Direct Compositionality

Edited by

CHRIS BARKER AND PAULINE JACOBSON

OXFORD
UNIVERSITY PRESS

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Great Clarendon Street, Oxford OX2 6DP

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide in

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Published in the United States
by Oxford University Press Inc., New York

First published 2007

British Library Cataloguing in Publication Data

Data available

Library of Congress Cataloging in Publication Data

Data available

Typeset by SPI Publisher Services, Pondicherry, India
Printed in Great Britain
on acid-free paper by
Biddles Ltd. www.biddles.co.uk

ISBN 978–0–19–920437–3 (Hbk)
ISBN 978–0–19–920438–0 (Pbk)

1 3 5 7 9 10 8 6 4 2

9

Degree Quantifiers, Position of Merger Effects with their Restrictors, and Conservativity

RAJESH BHATT AND ROUMYANA PANCHEVA

9.1 Outline

Degree clauses are arguments of the degree quantifiers *-er* and *as,* yet the dependency is discontinuous. The surface position of the degree clause is not arbitrary, however, but marks the scope of the comparison. In earlier work (Bhatt and Pancheva 2004), we accounted for these facts by proposing that degree quantifiers are composed with their first argument—the degree clause (marked as A in (1))—in a post-quantifier raising (QR) scope position.

(1) [***-er***$_{\mathrm{i}}$***/as***$_{\mathrm{i}}$ (A)] late merger to the QRed *-er/as*

[~~***er***$_{\mathrm{i}}$***/as***$_{\mathrm{i}}$~~ (B)]

We argued that late merger for comparative clauses is motivated by two factors, namely the non-conservative semantics of *-er* and Fox's (2001, 2002) mechanism of interpreting copies of moved expressions. We showed that an early merger of the comparative clause to an in-situ *-er* leads to a contradiction. Thus, late merger is the only option. However, this explanation is not available for equatives. The meaning of *as*, according to the standard definition (cf. (2*a*)) is conservative. Thus, early merger of the equative clause does not lead to a contradiction. We explore the consequences of positing an alternative meaning for *as* in (2*b*). We also consider the contribution of the factor argument of *as*, as in (3).

(2) (*a*) *as* (A)(B) = 1 iff $A \subseteq B$

(*b*) *as* (A)(B) = 1 iff $A = B$

(3) John is *twice* as tall as Tim is.

Finally, we discuss the connection between the conservativity of quantifiers and the position of merger of their restrictors, arriving at the generalization in (4).

(4) Restrictors of non-conservative quantifiers are merged late at the quantifier's scope position.

In exploring the question of why (4) holds, we conclude that conservativity is not a lexical property of quantifiers. Instead it arises as the result of early merger of the quantifier's restrictor and its subsequent interpretation in both the base and scope positions.

9.2 Background: Constituency in Degree Constructions

This section is a brief overview of the arguments in favor of the architecture of degree constructions that we assume. Much of the discussion can be found in Bhatt and Pancheva (2004).

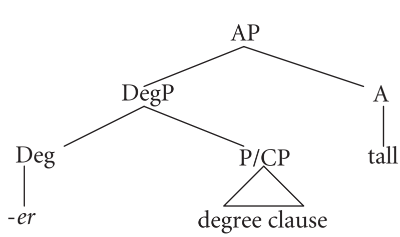
We take the degree clause to be a syntactic argument of the degree quantifier head, and its semantic restrictor. An important motivation for the syntactic analysis comes from the fact that there are selectional restrictions between the degree head and the degree clause, despite the discontinuous dependency. As illustrated in (5), *-er* selects *than*, while *as* selects *as.*

(5) (*a*) *-er* (+ many/much = *more*)/ (+ little = *less*)/ (+ few = *fewer*) . . . *than*

(*b*) *as* (+ many/much/little/few) . . . *as*

Selectional restrictions are the hallmark of head–complement relationships. It is thus reasonable to conclude that the degree clause is the syntactic argument of the degree head, as in the classical analysis in (6) (cf. Chomsky 1965; Selkirk 1970; Bresnan 1973, 1975; Carlson 1977; Heim 2000, among others).

(6)



Another argument for (6) comes from a consideration of semantic constituency, and is as follows: if degrees can be explicitly referred to (cf.(7)), it is also to be expected that they can be quantified over (cf.(8)), just like it happens with individuals. The degree head and the degree clause in (8) form a semantic constituent, a degree quantifier (DegP) argument of the matrix gradable predicate (cf. Cresswell 1976; von Stechow 1984; Heim 1985, 2000, among others). And in fact, Heim (2000) shows that this degree quantifier can take scope independent of the matrix gradable predicate (see her paper for examples and discussion).

(7) John is 6 feet / that (much) tall.

(8) (*a*) John is taller than 6 feet.

(*b*) John is [$_{\mathrm{AP}}$ [$_{\mathrm{DegP}}$ -*er* than 6 ft] tall]

(*c*) [$_{\mathrm{DegP}}$ -*er* than 6 ft]$_1$ John is [$_{\mathrm{AP}}$ t$_1$ tall]

Finally, antecedent-contained deletion (ACD) resolution in degree clauses is best explained by a constituency as in (6) (cf. Wold 1995; Heim 2000). In sentences such as (9), QR of the DegP will allow for ACD resolution. QR of the DP *more trees* is not expected, because this is a weak noun phrase. Extraposition of the degree clause alone will also not account for ACD (see also Larson and May 1990; Fox and Nissenbaum 1999; Fox 2002, for a critique of extraposition as a way of ACD resolution).

(9) John was climbing more trees than Bill was.

Thus, there are good reasons, syntactic and semantic, to analyze degree constructions as involving the constituency in (6). But even though the degree clause is a complement of the degree head, the degree head and the degree clause cannot appear as a constituent.

(10) (*a*) *Ralph is <u>more</u> *than Flora is* tall. vs. Ralph is tall<u>er</u> *than Flora is.*

(*b*) *Ralph is <u>as</u> *as Flora is* tall. vs. Ralph is <u>as</u> tall *as* Flora is.

In other words, if the degree clause is a complement of the degree head, and we assume it is, it must be obligatorily extraposed.

The surface position of the degree clause is not arbitrary, however. Rather, it marks the scope of the comparison (Williams 1974; Gueron and May 1984). In Bhatt and Pancheva (2004), we show that the surface position of the comparative clause is *exactly* as high as the scope of the comparison. This is illustrated in (11). In (11*a*) the degree clause is in the embedded clause, as indicated by the fact that it precedes the rationale clause *to get tenure* and an adjunct to the embedded verb *publish*. Correspondingly, the DegP is in the scope of the matrix verb *require*. When the degree clause is extraposed to the matrix clause (cf. (11*b*)), as indicated by the fact that it follows the rationale clause, the DegP has scope over *require*.

(11) (*a*) John is required [to publish fewer papers this year [than that number] in a major journal][to get tenure].
$\approx$ If John publishes more than a certain number of papers, he will not get tenure. (His university has an unusual tenure policy.)
degree clause is in the embedded clause
simplified LF: *required* [*er* [than n] λd [PRO publish d-few papers]]

(*b*) John is required [to publish fewer papers this year in a major journal] [to get tenure] [than that number].
$\approx$ The number of papers that John has to publish to get tenure is upper-bounded. He can publish more than that number but he doesn't have to.
degree clause is outside the matrix clause
simplified LF: [*er*[than n]] λd [*required* [PRO publish d-few papers]]

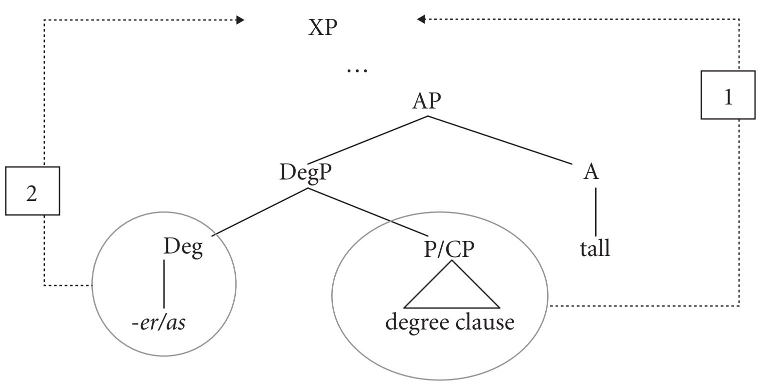
The following example shows that the same facts hold for equatives. The surface position of the *as*-clause determines the scope of the equation.

(12) (*a*) John is required [to publish exactly *as* many papers this year [as that number] in a major journal] [to get tenure].
$\approx$ If John publishes more than a certain number of papers, he will not get tenure. (His university has an unusual tenure policy.)
degree clause is in the embedded clause
simplified LF: *required* [[exactly *as*] [as n] λd [PRO publish d-many papers]]

(*b*) John is required [to publish exactly *as* many papers this year in a major journal] [to get tenure] [as that number].
$\approx$ The number of papers that John has to publish to get tenure is upper-bounded. He can publish more than that number but he doesn't have to.
degree clause is outside the embedded clause
simplified LF: [exactly *as*] [as n] λd [*required* [PRO publish d-many papers]]

The availability of the -*er/as* > *required* reading in (11*b*) and (12*b*) shows that the structure involving a degree abstraction that crosses *required* is semantically well-formed. The absence of this reading in (11*a*) and (12*a*) shows that the scope of -*er/as* is marked exactly by the surface position of the degree clause, that is that the degree quantifier $[_{\text{DegP}}$ -*er than n*$]$/$[_{\text{DegP}}$ *exactly as as n*$]$ cannot move further. The implication for the classical view of degree constructions is that the extraposition of the degree clause is not an independent syntactic fact, unrelated to the interpretation of the construction. Rather, the relation between the degree clause and the degree head has to be re-established, somehow, at LF, with the degree head "seeking" to establish scope at the position where the degree clause is attached. In other words, the derivation must proceed as follows: first the degree clause is extraposed to some position on the right edge of the tree, and then the degree quantifier is QRed to the exact same position.

(13)

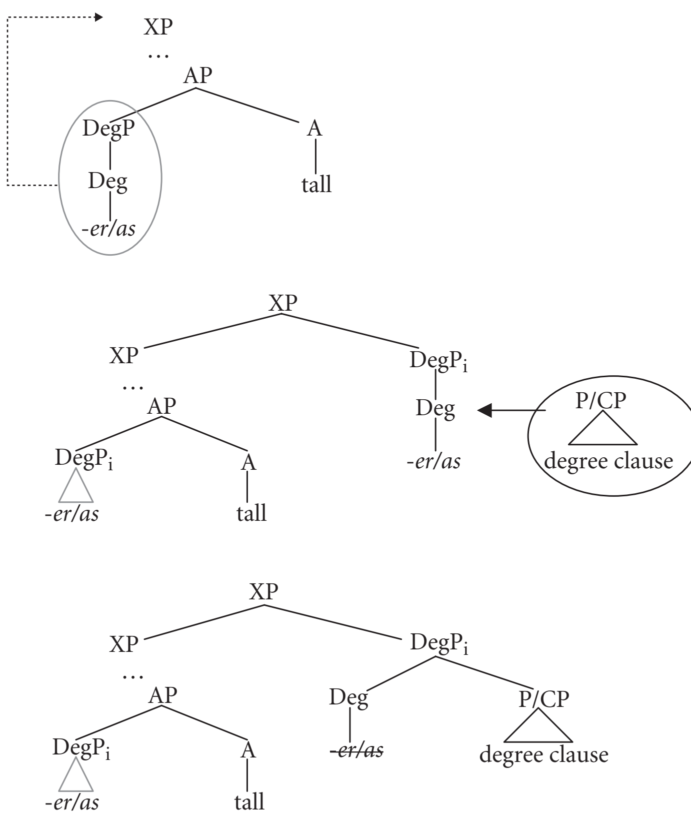


These facts and their interpretation raise several questions. We need to explain why degree clause extraposition is obligatory. Further, why does the surface position of the degree clause completely determine the scope of the degree head? What mechanisms are involved in the derivation of extraposition? More generally, how do syntax and semantics interact in degree-quantificational structures?

9.3 Late Merger

In Bhatt and Pancheva (2004) we proposed that the way to resolve the above issues is to posit that extraposition in degree constructions involves "covert" movement of the degree head to a scope position, followed by late merger of the degree clause to the QRed degree head. The steps of the derivation are illustrated in (14). First, the DegP composed of only the degree head, without a complement, undergoes QR (cf. (14*a*). The QRed DegP adjoins to the right to a suitable XP and is targeted by the degree clause (cf. (14*b*). The degree clause is merged as a complement to the degree head at the scope position and the degree head is pronounced at the base position (cf. (14*c*).

(14) (*a*) (*b*) (*c*)



Evidence that the surface position of the degree clause is the position of its first merge comes from correlations between extraposition and obviation of Condition C effects, extraposition and the scope of the degree head with respect to intensional predicates, ellipsis size and the scope of the degree head, ellipsis size and Condition C effects, and ellipsis resolution and the movability of syntactic material following the degree clause. Here we need not illustrate the details as they can be found in Bhatt and Pancheva (2004).

As for the intellectual debt, the mechanism of late merger to a QRed QP is found in Fox and Nissenbaum's (1999) and Fox's (2002) analysis of relative clause extraposition. The idea of late merger goes back to Lebeaux (1990), who proposed it as a solution to the argument/adjunct distinction with respect to A′-movement reconstruction. A more distantly related idea of quantifiers and their restrictors being introduced separately is found in Sportiche (1997, 1999).

Regarding the mechanism of extraposition, our proposal does not involve any actual movement of the degree clause itself. It is not merged with the degree head and then moved to the right, to its surface position. Instead, the only moving piece is the degree head. Thus we use "extraposition" only as a descriptive term. We do not assume any specialized operation of extraposition.

Regarding the question of why the degree clause may not appear adjacent to the degree head, the answer is twofold. The degree clause does not appear in the base position of the degree head because it is merged late. (Why it has to be merged late, we still need to explain.) The degree head does not appear adjacent to the degree clause, at the edge of the tree, because it is pronounced at the base. In this respect, our analysis relates to what has come to be known as the Phonological Theory of QR (cf. Bobaljik 1995, 2002; Pesetsky 2000, among others). On that approach to QR, QR is covert not in a timing sense but in the sense that it itself does not affect PF. This is because the lower copy of the QR-chain is pronounced, rather than the head of the chain. It still remains to be explained why the degree head needs to be pronounced in the base position. (In the case of other quantifier phrases, overt scrambling of the QP could be thought of as the option where the head of the chain is pronounced.) A suggestion is made in Bhatt and Pancheva (2004) that this is so because the degree head is an adjectival affix and needs to be adjacent to an adjective (thus, in cases of nominal comparison, the adjectival *many/much* is necessary).

Finally, the question of why there is a correlation between the scope of the degree head and the surface position of the degree clause is also partially answered—the degree clause is first merged in the scope position of the degree head. Given that the surface position of the degree clause is the position of its first merge, a prediction is made that the scope of the degree quantifier has to be *at least as high* as the level at which the degree clause is attached. One question that remains to be answered is why the scope of the degree has to be *exactly* as high. That is, why is further covert movement of the DegP, now composed of the degree head and the degree clause, not possible? Such a movement would result in a semantic scope for the DegP that is higher than the overt position of the degree clause. In addition, while the proposal allows for late merger of degree complements, it does not force it. This allows for extraposition but does not derive the fact that degree clause extraposition is obligatory. Therefore, we need a way to force late merger of degree clauses.

9.4 Motivation for Late Merger

9.4.1 *Three Questions and One Answer*

The discussion in the previous section has raised the following three questions. First of all, why is late merger of degree clauses obligatory, that is why are degree clauses obligatorily extraposed? The behavior of degree clauses, in that respect, is quite different from that of relative clauses. A line of work (Lebeaux 1990; Chomsky 1993; Fox 2000; Fox and Nissenbaum 1999) has noted that relative clauses can be merged late. But unlike degree clauses, they do not have to be. Second, why does the surface position of the degree clause *exactly* indicate the LF scope of the degree quantifier? And finally, why is it possible to merge the degree clause late, when it is a complement of the degree head? We know from the literature on late merger that late merger is restricted to adjuncts. The answer to all of these questions arises from an interaction between the semantics of degree heads and the way copies left by movement are interpreted. The generalization in (15) emerges from our discussion.

(15) Restrictors of non-conservative quantifiers are merged late at the quantifier's scope position.

9.4.2 *The Interpretation of Copies and Conservativity*

We make an assumption along the lines of Fox (2001, 2002), that copies of moved quantificational phrases have to be taken into consideration during the calculation of meaning at LF, rather than being converted to simple variables. This results in the interpretation of the restrictor of the quantifier inside the quantifier's scope. The copy of a quantificational expression is modified by two LF operations, Variable Insertion and Determiner Replacement. Variable Insertion adds a free variable into the restriction, which can then be bound by the next link in the movement chain. Determiner Replacement replaces the determiner in question with a uniqueness operator with semantics similar to *the*. The precise operations involved are shown in (16).

(16) *Trace Conversion* (from Fox 2001, 2002)
~~Det Predicate~~ → Det [Predicate $\lambda y\ (y = x)$] → *the* [Pred $\lambda y\ (y = x)$]

In two steps, we go from, for example, an uninterpretable copy of the QRed *every boy* to the interpretable *the boy x*, where *x* is the free variable which is bound by the next link in the movement chain involving *every boy* (cf. 17*b*)).

(17) [every boy]$_i$ [[~~every boy~~]$_i$ danced]

(*a*) not: [every boy] λx [x danced]

(*b*) rather: [every boy] λx [*the* [boy λy (y = x)] danced]
[every boy] λx [*the* λy [boy (y) and y = x)] danced]
[every boy] λx [*the* boy x danced]

If copies are interpreted as simple traces, we get (17*a*), while if copies are interpreted using Trace Conversion we get (17*b*). However, (17*a*) and (17*b*) are only trivially different. Fox (2001) notes that this is so because *every* is conservative, as seemingly all natural language determiners are (cf. Keenan 1981; Keenan and Stavi 1986). Conservativity is defined as in (18): informally, a quantifier is conservative if its second argument can be substituted by the intersection of its first and second arguments. As long as we are dealing with conservative quantifiers, interpreting structures involving QR will yield the same output, whether this is done by treating the copy of the quantifier phrase as a simple trace, or by Trace Conversion. The equivalence is shown in (19) (from Fox 2001).

(18) Q (A) (B) iff Q (A) (A∩B) conservativity

(19) Q(A,B) = Q(A)(A∩B) (by conservativity)
= Q(A)(A∩ [λx : A(x).B(x)]) (by assumptions about Presupposition Projection)
= Q(A)(λx : A(x).B(x)) (by conservativity)
= Q(A)(λx B(the[Ax]))

Fox (2001) further points out that, given this mechanism of trace interpretation, non-conservative quantifiers would only have trivial meanings. A case in point is *only*, which, if it were a determiner, would be non-conservative (cf. (20)). To see that (20*a*) is the case, consider the meaning of, for example, *Only Norwegians danced*, which can be true if and only if the set of dancers is a subset of the set of Norwegians. Correspondingly, *Only Norwegians were Norwegians who danced* is true if and only if the dancing Norwegians are a subset of the Norwegians (cf. (20*b*)). But now, it may be the case that the first statement is false, for example, both Norwegians and Bulgarians danced. It is still the case that the second statement is true, since no other nationality but the Norwegians were Norwegians who danced.

(20) *only* (A) (B) $\not\Leftrightarrow$ *only* (A) (A∩B)

(*a*) *only* (A) (B) = 1 iff B ⊆ A

(*b*) *only* (A) (A∩B) = 1 iff A∩B ⊆ A

When we consider the result of interpreting with Trace Conversion a structure with the putative determiner *only*, we see that the result is a tautology (cf. (21*b*)). On the other hand, a copy interpreted as a simple variable yields a contingency (cf. (21*a*)).

(21) [only Norwegians]$_i$ [[~~only Norwegians~~]$_i$ danced]

(*a*) [only Norwegians] λx [x danced] contingent statement

(*b*) [only Norwegians] λx [the Norwegians x danced] tautology

If we assume that the interpretation of chains involves an operation like Trace Conversion, then it follows that an element with the semantics of *only* cannot be a determiner. This is an important argument in favor of Trace Conversion.

Conservativity is standardly taken to be a lexical property of natural language determiners. Fox's observation opens the door to a line of inquiry which allows us to provide a structural explanation for the conservativity generalization. We explore the extent to which it is possible to tease out the property of conservativity from the lexical meanings of particular determiners and have it follow from the way movement chains are interpreted using Trace Conversion. Our particular extension of Fox's observation involves noting that early merger of the degree clause to non-conservative *-er* leads to a contradiction and that given certain assumptions about the semantics of *as*, it "overrides" a non-conservative meaning of *as*. Thus, in both cases, early merger of the restrictor is incompatible with a non-conservative meaning for the degree quantifier. The exact nature of the incompatibility will be explicated in the course of the discussion.

9.4.3 *The Semantics of* -er *and Position of Merger Effects*

9.4.3.1 *The Meaning of* -er We have noted that the degree clause is best analyzed as the complement of the degree head. The degree head semantically combines first with the degree clause and then with the main clause.

(22) (*a*) [-*er* [degree clause]] [main clause]

(*b*) Bill is taller than Ann is.

(*c*) -*er* [λd [Ann is d-tall]] [λd [Bill is d-tall]]

With the syntax in (22), we need to assign the semantics in (23) to -*er*. This is so, because sets of degrees have the monotonicity property: if the set contains a certain degree, it also contains all the degrees lesser than that degree (cf. (24)).

(23) *-er* (A)(B) = 1 iff $A \subset B$
where, e.g., $[\![A]\!] = \lambda d$ [Ann is d-tall]
$[\![B]\!] = \lambda d$ [Bill is d-tall]

(24) $\forall d \in D_d\ [d \in A \Rightarrow \forall d' \in D_d\ [d' \leq d \Rightarrow d' \in A]]$
where D_d, the domain of degrees, is the set of positive real numbers together with 0.

The meaning assigned to *-er* in (23) makes it non-conservative. *-er* (A) (B) and *-er* (A) (A∩B) are not equivalent. The former is a contingent statement while the latter is a contradiction. To see that this is the case, consider (25). *-er* (A) (B) is true when $A \subset B$ and false otherwise (cf. (25*a*)), as per the definition of *-er*. *-er* (A) (A∩B) is true when its first argument is a proper subset of the second and false otherwise (cf. (25*b*)), again according to the definition of *-er*. However, $A \subset A \cap B$ can never be true. Given that both A and B are sets of degrees, they can have three possible relations—A can be a proper superset of B, A and B can be equal, or A can be a proper subset of B. If the first of these is the case, $A \cap B = B$, but $A \subset B$ is false. If the second is the case, that is $A = B$, their intersection will be equal to both, and $A \subset A \cap B$ will be false since A cannot be a proper set of itself. Finally, if the third relation obtains, and $A \subset B$, the intersection of A and B will be A. But as we just said, $A \subset A$ is false. In sum, *-er* (A) (A∩B) is a contradiction.

(25) *-er* (A) (B) $\not\Leftrightarrow$ *-er* (A) (A∩B)

(*a*)	*-er* (A) (B) = 1	iff	$A \subset B$	contingent
(*b*)	*-er* (A) (A∩B) = 1	iff	$A \subset A \cap B$	contradiction

It is worth noting that we need to assign *-er* non-conservative semantics because of our syntactic assumptions, that is that *-er* first combines with the degree clause and then with the main clause. If the order of composition were to be reversed, then the degree head would in fact come out as conservative. Thus, an alternative degree quantifier *-ER* with the syntax in (26*a*) will have the semantics in (26*b*), requiring its second argument to be a subset of the first. According to (26*b*), *-ER* is conservative (cf. (27)).

(26) (*a*) [*-ER* [main clause]] [degree clause]

(*b*) *-ER* (B) (A) = 1 iff $A \subset B$ where $[\![A]\!] = \lambda d$ [Ann is d-tall]
$[\![B]\!] = \lambda d$ [Bill is d-tall]

(27) *-ER* (B) (A) $\Leftrightarrow$ *-ER* (B) (A∩B)

(*a*)	*-ER* (B) (A) = 1	iff	$A \subset B$	contingent
(*b*)	*-ER* (B) (A∩B) = 1	iff	$A \cap B \subset B$	contingent

To see that the equivalence in (27) holds, first let us assume that -*ER* (B) (A) is true, that is A ⊂ B, following the definition of -*ER*. But if A ⊂ B, then A ∩ B = A. This means that -*ER* (B) (A∩B) is also true: according to the meaning of -*ER*, its second argument has to be a proper subset of its first argument and this is the case since A∩B = A and A ⊂ B. Thus, when -*ER* (B) (A) is true, so is -*ER* (B) (A∩B). Now let us assume that -*ER* (B) (A∩B) is true, that is following the definition of -*ER*, A∩B ⊂ B. Given the properties of degree sets we know that either A⊆ B or B ⊆ A. This means that A ⊂ B, which then means that -*ER* (B) (A) is true. In other words, we have shown that the equivalence in (27) holds, that is that -*ER* is conservative.

The conclusion of this discussion is that whether a particular relationship between two sets yields a conservative quantifier or not depends upon the syntax of the quantifier, that is which set counts as the restrictor and which as the nuclear scope. We will return to this point later, when we propose that conservativity is not a lexical property of quantifiers, but is derived on the basis of the interaction between their lexical meaning and syntax. For now, we just note that we take the arguments in §9.2 above to be sufficient to justify a conclusion that the comparative quantifier is -*er* rather than -*ER*.

9.4.3.2 *The Consequences of Early and Late Merger* If the *than*-clause is merged to the degree head -*er* in situ, QR would create a structure where the *than*-clause has to be interpreted twice—once as a restrictor of -*er* (in the head of the A′-chain created by QR) and for a second time inside the second argument of -*er* (see (28)).

(28) *Early merger* (to the in-situ -*er*)

(*a*) [-*er* [than Ann is tall]]$_i$ [Bill is [~~-er [than Ann is tall]~~]$_i$ tall]

(*b*) -*er* [λd [Ann is *d*-tall]] [λd [Bill is [*the* [[λd [Ann is d-tall]] λd$_1$ (d$_1$ = d)] tall]]]

(*c*) -*er* (A) [λd [Bill is [*the* [A λd$_1$ (d$_1$ = d)] tall]]]

(*d*) **-*er* (A) (A∩B)**

If, on the other hand, the -*er*-clause is merged late, after the degree head -*er* has already undergone QR, there will be no copy of the restrictor of -*er* to interpret inside the second argument of -*er* (see (29)).

(29) *Late merger* (to the QRed *-er*)

(*a*) [*-er*$_i$ [than Ann is tall]] [Bill is ~~-er~~$_i$ tall]

(*b*) *-er* [λd [Ann is d-tall]] [λd [Bill is *the* [λd_1 (d_1 = d)] tall]]

(*c*) *-er* (A) [λd [Bill is d-tall]]

(*d*) ***-er* (A) (B)**

Clearly, given the meaning of *-er* in (23), the result of early merger (28*d*) (= (30*a*)) is a contradiction. We discussed this above in connection with (25*b*). Thus, only late merger, as in (29*d*) (=(30*b*)), can yield a contingent meaning for comparatives.

(30) (*a*) *-er* (A) ($A \cap B$) = 1 iff $A \subset A \cap B$ contradiction

(*b*) *-er* (A) (B) = 1 iff $A \subset B$ contingent

We thus have an answer to the first question posited in §9.4.1—why do comparative clauses have to be merged late. We have shown that, given the non-conservative semantics of *-er*, early merger of the degree clause would lead to a contradictory meaning. We next discuss the second question—can the DegP move, after the comparative clause has been merged to the comparative head in a scope position?

9.4.3.3 *Can* -er *and the Degree Clause Move Together, After Late Merger* Above we saw that the semantics forces obligatory late merger of the comparative clause, or in other terms "obligatory extraposition". But the question of whether the *-er* and the degree clause can move covertly further from the point of late merger remains unanswered. If such further movement were allowed, the scope of the comparison would not correspond to the surface position of the comparative clause.

It turns out that exactly the same logic that forces late merger of the degree clause also blocks any movement of *-er* with the degree clause. Such a movement would re-create the problem with early merger because it would leave a copy of the degree clause behind. That is, we would need to interpret the degree complement of *-er* in two locations, one of them a copy, leading to the contradiction in (31*c*).

(31) (*a*) [$_{\text{DegP}}$ *-er*$_i$ (A)] [~~-er~~$_i$ (B)] late merger

(*b*) [$_{\text{DegP}}$ *-er*$_i$ (A)]$_j$ [~~[DegP -er$_i$ (A)]~~$_j$ [~~-er~~$_i$ (B)]]
QR of *-er* and its restrictor

(*c*) ***-er* (A) ($A \cap B$)**

In sum, the same interpretive reasons are behind both the obligatory late merger of the comparative clause and its subsequent "freezing" in place, resulting in an *exactly as high as* correlation between scope of *-er* and the surface position of the comparative clause.

9.5 The Semantics of *as* and Position-of-Merger Effects

9.5.1 *The Standard Meaning of* as

The non-conservative meaning of *-er*, coupled with the mechanism of interpreting copies of moved QPs that requires the copy of the restrictor to the Q to be interpreted intersectively with the second argument of Q, yields the desired results regarding comparative clause "extraposition". However, the analysis would not carry over to equative *as*. According to the standard meaning, *as* means "*at least as*" (as in (32)). The semantics for *as* is posited to be as in (32), because a sentence such as (33) can mean that Bill is at least as tall as Ann is, that is that the set of degrees to which Ann is tall is a subset of the set of degrees to which Bill is tall.

(32) *as* (A) (B) = 1 iff $A \subseteq B$

(33) (*a*) Bill is as tall as Ann is.

(*b*) -*as* [λd [Ann is d-tall]] [λd [Bill is d-tall]]

Now, the meaning in (32) makes *as* conservative. Examples (34*a*, 34*b*) hold according to the definition of *as*. But $A \subseteq A \cap B$ is true if and only if $A \subseteq B$.

(34) *as* (A) (B) ⇔ *as* (A) ($A \cap B$)

(*a*)	*as* (A) (B) = 1	iff	$A \subseteq B$	contingent
(*b*)	*as* (A) ($A \cap B$) = 1	iff	$A \subseteq A \cap B$	contingent

Because the equivalence in (34) holds, both an early and late merger of the equatives clause would yield equivalent contingent statements.

(35) *Early merger* (to the in-situ *as*)

(*a*) [*as* [as Ann is tall]]$_i$ [Bill is [~~*as* [as Ann is tall]~~]$_i$ tall]

(*b*) *as* [λd [Ann is d-tall]] [λd [Bill is [*the* [[λd [Ann is d-tall]] λd_1 (d_1 = d)] tall]]]

(*c*) *as* (A) [λd [Bill is [*the* [A λd_1 (d_1 = d)] tall]]]

(*d*) ***as* (A) ($A \cap B$)**

(36) *Late merger* (to the QRed *as*)

(*a*) [*as*$_i$ [as Ann is tall]] [Bill is ~~*as*~~$_i$ tall]

(*b*) *as* [λd [Ann is d-tall]] [λd [Bill is *the* [λd_1 (d_1 = d)] tall]] (*c*) *as* (A) [λd [Bill is d-tall]]

(*d*) ***as*** **(A) (B)**

The degree complement of *as* obligatorily appears discontinuous from *as* just as the degree complement of *-er* obligatorily appears discontinuous from *-er*. Our explanation for this obligatory extraposition in the case of *-er* appealed to the non-conservative semantics of *-er*. If *as* has conservative semantics, we cannot extend this conservativity-based explanation to account for the similar obligatory extraposition found with the degree complement of *as*.

9.5.2 *Factorizing* as

So far we have considered equatives without a factor argument. By factor argument, we refer to the multiplier that can optionally appear in equatives. The factor argument is analogous to the differential argument of a comparative.

(37) (*a*) Ann is *twice* as tall as Sue is.

(*b*) Ann is *two cm* taller than Sue is.

Adding a factor argument makes an interesting difference. For any value of the factor argument that is greater than one, the augmented degree quantifier comes out as non-conservative. We take (38) to represent the general case of an equative with a factor argument. Example (32), where a factor argument is not present, falls out as a special case of (38), with the factor argument set to 1, and the assumption that degree sets have the monotonicity property (cf. (24)).[1]

(38) $n \times as\ (\mathrm{A})\ (\mathrm{B}) = 1 \quad \text{iff} \quad n \times Max\ (\mathrm{A}) \leq Max\ (\mathrm{B})$,
where $Max\ (\mathrm{A}) = \iota \mathrm{d}\ [\mathrm{d} \in \mathrm{A} \wedge \forall \mathrm{d}'[\mathrm{d}' \in \mathrm{A} \Rightarrow \mathrm{d}' \leq \mathrm{d}]]$

We know that *Max* (A) is always greater than or equal to *Max* (A $\cap$ B). As long as *Max* (A) is not equal to zero, it follows that for any $n > 1$, $n \times Max$ (A) must be greater than *Max* (A$\cap$B). In other words, (39*b*) is a contradiction. The augmented equative quantifier $n \times$ *as* is not conservative.

[1] The definition in (38) has been formulated with the plausible assumption that degree sets are closed intervals. It does not work for open intervals. If we also want to consider open intervals, we need the more complex definition of *Max* in (i):

(i) $Max\,(\mathrm{A}) = \iota \mathrm{d}\ \forall\ \mathrm{d}'\ [\mathrm{d}' < \mathrm{d} \Rightarrow \mathrm{d}' \in \mathrm{A}]\ \wedge \forall\ \mathrm{d}''\ [\mathrm{d}'' \in \mathrm{A} \Rightarrow \mathrm{d} \geq \mathrm{d}'']$

One consequence of this definition is that (32) does not fall out as a special case of (38) with the factor argument set to 1. The two definitions diverge when the two degree arguments of *as* are degree sets that differ at a single point. This is because *Max* returns the value *n* both when applied to the open interval A = 0 . . .) n and when applied to the closed interval B = 0 . . . n). As a result *as* (1)(A)(B) = *as* (1)(B)(A) = 1. But according to the earlier definition of *as*, *as* (B)(A) = 0, while *as* (A)(B) = 1. This special case aside, the two definitions return identical results.

(39) $n \times as$ (A) (B) $\not\Leftrightarrow$ $n \times as$ (A) (A ∩ B) for $n > 1$

(*a*) $n \times as$ (A) (B) = 1 iff $n \times Max$ (A) ≤ Max (B) contingent

(*b*) $n \times as$ (A) (A∩B) = 1 iff $n \times Max$ (A) ≤ Max (A∩B) contradiction

Therefore, only late merger of the equatives clause would yield a contingent statement. Early merger would result in a contradiction.

(40) (*a*) $[_{\text{DegP}}$ *twice as* [as Ann is tall]$]_{\text{i}}$ [Bill is ~~$[_{\text{DegP}}$ *twice as* [as Ann is tall]]~~$_{\text{i}}$ tall] early merger

(*b*) ***twice as* (A) (A ∩ B)**

(41) (*a*) $[_{\text{DegP}}$ *twice as*$_{\text{i}}$ [as Ann is tall]] [Bill is ~~*twice as*~~$_{\text{i}}$ tall] late merger

(*b*) ***twice as* (A) (B)**

For equatives with the factor argument > 1, just as for comparatives, we have an explanation for why the degree clause is obligatorily discontinuous from the degree quantifier—it is obligatorily merged late, given that an early merger will yield a contradictory LF.

It remains to be explained why late merger is obligatory for equatives without a factor argument (i.e. $n = 1$) or with factor arguments less than one. Let us therefore examine the conservativity properties of such equatives. Consider (42).

(42) Bill is (*half*) as tall as Ann is.

When the factor argument of the equative is less than or equal to 1, the resulting augmented degree quantifier is conservative.

(43) $n \times as$ (A) (B) ⇔ $n \times as$ (A) (A ∩ B) for $n \leq 1$

(*a*) $n \times as$ (A) (B) = 1 iff $n \times Max$ (A) ≤ Max (B)

(*b*) $n \times as$ (A) (A ∩ B) = 1 iff $n \times Max$ (A) ≤ Max (A ∩ B)

(*c*) $n \times Max$ (A) ≤ Max (A ∩ B) iff $n \times Max$ (A) ≤ Max (B)

To see this, let us first assume that the left-hand side of (43*c*) is true, namely, that $n \times Max$ (A) ≤ Max (A ∩ B). A and B are sets of degrees, with the property in (24). Therefore one of the following two situations holds: (i) A ⊆ B or (ii) B ⊂ A. If A ⊆ B, then Max (A) ≤ Max (B). It follows for any $n \leq 1$ that $n \times Max$ (A) ≤ Max (B). If B ⊂ A, then A ∩ B = B and it follows directly from $n \times Max$ (A) ≤ Max (A ∩ B) (the left-hand side in (43*c*)) that $n \times Max$ (A) ≤ Max (B). Now let us assume that the right-hand side in (43*c*) is true. Once again, one of the following two situations holds: (i) A ⊆ B or (ii) B ⊂ A. If A ⊆ B, then

$A \cap B = A$. For any $n \leq 1$, $n \times Max\ (A) \leq Max\ (A)$, and hence $n \times Max\ (A) \leq Max\ (A \cap B)$, that is the left-hand side follows. If $B \subset A$, then $A \cap B = B$. The left-hand side now follows directly from the right-handside.

To sum up, the result of taking the factor argument into consideration is that for factors greater than 1, the augmented degree quantifier is not conservative, whereas for factors less than or equal to 1, the resulting augmented quantifier is conservative.

The conservativity of the equative degree quantifier for values of the factor argument less than or equal to 1 means that we cannot straightforwardly extend to these equatives the conservativity-based argument developed to force obligatory extraposition. But as has been noted earlier, these equatives do not differ from other equatives and comparatives in the relevant aspects—obligatory extraposition and the surface position of the degree clause marking the scope of the comparison/equation. We therefore consider two strategies, which are not mutually exclusive, to account for obligatory extraposition of degree complement of *as.*

The first approach is based on the intuition that the syntactic system is not dependent upon the meanings of particular numerals involved in a particular derivation.[2] Under this approach, the fact that certain values of the factor argument block early merger of the degree complement of *as* is enough to block early merger of the degree complement in the general case. The degree quantifier itself consists of *as* together with its factor argument—this is the syntactic object that moves covertly. Depending upon the actual value of the factor argument, the resulting degree quantifier may or may not be conservative. But this information is not accessible to the syntactic system and early merger is ruled out. An unresolved puzzle here is why the syntactic system picks the late merge option in the case of indeterminacy. One plausible explanation, but one which requires some "intelligence" on the part of the syntactic system, is that late merger is the safe option in case of indeterminacy. If the quantifier in question turns out to have inherently conservative semantics, late merger will do no harm, but if the quantifier turns out to have non-conservative semantics, late merger is the only option. Early merger would lead to a contradiction. In our discussion of late merger of the complement of -*er*, we had noted that since early merge of the complement led

[2] A similar insight is explored by Fox (2000: 66–74) in the context of Scope Economy. He notes that certain cases of scopally commutative quantifiers are treated by the syntactic system as scopally non-commutative. In these cases, proving scopal commutativity requires making reference to the arithmetic properties of the expressions involved, such as the meaning of expressions like *even/odd*, as well as the meanings of particular numerical expressions. He hypothesizes that such information is unavailable to the syntactic system.

to a contradiction, late merger was forced. But this left open the possibility of a derivation where the degree complement is merged early but the derivation is ruled out because after QR, it has contradictory semantics. The discussion from equatives suggests a more constrained picture. Early merger of degree complements is just not syntactically available. If it was available in principle and was constrained only by semantic convergence, we would expect equatives with factor argument less than or equal to one to allow for early merger. We will return to the architectural commitments that this way of thinking imposes in §§9.6 and 9.7.

The second approach we consider entertains a different meaning for *as*—an "*exactly as*" meaning as opposed to the more commonly assumed "*at least as*" meaning. The "*exactly as*" meaning is non-conservative and we observe that such a meaning is incompatible with early merger. If the degree complement of an *as* with an "*exactly as*" meaning is merged early, then the "*exactly as*" meaning does not survive. What we end up with is an "*at least as*" meaning.

9.5.3 *Another Meaning for* as

We have worked so far with the standard weak ("*at least as*") meaning as the basic meaning of *as*. This meaning yields a conservative quantifier (unless the factor argument is greater than 1). Alternatively we could consider another meaning as the basic meaning of *as*. Note that we do not know, a priori, what the semantic content of *as* is. We only know what equatives sentences mean, and based on that, we can extrapolate the lexical meaning of *as*.

Equative sentences have a strong ("*exactly as*") and a weak ("*at least as*") interpretation exemplified in (44) and (45*a*, 45*b*). An utterance such as (44) can be countered by (45*a*), or confirmed by (45*b*), illustrating the two readings of the equative (e.g. Horn 1972, 2001; Klein 1980).

(44) (I think that) Bill is *as* tall as Ann is.

(45) (*a*) No, he is not, he is taller. ("*exactly as*")

(*b*) Yes, in fact I know he is taller. ("*at least as*")

Traditional and more recent scalar implicature accounts (e.g. Horn 1972, 2001; Klein 1980; Chierchia 2004; Kratzer 2003) assign *as* a weak ("*at least as*") semantic content and derive the strong reading as a pragmatic effect, given that the two readings are scalarly ordered, and based on the (neo-) Gricean assumption that speakers make the most informative contribution possible (cf. (46)).

(46) *Grice (1968)'s Category of Quantity and its two maxims:*

1. Make your contribution as informative as is required (for the current purposes of the exchange).
2. Do not make your contribution more informative than is required.

The calculation of the meaning of an equative, according to this type of approach, is done as follows. The equative sentence is less informative than the corresponding comparative (cf. (47)). The equative is true in case Bill is of the same height as Ann or is taller than her; the comparative is true only in the latter case.

(47) Bill is *as* tall as Ann is. $\ll_{\text{informative}}$ Bill is tall*er* than Ann is.

The semantics of the equative is as in (48*a*). Example (48*b*) is a pragmatic inference, as if the stronger assertion in (47) were true, the speaker would have made it. Example (48*c*) follows from (48*a*) and (48*b*).

(48) Bill is *as* tall as Ann is.

(*a*)	Bill is *at least as* tall as Ann is.	semantic content
(*b*)	Bill is not taller than Ann is.	pragmatic inference
(*c*)	Bill is *exactly as* tall as Ann is.	pragmatic inference

As we noted above, the lexical meaning of *as* is not directly observable. The strategy in the above approach is to posit the weak meaning as basic and derive the strong one as a scalar implicature. The other alternative is to posit the strong meaning as basic and derive the weak one through some independently needed mechanism. We explore this other alternative, where *as* has strong lexical meaning, as in (49) and where the weak reading is derived from the strong reading.

(49) *as* (A) (B) = 1 iff A = B

In fact, something other than scalar implicature seems to be needed to account for scalar readings, on independent grounds. Fox (2003) notes a problem with the scalar implicature accounts. Given the pattern of reasoning that generates the strong reading of *as* as a scalar implicature from the weak reading of *as*, what blocks the reasoning in (51)? As indicated in (50), an "*as*" equative is less informative than an "*exactly as*" equative. Because of this, on Gricean principles, (51) would assert the weak "*at least as*" reading and also trigger the pragmatic inference that the more informative "*exactly as*" reading is not available. But then, as follows from (51*a*) and (51*b*), the inference is drawn that the corresponding comparative is true. The logic is exactly as in (47)–(48), but the result here is undesirable.

(50) Bill is *as* tall as Ann is. $\ll_{\text{informative}}$ Bill is *exactly as* tall as Ann is.

(51) Bill is *as* tall as Ann is.

(*a*) Bill is *at least as* tall as Ann is. semantic content

(*b*) Bill is not exactly as tall as Ann is. pragmatic inference

(*c*) Bill is tall*er* than Ann is. pragmatic inference

Adopting a strong meaning for *as* eliminates the problem raised by (51). Importantly for our purposes, the new meaning of *as* also makes it non-conservative (cf. (52)). It is easy to see that this is the case:

(52) $\textit{as}\ (\mathrm{A})\ (\mathrm{B}) \not\Leftrightarrow \textit{as}\ (\mathrm{A})\ (\mathrm{A} \cap \mathrm{B})$

(*a*) $\textit{as}\ (\mathrm{A})\ (\mathrm{B}) = 1$ iff $\mathrm{A} = \mathrm{B}$

(*b*) $\textit{as}\ (\mathrm{A})\ (\mathrm{A} \cap \mathrm{B}) = 1$ iff $\mathrm{A} = \mathrm{A} \cap \mathrm{B}$

(*c*) $\mathrm{A} = \mathrm{A} \cap \mathrm{B}$ iff $\mathrm{A} \subseteq \mathrm{B}$

Now, at least we have a common way of characterizing all cases of late merger: they all involve restrictors of (atomic) non-conservative quantifiers, that is *-er* and *as*.

At this point let us also consider the case of equatives with a factor argument. Their reformulated semantics is shown in (53).

(53) $n \times \textit{as}\ (\mathrm{A})\ (\mathrm{B}) = 1$ iff $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{B})$

The conservativity/non-conservativity of the resulting degree quantifier depends upon the value of the factor argument. In case the factor argument is ≥ 1, the derived quantifier is non-conservative. If the factor argument is <1, the derived quantifier is conservative.

(54) $n \times \textit{as}\ (\mathrm{A})\ (\mathrm{B}) \not\Leftrightarrow n \times \textit{as}\ (\mathrm{A})\ (\mathrm{A} \cap \mathrm{B})$ for $n \geq 1$
$n \times \textit{as}\ (\mathrm{A})\ (\mathrm{B}) \Leftrightarrow n \times \textit{as}\ (\mathrm{A})\ (\mathrm{A} \cap \mathrm{B})$ for $n < 1$

(*a*) $n \times \textit{as}\ (\mathrm{A})\ (\mathrm{B}) = 1$ iff $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{B})$

(*b*) $n \times \textit{as}\ (\mathrm{A})\ (\mathrm{A}\cap\mathrm{B}) = 1$ iff $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{A} \cap \mathrm{B})$

(*c*) $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{A} \cap \mathrm{B})$ iff $n = 1$ and $\mathrm{A} \subseteq \mathrm{B}$, or
$n < 1$ and $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{B})$

We consider the $n < 1$ case first. Assuming a non-empty A, and the fact that A and B have the monotonicity property $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}\ (\mathrm{B})$ can only be true if $\mathrm{B} \subset \mathrm{A}$. If $\mathrm{B} \subset \mathrm{A}$, then $\mathrm{A} \cap \mathrm{B} = \mathrm{B}$, and it follows that $n \times \textit{Max}\ (\mathrm{A}) = \textit{Max}$

($A \cap B$). Similarly, $n \times Max$ (A) = Max ($A \cap B$) can only be true if $A \cap B \subset A$. If $A \cap B \subset A$, then $B \subset A$, then $n \times Max$ (A) = Max (B). Hence for $n < 1$, *as* with strong semantics is conservative.

Next, let us consider the $n > 1$ case. Here we find that for non-empty A, $n \times as$ (A) (B) is a contingent statement while $n \times as$ (A) ($A \cap B$) is a contradiction. The latter is a contradiction, because $n \times Max$ (A) = Max ($A \cap B$) can be true if and only if Max (A) < Max ($A \cap B$). However, since $A \supseteq A \cap B$, Max (A) $\geq$ Max ($A \cap B$). In other words, for $n > 1$, *as* with strong semantics is not conservative.

Before we go on to the $n = 1$ case, it is worth noting that so far the switch from a weak semantics for *as* to a strong semantics for *as* has not had any impact on the conservativity properties of the degree quantifiers in question. Irrespective of the semantics we adopt, when the factor argument is less than 1, the resulting degree quantifier is conservative and when the factor argument is greater than 1, the resulting degree quantifier is not conservative.

The distinctions between the weak semantics and the strong semantics for *as* become visible when we consider the case where the factor argument is equal to 1. In this case, $n \times as$ (A) (B) reduces to A = B, and $n \times as$ (A) ($A \cap B$) reduces to $A = A \cap B$, which in turn is equivalent to $A \subseteq B$. These statements are both contingent and they are not equivalent. Thus, with the strong semantics and the factor argument set to 1, *as* is not conservative, whereas with weak semantics and a factor of 1, *as* comes out as conservative.

Interestingly, the non-conservativity of *as* with a strong meaning and a factor of 1 has different effects than the non-conservativity of *as* with the factor argument greater than 1. When n is greater than 1, $n \times as$ (A) ($A \cap B$)—which corresponds to the early merge structure—is a contradiction. This rules out early merger, that is it forces obligatory "extraposition". In contrast, when n is equal to 1, $n \times as$ (A) ($A \cap B$), the output of the early merge structure, is not a contradiction—instead it is a contingent statement equivalent to $A \subseteq B$, the weak semantics for *as*. As a result, we cannot directly appeal to interpretation in this particular case to block early merger. Early merger yields a contingent statement, but one where the strong lexical meaning of *as* is "lost".

To sum up, adopting a strong semantics for *as* does not help to derive the prohibition against early merge in the $n \leq 1$ cases. Nothing at all changes for the $n < 1$ case, which remains conservative, while with $n = 1$, we get non-conservativity but it does not by itself block early merger. Nevertheless, if we allow for early merger of the degree complement of an *as* with strong semantics and degree argument set to one, we get the curious result that after

QR, we end up with a conservative quantifier with the semantics associated with the weak reading of *as.* In other words, early merger would override the non-conservative meaning. We speculate that late merger is motivated by the need to express non-conservative meanings which could not be expressed if early merge was obligatory.

Of course, the above motivation from non-conservative semantics for late merger does not extend to the cases of *as* with factor argument less than one which have been shown to have conservative semantics even if we assume a strong semantics for *as*. Setting aside temporarily the question of what blocks early merger in the $n < 1$ cases, let us consider one potential consequence of adopting a strong semantics for *as* in the context of our overall proposal for degree constructions.

9.5.4 *The Syntactic Account of the Scalar Interpretation of Equatives*

One consequence of adopting a strong semantics for *as* together with our overall proposal is that it suggests a way to derive the scalar interpretations of equatives in the syntax. Late merger of the equatives clause straightforwardly yields the strong "*exactly as*" reading of equatives, and early merger would yield the weak "*at least as*" reading, under the new definition of *as* as "*exactly as*".

(55) (*a*) $\textit{as}\,(A)\,(A \cap B) = 1$ iff $A = A \cap B$ iff $A \subseteq B$ "*at least as*" reading

(*b*) $\textit{as}\,(A)\,(B) = 1$ iff $A = B$ "*exactly as*" reading

However, early merger of the degree complement of *as* seems to not be actually available as shown by the obligatory "extraposition" of the equative clause. An alternative is to explore the idea that the weak readings of equatives arise through late merger of the degree clause, followed by short QR of the degree quantifier $[_{\text{DegP}}\ \textit{as}\ (A)]$ (see (56*a*, 56*b*)). This movement creates a structure analogous to the early merger structure, and hence yields a weak reading (see (56*c*)).

(56) (*a*) $[_{\text{DegP}}\ \textit{as}_i\ (A)\ ]\ [\ \cancel{\textit{as}}_i\ (B)]$ late merger

(*b*) $[_{\text{DegP}}\ \textit{as}_i\ (A)\ ]_j\ [\cancel{[_{\text{DegP}}\ \textit{as}_i\ (A)\ ]}_j\ [\ \cancel{\textit{as}}_i\ (B)]]$ QR of *as* and its restrictor

(*c*) $\boldsymbol{\textit{as}\ (A)\ (A \cap B)}$ "*at least as*" reading

A possible argument in support of the syntactic account for the scalar interpretations of equatives could come from ellipsis. It has been noted that the ellipsis site and its antecedent need to satisfy a Parallelism condition. Thus the following example is only two ways (and not four ways) ambiguous (from Fox 2000).

(57) A boy admires every teacher. A girl does, too <admire every teacher>.

(*a*) a boy > every teacher, a girl > every teacher

(*b*) *a boy > every teacher, every teacher > a girl

(*c*) *every teacher > a boy, a girl > every teacher

(*d*) every teacher > a boy, every teacher > a girl

The explanation for the absence of the readings in (57*b*, 57*c*) is based on the idea that ellipsis is only possible when the scopal relations in the ellipsis site and the antecedent are isomorphic. If isomorphism does not extend to the domain of implicature, we could use the disambiguation found in elliptical contexts as a probe into whether we are dealing with two independent structures/meanings or an instance of implicature. If there are two independent structures/meanings, we would expect to find disambiguation along the lines of (57). Otherwise if we have implicature, we might expect four-way ambiguity. So if the two readings of *John has three daughters* involve two distinct structures, we expect (58) to be two ways ambiguous, while if one of the readings is an implicature of the other, we would expect, in principle, that (58) could be four ways ambiguous.

(58) John has three daughters. Bill does, too.

(*a*) Reading 1: (exactly three, exactly three)
Background: one needs to have exactly three children to get a tax break.
John has exactly three daughters. Bill has exactly three daughters, too.

(*b*) *Reading 2: (exactly three, at least three)
Background: one needs to have exactly three children to get a tax break.
(58) cannot be true if John has three daughters and Bill has four daughters.

(*c*) *Reading 3: (at least three, exactly three)
Background: one needs to have at least three children to get a tax break.
If Reading 3 was available, we could take (58) to be false when John has three daughters but Bill has four.

(*d*) Reading 4: (at least three, at least three)
Background: one needs to have at least three children to get a tax break.
John has four children and Bill has five children.

The judgments in (58) are subtle because it is not easy to separate out the "*exactly n*" reading from the "*at least n*" reading without the additional contextual support indicated in (58). With the additional contextual support indicated, it seems that we do get disambiguation. The experiment in (58) can be replicated with equatives in (59) and once we set up similar contextual assumptions, with similar results. For example, in (59) to get Ian's role in a play, one might need to be exactly as tall as Ian. This would favor the *exactly as* reading. On the other hand, Ian might be a window-cleaner and to get his job, one might need to be at least as tall as him. This would favor the *at least* reading.

(59) Bill is as tall as Ian is and Chris is too.

(*a*) Bill is exactly as tall as Ian is and Chris is exactly as tall as Ian is.

(*b*) Bill is at least as tall as Ian is and Chris is at least as tall as Ian is.

(*c*) Bill is at least as tall as Ian is and Chris is exactly as tall as Ian is.

(*d*) Bill is exactly as tall as Ian is and Chris is at least as tall as Ian is.

(60) (*a*) Bill is [*as*$_i$ [as Ian is tall]][~~Bill~~ ~~*as*~~$_i$ tall] and Chris is Δ

(*b*) Bill λx [*as*$_i$ [as Ian is tall]][x ~~*as*~~$_i$ tall] and
Chris λx [*as*$_i$ [as Ian is tall]] [x ~~*as*~~$_i$ tall]

(61) (*a*) Bill is [*as*$_i$ [as Ian is tall]]$_j$[~~[*as*i [as Ian is tall]]j~~ [~~Bill~~ ~~*as*~~$_i$ tall]] and
Chris is Δ

(*b*) Bill λx [*as*$_i$ [as Ian is tall]]$_j$ [~~[*as*i [as Ian is tall]]j~~ [~~x~~ ~~*as*~~$_i$ tall]] and
Chris λx [*as*$_i$ [as Ian is tall]]$_j$ [~~[*as*i [as Ian is tall]]j~~ [~~x~~ ~~*as*~~$_i$ tall]]

As in (58), the judgments are subtle but we do seem to get disambiguation. This would seem to support the ambiguity hypothesis. But we think that the facts from disambiguation do not by themselves lend unequivocal support to the ambiguity hypothesis. They would do so if we could keep the background assumptions in the two conjuncts independent. In the examples at hand, the contextual assumptions in both conjuncts are the same. When they favor an *exactly* reading (as in the *a*/*b* examples), we get an *exactly* reading, and when they favor an *at least* reading (as in the *c*/*d* examples), we get an *at least* reading. Since there is a plausible implicature-based explanation of the disambiguation pattern, the disambiguation facts are ultimately compatible with either account.

Independently of the evidence from ellipsis, we note that if the strong and the weak readings of equatives are represented by two syntactic structures which differ along the lines we are suggesting, that is late merger vs. late merger followed by short QR, it will be in general (the problematic case of ellipsis discussed above aside) difficult to isolate empirically these two structures, as the weak reading is always only a step or short QR of the quantifier $[_{\text{DegP}}$ *as* (A)] away. Short QR of $[_{\text{DegP}}$ *as* (A)] is expected to have no effect on scopal interpretation, as the $[_{\text{DegP}}$ *as*] is already in its scope position when the degree clause is merged.

Deriving weak readings from short QR of *as* with the degree clause faces a potential challenge. To derive the weak reading from the strong reading, we assume short QR of the degree quantifier that consists of the degree head *as* and its degree complement. But because of the correlation between the surface position of the degree clause and the scope of the degree head (cf. 10), we need to block long QR of the degree quantifier that consists of the degree head *as* and its degree complement. It is potentially problematic to block long QR of the degree quantifier but still allow for short QR. In our basic proposal, early merger and further QR of the degree quantifier are both blocked by the non-conservative semantics of -*er*. We wish to appeal to the non-conservative semantics to block early merger of the degree complement of *as*. But then, further QR of the degree quantifier is also blocked. One way out of this quandary is to note that short QR and long QR have distinct formal properties. For example, while long QR is subject to the Principle of Scope Economy formulated in Fox (2000), short QR is not. In general, short QR seems to be an option that is always freely available. This distinction between short and long QR helps sustain the viability of the approach that derives the weak reading from the strong reading via short QR while still disallowing long QR. In what follows, the choice between weak and strong semantics is not directly relevant and so, having explored the implications of a strong semantics for *as*, we will stay agnostic for the rest of this paper on the question of what the right semantics for *as* is.

To sum up, we have considered two motivations for late merger of the degree complements of *as*: indeterminacy with respect to conservativity induced by the factor argument and a strong semantics for *as*. These two motivations are not mutually exclusive. The strong semantics motivation only applies to the case where the factor argument is equal to one. When the factor argument *n* is less than one, the [*n as*] quantifier has conservative semantics irrespective of what semantics for *as* we choose. Since the facts remain the same irrespective of the value of the factor argument, we need to appeal to the motivation from indeterminacy no matter what semantics we adopt for *as*.

9.6 Early Merger, Late Merger, and (Non-)Conservativity

Comparative -*er* has non-conservative semantics, and the conservativity of the combination of *as* and its factor argument depends upon the value of the factor argument. Both have their restrictors merged late. Early merger of the degree clause to *-er* yields a contradiction. Early merger of the degree clause to *as*, assuming strong semantics and factor argument equal to 1, would "override" the non-conservative lexical meaning of *as*, and would yield a conservative interpretation for *as* ("*at least as*").

(62) (*a*) *as* (A) ($A \cap B$) = 1 iff $A = A \cap B$ strong "*exactly as*" lexical meaning
(*b*) $A = A \cap B$ iff $A \subseteq B$ "*at least as*" derived reading

In other words, if its restrictor were merged early, the putative non-conservative meaning of *as* would never emerge, and speakers would never have evidence for it. Late merger of its restrictor would allow an *as* with strong semantics to "show" its lexical meaning. Thus, it turns out, an early merger of the restrictor is incompatible with non-conservative meanings for quantifiers. We can formulate the generalization in (63).

(63) Restrictors of non-conservative quantifiers are merged late, at the quantifier's scope position.

In fact, the generalization is even stronger:

(64) Early merger of restrictor $\Rightarrow$ conservative derived meaning (when allowed by the quantifier's lexical meaning)

(65) Q (A) (B) when A is early merged $\Leftrightarrow$ $[\text{Q (A)}]_i$ $[\cancel{[\text{Q (A)}]}_i \text{ (B)}]$ $\Leftrightarrow$ Q (A) ($A \cap B$)

We are a step closer to deriving the conservativity property of natural language quantifiers from the mechanism of interpreting the copies of their restrictors. What is left is to show that restrictors of conservative quantifiers are always merged early. Then, we can derive conservativity as not a lexical property, but a property derived from the syntax of merger and the mechanism for copy interpretation. As we shall see in the next section, this turns out to be more involved than one might hope.

9.7 Late Merger of Complements

Why can the complement of *-er/as* be merged late but not the complement of, for example, *rumor*? If such late merger for complements of lexical predicates were allowed, (66) would be acceptable, rather than a condition C violation.

(66) ??Which rumor that John_i liked Mary did he_i later deny?

The mechanism of interpreting copies suggests a possible answer for complements of lexical predicates (cf. Fox 2002). Higher and lower *rumor* are of different types, resulting in an illegitimate LF.

(67) *LF with late merger*:
[Which rumor that John liked Mary] λx [he denied [the rumor x]]

In the case of *as*, the Determiner Replacement part of Trace Conversion replaces the lower *as*. As a result, there is no offending copy in the base position that could cause a type mismatch. In (67), Determiner Replacement targets the copy of *which*, leaving behind the lower copy of *rumor*, which is responsible for the ensuing type mismatch.

Sauerland (p.c.), in Fox (2002), noted that the above line of explanation incorrectly predicted that it should be possible to late merge NP complements of determiners. Thus in (68), it should in principle be possible to merge *every* in the theta-position and late merge its restrictor.

(68) *I gave him [$_{D}$ every] yesterday [$_{NP}$ book that John wanted to read].

Two possible answers suggest themselves to us. The first is that degree clauses do not receive a theta-role, nor does *-er/as*. Determiners cannot receive a theta-role by themselves, thus their restrictors have to be merged early. The second answer, which follows from the preceding discussion, is that restrictors of conservative quantifiers have to be merged early. This answer links with the generalization that we reached earlier, regarding late merger and non-conservativity, but it relies on conservativity as a lexical property, and is a stipulation.

The most attractive answer would be that restrictors of quantifiers are merged early *whenever possible*. Non-conservative quantifiers do not "survive" early merger (cf. (64)), and, as a last resort, are merged late. This answer would allow us to not directly make reference to the conservativity of quantifiers. Rather early merger would filter out quantifiers with non-conservative semantics, yielding either contradictions, tautologies, or contingent conservative meanings. The only way to express non-conservative meanings would be by late merger. The fact that natural language quantifiers are conservative would follow from the syntax.

Given the above "merge early whenever possible" model, we would expect those *as* plus factor argument combinations which have conservative semantics to allow for early merger. We have seen that this is not the case. One option would be to say that this is because the syntactic system was unable to determine the conservativity of these combinations and so went for the safe late merger option. Only those quantifiers whose conservativity could be determined allowed for early merger. But once we do this, we lose our explanation from the interpretation of traces for the generalization that natural language quantifiers are conservative. Another option is to say that a syntactic uniformity consideration requires [*n as*] augmented quantifiers to have the same syntax, regardless of the value of *n*. Because for some values of *n* early merger leads to failure of interpretability, late merger is the only option for [*n as*]. This way of thinking allows us to not make reference to conservativity. Rather, the property of conservativity would fall out as the result of the syntactic derivation.

9.8 Concluding Remarks

We started with the observation of a puzzling need for extraposition of degree clauses, correlated with the fact that the surface position of the extraposition marks the scope of the degree quantifier. The mechanism of late merger was posited as the way the degree clause is syntactically integrated into the degree construction. This proposal gives us an answer to the puzzling facts. Regarding the motivation for late merger, we suggested that of relevance are the semantics of degree quantifiers and the mechanism for interpreting copies of moved expressions. With -*er* being non-conservative, late merger of the comparative clause is enforced as the only option, as both early merger and a further movement of -*er* and the degree clause together yield a contradiction. Given the standard meaning of *as*, *as* is conservative and early merger is not precluded. We observed that once we take into account the role of the factor argument of *as*, the conservativity properties of *as* plus the factor argument are dependent upon the exact value of the factor argument. This indeterminacy results in late merger due to considerations of syntactic uniformity. We also explored the consequences of redefining *as*, giving it a non-conservative meaning, as a way to account for the obligatory late merger. An additional consequence of this redefinition was that the scalar readings of equatives could be derived syntactically: late merger yielded the strong "exactly as" reading; late merger followed by short QR of *as* and the equative clause yielded the weak "at least as" reading.

We put forth the generalization that restrictors of non-conservative quantifiers and quantifiers whose conservativity cannot be determined by the syntactic system are necessarily merged late while restrictors of conservative quantifiers are merged early. Quantifiers whose lexical meaning does not clash with the interpretive requirement imposed by early merger are what we call conservative quantifiers. Late merger allows for expression of potential non-conservative meanings. We conclude with the following question. Why is it that quantifiers that range over individuals have inherently conservative semantics, while quantifiers that range over degrees can have non-conservative semantics? Why do we not find quantifiers over individuals with semantics that forces late merger of their restrictors?

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