a construction in which the restriction of a *wh*-phrase is left behind after overt *wh*-movement, as in (30d):

(30) a. Was glaubt Luise wen Karl gesehen hat?
What believes Luise whom Karl seen has
'Who does Luise believe that Karl saw?'

b. Wen hat Luise wo gesehen?
Who has Luise where seen
'Where did Luise see whom?'

c. Wen hat Luise alles gesehen?
Whom has Luise all seen
'Who-all did Luise see?'

d. Wen hat Luise von den Musikern getroffen
whom has Luise of the musicians met
'Which of the musicians did Luise meet?'

The scope-marking question in (30a), as Beck argues, is interpreted like a regular long-distance question in German. That requires that the *wh*-phrase *wen*, from the embedded clause, is covertly raised to take scope over the whole question. Beck also argues on semantic grounds that each of the underlined expressions in the rest of the examples must raise at LF: the *wh*-phrase in-situ in (30b) must be interpreted in [Spec,CP]; *alles* in (30b) universally quantifies over a question denotation, so it must take scope over the whole question at LF; and finally the restriction of the D-linked *wh*-phrase must be interpreted along with the *wh*-element, so the restriction must also raise to [Spec,CP].

Raising the underlined phrases is possible in each of the examples in (30), since they are acceptable. However, if the proper name, which, being in the subject position c-commands

the moved element, is replaced by a quantified expression, the status of the sentences changes: they become unacceptable:

(31) a. ??Was glaubt niemand wen Karl gesehen hat?
What believes nobody whom Karl seen has
'Who does nobody believe that Karl saw?'

b. ??Wen hat niemand wo gesehen?
Who has nobody where seen
'Where did nobody see whom?'

c. ??Wen hat niemand alles gesehen?
Whom has nobody all seen
'Who-all did nobody see?'

d. ??Wen hat keine Studentin von den Musikern getroffen
whom has no student of the musicians met
'Which of the musicians did no student meet?'

The conclusion to be drawn from the contrast between (30) and (31) is that the quantified expressions in (31) intervene between each moved element and its trace. That causes the ungrammaticality in the latter case. However, that conclusion is too strong. As (32) shows, the quantified expressions don't cause a problem if they separate an overtly moved expression and its trace:

(32) a. Wen glaubt niemand daß Karl gesehen hat ?
What believes nobody that Karl seen has
'Who does nobody believe that Karl saw?'

b. Wo hat niemand Karl gesehen?
Where has nobody Karl seen
'Where did nobody see Karl?'

c. Wen alles hat niemand gesehen?
Whom all has nobody seen
'Who-all did nobody see?'

d. Wen von den Musikern hat keine Studentin getroffen
whom of the musicians has no student met
'Which of the musicians did no student meet?'

The contrast between (31) and (32) requires a characterization of intervention effects that makes reference to the type of movement involved in creating the offending configuration in (33):

(33) *$Q_1...Q_2...t_1$

Therefore, MQSC, which Beck proposes, applies only to LF movement.

From a different empirical point, we reached the same conclusion, namely, that LF movement of DegP is more restricted than overt movement. We have also observed that Beck's filter is general enough to cover also the cases related to comparatives.

Finally, it is important to mention that Bošković (1998) and Bošković (2000) reach independently Beck's conclusion that LF movement is more restricted than overt movement. Here is one of Bošković's arguments. French is a language that has overt *wh*-movement but allows a *wh*-phrase to remain in situ in certain well defined contexts. This is illustrated in (34):

(34) a. Tu as vu qui?
you have seen whom
'Who did you see?'
b. Qui as-tu vu

Bošković brings evidence that the *wh*-phrase in-situ in (34a) must undergo movement to C at LF. In long-distance questions, however, *wh*-phrases can't remain in situ. Consider (35) in this respect:

(35) a. *Jean et Pierre croient que Marie a vu qui
Jean and Pierre believe that Marie has seen whom
'Whom do Jean and Pierre believethat Marie saw?'
b. Qui Jean et Pierre croient-ils que Marie a vu

Like in (34a), the *wh*-phrase in the long-distance question (35a) must undergo LF-movement to the matrix C. But the contrast between (34a) and (35a) shows that long distance *wh*-movement is clause-bounded at LF. Crucially, this is not so with overt movement, as we can see from (35b). Therefore, Bošković concludes, LF-movement must be more restricted than overt movement. Bošković offers an account in terms of feature movement. Under Chomsky (1995) Move F hypothesis, LF movement applies to feature bundles, not to whole lexical items. Feature movement is an instance of head movement. Consequently, crossed heads are interveners in the sense of Relativised Minimality. In (35a) the embedded complementizer, an A' head, blocks the LF movement of the *wh*-features to the matrix C, also an A' head. Since overt movement applies to whole categories, no intervention effect is observed in (35b).

We take the fact that Beck (1996b) and Bošković (1998) converge on their view about the relative restrictedness of LF-movement to indicate that the conclusion is on the right track. But, although they make a very similar claim, the empirical basis for each of the accounts is somewhat different and it isn't immediately obvious that either account can be extended to the whole set of data. Beck's account refers to inherently quantified elements as interveners. Also, very importantly, the cases that Beck considers involve phrasal movement. Bošković identifies a different set of interveners. Perhaps it is desirable, on conceptual grounds, that the two sets of data find a common explanation. In the lack of an obvious general proposal, however, we side with Beck's account because our data are, in the relevant respect, very similar to the data for which MQSC was originally proposed.

4 Schwarzschild and Wilkinson's problem and MQSC

In *Section 1* we discussed data like (36) which do not allow one to observe any scope interaction between the quantified DP and the comparative operator:

(36) (Scott is 180cm tall.) Every girl is less tall than that.

Along with Heim (2000), we argued that the lack of ambiguity in (36) does not suggest that *er* has no scopal properties. We gave an argument from CCs defending the quantificational

theory of comparatives. Following Heim (2000), we appealed to an interface constraint that disallowed LFs derived by scoping the comparative DegP across a quantified DP in order to account for "missing" readings in sentences with comparatives. We further argued, on the basis of cases involving overt movement of DegP, that Heim's constraint should be reduced to the more general Beck filter on LF-movement. There is a set of data involving the comparative construction, which, in the relevant respect, poses a similar question to the quantificational theory of comparatives. We offer here some speculations about that. These data involve quantifiers in the *than*-clause. The problem has been known for many years, but recently examined in great detail in Schwarzschild and Wilkinson (2002). A few examples are given in (37):

(37) a. Scott is taller than every girl.
b. Scott is taller than every girl is.
c. Scott is taller than most of the others.
d. Scott is taller than most of the others are.
e. Scott is taller than exactly three girls.
f. Scott is taller than exactly three girls are.

Similarly to (36), all of the sentences in (37) are unambiguous. And, again, the quantified DP cannot stay in the scope of the comparative operator. To see that, let us look more carefully at (37b), for example. If *every girl* is interpreted in-situ, we derive counterintuitive truth conditions, as (38b) shows. The LF in (38a) results from resolving ellipsis in the *than*-clause through LF copying:

(38) a. [[$_{\text{DegP}}$ er than wh$_2$ every girl is **t$_2$-tall**] [1[$_{\text{IP}}$ Scott is t$_1$-tall]]]
b. max(λd.*tall*(d)(every girl)) < max(λd.*tall*(d)(*Scott*))

According to (38b), (37b) is true only if Scott is taller than the shortest girl. To derive the intuitive truth conditions, which make the sentence true only if Scott is taller than each of the girls, i.e. he is taller than the tallest girl, one has to allow the universal quantifier in (37b) to QR above the *than*-clause outside of the scope of the comparative operator. And further, one has to stipulate that QR in this context is obligatory since the reading derived when QR does not apply is unattested, as we saw from (38). So, let us make sure that QR leads to the desirable truth conditions:

(39) a. [[every girl] [3[$_{\text{DegP}}$ er than wh$_2$ t$_3$ is **t$_2$-tall**]] [1[$_{\text{IP}}$ Scott is t$_1$-tall]]]
b. ∀x[girl(x) → max(λd.tall(d)(x)) < max(λd.tall(d)(Scott))

These are indeed the desired results. But does MQSC, which we argued to be accountable for "missing" readings like those in (36) also extend to quantifiers in the *than*-clause? Since quantifiers behave similarly in the two types of contexts, we expect that their inability to appear in the scope of the comparative operator to have the same explanation. If we are on the right track, then the answer is Yes, MQSC rules out the LF in (38a), and this creates the effect of illusionary obligatoriness of QR. Let us elaborate.

We picked the clausal comparative in (37b), as an exemplary case because it is somewhat easier to see the relevance of MQSC in clausal comparatives. Recall, that the standard quantificational theory assumes that ellipsis in the *than*-clause is resolved similarly to ACD in sentences like *John dated every girl Bill did*. *-er* and its restriction, the *than*-clause with which it forms a constituent, is QR-ed in the covert component, which makes it possible to reconstruct the elided predicate. That predicate contains the trace of the moved DegP. QR itself doesn't violate MQSC, unlike in the wide scope DegP "reading" of (36). DegP in (38a)

does not raise across an intervener. What makes (38a) illegitimate is reconstructing the trace of DegP in the *than*-clause and thus creating the configuration *DegP intervener* t_{DegP}. If we are correct in assuming that a violated MQSC accounts for the missing readings in (37), we have an argument that the condition applies representationally. If it applied derivationally, the LF in (38a) could be saved by having MQSC apply before LF-copying.

Some explanation is now in order for the phrasal comparatives in (37a), (37c), and (37e). Recall from *Section 1* that there is no agreement on the question whether these involve ellipsis in the *than*-clause. If they do, then the "missing" wide scope DegP reading must be attributed to MQSC without further discussion: the reconstructed predicate *be d-tall* contains an offending trace which is separated from its binder by an intervener.

The (semantic) alternative to an ellipsis-based analysis of phrasal comparatives is the direct analysis, suggested by Heim (1985). We will briefly review a close relative of that proposal and after that we will consider its implications for the "missing" readings in the phrasal comparatives in (37).[8]

Any comparative construction, be it causal or phrasal, needs two predicates: one to be ascribed of the subject, and another, of the DP-complement of the preposition *than* in the case of phrasal comparatives, or the subject of the *than*-clause in the case of clasal comparatives. The surface representation of comparatives, however, contains only one such predicate. The standard solution for clausal comparatives, as we discussed many times by now, is to assume that the predicate in the *than*-clause is syntactically reconstructed. The alternative, that Heim suggests and exploits in her 1985 paper on comparatives is semantic ellipsis. Recall that semantic ellipsis refers to a phenomenon triggered by an operator that requires using the denotation of an expression twice in the interpretation. The direct analysis gives such semantics to the comparative operator: one of its arguments is a relation between a degree and an individual: it applies once to the individual denoted by the subject and once more to the individual denoted ny the DP in the *than*-clause. For this to be possible, however, DegP must always raise at a minimal distance above the main verb in order to derive the appropriate relation which can be an argument of *-er*. *-er* is specified in the lexicon as in (40):

(40) $[[\text{er}]] := \lambda y{:}y \in D.[\lambda R{:}R \in D_{<d,et>}.[\lambda x{:}x \in D.\max(\lambda d.R(d)(x)) > \max(\lambda d.R(d)(y))]]$

As we see from (40), *-er* applies first to the denotation of the *than*-phrase. Since *than* is semantically vacuous, the denotation of the PP is the denotation of the DP, an individual. The second argument of *-er* is a relation. Finally, *-er* takes an individual as an argument to yield

[8] In a nutshell, Heim proposes that phrasal comparatives contain a comparative operator with the following semantics: *-er* has two arguments: an ordered pair of individuals, and a scalar predicate - a relation between a degree and individual. It is defined as in (i):

(i) $[[\text{-er}]]\langle x,y\rangle(R_{<d,et>}) = 1$ iff $\max(\lambda d.R(d)(x)) > \max(\lambda d.R(d)(y))$

For example, the LF of (iia), is derived without reconstruction in the *than*-clause. Rather, the DP *Amy* adjoins to the subject of the main clause, and *-er* adjoins to that constituent, as in (iib):

(ii) a. Scott is taller than Amy.

b. $[_{IP}$ [er $[_{DP}$Scott Amy]] [1[2[t_2 is t_1-tall]]]]]

(iib) leads to the interpretation in (iii):

(iii) $\max(\lambda d.\textit{tall}(d)(\textit{Scott})) > \max(\lambda d.\textit{tall}(d)(\textit{Amy}))$

According to (i), (iiia) is true only if the degree to which Scott is tall is greater than the degree to which Amy is taller. The conditions correspond to speakers' intuitions. However, as Lerner and Pinkal (1995) point out the syntactic status of these two adjunction operations, especially the adjunction of the DP that starts in the *than*-phrase to the subject, is unclear. In addition, we also believe that the semantic interpretation in not, strictly speaking compositional. If it were, [[-er]] would not apply to the pair of individuals denoted by each DP but rather to the denotation of the constituent that dominates the two DPs. But it isn't obvious to us that the denotation of that constituent in an ordered pair of individuals. To avoid these problems, we consider a variant of the original proposal. It is in the spirit of the direct analysis, and is a straightforward extension of Heim (1999)'s proposal about the interpretation of superlatives.

true just in case the maximal degree of the set of degrees related to the individual from the main clause is bigger than the maximal degree of the set of degrees related to the individual from the *than*-phrase. A sample derivation involving phrasal comparatives is given in (41):

(41) a. Scott is taller than Amy.
b. [$_{IP}$ Scott [$_{DegP}$ er than Amy] [1[2[t_2 is t_1-tall]]]]
c. [[er]]([[Amy]])(λd.λx.tall(d)(x))([[Scott]]) =1 iff
max(λd.*tall*(d)(*Scott*)) > max(λd.*tall*(d)(*Amy*))

Now, we are ready to go back to (37a): *Scott is taller than every girl*. Under Heim's proposal, (42) is the LF of (37a):

(42) [$_{IP}$ Scott [$_{DegP}$ er than every girl] [1[2[t_2 is t_1-tall]]]]

In phrasal comparatives, in contrast to clausal comparatives, *-er* must apply directly to the denotation of the DP in the *than*-phrase. However, in (37a) that DP is not of the appropriate type. *-Er*'s first argument is an individual but *every girl* denotes an expression of type <et,t>. To resolve the type mismatch, *every girl* must be QR-ed. And no matter how short than movement is, it will be above the scope of the comparative operator. But this, in turn, explains why in phrasal comparatives like (37a), (37c), and (37e), the only attested reading is the one where DegP scopes below the quantified DP.

To summarize the discussion so far, we addressed the question about missing readings in the comparative construction, involving quantified expressions in the *than*-clause. We extended the MQSC-based explanation to at least clausal comparatives. Crucially, we argued that the disallowed configuration in which a quantified expression intervenes between DegP and its trace is created as a result of the reconstruction process in the *than*-clause. We argued that even if phrasal comparatives do not involve ellipsis, there is an alternative explanation that accounts for the wide scope of a universal quantifier there.

We need to acknowledge, however, that Schwarzschild and Wilkinson (2002) present an argument against QR-ing a quantified expression out of a *than*-clause. And this might be a potential problem for us since we argued that such DPs cannot be interpreted in the scope of DegP, rather they must move out of the c-command domain of DegP in LF. We leave our answer to this challenge for future research. But first, let us present Schwarzschild and Wiskinson's argument. It involves sentences with a quantifier in the *than*-clause buried in the scope of another scope bearing element. (43) is such an example:

(43) Bill did better than John predicted most of his students would do.

Consider (43) in the context where John predicts that most of his students will get a score between 80 and 90 on the exam. If John gets 96 points, (43) can truthfully be uttered in this context. But how is the sentence interpreted? The problem with the quantifier *most of his students* in the *than*-clause resurfaces as it did in (37). If it is interpreted in situ, we get too weak truth conditions for (43). The sentence is predicted to be true if John makes a prediction that the bigger portion of his students will score within a particular range and Bill scores more than the lower limit that John sets but not more than the higher limit. For example, if Bill gets 81 points, (43) will still be true in the context where John predicts that most of his students will get between 80 and 90 points. This type of problem was explained as a violation of MQSC in clausal comparatives in (37) and resolved by QR-ing the quantifier out of the *than*-clause. But, for (43) that solution doesn't work. Suppose we QR that quantifier and give it wider scope than DegP. Then (43) will have the truth conditions in (44):

(44) Most of John's students are x such that: Bill did better than John predicted x would do.

The problem with (44) is that the first argument of the comparative operator, *λd.John predicted x to do d-well*, is the empty set since John made no predictions about the scores of particular students. The *max* operator cannot apply to an empty set of degrees because the maximum of that set is undefined. And consequently, contrary to speakers' intuitions (43) is not predicted to be true in the context we considered. As a solution, Schwarzschild and Wilkinson (2002) develop a new theory of scalar predicates where the degree argument of gradable adjectives/adverbs is in fact an interval, rather than a point on the scale.

This is not to say that the MQSC account of "missing" readings, for which we argued, must be wrong. Rather, the solution relying on QR out of the *than*-clause, is problematic in light of (43). Either, there is an alternative strategy altogether that is used in deriving the interpretation of (43) and the interpretation of the sentences in (37), or such a strategy is available along with QR out of the *than*-clause but for an independent reason, it is the only option when the quantifier is embedded under another scope bearing element in the *than*-clause.

5 Conclusion

To sum up, the ambiguity observed in comparative conditionals supports the view that the comparative construction contains a degree quantifier. Scope interactions in the comparative construction are constrained by a general constraint on LF movement.

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