

COMPARATIVE DELETION AND COMPARATIVE SUBDELETION

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1. INTRODUCTION

On a commonly held view (Cresswell 1976; von Stechow 1984), the GRADABLE ADJECTIVE *long* in (1) denotes a binary relation imposing the requirement that the subject possesses the adjectival property at least to the DEGREE expressed by the MEASURE PHRASE (*2m*).

(1) The table is 2m long.

In the COMPARATIVE construction (2), the degree to which the gradable adjective property holds of the subject is ordered with respect to a second, linguistically specified degree term (*2m*), also known as the STANDARD of comparison.

(2) The table is longer than 2m.

The pair in (3) reveals that the standard does not need to be overt but can also be implicitly provided by the COMPARATIVE COMPLEMENT (henceforth also *than-XP*), which represents a type of DEGREE CLAUSE. The adjectival comparative (3a), for one, characterizes situations in which the table and the room are assigned values by the degree predicate *long* such that the degree to which the table is long exceeds the degree to which the room is long. Similarly, the nominal comparative (3b), where the gradable property surfaces as an attribute AP, establishes an order between the longitudinal extension of two tables.

- (3) a. The table is *longer* [_{than-XP} than the room is].
b. This is a *longer* table [_{than-XP} than that one is].

An informal paraphrase for sentence (3a) is given in (4). Note that (4) contains two meta language degree variables, which occupy the same position relative to the gradable adjective as the overt measure phrase (*2m*) in (1).

(4) The degree d_1 , such that the table is *d_1 -long*, exceeds the degree d_2 , such that the room is *d_2 -long*.

In (3), the gradable property inside the *than-XP* remains unpronounced. SUBCOMPARATIVES, exemplified by (5), minimally differ from regular exponents of comparatives in that both the matrix clause and the comparative complement embed phonologically overt, usually distinct, degree predicates ((5) from Chomsky 1977):

- (5) a. This table is *higher* than that one is *wide*.
b. No, this table is *higher* than that one is *high*. (with contrastive stress on *high*)

One of the earliest observations about structures like (3) was that the silent gradable property inside the comparative complement is not only essential to the interpretation but also part of the underlying syntactic representation. This can be seen from the fact that the sentence fragments inside the *than*-XPs of (3) cannot be used in isolation (Lees 1961; Hale 1970; Bresnan 1972, 1973b):

- (6) a. *The room is.
b. *That one is.

Following Bresnan (1975), it has become common practice to take these contrasts to indicate that the strings in (3) are derived from the richer base generated structures in (7) by the operation of COMPARATIVE DELETION (CD), which renders the gradable property inside the *than*-XP unpronounced (Bresnan 1975; \triangleleft marks the gap).

- (7) a. The table is *longer* than the room is $d-\triangleleft_{CD}$. (\triangleleft_{CD} = long)
b. This is a *longer table* than that one is $d-\triangleleft_{CD}$. (\triangleleft_{CD} = long table)

More accurately, as seen in (7), the comparative complement contains two gaps: the node reflexively embedding the degree predicate (*long* and *long table*, respectively) and the degree variable which serves as the second argument of the comparison relation (cf. the informal paraphrase (4)). Current theorizing makes CD responsible for the former type of deletion only, while the degree variable is commonly thought to occupy the foot position of a movement chain (Chomsky 1977; section 2). This distinction has, among others, important consequences for the analysis of subcomparatives.

At least at first sight, the surface appearance of subcomparatives such as (5) seems not to have been shaped by CD. However, AMOUNT COMPARATIVES and amount subcomparatives, illustrated in (8) and (9), respectively, reveal that this impression is misleading. On the standard analysis (Bresnan 1973), the degree variables in this class of constructions is supplied by hidden occurrences of the degree predicates *much/many*. Since *much/many* obligatorily remains unexpressed also in subcomparatives (9), it can be concluded that there must also be an operation which affects prenominal APs to the exclusion of their NP-hosts. This operation has come to be known as COMPARATIVE SUBDELETION (CSD; Bresnan 1973).

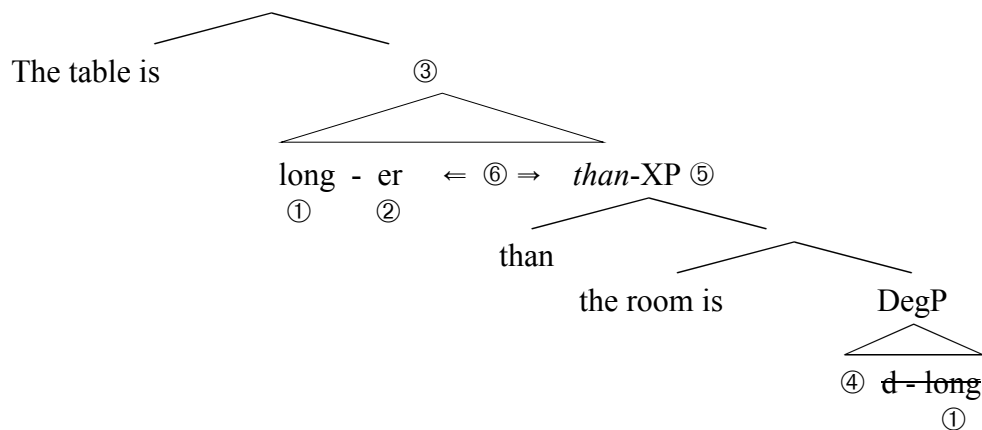
- (8) a. They have more tables than we have $d-\triangleleft_{CD}$. (\triangleleft_{CD} = many tables)
b. They have more oil than we have $d-\triangleleft_{CD}$. (\triangleleft_{CD} = much oil)
- (9) a. They have more tables than we have [$d-\triangleleft_{CSD}$ chairs]. (\triangleleft_{CSD} = many)
b. They have more oil than we have [$d-\triangleleft_{CSD}$ water]. (\triangleleft_{CSD} = much)

The central goal of the present chapter is to address the nature of CD and CSD by discussing basic properties of the construction and tracing the emergence of a set of widely shared assumptions about their analysis. More precisely, there are two specific questions that

have been prominent in the study of CD and CSD. The first one probes the relation between CD and CSD, searching for criteria that aid in deciding whether comparatives and subdeletion constructions can be subsumed under a unified analysis or have to be treated as fundamentally distinct phenomena. A second question concerns the type of operations responsible for manipulating the comparative complement and asks whether CD and CSD are best conceived of as manifestations of ellipsis, some type of movement process, or an interpretive rule similar to the one governing empty pronominals (null anaphora). Related to that, the theory has to make explicit at which level of representation the gap is identified, specifying whether CD and CSD are syntactic processes or rules that operate in the semantic component.

Since most aspects of the analyses of CD and CSD are closely tied to more general assumptions about the structure and interpretation of comparatives, a survey of CD and CSD is not complete without taking into consideration other, at first sight unrelated properties of the construction. Explicating how these properties relate to CD and CSD, is a second major objective of this article. Probably all analyses agree that the syntax of comparatives at some point in the derivation resembles the tree diagram in (10), which is underspecified, yet includes designated locations for all of the main ingredients of the construction. Based on this schematic diagram, it becomes possible to identify at least six areas, marked by numbered bullets in (10), in which different theories of comparatives have opted for different analytical choices that, at least indirectly, affect the treatment of CD and CSD. Each numbered bullet is associated with a (set of) fairly precise questions, collected under (11), that will also serve as a loose guide for the discussion to follow.

(10) The table is longer than the room is [*d-long*].



- (11)
- ① What is the meaning of gradable adjectives?
 - ② What is the semantic contribution of *-er*?
 - ③ What is the constituency of the string AP[^]-er[^]than-XP?
 - ④ What kind of operation is CD/CSD?
 - Ellipsis, movement of a type or silent anaphor?
 - Are CD and CSD reducible to a common source?
 - ⑤ What is the internal structure of the comparative complement (*than-XP*)?

- ⑥ How does the matrix clause combine with the comparative complement?
 - By cyclic insertion or Late Merge
 - Does the combination result in coordination or subordination?
 - What is the syntactic function/semantic contribution of *than*?

Before proceeding, some terminological and taxonomic clarifications are in order. Comparatives belong to the larger family of gradable constructions, which also include equatives (*as long as*), superlatives (*longest*), excessives (*too long to*), *enough* constructions (*long enough to*) and others. Even though the discussion will be restricted to comparatives, many aspects of the analyses to be presented naturally carry over to other members of this family. Second, comparatives and gradable constructions more generally can be found across different morphosyntactic categories (V, A, N, possibly P) and in all grammatical functions. Thus, along with the predicate and attributive uses illustrated above, adverbs as well as verbal predicates can be graded:

(12) *More surprisingly*, John ate more than Mary.

Many languages distinguish between analytic forms of the comparative (*long-er*) and synthetic ones (*more interesting*). While there are systematic differences (only the latter admit metacomparatives, for one), they will for present purposes be treated alike (see Corver 1997; Embick 2007; Bobaljik 2012):

(13) The table is as *long* as the door is wide.

(14) The table is as long as the door is.

Finally, reasons of space make it impossible to include into the discussion many aspects of the syntax of comparative constructions. Notably, we will - apart from some remarks in section 4 - not address the way in which optional ellipsis operations shape the surface appearance of the *than*-XP. To illustrate, while (15a) only involves CSD, (15)b-e have been hypothesized to be the product of Pseudogapping (15b), Gapping (15c), VP-deletion (15d), and Comparative Ellipsis (15e), respectively.

(15) a. John bought more apples than Bill bought pears.

b. John bought more apples than Bill did pears.

c. John bought more apples than Bill pears.

d. John bought more apples than Bill did

e. John bought more apples than Bill

Structures such as (15e), in which *than* precedes a single NP are also known as PHRASAL COMPARATIVES. In particular the question whether phrasal comparatives are to be analyzed as reduced, elliptical clauses or as base-generated constructions that do not involve ellipsis has

attracted a fair amount of attention in the literature. (For recent discussion see Lechner 2004; Pancheva 2006, 2010; and Bhatt and Takahashi 2011.)

The chapter is organized as follows. Section 2 introduces central basic concepts about comparatives, starting with a brief background in scalar semantics, the interpretation of the comparatives morpheme (*more/-er*) and the transparent mapping operations from Logical Forms (LF) to semantics. The focus of the discussion will rest on the organization of the comparative complement and the structural relation among the degree morpheme, the gradable AP and the *than*-XP. The latter is of particular interest, because assumptions about constituency do not only inform the semantics of comparatives and the analysis of CD, but also have consequences for a topic to be taken up in section 4 - the relation between the degree complement and the matrix clause. The discussion also summarizes arguments from the literature for the existence of gaps in subcomparatives. Section 3 provides an overview of different analytic strategies towards CD and CSD. Next, section 4 turns the attention to the nature of the relationship between the comparative complement and the matrix clause, addressing the question whether the nexus is best characterized in terms of syntactic subordination or coordination. In the final section, we add some remarks about multiple comparatives and review two influential current trends in research on comparatives which expand to cross-linguistic variation.

2. THE SYNTAX AND SEMANTICS OF COMPARATIVES

2.1. DEGREE SEMANTICS, COMPARATIVE SEMANTICS AND THE STRUCTURE OF DEG_P

The semantics of comparatives builds on more fundamental notions of measurement theory and gradable adjective semantics, relevant aspects of which will be introduced below. Surveys of recent advances in degree semantics can be found in Beck (2011) and Morcycki (to appear).

We adopt the standard hypothesis that the ontology of possible denotations is enriched by a sorted domain of numerical degrees D_d . Degrees are points or intervals that are ordered on a SCALE (usually a weak ordering) and serve as the values of gradable adjective meanings. Since adjectives may differ in what kinds of properties they measure (length, age, weight, ...), scales come in different flavors. This is modeled by assuming that each scale includes a DIMENSION parameter that is part of the lexical specification of the adjective and that scales with different dimension form mutually exclusive sets of degrees. Thus, the values for *long* and *old* are projected onto two distinct scales, rendering comparison between the two degrees impossible (INCOMMENSURABILITY; Kennedy 2002):

(16) *The table is as long as the door is old.

A particularly elegant way of integrating the dimensional parameter into the compositional semantics is provided by the use of MEASURE FUNCTIONS in the definition of the lexical entries for gradable adjectives. A measure function is a partial map from the domain of individuals D_e to D_d (type $\langle d, e \rangle$) that assigns a unique value to each object it is defined for. For instance, LENGTH maps any individual with spatial extension to its maximal degree of length, while WEIGHT returns for each object its maximal mass values, and so on:

- (17) a. LENGTH = $\lambda x_e.x$'s length
 b. WEIGHT = $\lambda x_e.x$'s weight

A natural language predicate like *long* can then be construed as a relation between degrees and individuals (type $\langle d, \langle e, t \rangle \rangle$) that incorporates a measure function in its lexical definition. On this prevalent conception, *long* applies to a degree *d* first, and returns all individuals that are ordered at least as high as *d* on the scale of length. (Note that on this Representational Theory of Measurement, it is not the objects that are ordered, but their degree values; for discussion see e.g. Lassiter 2011).

- (18) a. **[[long]]** = $\lambda d \lambda x. \text{LENGTH}(x) \geq d$
 b. **[[wide]]** = $\lambda d \lambda x. \text{LENGTH}(x) \geq d$
 c. **[[tall]]** = $\lambda d \lambda x. \text{HEIGHT}(x) \geq d$
 d. **[[old]]** = $\lambda d \lambda x. \text{AGE}(x) \geq d$

From this it follows that well-formed instances of subcomparatives (*The table is longer than the room is wide*) are legitimized whenever the adjective meaning refers to the same measure function.

The lexical entries for gradable adjectives can now be mapped onto their positive, comparative and superlatives forms by a family of DEGREE HEADS, which is located in the head position of a functional DegP. These degree heads syntactically select their degree complement, as witnessed by the fact that different degree heads combine with different degree clauses (*as tall as, taller than, too tall to, ...*). It is therefore plausible to locate the *than*-XP in the complement position of DegP, and the gradable AP in SpecDegP (for alternative parses see section 2.2 below):

- (19) [_{TP} John is [_{DegP} [_{AP} tall] [_{Deg'} -er [_{than}-XP than 6ft]]]]

A widely used lexical entry for the comparative head *more/-er*, given in (20), takes a degree expression *d*, a gradable adjective denotation *A* and the subject *x* as its arguments (type $\langle d, \langle \langle d, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle \rangle$) and states that *x*'s maximal degree of *A*-ness exceeds the standard value *d* (Rullman 1995; von Stechow 1984). The maximality operator **max** is defined in (21). **Max**, if applied to a predicate of degrees, exhaustivizes the degrees the predicate is true of, returning a singular, maximal degree (Rullmann 1995). Assume moreover that measure phrases denote degree descriptions of type *d* and that the complementizer *than* is semantically vacuous (von Stechow 1984; see section 4.1 for an alternative view).

- (20) **[[more/-er]]** = $\lambda d \lambda A_{\langle d, \langle e, t \rangle \rangle} \lambda x. \text{max}(\lambda d'. A(d')(x)) > d$
 (21) **[[max]]** =_{Def} $\lambda D \lambda d [D(d) \wedge \forall d' [D(d') \rightarrow d' \leq d]]$
 (22) **[[6 ft]]** = 6ft

The sample computation in (23) demonstrates that the above ingredients correctly capture the truth conditions of (19). The degree head (20) combines with the standard of comparison (*6ft*) first, and takes the gradable adjective as its second argument. As desired, sentence (19) comes out as true just in case John’s maximal degree of height exceeds 6 feet.

$$\begin{aligned}
 (23) \quad \llbracket (19) \rrbracket &= \llbracket \text{-er} \rrbracket(\llbracket \text{than } 6\text{ft} \rrbracket)(\llbracket \text{John} \rrbracket) = \\
 &= \lambda d \lambda A_{\langle d, \langle e, t \rangle \rangle} \lambda x. \max(\lambda d'. A(d')(x)) > d \text{ (6ft)} (\lambda d \lambda x. \text{HEIGHT}(x) \geq d)(j) = \\
 &= \lambda x. \max(\lambda d'. \lambda d \lambda x. \text{HEIGHT}(x) \geq d (d')(x)) > 6 \text{ feet } (j) = \\
 &= \lambda x. \max(\lambda d'. \text{HEIGHT}(x) \geq d') > 6 \text{ feet } (j) = \\
 &= \max(\lambda d'. \text{HEIGHT}(j) \geq d') > 6 \text{ feet} = \\
 &= \text{id}[\text{HEIGHT}(j) \geq d \wedge \forall d'[\text{HEIGHT}(j) \geq d' \rightarrow d' \leq d]] > 6 \text{ feet} \\
 &\quad \text{'The maximal degree of John's height exceeds 6 feet'}
 \end{aligned}$$

In order to avoid clutter, we will from now on use the simpler and equivalent standard meta language format (24) for gradable adjective denotations of type $\langle d, \langle e, t \rangle \rangle$. (24) maps individuals to their maximal degree of tallness.

$$(24) \quad \llbracket \text{tall} \rrbracket = \lambda d \lambda x. x \text{ is } d\text{-tall}$$

So far, the semantic rules admit comparative complements of the simplest possible type only, those in which the constituent following *than* denotes a degree description. However, as can be easily seen, this leaves most comparatives we encountered in section 1, repeated in (25), impervious to analysis:

- (25) a. The table is longer than the door.
 b. The table is longer than the door is wide.
 c. John wrote a longer letter than Sam has written.
 d. John owns more books than Sam owns.

The solution resides with the independently motivated assumption that the comparative complements in (25) all include a movement chain created by EMPTY OPERATOR (OP) MOVEMENT. This chain creates suitable semantic objects which can then be integrated into the comparative semantics. We will make explicit the consequences of this assumption for the syntax-semantics mapping first, delaying the discussion of the syntactic evidence for empty operator movement to a separate subsection. Moreover, for reasons of exposition, it is instructive to consider the subcomparatives in (25)b first because these structures hide fewer of the semantically relevant components and are therefore more informative about the mapping from syntax to interpretation.

2.2. THE COMPOSITION OF THE *THAN*-XP

Chomsky (1977) demonstrates that there is good reason to believe that the syntactic representation of the comparative complement of (26)a includes an empty operator chain.

Comparatives resemble in this respect headed ((27)) and free relative clauses ((28)). In all three constructions, an empty operator binds a trace of suitable type in its base position.¹

- (26) a. The table is longer than the door is wide.
 b. The table is longer [_{than-XP} than OP₁ the door is d₁-wide].
- (27) a. the table you bought
 b. the table [_{CP} OP₁ that you bought t₁]
- (28) a. whatever you bought
 b. whatever [_{CP} OP₁ you bought t₁]

Direct evidence for the claim that the constructions implicate movement comes from the observation that the gap cannot be filled:

- (29) a. *The table is longer than the door is *that/3ft* wide.
 b. *the table that you bought *it/that table*
 c. *I liked whatever you bought *it/that*.

Semantically, empty operator movement in relative clauses results in set formation (Quine 1960) or, equivalently, a predicate derived by λ -abstraction over the individual variable that is bound by the empty operator. Adopting the same mechanism for comparatives, it is usually assumed that the comparative complement denotes a degree predicate (von Stechow 1984):²

- (30) [**OP₁ the door is d₁-wide**] = λd .the door is d-wide

That degree predicates indeed include a variable which is accessible to binding by syntactic operations can be inferred from degree questions, in which a fronted *wh*-phrase abstracts over this degree variable (Beck 1996, 2011):

- (31) a. How high is the desk?
 b. [how-Q [λ_1 the desk is d₁-high]]

Abstraction or set formation by syntactic movement is not only attested in empty operator movement constructions, but has, among others, become the standard strategy for rendering object quantifiers interpretable (Heim & Kratzer 1998). To illustrate, the Generalized Quantifier (GQ; type $\langle\langle e,t \rangle, t \rangle$) in (32) cannot combine with the transitive predicates (type $\langle\langle e, \langle e,t \rangle \rangle$). Quantifier Raising (QR) therefore evacuates the object from its base position and attaches it as a prefix to a propositional node, from where it binds an individual variable.

- (32) a. Surface syntax: John [_{VP} read _{<e,<e,t>>} [every book]_{<<e,t>,t>}]
 b. Quantifier Raising: [[every book]_{<<e,t>,t>} [λ_1 John [_{VP} read t₁]]]
 c. Semantic composition: $\lambda Q_{<e,t>} \forall x [\text{book}(x) \rightarrow Q(x)] (\lambda x. \text{John read } x)$

There is now an interesting homology that can be exploited in the treatment of the phenomena (26) – (28). Beginning with (28), free relatives internally host a derived predicate, while externally they either function as definite descriptions or universally quantified expressions, depending on context and analysis. The former interpretation can be produced by a domain generalized version of the maximalization operator (21) (NOMINALIZATION, adopting Russell’s 1905 terminology), which returns the maximal individual that has the property expressed by the relative predicate (type e; Rullmann 1995). Alternatively, if one wishes to give certain free relatives a true universal, generalized quantifier meaning (type <<e,t>,t>; but see Jacobson 1995), they need to QR to avoid a type conflict, just like the quantificational object in (32).

Both of these options have also been explored in the study of comparatives, assigning the degree clause either an analysis as a nominalized degree predicate (von Stechow 1984) or a GQ of degrees (Heim 2000). On the former account, the *than*-XP, which denotes a derived degree predicate (cf. (30)) is maximized, yielding the nominalized degree (33)a. This degree term serves then as the first argument of the degree head *-er*, defined as in (34) (Stechow 1984), which subsequently combines with the gradable adjective and the subject:

- (33) a. [_{TP} The table is [_{DegP} [_{AP} long] [_{Deg'} -er [_{than-XP} than OP₁ the door is d₁-wide]]]]
 b. [**max (than) the door is wide**]
 = $\text{id}[\text{the door is } d\text{-wide} \wedge \forall d' [\text{the door is } d'\text{-wide} \rightarrow d' \leq d]]$
 c. [**more/-er**](**max (than) the door is wide**)(**long**)(**the table**)

- (34) [**more/-er**] = $\lambda D_{<d,t>} \lambda A_{<d,<e,t>>} \lambda x. \exists d [A(d)(x) \wedge d > \max(D)]$

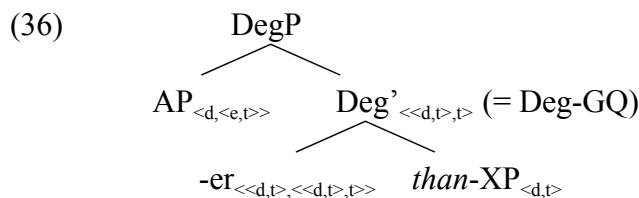
In (33), the *than*-XP is interpreted *in-situ*. But the maximality analysis also affords the degree clause the freedom to undergo covert raising. As degree descriptions semantically behave like names, degree clause exportation is not reflected truth conditionally, though, at least not in the scope relations between the degree head and other operators. The analysis contrasts in this respect from quantificational theories, to be discussed in turn below.³

The analogy with free relatives drawn above also suggests an alternative analysis on which comparatives embed GQs of degrees that need to undergo QR in order to resolve a type mismatch (Heim 2000; Bhatt and Pancheva 2004). This approach, commonly used in current research, translates the degree head *-er* as the degree counterpart of quantificational determiners in the individual domain (*every*, *no*, etc.,...; type <<e,t>, <<e,t>,t>>). In both types of constructions, the quantificational head combines with a property of degrees and individuals, respectively, and generates a second order property in the same domain. (35) spells out four

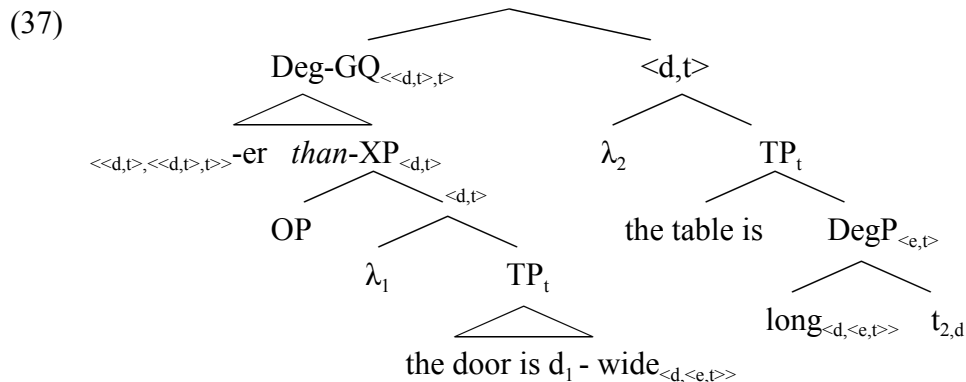
members of this family of quantificational degree determiners (type $\langle\langle d,t\rangle, \langle\langle d,t\rangle, t\rangle\rangle$), all of which deliver identical truth conditions (cf. Pancheva 2012):

- (35) a. **[more/-er]** = $\lambda D_{\langle d,t\rangle} \lambda D'_{\langle d,t\rangle}. D \subset D'$ [Bhatt and Pancheva 2004]
 b. **[more/-er]** = $\lambda D_{\langle d,t\rangle} \lambda D'_{\langle d,t\rangle}. \exists d [D(d) \wedge \neg D'(d)]$ [Seuren 1973, a.o.]
 c. **[more/-er]** = $\lambda D_{\langle d,t\rangle} \lambda D'_{\langle d,t\rangle}. \exists d [D'(d) \wedge d > \max(D)]$ [von Stechow 1984]
 d. **[more/-er]** = $\lambda D_{\langle d,t\rangle} \lambda D'_{\langle d,t\rangle}. \max(D') > \max(D)$ [Heim 1985]

What all quantificational theories of comparatives have in common is that they require changes in the surface constituency because the GQ formed by *-er* and the *than*-XP (type $\langle\langle d,t\rangle, t\rangle$) cannot be interpreted *in-situ*. This holds irrespective of the phrase structure assigned to AP, *-er* and the degree complement. Consider the analysis adopted here first, according to which AP is located in SpecDegP, and *-er* forms a constituent with the *than*-XP. For ease of reference, the latter unit will from now on also be referred to as Deg-GQ.



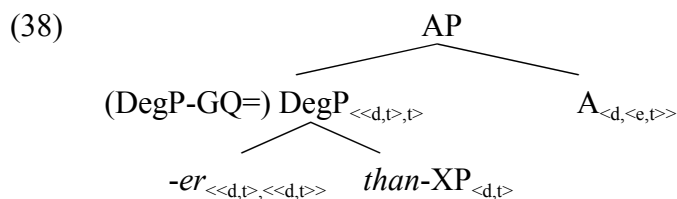
The gradable adjective is of type $\langle d, \langle e, t \rangle \rangle$ and its sister of type $\langle\langle d, t \rangle, t\rangle$. Hence, the two nodes do not match type-wise. As a result, Deg-GQ needs to undergo (covert) movement to a propositional node, as schematized in (37).



Given that, in analogy to GQs in the individual domains, degree GQs strand degree variables, the binder index of Deg-GQ (λ_2) abstracts over this variable, producing a degree predicate ($\langle d, t \rangle$) that the Deg-GQ can then apply to. The derivation looks for all means and purposes like the one standardly employed to render object quantifiers interpretable in LF-transparent theories of quantifier scope.^{4,5}

The same type repair strategy can be used if the degree head is taken to select its argument in the reverse order, such that *than*-XP and AP are projected on the right, or if one opts for the alternative parse for DegP in (38). On this classical analysis of the DegP (Chomsky 1965,

Selkirk 1970, Bresnan 1973, Heim 2000), DegP-GQ/DegP is situated in the specifier of AP. Again, DegP-GQ needs to QR in order to resolve a type conflict:



A third option for combining the basic ingredients of comparison that is consistent with a GQ analysis is one where the gradable adjective is closer to the degree head than the degree complement, as in (39) (Kennedy 1999). Then, the order of the arguments in the lexical rule of *-er* must be reversed, resulting in (40)⁶:

(39) $[\text{DegP} [\text{Deg}' [\text{Deg}' -er \text{AP}] \text{than-XP}]]$

(40) $[\text{more/-er}] = \lambda D_{\langle d,t \rangle} \lambda D'_{\langle d,t \rangle} . D \supset D'$

Thus, the quantificational analysis can be implemented on the basis of all three possible phrase structures the DegP has been given in the literature.^{7, 8}

- (41) a. $[\text{DegP} \text{AP} [\text{Deg}' -er \text{than-XP}]]$ [Izvorski 1995; Lechner 1999, 2004, a.o.]
 b. $[\text{AP} [\text{DegP} -er \text{than-XP}] \text{AP}]$ [Bresnan 1972, a.o.]
 c. $[\text{DegP} [\text{Deg}' [\text{Deg}' -er \text{AP}] \text{than-XP}]]$ [Corver 1990; Kennedy 1999, a.o.]

There is, however, a critical difference between (41)a/b and (41)c, exposed by the LF-tree in (37), which favors the former two analyses over (41)c: only (41)a/b treat the degree head and the complement as a unit and therefore makes these nodes suitable targets of movement. More specifically, one central feature of the quantificational account consists in the requirement that the Deg-GQ covertly moves. If (41)a/b are adopted, these changes in c-command are (i) predicted to affect the scope of *-er* with respect to other operators, and (ii) should register in c-command sensitive properties of nodes inside the *than-XP*. At least the second consequence comes as a surprise for adherents of phrase structure (41)c, for the simple reason that the comparative complement is interpreted *in-situ*. We will briefly turn to evidence corroborating predictions (i) and (ii), and concomitantly, the view that *-er* and the *than-XP* form a constituent, as expressed by (41)a/b. The relevant observations come from two sources: scope interaction between *-er* and intensional operators, and correlations between Principle C effects and ellipsis scope.

Heim (2000) notes that (42) is ambiguous. It can either express a minimum length requirement ((42)a) or the condition that the paper not exceed the length of 15 pages ((42)b). These two readings are the product of two different scope options between the comparative head *-er* and the modal *required*, as indicated in (43). (*Acc* denotes the accessibility relation for worlds/situations.)

- (42) (This draft is 10 pages.) The paper is required to be exactly 5 pages longer than that.
- a. $\lambda w. \forall w' \in \text{Acc}(w)(w') \rightarrow \max(\lambda d. \text{the paper is } d\text{-long in } w) = 15 \text{ pages}$
‘In each world that meets the requirements the paper is exactly 15 pages long’
 - b. $\lambda w. \max(\lambda d: \forall w' \in \text{Acc}(w)(w') \rightarrow \text{the paper is } d\text{-long in } w') = 15 \text{ pages}$
‘The paper is exactly 15 pages long in those worlds where it is the shortest’
- (43) a. *required* [[exactly 5 pages *-er* than that] [the paper be *d*-long]]
b. [exactly 5 pages *-er* than that] [*required* [the paper be *d*-long]]

In order to generate the non-surface scope option (43)a, the degree clause must be allowed to scope out of its base position. This finding endorses the view that, as posited by the quantificational analysis, the unit [*-er than*-XP] indeed partakes in covert scope shifting operations. Recall from above that on the nominalization analysis (34), which treats the comparative complement as a degree description, the *than*-XP may also undergo QR. However, unlike in the quantificational approach, this movement is semantically vacuous, since degree descriptions (type *d*) do not create new scope options.

Additional support for the assumption that the degree head *-er* moves comes the interaction between the scope position of *-er* and binding theory. Implementing a generalization originally due to Williams (1974)⁹, Bhatt and Pancheva (2004) show that names inside the *than*-XPs are evaluated for Principle C in the scope position of the comparative head.¹⁰

To begin with, the surface string (44) represents an instance of antecedent contained deletion (see chapter xx) that has both a narrow ellipsis interpretation (*than Mary's boss works*) and a wide ellipsis reading (*than Mary's boss tells her to work*). As is common with such structures, these two ways of ellipsis resolution can be correlated with two attachment sites for the elliptical sentence. If the *than*-XP is interpreted inside the embedded clause (cf. LF (44)a), antecedent containment is resolved locally. That the *than*-XP is in fact attached low is confirmed by the inability of the name (*Mary's*) to corefer with the dative pronoun *her* inside the matrix clause. ((44) is from Bhatt and Pancheva 2004, (69)).

- (44) [TP₁ Her father tells her₁ [TP₂ to work harder than Mary₁'s boss does]]
- a. *Her father tells her₁ [TP₂ [-er than λ_2 Mary₁'s boss works *d*₂-hard]]_{<<d,t>,t>}
 $[\lambda_3$ [to work *d*₃-hard]]_{<d,t>}
‘Her father tells her₁ to work harder than Mary₁'s boss works.’
 - b. [[-er than λ_2 Mary₁'s boss works *d*₂-hard]]_{<<d,t>,t>} [λ_3 [TP₁ her father tells her₁ to work *d*₃-hard]]_{<d,t>}
‘Her father tells her₁ to work harder than Mary₁'s boss tells her to work.’

If, alternatively, the *than*-XP is interpreted in the higher clause, which results in wide ellipsis (cf. (44)b), the disjoint reference effect disappears, indicating that ellipsis resolution has a structural basis. Thus, the LF position of the *than*-XP can be triangulated by inspection of a correlation between two *a priori* autonomous properties – the size of ellipsis and possible coreference patterns.

Furthermore, Bhatt and Pancheva demonstrate that the best explanation of this assembly of facts resides with a theory on which the degree head moves independently, freely choosing among suitable landing sites, followed by countercyclic insertion of the *than*-XP into the scope position of *-er* in. The derivation of the wide scope interpretation (44)b then looks as in (45).

- (45) a. Step 1: Move *-er* to scope position (wide ellipsis interpretation)
 [-*er* [λ_3 [_{TP1} her father tells her₁ to work d₃-hard]]]]
 b. Step 2: Late Merge of *than*-XP
 [[-*er* than λ_2 *Mary*₁'s boss works d₂-hard]
 [λ_3 [_{TP1} her father tells her₁ to work d₃-hard]]]]

Late Merge of the comparative complement is essential for the analysis of Principle C obviation ((44)b) to succeed because it ensures that the *than*-XP does not strand a copy in its ‘base’ position below the pronoun, which would correspond to the sister node of the degree variable d₃ in (45). Otherwise, covert movement of the unit [-*er than*-XP] should change coreference options no more than QR does in (46):

- (46) *We showed him₁ every book that Bill₁ wanted.

By contrast, a disjoint reference effect can be avoided on the analysis in (45), since in step 2, the name (*Mary*'s) is merged together with the *than*-XP above the c-command domain of the coreferential pronoun.

In closing this subsection, it should be noted that apart from the maximality and the quantificational account, there is a third influential analysis of comparative semantics, on which comparatives are treated as hidden conjunctions (Seuren 1973; Klein 1980; Schwarzschild 2008 calls this the ‘A-not-A analysis’).

- (47) a. The table is longer than the door is wide.
 b. $\exists d$ [the table is d-long \wedge \neg [the door is d-wide]].

We will return to potential benefits of A-not-A analyses in the discussion of subdeletion in section 4.1. The remainder of section 2 expands on two syntactic issues: empirical ramifications of the empty operator analysis (2.3), and morphosyntactic evidence for a gap in subdeletion constructions (2.4).

2.3. EVIDENCE FOR EMPTY OPERATOR MOVEMENT

The classic diagnostics for movement (Chomsky 1977) include the four criteria that dislocation operations (i) leave a gap, (ii) can cross over bridge verbs, (iii) comply with syntactic locality constraints and (iv) relocate an (overt) element to a higher position in the tree. The first criterion has been seen to be satisfied by empty operator movement, which creates a derived degree predicate. The present subsection reports findings from the literature documenting that comparatives also pass the second to fourth movement tests.

As for now, the discussion pursues the limited goal of demonstrating that comparative formation involves movement of some kind, ignoring for the moment whether the degree clause contains one dislocation operation or two (on this issue see section 3). This qualification is important in order to avoid potential confusion arising from the fact that early syntactic analyses conflated what is nowadays known to be two distinct relations: CD and abstraction over the degree variable (see 2.2):

(48) The table is longer than OP_1 the door is $d_1-\hat{\Delta}_{CD}$. ($\hat{\Delta}_{CD} = \text{long}$)

While as of writing, there is a broad consensus that empty operator movement results in binding of the degree variable and that CD targets the gradable predicate only, in the initial stages of the debate, i.e. in the 1970ies, neither the semantics of comparatives nor the relation between syntax and semantics had been sufficiently mapped out to make such a distinction. As a result, evidence that was taken to support a movement analysis of CD is, on current understanding, to be re-interpreted as evidence for OP-movement inside the *than*-XP. The proper analysis of CD itself - movement, ellipsis or some other mechanism - will be at the center of section 3.

2.3.1 Locality and Crossover (diagnostics (ii) and (iii))

Strong support for the claim that the *than*-XP includes a movement chain is provided by the fact that both comparatives and subcomparatives constructions are sensitive to island constraints. Observe first that comparatives can be construed at a distance (Ross 1967/1986), as long as the embedding predicate is a bridge verb (diagnostic (ii); the empty operator chain binding the degree variable will from now on be omitted unless relevant):

- (49) a. John met more linguists than you met.
 b. John met more linguists than we thought you said Bill believed Sue met $\hat{\Delta}$.
 c. *John met more linguists than I quipped that Sue had met $\hat{\Delta}$.

(50) and (51) illustrate for both comparatives and subcomparatives the effects of the Complex Noun Phrase Constraint, the Coordinate Structure Constraint, the Sentential Subject Constraint, the Wh-Island Constraint and the Adjunct Condition, respectively (diagnostic (iii)):

- (50) a. *John bought more oranges than we had discussed [a plan to buy $\hat{\Delta}$].
 ($\hat{\Delta} = \text{d-many oranges}$)
 b. *John bought more oranges than we had bought [apples and $\hat{\Delta}$].
 c. *John bought more oranges than [that he had sold $\hat{\Delta}$] was generally believed.
 d. *John bought more oranges than Sue wondered [whether to buy $\hat{\Delta}$].
 e. *John bought more oranges than Bill slept [after he had sold $\hat{\Delta}$].

- (51) a. *John bought more oranges than we had discussed [a plan to buy [\triangle apples]].
 b. *John bought more oranges than we had bought [three pears and \triangle apples].
 c. *John bought more oranges than [that he had sold [\triangle apples]] was generally believed.
 d. *John bought more oranges than Sue wondered [whether to buy [\triangle apples]].
 e. *John bought more oranges than Bill slept [after he had sold [\triangle apples]].
 (\triangle = many)

Crossover effects are widely held to constitute another test signaling movement. As the contrasts below reveal, both CD and subdeletion are subject to strong Crossover:

- (52) a. More students flunked than \triangle_1 thought they₁ would (flunk).
 (\triangle = many students) [Bresnan 1975, (16)]
 b. *More students flunked than they₁ thought \triangle_1 would (flunk).
 (53) a. As many new students flunked as [\triangle old students]₁ imagined they₁ would
 (flunk). (\triangle = many) [Bresnan 1975, (125)]
 b. *As many new students flunked as they₁ imagined [\triangle old students]₁ would
 (flunk).

Hence, various properties characteristic of movement also show up in comparatives, indicating that comparative formation is at least co-determined by the principles restricting movement.

2.3.2. Overt reflexes of empty operator movement (diagnostic (iv))

In some varieties of American English, the comparative complement can also contain an overt, fronted *wh*-phrase that directly follows *than* (diagnostic (iv); Hankamer 1971; Bresnan 1972; Huang 1977; for Greek see Merchant 2009).

- (54) a. John is taller than what Mary is. [Chomsky 1977]
 b. No one sold more Kool-Aid than what Jimmy sold. [Huang 1977]
 c. I hope you can walk quicker than what you eat. [Huang 1977]
 d. They're just as quick with their tongues as what you are.
 [Jespersen 1954-1958, vol. III:9.6]

Chomsky (1977) takes this to indicate that the degree clause is internally organized as in (55),¹¹ leaving aside for the moment what exactly the *wh*-operator in SpecCP binds (see remarks on (48)).

- (55) John is taller [than [_{CP} what₁ Mary is t₁]].

Indirect justification for the presence of an overt, fronted *wh*-phrase has been identified in Den Besten (1978). In Dutch degree constructions, the presence of a *wh*-movement chain is

inversely correlated with the complementizer *dat*. As seen in (56)a, *dat* is blocked from occurring inside a *than*-XP:¹²

- (56) a. *Jan had meer mensen uitgenodigd dan dat hij vorig jaar \triangle had uitgenodigd.
 John had more people invited than that he last year had invited
 b. Jan zal eerder Kees uitnodigen, dan dat ie Marie zal uitnodigen.
 John will rather Kees invite, than that he Mary will invite
 ‘It is rather the case that John will invite Kees than that he will invite Mary.’

In (56)b, this restriction is suspended because the construction does not express a comparison between degrees. As a result, (56)b neither contains a gap created by CD nor an empty operator chain. The contrast between (56)a and the implicit comparative (56)b therefore illustrates, first, that *dat* can be used as a diagnostic for the application of *wh*-movement within a comparative clause and, second, that the restriction on *dat* cannot be morphological or phonological in nature.

French Stylistic Inversion provides further support for the empty operator movement hypothesis. Kayne and Pollock (1978) observe that subject verb inversion is contingent on fronting of an overt *wh*-element. Since Stylistic Inversion is also attested with comparatives, it can be concluded that in (57), a fronted *wh*-phrase occupies SpecCP (see Milner 1978):

- (57) a. Pierre a plus de livres que n’en a Paul.
 Peter has more of books than NEG of-them has Paul
 ‘Peter owns more books than Paul does.’
 b. Elle est aussi triste que l’était Jeanne hier.
 She is as sad as it was Jeanne yesterday
 ‘She is as sad as Jeanne was yesterday.’

Stylistic Inversion attests to another criterial property of *wh*-movement in comparatives: it applies in a local, successive cyclic fashion. As shown in (58)a, inversion of the subject (*Paul*) with the verb (*était*) is also found in embedded contexts. Given that inversion is dependent upon the presence of a derived position (a filled SpecCP), it follows that the operator must have moved successive-cyclically via an intermediate landing site in the lower SpecCP position ((58)b):

- (58) a. Pierre est plus gentil que tu ne disais qu’était Paul.
 ‘Pierre is more gentle than you said that Paul is.’
 b. Pierre est plus gentil [_{CP} OP₁ [_C que tu ne disais [_{CP} t₁ [_C que était *Paul* t₁]]]]

Note that successive cyclicity does not follow from semantic considerations but reflects syntactic properties of the movement operation.

Summarizing, in certain languages, *wh*-expressions in SpecCP either surface overtly or serve as the trigger for other syntactic processes (Stylistic Inversion, *dat* drop in Dutch). This

constitutes convincing evidence for the assumption that movement is implicated in the formation of comparative complements.

2.4. EVIDENCE FOR A GAP IN SUBCOMPARATIVES

Although it was already recognized early on that comparatives contain a gap created by CD, the existence of such a silent position did not reveal itself as readily in subcomparatives like (59). The issue remained under debate presumably because while clearly distinct semantically, comparative complements suspiciously resemble their declarative counterparts (60) in their surface appearance:

- (59) a. The desk was longer than *the table was wide*.
 b. I met more linguists than *you met biologists*.
- (60) a. John said that *the table was wide*.
 b. John said that *you met biologists*.

This imbalance between CD and CSD instigated the search for syntactic criteria that react to the presence of a gap in subcomparatives. We will briefly review the most prominent of these diagnostics in 2.4.1 below. A separate subsection (2.4.2) considers data corroborating the existence of a gap in subdeletion constructions from so-called *of*-comparatives.

2.4.1 Evidence from regular subcomparatives

Apart from interpretative properties, Bresnan (1975) lists a number of additional arguments for the presence of a gap in subdeletion constructions. In current notation, this gap corresponds to the degree predicate *much/many* which introduces the degree variable to be bound by empty operator movement. Thus, the underlying representation of (59) would be as in (61):

- (61) a. ...than OP_1 the table was $d_1 - \hat{\Delta}_{CSD}$ wide ($\hat{\Delta}_{CSD} = \text{much}$)
 b. ...than OP_1 you met $d_1 - \hat{\Delta}_{CSD}$ biologists ($\hat{\Delta}_{CSD} = \text{many}$)

It was already noted in section 2.2 (cf. (29)) that postulating a silent version of *much/many* in subcomparatives explains why the construction does not tolerate measure phrases or degree modifiers (*too*). They are blocked for the same reason that overt manifestations of *much/many* do not co-occur with this class of expressions.

- (62) a. *The desk was longer than the table was that/five feet/too wide.
 b. *John met more linguists than I met many/three/most/a few biologists at the party.

A related argument is based on the behavior of measure verbs in subcomparatives:

- (63) a. *This mouse weighs ounces.
 b. This mouse weighs six/that many ounces.

- (64) a. John weighs more pounds than this mouse weighs ounces.
 b. *John weighs more pounds than this mouse weighs six/that many ounces.

The verb *weigh* selects a measure phrase as its complement. As evidenced by (63)a, this measure phrase cannot consist of a bare plural only, but needs to be filled by a degree description. In subcomparatives, the relations are reversed, as is expected if the gap that CSD has created is the equivalent of a degree type measure phrase.

A phonological indication for the presence of a gap comes from the phenomenon of tensed auxiliary contraction (King 1970; Bresnan 1971a). Contraction is known to be blocked directly in front of a deletion site:

- (65) *They'll water the plants on Tuesday, and I'll on Thursday

The paradigms (66) and (67) below demonstrate that phonological reduction is also prohibited before positions arguably affected by CSD. Hence, subcomparative formation and contraction are mutually exclusive:

- (66) a. I am cleverer than you are prudent.
 b. *I'm cleverer than you're prudent.
- (67) a. It was as much trouble then as it is fun now.
 b. *It was as much trouble then as it's fun now.

The strength of this phonological argument has been disputed in Grimshaw (1987), though, who contends that the effects visible in (66) and (67) are weak and accordingly revises the acceptability status of (66)b and (67)b to '?'. In particular, contraction appears to produce much better results with CSD than with CD:

- (68) a. I'm cleverer than you are.
 b. *I'm cleverer than you're.
- (69) a. It was as much trouble then as it is now.
 b. *It was as much trouble then as it's now.

Empirical evidence for the presence of a gap in subcomparatives has also been adduced from other languages. Bennis (1977) points out that in Dutch, nodes inside a compared NP can be filled by the clitic pronoun *er* ('of-them/it'; see also Bennis 1978 and den Besten 1978):

- (70) a. Ik ken meer taalkundigen dan jij ontmoet hebt.
 I know more linguists than you met have
 'I know more linguists than you have met.'

- b. Ik ken meer taalkundigen dan jij *er* ontmoet hebt.
 I know more linguists than you CL met have
 ‘I know more linguists than you have met.’

This clitic displays the syntactic behavior characteristic of partitive, quantitative *er*, which pronominalizes part of a quantified noun phrase in (71). As illustrated by (72), partitive *er* can substitute plural count nouns like *boterhammen* (‘sandwiches’) but not mass nouns like *brood* (‘bread’); it cannot replace NPs that are modified by low, ethnic adjectives ((73)); and it can stand in for parts of NPs to the exclusion of relative clauses ((74)):

- (71) Ik geloof dat Jan er toen [veel/drie --] ontmoet heeft.
 I believe that John CL then many/three met has
 ‘I believe John met many/three of those.’

- (72) a. Jan at gisteren weinig boterhammen. Vandaag eet hij er veel.
 John ate yesterday few sandwiches. Today eats he CL many
 ‘John ate few sandwiches yesterday. Today he eats many.’
 b. Jan at gisteren weinig brood. *Vandaag eet hij er veel.
 John ate yesterday little bread. Today eats he CL much
 ‘John ate little bread yesterday. Today he eats a lot of bread.’

- (73) *Context:* Last week, John met five Dutch linguists.
 Jan ontmoette er gisteren [drie (*Japanse) --].
 John met CL yesterday [three (Japanese) --]
 ‘John met three (Japanese) linguists yesterday.’

- (74) *Context:* Last week, John met five Dutch linguists.
 Jan ontmoette er gisteren drie die uit Japan kwamen.
 John met CL yesterday three who from Japan came
 ‘John met three linguists who came from Japan.’

(75) – (77) attest to the fact that *er* behaves alike in comparatives. The quantitative clitic typically replaces low positions inside the NP (‘N’-deletion’), leaving higher adjuncts and determiners unaffected.

- (75) a. Jan at gisteren meer boterhammen dan hij er vandaag heeft gegeten.
 John ate yesterday more sandwiches than he CL today has eaten
 ‘John ate more sandwiches yesterday than he has eaten today.’
 b. *Jan at gisteren meer brood dan hij er vandaag heeft gegeten.
 John ate yesterday more bread than he CL today has eaten
 ‘John ate more bread yesterday than he has eaten today.’

- (76) Jan heeft meer Chinese taalkundigen ontmoet dan jij er (*Japanse) ontmoet hebt.
 John has more Chinese linguists met than you CL (*Japanese) met have
 ‘John met more Chinese linguists than you met Japanese linguists.’
- (77) Jan kent meer taalkundigen die uit China komen dan ik er ken die uit Japan komen.
 John knows more linguists that from China come than I CL know who from Japan come.
 ‘John knows more linguists who come from China than I know linguists who come from Japan.’

Whatever the correct analysis of partitive *er*, the parallelism between positive contexts and comparatives suggests that all of the *er*-comparatives above are actually manifestations of subdeletion in which the common noun has been lexicalized by partitive *er* while CSD has removed *many*. On this conception, one is led to expect that *er*-subcomparatives contain a silent degree predicate *many* that must not be filled. The correctness of this prediction is vindicated by the observation that *er* is incompatible with numerals:

- (78) *Ik ken meer taalkundigen dan jij er drie ontmoet hebt.
 I know more linguists than you CL three met have
 ‘I know more linguists than you met.’

French provides evidence for a gap roughly along the same lines as Dutch. As noted in Milner (1978a) and Pinkham (1982), in French degree clauses the common noun embedding the degree variable is replaced under identity by the quantitative clitic *en* (‘of-it’). Just like in Dutch, this partitive proform is in complementary distribution with cardinal numerals in comparatives, but not in positive contexts:

- (79) J’ai plus de livres que Paul n’en a (*trois).
 I have more of books than Paul NEG CL has three
 ‘I have more books than Paul has (*three).’
- (80) Paul en a beaucoup/trois.
 Paul CL has many/three
 ‘Paul has many/three books.’

The clitic *en* in (79) arguably lexicalizes a meaning closely related to a partitive PP, whereas the gradable property *many* has been elided by CSD. Thus, (79) parallels Dutch *er*-comparatives in that its surface form has been shaped by subdeletion.

The section to follow reports findings to the same conclusion from another construction that fits the profile of partitives: *of*-comparatives.

2.4.2. Evidence from *of*-comparatives

Part of Bresnan's (1975, 1976a) argumentation in support of a gap in subcomparatives is based on strings in which the subdeletion site is followed by a lexical *of*-phrase, as in (81)b:

- (81) a. John met more linguists than I met biologists.
b. John met more of the linguists than I met *of* the biologists.

Bresnan claims that these *of*-comparatives also instantiate cases of subcomparatives, as made explicit in (82). A first indication that this might be the right analysis is supplied by the by now familiar observation that the hypothesized gap is in complementary distribution with overt numerals and measure expressions:

- (82) . . . than I met [$d-\Delta_{\text{CSD}}$ of the biologists] ($\Delta_{\text{CSD}} = \text{many}$)
(83) *John met more of the linguists than I met three/many of the biologists.

In addition, Bresnan notes that the presence of hidden *many* in subcomparatives is detectable by the effects it has on its local syntactic environment. As illustrated by (84), while *of* is not compatible with plural indefinites ((84)a), its presence is obligatory if followed by a definite plural NP ((84)b):

- (84) a. many (*of) linguists, more (*of) linguists
b. many *(of) those linguists, more *(of) those linguists

The paradigm in (85) certifies that exactly the same pattern is characteristic of subcomparatives. This parallelism between partitives and *of*-comparatives is accounted for if *of*-comparatives contain an underlying, elided manifestation of *many*, as implied by the subdeletion analysis.

- (85) a. We met more linguists than we met (*of) biologists.
b. We met more of the linguists than we met *(of) the biologists.

Grimshaw (1987) brings to attention evidence that suggests an alternative treatment of *of*-comparatives in terms of CD instead of CSD. Adapting Taraldsen's (1978) analysis to English, Grimshaw suggests that what is missing in (81)b is a larger constituent than just *many*, and that this node has been removed by CD subsequent to extraposition of the *of*-PP. On this view, *of*-comparatives can be derived by the same mechanisms that are already available for the analysis of regular comparatives.

A uniform account along these lines receives independent confirmation from an interesting contrast between CSD and *of*-comparatives. While NPs affected by subdeletion can be located clause internally ((87)a and (88)a), *of*-comparatives are restricted to peripheral positions ((87)b and (88)b):¹³

- (86) a. I met more linguists than you met biologists. (final *of*-PP)
 b. I met more of the linguists than you met of the biologists.
- (87) a. More linguists were dull than biologists were interesting. (internal *of*-PP)
 b. *More of the linguists were dull than of the biologists were interesting.
- (88) a. I found more linguists dull than I found biologists interesting. (internal *of*-PP)
 b. *I found more of the linguists dull than I found of the biologists interesting.

Grimshaw moreover points out that the distribution of *of*-phrases mimics that of *of*-PPs in amount questions, which equally penalize PPs in sentence internal location:

- (89) a. How many did you meet of the linguists? (final *of*-PP)
 b. *How many do you think of the linguists were dull? (internal *of*-PP)
 c. *How many do you find of the linguists dull? (internal *of*-PP)

The dichotomy between (86)b/(89)a on the one side and the ill-formed examples (87)b, (88)b and (89)b/c on the other side can now be explained by the assumption that extraposition feeds CD. Concretely, suppose that the partitives under consideration are assigned the parse (90)a, in which *many* is followed by an empty nominal (Barker 1998).¹⁴ Word order reveals that the PPs in (86)b and (89)a have been shifted to the right, as schematized in (90)b, providing the context for CD and *wh*-movement to apply to the residual DP (cf. (90)c). In that setting, the gap in *of*-comparatives includes at least the empty head noun \emptyset_{NP} and the PP-trace in addition to the scalar predicate *many*, and therefore must have been produced by CD.

- (90) a. Underlying structure of partitives
 [_{DP} many [_{NP} [_{NP} [of the linguists]]]]
 b. Step 1: PP extraposition
 [_{DP} many [_{NP} t₁]] ... [_{PP} of the linguists]₁
 c. Step 2: CD/*wh*-movement target the residual NP
 [_{DP} d- Δ_{CD}] ... [_{PP} of the linguists]₁ (Δ_{CD} = [_{DP} many \emptyset_{NP} t₁])
 [_{DP} how many [_{NP} t₁]] [_{PP} of the linguists]₁

Next, in all of the ill-formed cases, the *of*-PPs remain in their base position, indicating that they have not been extracted from their hosts by extraposition (see chapter 42). But then, the sentences could not have been the result of CD, because CD would either illegitimately have to apply to a non-constituent (*many*[^] \emptyset_{NP} in (90)a) or target a node that CD is not defined for (the AP *many*, to the exclusion of NP). In view of the above, Grimshaw concludes that *of*-comparatives do not instantiate manifestations of subdeletion, but are regular comparatives generated by CD. For further arguments in support of the extraposition analysis see Kennedy (2002).

3. COMPARATIVE DELETION AND COMPARATIVE SUBDELETION

Turning to the central questions of this article, the present section traces the roots of the operation which removes the gradable property from the surface representation of the degree clause (CD and CSD; Bresnan 1973). The debate concerning the proper analysis of CD is also of historical significance, as it informed the controversy between Bresnan (Bresnan 1975, 1976a, 1976c, 1977) and Chomsky (Chomsky 1973, 1977b) about the question whether the grammar includes ‘unbounded’ syntactic relations, i.e. long distance relations that are not broken up in local parts by successive cyclic movement. Specifically, Chomsky’s (1977) analysis of comparatives was part of the research program, initiated in Chomsky (1973), which aimed at eliminating construction specific transformations in favor of general conditions on derivations and representations. At the core of this program was the hypothesis that apparently different construction types (comparatives, topicalization, clefts, wh-questions, relatives, etc...) can be captured by a single general movement schema (Move α ; Chomsky 1981) which is limited (‘bounded’) by Subjacency and other locality constraints. In current terminology, this amounts to the claim that no movement operation crosses phase boundaries without stopping in intermediate landing sites located at the phase edges. By contrast, Bresnan advocated the position that CD falls into the same group of operations as VP-ellipsis and other deletion rules, which are known to operate at a distance. Subdeletion (and attributive comparatives) were central to the debate because they appear to be subject to two conflicting sets of requirements: they display sensitivity to all known island effects, with the notable exception of the Left Branch Condition. This constellation lent itself to generalization into two different directions: either CD is analyzed as a local movement rule, a claim which comes with the commitment of finding an explanation for the exceptional behavior with respect to the Left Branch Condition (Chomsky 1977: 123), or CD applies unbounded, and the standard movement diagnostics have to be taken to be not causally linked to movement after all.

We will briefly summarize the main points of divergence between these two camps, proceeding from there to a discussion of recent trends in the analysis of CD and CSD.

3.1. BOUNDED MOVEMENT (CHOMSKY) VS. UNBOUNDED DELETION (BRESNAN)

As long as syntactic locality conditions are respected, CD can apply at an arbitrary distance:

- (91) John met *more linguists* [than we thought [you said [(...) [Sue met \triangle]]]].
(\triangle = many linguists)

Bresnan (1975) interprets this to signal that CD instantiates an unbounded deletion rule, similar to VP-ellipsis, which is also known to be able to select its antecedent non-locally ((92) adapted from Kennedy 2002):

- (92) John *liked* everyone Bill did and Bill *invited* everyone Sue did \triangle .
(\triangle = liked/invited)

On the other hand, movement analyses of CD maintain that CD consists in a local dislocation operation which is special in that the head of the movement chain is not pronounced (Chomsky 1977; see also Vergnaud 1974; den Besten 1978). More precisely, in Chomsky (1977) it is assumed that a node that in current notation corresponds to DegP moves to SpecCP. If movement applies at a distance, as in (91), the chain is decomposed into a series of local, bounded movement steps by successive cyclic applications of CD:

(93) . . . *more linguists* than [OP₁ we thought [$\hat{\Delta}_1$ you said [($\hat{\Delta}_1$. . .) [$\hat{\Delta}_1$ Sue met $\hat{\Delta}_1$]]]]

In the highest SpecCP, the content of the operator is then identified by a mechanism resembling the one which matches a relative clause operator with its head ((95)):

(94) John met more linguists than [_{CP} OP₁ Sue met $\hat{\Delta}_1$]. (OP = many linguists)

(95) John met the linguists that [_{CP} OP₁ Sue met t₁]. (OP = linguists)

Translated into current terminology, the operator in SpecCP contains a silent copy of the CD-site or the trace, respectively, which is deleted under identity with the head of the construction (Sauerland 2004). As already mentioned, on the classical movement analysis of CD, there is no designated position for the degree variable, but only a single gap created by operator movement of DegP. While this obscures the transparent mapping from syntax to semantics, this complication can be easily avoided by postulating two separate operations, one for CD proper and the other for binding of the degree variable, as made explicit in (48).

The dichotomy between the deletion and the movement account becomes visible mainly in subcomparatives. Just like CD, CSD can apply at a distance, suggesting that the rule is unbounded:

(96) John met more linguists than we thought you said you met [$\hat{\Delta}_{\text{CSD}}$ biologists].
($\hat{\Delta}_{\text{CSD}}$ = many)

However, unlike other known types of movement rules in English, CSD appears to be able to remove parts of a constituent that occupies a left branch, in apparent violation of the Left Branch Condition (Ross 1967/1986; see also Corver 1990 and chapter 66). In (96), for instance, the node that CSD operates on (*many*) resides inside a modifier left-adjoined to NP. But extraction out of left branches is known to lead to sharply degraded results in other contexts, irrespective whether it is a full degree predicate ((97)a/b) that is moved or just an expression binding a degree variable ((97)c):

- (97) a. **How many*₁ did you meet [t₁ biologists]?
b. **How smart*₁ did you meet [t₁ biologists]?
c. **How (much)*₁ was the table [t₁ wide]?

Left-branch adjectival modifiers follow the same pattern, as witnessed by the fact that prenominal attributive APs can be removed by CSD, but not by regular movement:

- (98) Maggie is as fine a doctor as her sister is [a \triangle_{CSD} lawyer]. ($\triangle_{\text{CSD}} = \text{fine}$)
 (99) **So fine_i* her sister is [a t_1 lawyer], that they call her Portia.

Moreover, left branch violations also afflict the analysis of regular attributive comparatives such as (100)a, yet in a slightly different way. As detailed by (100)b, the degree variable bound by the empty operator is located within a prenominal adjunct. Hence, (100) is - at least on orthodox assumptions about constituency - incorrectly excluded by the Left Branch Condition (Moltmann 1992). We will not pursue this issue here, but revisit the problem and a possible solution in section 3.3.

- (100) a. John met more linguists than OP_1 Bill met [$_{\text{DP}} d_1 - \triangle_{\text{CD}}$]. ($\triangle_{\text{CD}} = \text{many linguists}$)
 b. OP_1 than Bill met [$_{\text{DP}} [_{\text{DegP}} d_1 - \text{many}] \text{ people}$].

Thus, CSD poses a puzzle for the movement hypothesis: although subdeletion can reach into a left branch, movement from the same position is impossible. Based on this observation, Bresnan concludes that CSD cannot be an exponent of a movement operation but is to be analyzed in terms of an unbounded deletion rule. More precisely, she argues that CSD and CD derive from a single unbounded deletion transformation that may vary with respect to the size of the constituent it targets, subject to the Relativized A-over-A Condition (see Appendix). In order to account for the island sensitivity of CSD and CD, Bresnan further assumes that locality also regiments deletion operations. It follows that the unbounded dependencies in (96) no longer need to be seen as the result of the iterative application of bounded movement operations, but can be derived by deletion at a distance. Naturally, opting for this choice also entails that island sensitivity can no longer be taken to be a symptom of movement. It is here where Bresnan's views depart most radically from Chomsky's.

In fact, there is a number of further arguments that cast doubt on the movement analysis of subdeletion. We will review three of these problems, before addressing the limitations of Bresnan's own analysis of CSD. First, *that*-trace effects have much less of an effect on subcomparatives than on ordinary comparatives (Bresnan 1977, Grimshaw 1987):

- (101) a. Even fewer books were published than we expected that [\triangle magazines] would be.
 b. Even fewer books were published than we expected (*that) \triangle would be.

Second, Taraldsen (1978) reports even more blatant cases of disregard to islands than those illustrated above. In Norwegian, gaps created by subdeletion can be found inside prenominal possessors ((102)a). Thus, CSD may not only target left branches, but also left branches which themselves are trapped inside islands. An English equivalent of (102)a is given in (102)b:¹⁵

- (102) a. Han er like mange studenters venn som han er [_{NP} [_{NP} \triangle læreres] fiende].
 ‘He is as many students’ friend as he is teacher’s enemy.’
 b. John is as many women’s lover as he is [_{NP} [_{NP} \triangle men’s] enemy].

A third apparently island violating application of CSD, brought to attention in Corver (1993), comes from Dutch. In (103), the gap is located inside the nominal complement of a preposition *wat voor*. This is unexpected inasmuch Dutch disallows preposition stranding (see (104)a) or subextraction from the complement of P (see (104)b), in which the wh-word *wat* is moved out of a *wat-voor* noun phrase that is the complement of P; van Riemsdijk 1978; on prepositional CSD see Kennedy 2002 for Czech and Merchant 2009 for Greek).

- (103) Jan heeft [_{PP} voor [_{NP} meer voetbalclubs]] gevoetbald dan
 hij [_{PP} voor [_{NP} –tennisclubs]] getennist heeft.
 ‘John has for more soccer teams played-soccer than he for tennis clubs played-tennis
 has.’

- (104) a. *Jan heeft [_{PP} voor [_{NP} meer clubs]] gevoetbald dan hij [_{PP} voor -] getennist
 heeft.
 ‘John has for more clubs played-soccer than he for played-tennis has’
 b. *Wat heeft Jan [_{PP} met [_{NP} t voor meisje]] gedanst?
 What has John with for girl danced
 ‘What kind of girl did John dance with?’

Even though the movement analysis is, as was seen, hampered by various shortcomings, the alternative deletion account can, at least in Bresnan’s original formulation, not be entirely correct, either. Notably, the deletion hypothesis encounters serious empirical complications in that it predicts an inaccurate taxonomy that groups CD together with other ellipsis phenomena. This leaves, for one, the observation unaccounted for that many deletion processes are largely insensitive to islands, while those which are are subject to conditions that largely do not resemble the restrictions on CD. To exemplify, VP-ellipsis in non-antecedent contained environments can reach into *wh*-islands (see (105); Sag 1976), while Sluicing generally seems to ignore locality constraints. Clearly, CD behaves differently in this respect.

- (105) I knew that some students presented this article in my class but
 I couldn’t recall [which of the students didn’t].

- (106) They want to hire someone who speaks a Balkan language, but I don’t remember which.
 [Merchant 2003: (26)a]

On the other hand, CD does not pattern along with other, more local deletion operations, either. While it is one essential property of CD that it targets APs, the prototypical exponent of a local

deletion rule, Gapping, is for some reason unable to do so ((107); example is from Johnson 2003: (65)a). Hence, CD cannot be assimilated to Gapping.

(107) *Vivek made Nishi angry at Melissa, before he made Carrie \triangle (\triangle = angry)

The observations above in particular raise doubts whether it is possible to find a natural class of ellipsis phenomena which displays the same signature as CD. But they also point to another, more general shortcoming of Bresnan's deletion analysis, which consists in its failure to provide an explanation for why C(S)D reacts to syntactic islands constraints.

Apart from misclassifying CD as ellipsis and losing an account for locality effects, Bresnan's analysis is too permissive in two further domains. As first noted by Pinkham (1985), if CD were the result of an unbounded rule, all of the instances of attributive subdeletion in (108) should be impeccable (see Kennedy and Merchant 2000; (108)c is their (7a)):¹⁶

- (108) a. *John has a longer desk than Sue has a wide table.
b. *John has a longer desk than Sue has a table.
c. *Pico wrote a more interesting novel than Brio wrote a play.

Finally, a fourth major problem for a deletion analysis, also due to Pinkham, concerns the placement of the comparative clause. Unlike CD, subdeletion is restricted to comparative complements in sentence-final position (Pinkham 1982; see also Huang 1977; Hendrick 1978).¹⁷ Again, this property is not typically found with other cases of deletion.

- (109) a. More men than the company was willing to hire \triangle came for an interview.
b. *More women than the company was willing to hire [\triangle men] came for an interview.

- (110) a. How many more men than you had invited \triangle decided to come?
b. ?*How many more men than you had invited [\triangle women] decided to come?

In sum, there are solid reasons for not assigning to CD and in particular CSD an analysis that subsumes comparatives under unbounded deletion phenomena. But, as was seen above, the movement account also leaves various criterial properties of CSD (Left Branch Condition, possessives, *that-t* effects, peripherality condition) unaccounted for. At the moment, the issue of how to integrate CSD into the zoo of known dislocation operations remains largely unresolved (see sections 3.3., though, and section 5 for further discussion).

Section 3.2 presents three recent, alternative analyses of CD, while section 3.3 turns to two proposals that have been advanced for CSD.

3.2. RECENT ANALYSES OF CD

In what follows, we present three analyses that are representative of three different strategies which have recently been pursued in the analysis of CD: null anaphora, semantic identification and movement.

Exploring the similarity between CD and *one*-anaphora exposed in (111), Lerner and Pinkal (1995) suggest that CD is a discourse mechanism which resembles the rule governing the distribution of silent and overt pronouns (Lerner and Pinkal 1995: 228):

- (111) a. John owns a faster car than OP Bill owns $\hat{\Delta}$. ($\hat{\Delta}$ = fast car)
b. John owns a fast car and Bill owns one $\hat{\Delta}$, too. ($\hat{\Delta}$ = fast car)

The analysis also extends to predicative comparatives such as (112):

- (112) Mary is younger than OP Peter is $\hat{\Delta}$. ($\hat{\Delta}$ = young)

In essence, the account rests on the assumption that a context variable built into the denotation of the empty comparative operator takes up the denotation of the gradable property, and is λ -converted into the appropriate position within the comparative complement. The *than*-XP of (112) can informally be represented as in (113)a. P_o is a context variable that is later instantiated by *young*, yielding (113)b:

- (113) a. than $P_o(d)(\text{Peter})$
b. than young (d)(Peter)

While correct for structures such as (111) and (112), Kennedy (1997, 2002) notes that the analysis overgenerates in more complex environments as it fails to account for the fact that the content of the CD site is always determined locally. In (114), for instance, the missing adjective inside the comparative clause can only be interpreted as *d-long*:

- (114) The table is wider than this rug is, but this rug is longer than the desk is $\hat{\Delta}$.
($\hat{\Delta}$ = d-long/*d-wide) [Kennedy 1997: 154, (167)]

CD behaves unlike other types of ellipsis such as VP-deletion or N²-deletion in this respect, which can be recovered at a distance:

- (115) Marcus read every book I did and I bought every book Charles did $\hat{\Delta}$.
($\hat{\Delta}$ = bought/read) [Kennedy 1997: 154, (166)]

This difference poses a problem for the unrestricted anaphora approach (Lerner and Pinkal 1995), because it fails to exclude the unattested reading (114)b. Kennedy's system avoids this shortcoming by building CD-resolution into the compositional semantic procedure, instead of

delegating it to discourse principles. More specifically, he proposes that the empty operator inside the *than*-XP binds a property denoting trace corresponding to DegP.

(116) Mary is younger than $[_{CP} OP \lambda_1 \text{ Peter is } [_{DegP} T_{\langle e, t \rangle}]]$

This higher-type variable T_1 serves as a place holder into which the AP-denotation of the antecedent inside the matrix clause (*young*) is λ -converted in course of the semantic computation, ensuring that the silent gradable property chooses the closest possible antecedent. Locality of CD then falls out as a consequence of compositionality (for details see Kennedy 2002).

Both Lerner and Pinkal and Kennedy develop analyses in which CD is recovered late in the derivation, by semantic mechanisms. There is evidence, however, that the missing gradable property in comparatives is already part of the syntactic representation, contradicting the tenets of semantic approaches. For instance, (117)a documents that names inside the CD-site trigger Principle C effects. If possible coreference patterns are taken to be encoded in c-command relations at LF, this signals that the LF of (117)a ought to look as in (117)b:

(117) a. *Mary is prouder of John₁ than he₁ is \triangle . (\triangle = d-proud of John₁)
 b. Mary is prouder of John₁ than he₁ is [d-proud of John₁]

Comparatives are also sensitive to other constraints that arguably have a syntactic basis. As seen in (118), extraction out of comparatives observes the Coordinate Structure Constraint (CSC; Ross 1967/1986). Assuming that the CSC is operative at LF (Fox 2000), the contrast between (118)a and (118)b/c falls out from the CSC if the CD-site is already present in the LF-representation. The paradigm (118) remains unaccounted for on a semantic analysis of CD, though.

(118) a. a person who₁ Mary is [more proud of t₁] than Peter is \triangle
 (\triangle = d-proud of t₁)
 b. *a person who₁ Mary is [more proud of t₁] than Peter is \triangle of Ralf₂
 (\triangle = d-proud of t₂)
 c. *a person who₁ Mary is [more proud of Millhouse] than Peter is \triangle
 (\triangle = d-proud of t₂)

Based on these and related observations, Lechner (1999, 2004) advocates a syntactic mechanism for CD that makes comparatives closely resemble head raising relative clauses.¹⁸ Specifically, it is suggested that CD consists in a movement operation that raises the gradable property from inside the *than*-XP to its surface position, where it checks a selectional feature of the degree head. Embedded in the phrase structure (41)a, repeated from above, the derivation proceeds as schematized in (119).

(41)a $[_{DegP} AP [_{Deg} \text{-er } \textit{than}\text{-XP}]]$

- (119) Mary is [_{DegP} [_{AP} *tall-er*] [_{Deg'} Deg^o [_{+comp}]
 [_{than-XP} than OP [_λ₁ Bill is [_{DegP} [_{AP} *tall*] [_{Deg'} Deg^o d₁]]]]]]]

In (119), the AP *tall* is base generated in the lower SpecDegP, from where it is attracted by the [+comp] feature on the matrix Deg^o into the higher SpecDegP. Checking is reflected by comparative morphology on the head of the AP. However, unlike in typical movement configurations, both copies are interpreted. This follows from semantic considerations: Given that *-er* is lexically specified as in (34), the comparative head combines with a gradable adjective denotation as its second argument, mandating that the higher AP copy is retained at LF. The lower AP is interpreted in order to ensure that the degree variable created by operator movement can be compositionally integrated into the computation.

- (34) [**more/-er**] = $\lambda D_{\langle d,t \rangle} \lambda A_{\langle d, \langle e, t \rangle \rangle} \lambda x. \exists d [A(d)(x) \wedge d > \max(D)]$

Thus, comparatives reveal an analytical option inherent in the theory of movement which has hitherto not been recognized: movement can proceed without chain formation.

Among others, the system accounts for the locality of CD and the fact that the CD-site is present during the syntactic derivation. Moreover, it captures the observation in (120) that CD is attested in contexts that do not tolerate ellipsis, documenting that CD behaves like movement and unlike deletion ((120)a from Johnson 1996).

- (120) a. *I consider Betsy pretty and you consider Sam.
 b. I consider Betsy prettier than you consider Sam.

In prenominal attributive comparatives such as (121)a, the constituent that moves includes both the nominal head and the AP modifier. Since the matrix degree head attracts a feature on AP, and this feature needs to be located on the topmost node that moves, the NP must be contained within the prenominal AP, as schematized in (121)b. This analysis essentially treats all prenominal APs as substantive modifiers (Abney 1987):

- (121) a. Sam read longer books than Mary read
 b. Sam read [_{DegP} [_{AP} longer [_{NP} books]]
 than _λ₁ Mary read [_{DP} [_{DegP} [_{AP} longer [_{NP} books]] [_{Deg'} t₁]]]]]

The assumption that AP embeds NP is corroborated by a number of generalizations. First, on the orthodox left-adjunction analysis of prenominal APs in (122), the degree clause is merged inbetween AP and NP, from where it has to extrapose. This is problematic, as prenominal adjuncts are islands for extraposition (cf. (123)):

- (122) [_{NP} [_{DegP} AP [_{Deg'} -er *than-XP*]] NP]

- (123) *eine [_{NP} [_{NP} [_{AP/DegP} stolze t₁] [_{NP} Frau]]] [auf ihren Hund]₁]
 a proud woman of her dog

The subjective parse in (121)b avoids this complication by generating the *than*-XP in its surface position. As a result, the degree complement does not need to extrapose.

Second, if AP and its embedding DegP were adjoined to NP, operator movement would have to proceed out of a left branch (cf. (100)). Again, the alternative factorization in (121)b, which locates the degree variable in the object position of Deg^o, fares better as it offers a strategy to make the operator chain abide by standard locality conditions.

Finally, the specific phrase structure accounts for a number of interpretational contrasts between pre- and postnominal phrasal comparatives, including the one in (124), originally due to Bresnan (1973):

- (124) a. #She met a [_{AP} *younger* [_{NP} *man*]] [than Sally [_{AP} *young* [_{NP} *man*]]]
 b. She met a [_{NP} [_{NP} *man*] [_{DegP} *younger* [than Sally [_{AP} *young*]]]]

(124) demonstrates that the size of the CD-site correlates with the position of the *than*-XP relative to the head noun. In the prenominal comparative (124)a, the missing constituent comprises of both the AP and the NP, hence *young man* is infelicitously predicated of *Sally*, whereas in the postnominal construction, the CD-site is small (*young*) and the sortal conflict disappears. The raising analysis offers a natural explanation of this asymmetry, because word order requires the subjective phrase structure, which in turn triggers movement of [AP NP], for the prenominal frame only. In postnominal comparatives, movement solely targets the AP *young*. Hence, the head noun (*man*) is necessarily part of the lower copy inside the comparative complement in (124)a, but not (124)b. Further aspects and consequences of the system are explored in Lechner (2004) and critical discussion can be found in Kennedy (2000).

Note in the end that while the AP-raising account can also be implemented in terms of a quantificational semantics of comparatives, it is incompatible with the Late Merge analysis of the comparative complement developed in Bhatt and Pancheva (2004). This is so because the *than*-XP needs to be already present at the point of the derivation at which AP-raising applies. We have to leave a more thorough investigation of the benefits and disadvantages of head raising for another occasion, though.

3.3. RECENT ANALYSES OF CSD

Two recent studies of subdeletion (Izvorski 1995 and Kennedy 2002), advance the position that CD and CSD can be subsumed under a common analysis. We briefly summarize the main components and results of these analyses.

Izvorski (1995) argues that subdeletion, just like CD constructions, involves *wh*-movement. Importantly, though, she assumes that the term targeted by movement in subcomparatives is not a left-branch modifier, but a phonologically empty amount phrase roughly corresponding to *in what quantity/to what degree* (see also Grimshaw 1987). A sentence like (125)a is then assigned the underlying structure in (125)b:

- (125) a. John met more linguists than I met biologists.
 b. John met more linguists than [in what quantity]_i I met biologists t_i.

As Izvorski notes, these adverbials can be affected by *wh*-movement:

- (126) a. [In what quantity] did Mary eat apples?
 b. We know [in what quantities] Mary used to drink wine.

On the adjunct analysis, the left-branch extraction ceases to pose a problem simply because movement does not reach into an adjunct. At the same time, subdeletion is still expected to be sensitive to island conditions. To illustrate on the basis of the Complex NP Constraint, (127)a is ill-formed since the trace of the amount adjunct is, as shown in (127)b, located inside an NP island:

- (127) a. *John bought more oranges than we had discussed [a plan [to buy apples]].
 b. John bought more oranges than [in what quantity]_i we had discussed [a plan [to buy apples t_i]].

Izvorksi further demonstrates that various other problems for a unified analysis of CD and subdeletion, among them the absence of a *that*-trace effect and multiple subcomparatives, can be accounted for under her *wh*-movement analysis. For instance, the absence of *that*-trace effects with subcomparatives falls out from the independent observation that overt complementizers do not intervene with adjunct extraction (Lasnik and Saito 1984).

While Kennedy (2002) also defends the position that CD and subdeletion can be reduced to a common syntactic analysis, he does not locate differences between the constructions in a structural source, but in the timing of movement. More concretely, Kennedy suggests that CD involves overt movement to SpecCP of the comparative complement (cf. (128)), followed by deletion under identity with the head of the comparative, while movement applies in the covert component in subdeletion constructions (cf. (129)). Thus, the results of dislocation with CSD are detectable only at LF. A consequence of this proposal is that CD and subdeletion are given structurally identical LF-representations ((128)b and (129)b), yet differ in their phonological forms ((128)a and (129)a):

- (128) a. John met more linguists than I ~~linguists~~_i met t_i. (overt syntax)
 b. John met more linguists than [_{CP} [_{DP} linguists]_i I met t_i]. (LF)
- (129) a. John met more linguists than I met biologists. (overt syntax)
 b. John met more linguists than [_{CP} [_{DP} biologists]_i I met t_i]. (LF)

Kennedy observes that the similarities between CD and subdeletion, such as sensitivity to islands and crossover effects, are all related to properties that are evaluated at LF. Thus, the shared

characteristics of the two constructions can be reduced to the assumption that they have identical LFs. By contrast, differences between CD and CSD, including *that*-trace effects, preposition stranding and contraction, typically result from conditions that restrict overt movement only. To exemplify, while preposition stranding is impossible in many languages, including Dutch ((130)a), prepositions can be separated from their complements by covert movement, as documented by the well-formedness of the *wh-in-situ* structure (130)b:

- (130) a. *Wie_i heeft Jan [_{PP} op t_i] gerekend?
 who has John on counted
 b. Wie heeft er [_{PP} op [wie]] gerekend?
 who has there on whom counted
 ‘Who counted on whom?’

Among others, the analysis accounts for the contrasts in PP-island sensitivity between regular comparatives (131)a (= (104)a), and contexts of CSD (131)b (= (103)):

- (131) a. *Jan heeft [_{PP} voor [_{NP} meer clubs]] gevoetbald dan hij [_{PP} voor \triangle] getennist heeft.
 John has for more clubs played-soccer than he for played-tennis has
 b. Jan heeft [_{PP} voor [_{NP} meer voetbalclubs]] gevoetbald dan hij [_{PP} voor [_{NP}–
 tennisclubs]] getennist heeft.
 John has for more soccer teams played-soccer than he for tennis clubs played-
 tennis has

In (131)a, overt A'-movement leads to ungrammaticality since overt extraction is sensitive to the condition that prohibits P-stranding in Dutch. By contrast, in the subdeletion construction (131)b, movement applies at LF. Given that the relevant constraint is not operative at LF, the output is correctly predicted to be well-formed.

The next section turns to a brief overview of analytical opportunities that have been explored in the study of the relation between the matrix clause and the comparative complement. Particular attention will be given to the question whether the nexus between the matrix clause and the comparative complement displays properties of coordinate structures.

4. COORDINATION VS. SUBORDINATION

This section addresses the nature of the relationship between the comparative clause and the matrix clause. Following Bresnan (1972), it is generally assumed that the comparative clause serves as a syntactic argument of the degree head, and is therefore generated in a subordinate position ((132)a). Optional extraposition as in (132)b can shift the comparative complement to the right periphery, where it adjoins to the matrix clause:

- (132) a. [More linguists [than I had ever met \triangle]] were present at the party.
 b. [_{TP} [_{TP} [More linguists t_i] were present at the party] [than I had ever met \triangle]_i].

Interestingly, once extraposed, the degree clause displays certain coordinate like properties. Thus, in these contexts it looks as if the subordinating particle *than* all of a sudden functions as a coordinating particle (Hankamer 1973). In what follows, we review some arguments in support of the existence of a coordinate parse for comparatives. For limitations of space, the survey will be focused on lesser known observations about subdeletion constructions, most of which carry over to regular comparatives, though. Comprehensive discussion of the coordinate-like properties of comparatives can be found in Hendriks (1995) and Lechner (2004).

4.1. SUBDELETION

A first argument indicating that subcomparatives exhibit coordinate-like behavior comes from Gapping. Gapping is an ellipsis operation which deletes strings minimally including a finite verb in non-initial conjuncts under identity with an antecedent in a preceding conjunct (Neijt 1979; Thiersch 1982; Corver 1990; Johnson 2003, 2014). As the contrast in (133) reveals, Gapping exclusively applies to coordinate structures (Jackendoff 1971):

- (133) a. John kissed Mary and Sue Bill.
b. *John kissed Mary when Sue Bill.

Gapping is also attested in subcomparatives, though, suggesting that at some level, the degree complement and the matrix clause enter into a coordinate-like relationship.¹⁹

- (134) John kissed more girls than Mary boys.

Another property characteristic of Gapping is that it cannot target embedded clauses ((135)a). (135)b demonstrates that the same restriction holds for Gapping in subcomparatives (Huang 1977; Hendriks 1995 for Dutch):

- (135) a. John wore the top hat and (*I believe that) Mary -- the suspenders.
b. Felix knows more Greek than (*I believe that) Max -- Latin.

As noted by Bresnan (1975), the sequence *take advantage* behaves as a unit with respect to Gapping in that deletion cannot remove just the verbal head *take*:

- (136) John took advantage of Mary, and Mary -- (*advantage) of John.

Again, verb deletion in subcomparatives shares the profile of coordinate Gapping:

- (137) John took more advantage of Mary than Mary -- (*advantage) of John.

Finally, whenever Gapping targets a complex predicate, it removes a contiguous string that obligatorily includes the highest finite verb (Ross 1970):

- (138) I want to try to begin to write a novel and
- a. Mary -- to try to begin to write a play.
 - b. Mary -- to begin to write a play.
 - c. Mary -- to write a play.
 - d. Mary -- a play.
 - e. *Mary wants -- a play.
 - f. *Mary wants -- to begin -- a play.

Exactly the same condition is also operative in subcomparatives (Huang 1977):

- (139) I want to try to begin to grow more cauliflowers than
- a. Mary -- to try to begin to grow carrots.
 - b. Mary -- to begin to grow carrots.
 - c. Mary -- to grow carrots.
 - d. Mary -- carrots.
 - e. *Mary wants -- carrots.
 - f. *Mary wants -- to begin -- carrots.

In sum, the parallel behavior of Gapping in coordinate structures and subcomparatives strongly suggests that the degree complement and the matrix clause can, at least at some point of the derivation, be assigned a coordinate parse.

Right Node Raising (RNR) supplies a qualitatively different, second argument for subcomparative coordination. In general, RNR is precluded from applying to subordinate contexts:

- (140) a. Mary liked --, but John hated [the man with the red beard].
 b. *Mary liked --, although John hated [the man with the red beard].

Still, the results of RNR can also be found with subdeletion constructions ((141); Corver 1993; Hendriks 1995), providing further evidence for the presence of a coordinate structure in subcomparatives:

- (141) More women like than men hate [the man with the red beard].

Third, the pattern of subcomparatives parallels that of coordinate structures also with respect to subextraction (Huang 1977; Corver 1990, 1993). Asymmetric movement is not only blocked in conjunctions ((142)), but also in subcomparatives ((143)):

- (142) a. *What kind of vegetable do women like t and men detest Brussels sprouts?
 b. What kind of vegetable do women like t and men detest t?

- (143) a. *What kind of vegetable do more women like *t* than men detest Brussels sprouts?
 b. What kind of vegetable do more women like *t* than men detest *t*?

An intriguing property characteristic of Across-The-Board (ATB) movement is that the ATB-extracted constituents need to reside in isomorphic positions (Williams 1978):

- (144) a. Tell me who *t* likes beer and *t* hates children
 b. Tell me what adults admire *t* and children hate *t*
 c. *Tell me who Jill admires *t* and *t* hates children

Although the nature of this constraint is poorly understood, it is instructive to note that the isomorphism requirement treats *wh*-movement and CSD alike. George (1980) brings to attention the paradigm in (145), which signals that the nodes containing the CSD-site and its antecedent need to occupy structurally identical positions:

- (145) a. John killed more Englishmen than the Inquisition burned \triangle Frenchmen.
 b. *John killed more Englishmen than \triangle Frenchmen fought the Inquisition.
 c. More Frenchmen revered John than \triangle Englishmen adored Sir Thomas.
 d. *More Frenchmen revered John than Sir Thomas More converted \triangle Englishmen.

Finally, (146) documents another, curious fact about CSD: the degree complement of subcomparatives obligatorily has to extrapose, emulating once again the behavior of coordinate structures, where the conjuncts have to be arranged in a linear sequence.

- (146) a. *John gave more books [than he had given \triangle pencils to Sue] to his best friend Peter.
 b. John gave more books to Sue [than he had given \triangle pencils to his best friend Peter].

The central question arising at this point is what forces subcomparatives to enter into a coordinate parse. One approach, which has been pursued in Corver (1993), operates on the assumption that subdeletion constructions are not assembled by the same mechanisms implicated in regular comparative formation, but are derived by ATB-movement. On a slightly modified version of this analysis, schematized in (147)b, *-er* asymmetrically moves out of the matrix DegP at LF and attaches to a position from where it ATB-binds both the degree variable in the main clause and in the comparative complement:²⁰

- (147) a. John met more linguists than I met biologists.
 b. [-er [λ_1 [John met d_1 -many linguists] than [I met d_1 -many biologists]]].

A suitable semantics for this syntactic analysis is provided by the A-not-A analysis (Seuren 1973; Klein 1980). In particular, suppose that the coordinating versions of *than* and *more* are assigned the lexical meaning rules in (148) and that $\text{than}_{\text{coor}}$ heads an asymmetric coordination, as detailed in (149)a. Then, the ATB-chain created by asymmetric movement of $-\text{er}_{\text{coor}}$ can be compositionally interpreted as follows. Coordinating $\text{than}_{\text{coor}}$ (148)a applies to the comparative complement and the matrix clause, in that order, yielding a conjunction of two propositions that differ in polarity ((149)b). Next, the movement index of *more* (λ_1 in (149)a) abstracts over the two degree variables. Finally, the degree head combines with the derived degree predicate ((149)c) and binds off the degree variable, resulting in the quasi formalization (149)d:²¹

- (148) a. $[\text{than}_{\text{coor}}] = \lambda p \lambda q. p \wedge \neg q$
 b. $[\text{more}/-\text{er}_{\text{coor}}] = \lambda D_{\langle d, t \rangle}. \exists d [D(d)]$
- (149) a. $[-\text{er}_{\text{coor}} [\lambda_1 [\text{John met } d_1\text{-many linguists}]]$
 $[\text{than-XP } \text{than}_{\text{coor}} [\text{I met } d_1\text{-many biologists}]]]$
 b. $[\text{than}][[\text{I met } d_1\text{-many biologists}]]([\text{John met } d_1\text{-many linguists}]) =$
 $= \text{John met } d_1\text{-many linguists} \wedge \neg[\text{I met } d_1\text{-many biologists}]$
 c. $[(149)\text{a}] =$
 $= [-\text{er}_{\text{coor}}](\lambda_1[\text{John met } d_1\text{-many linguists} \wedge \neg[\text{I met } d_1\text{-many biologists}]])$
 d. $\exists d [[\text{John met } d\text{-many linguists}] \wedge \neg [\text{I met } d\text{-many biologists}]]$

Naturally, this sketch of an analysis does not provide an explanation for why comparatives and subcomparatives should differ in such fundamental ways. We have to delegate this issue to another occasion.

4.2. REGULAR COMPARATIVES

Turning at this point to the clausal architecture of regular comparatives, degree clauses shaped by CD mainly differ from subdeletion constructions in that they do not need to extrapose and can be parsed into genuinely subordinate structures:

- (150) John gave more books than he had given \triangle to Sue to his best friend Peter.

The degree complement and the matrix clause can enter into a coordinate-like relation subsequent to extraposition, though. To illustrate by means of three groups of phenomena, Bresnan (1977) reports that comparatives resemble coordinate structures in that they may be targeted by ATB-movement ((151)a; Napoli 1983). Napoli (1983) observes that comparatives can be reduced by RNR ((151)b). Third, Emonds (1985), among others, pointed out that Gapping is also found in comparative complements ((151)c):

- (151) a. a man who Mary called t an idiot as often as June called t a cretin
 b. More people admire than love [this woman I met yesterday in the park].
 c. Fred can read newspapers as quickly as Jim can -- letters.

For limitations of space, it is not possible to present a more complete map of the parallelism between regular comparatives and coordinate structures. Systematic and detailed discussions can be found in Hendriks (1995) and Lechner (2004), though.

Finally, a particularly intriguing feature of comparatives manifests itself in hybrid constellations which simultaneously display the characteristics of coordination and subordination. In the Dutch example (152), for example, ATB-extraction has removed *waar* from both clauses, suggesting a coordinate parse. At the same, the finite verb resides in the final position of the comparative clause, which is indicative of a subordinate structure. Thus, comparatives appear to be hybrids.

- (152) *Waar heeft Jan* [_{NP} evenveel foto's [_{PP} t van]] *gezien als Marie* [_{NP} tekeningen [_{PP} t van]] *heeft gekocht.*
what has John as-many pictures -- of seen as Mary drawings – of has bought
'What did John see as many pictures of as Mary bought drawings of?'

For a set of strategies for resolving such paradoxes, which correlates the size of the two conjuncts with their internal syntactic organization see Lechner (2001, 2004).

5. A RESIDUAL ISSUE AND RECENT TRENDS IN THE ANALYSIS OF CD/CSD

5.1. MULTIPLE CSD

Thus far, the discussion was restricted to comparatives with a single degree relation and a single comparative head. However, this limitation is not representative of the construction, as exemplified by the existence of multiply headed comparatives such as (153) (von Stechow 1984; Corver 1990, 1993; Meier 2001; Moltmann 1992):

- (153) More women ate more sandwiches than men ate bananas.

In the literature, the phenomenon of multiple CSD has received attention for a number of reasons. First, von Stechow (1984) observed that the multiply headed construction (153) does not involve a simple comparison of the number of sandwiches and the number of bananas with the number of women and men, respectively. Rather, (153) contains a hidden conjunction asserting that (i) the number of women that ate sandwiches exceeds the number of men that ate bananas and (ii) the number of sandwiches eaten by women exceeds the number of bananas eaten by men.²² These truth conditions can be compositionally obtained without any *ad hoc* devices from an LF-representation similar to (154) (von Stechow 1984; Meier 2001):

- (154) More women [than men ate bananas] ate more sandwiches [than men ate bananas]

What is less clear, however, is how the surface form (153) can be translated into (154) by standardly sanctioned syntactic principles. If the derivation is to be guided by interpretation, such that (154) provides the underlying source for (153), the degree complement *than men ate bananas* would have to undergo Across-The-Board movement to the right. But ATB-

extraposition is generally restricted to coordinate structures, as for instance seen by the fact that (155)a lacks the ATB-extraposition reading (155)b:

- (155) a. The men liked the women we met.
b. The men we met liked the women we met.

It follows that multiply headed comparatives are inconsistent with analyses according to which the clause-final position of the *than*-clause is derived by extraposition.

Second, at least in overt syntax, the matrix clause and the comparative complement of (153) appear to be part of a coordinate structure, as witnessed by the ability of Gapping to target the *than*-XP:

- (156) More women ate more sandwiches than men bananas.

Thus, multiple comparatives require a coordinate parse both for syntactic and semantic reasons - yet, the semantic conjunction groups together two sets of nodes (see paraphrase above (154)) that do not match those coordinated in syntax (matrix clause and *than*-XP).

Third, while multiply headed comparatives can be derived by subdeletion, corresponding examples with CD are ill-formed, illustrating a further difference between CD and CSD (Corver 1990, 1993; Ishii 1991):²³

- (157) a. More men sold more apples than [Δ_{CSD} women] had bought [Δ_{CSD} pears].
b. *More men sold more apples than Δ_{CD} had bought Δ_{CD} .

Finally, as pointed out in Corver (1993), multiple subdeletion poses a potential problem for the classical *wh*-movement analysis of subdeletion (Chomsky 1977), because a single SpecCP would have to host more than one empty operator. Such configurations are not attested in other contexts, such as relative clauses.

In sum, multiheaded comparatives exhibit a variety of intriguing properties that so far have resisted a satisfactory, unified analysis.

5.2. CROSS-LINGUISTIC VARIATION

Comparatives and related gradable constructions display a great degree of cross-linguistic variation (Stassen 1985), a fact which has received a significant amount of attention in the recent literature. The present section collects some of these findings, focusing on three case studies which are at the same time representative for the probably most interesting current trends in syntactic research on comparatives: (i) the typology of *than* (Pancheva 2006, 2010); (ii) different strategies of comparison (implicit vs. explicit) and language specific constraints on degree abstraction (Beck et. al 2004; Kennedy 2009) and (iii) cross-linguistic variation in the formation of phrasal comparatives and the selectional properties of degree heads (Bhatt and Takahashi 2011).

5.2.1. The typology of *than*

The particle *than* is commonly held to be either semantically vacuous (Heim 1985, 2000; Kennedy 1999; Schwarzschild and Wilkinson 2002) or the syntactic manifestation of the maximalization operator (von Stechow 1984; Rullmann 1995). Drawing on a wide array of contrastive data from Slavic and Germanic, Pancheva (2006) develops an alternative analysis, which treats *than* as the analogue of a partitive preposition in the degree domain. Regular partitive *of* can either combine with individual terms ((158)a) or individual predicates ((158)b). In the former case, *of* denotes a relation between individuals (type $\langle e, \langle e, t \rangle \rangle$; (159)a), while predicative *of* effectively functions as a predicate modifier (type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$; (159)b):

- (158) a. some *of* _{$\langle e, \langle e, t \rangle \rangle$} [the water]_e
 b. a glass *of* _{$\langle \langle e, t \rangle, \langle e, t \rangle \rangle$} [water] _{$\langle e, t \rangle$}

- (159) a. $\llbracket \mathbf{of}_1 \rrbracket$ = $\lambda x \lambda y. y$ is part of x
 b. $\llbracket \mathbf{of}_2 \rrbracket$ = $\lambda P_{\langle e, t \rangle} \lambda y. y$ is part of P

Pancheva provides a range of arguments for the two claims that (i) the degree marker *than* is equally ambiguous between a relational, $\langle d, \langle d, t \rangle \rangle$ -type meaning ((160)a) and a predicate modifier denotation ((160)b; type $\langle \langle d, t \rangle, \langle d, t \rangle \rangle$), and that (ii) the parallelism between *of* and *than* extends to the lexical semantics in that the core meaning of *than* consists in the part-of relation. Thus, *than* is a partitive degree preposition, establishing a mereology of intervals.

- (160) a. $\llbracket \mathbf{than}_1 \rrbracket$ = $\lambda d' \lambda d. d$ is part of d'
 b. $\llbracket \mathbf{than}_2 \rrbracket$ = $\lambda D_{\langle d, t \rangle} \lambda d. d$ is part of D

These two manifestations of *than* can be distinguished by their distribution. Relational *than*₁, which selects for two degree descriptions, introduces clausal comparatives as well as phrasal comparatives derived from a clausal source. In both constructions, the degree complement can be taken to denote a degree description derived by maximization of a degree abstract. By contrast, predicative *than*₂ shows up in irreducibly phrasal comparatives and measure phrase comparatives in languages like Russian, Bulgarian and Polish. To provide the degree head with a suitable denotation, Pancheva moreover proposes that the *than*-XP is internally organized as a small clause, in which the degree variable can, if necessary, be abstracted over by *wh*-movement.

To illustrate, the measure phrase *2m* in the Russian phrasal comparative (161)a serves as a small clause predicate ($\langle d, t \rangle$) that can directly combine with predicative *than*₂. The ill-formedness of (161)b confirms that (161)a is not derived from a reduced clause, since clausal degree complements in Russian may in other contexts be construed with an overt *wh*-operator:

- (161) a. Ivan rostom bol'she [_{$\langle d, t \rangle$} dvux metron]. [Pancheva 2006: (12)]
 Ivan in-height more two meters_{GEN}
 'Ivan is taller than 2m.'

- b. *Ivan rostom bol’še čem dva metra
Ivan in-height more what two meters²⁴

In (161), the object of prepositional *than* consists of a predicate only. But the small clause may also include a subject, an option which is documented by the English phrasal comparatives in (162). For these constellations, the analysis correctly predicts that the behavior of the constituent immediately following *than* mimics that of a small clause subject:²⁵ it can be exceptionally Case marked ((162)a), it may host reflexives ((162)b) and it can be extracted ((162)c). Compositional interpretation is finally ensured by degree abstraction inside the small clause by short operator movement, as detailed in (163):

- (162) a. She is taller than him (*is).
b. It is impossible that John is taller than himself (*is).
c. Who is he taller than t (*is).

(163) Who₂ is he taller than [_{<d,t>} λ₁ [t₂ d₁-tall _{<d,<e,t>>}]]

To summarize, a new perspective on the semantic contribution of *than* offers novel insights into the typology of comparatives in Slavic, as well as some well-known, yet hitherto recalcitrant properties of phrasal comparatives in English. For detailed analysis of the cross-linguistic typology of *than* in Slavic and further justification of small clause comparatives see Pancheva (2006, 2010).

5.2.2. Japanese vs. English I: subdeletion and negative islands

Another type of parametric variation is discussed in Beck *et al.* (2004), who consider three differences that set apart languages like Japanese and Chinese from English: (i) Japanese lacks subdeletion constructions ((164)); (ii) in Japanese, attributive comparatives are restricted to numerical amount constructions with *many* ((165); Ishii 1991); and (iii) Japanese comparatives are not sensitive to negative islands ((166)):

- (164) a. *Kono tana-wa [ano doa-ga hiroi yori (mo)]. [Beck et. al 2004: (5)]
this shelf-TOP [that door-NOM wide YORI (mo)]
b. This shelf is taller than that door is wide.
- (165) a. Taroo-wa [Hanako katta yori] takusan kasa-o katta. [ibid., (3a)]
Taroo-TOP Hanako bought YORI many umbrella-ACC bought
‘Taroo bought more umbrellas than Hanako’
b. ?*Taroo-wa [Hanako katta yori] nagai kasa-o katta. [ibid., (4a)]
Taroo-TOP Hanako bought YORI long umbrella-ACC bought
‘Taroo bought a longer umbrella than Hanako did.’

- (166) a. John-wa [dare-mo kawa-naka-tta no yori] takai hon-o katta. [ibid., (6)]
 John-TOP anyone buy-Neg-Past NO YORI expensive book-ACC bought
 b. *John bought a more expensive book than nobody did.

Beck *et al.* (2004) suggest to relate these points of variation to a parameter that regulates whether a language more generally admits binding of degree variable binding in the syntax or not. On the standard view, object language degree abstraction is an essential ingredient of the analysis of subdeletion, the explanation of negative islands and the formation of attributive degree structures. In all three contexts, a degree variable is bound by a movement index. The phenomena in (i) to (iii) can therefore be made to follow from the assumption that binding of degree variables is parametrically absent in Japanese. Further support for this claim comes from the observation that Japanese lacks degree interrogatives.

A natural question arising at this point is how the ordering relation constitutive of comparatives can be obtained without degree abstraction. According to Beck *et al.*, the answer involves two independent assumptions: (i) the *yor*i-clause functions as a free relative and (ii) the ordering relation is not derived compositionally from the semantic contribution of the degree head (*explicit comparison*), but is the result of contextual, pragmatic strategies (*implicit comparison*). To exemplify, the analysis assigns to (165)a roughly the same meaning as to the implicit comparative *Compared to what Hanako bought, Taroo bought more umbrellas*, while the deviance of (165)b is related to the same factors responsible for the infelicity of *?Compared to what Hanako bought, Taroo bought a long umbrella*. In this way, the contrast between subdeletion in regular and amount comparatives is reduced to pragmatic factors.

Elaborating on the analysis of Beck *et al.*, Kennedy (2009) argues for a more restricted version of the degree parameter, given in (167), which identifies the locus of cross-linguistic variation at the semantic type of the complement of *more/-er*, instead of the general availability of object language degree abstraction:

- (167) a. Non-phrasal comparative complements (“complex standards”) in Japanese are always of type e.
 b. Non-phrasal comparative complements in English are potentially of type d.

(167) states that languages differ in whether their degree heads partake in DEGREE comparison, INDIVIDUAL comparison or both. In Japanese, for instance, the standard of comparison is always an individual term, which serves as the first argument of the three place relational degree head (168) (Heim 1985; on *more/-er*₃ see Bhatt and Takahashi 2011 and section 5.2.3 below):

$$(168) \text{ [more/-er}_3\text{]} = \lambda x \lambda A_{\langle d, \langle e, t \rangle \rangle} \lambda y. \max(\lambda d. A(d)(y)) > \max(\lambda d. A(d)(x))$$

English, on the other hand, also admits degree expressions as standards.²⁶ On this analysis, the contrast between English and Japanese type languages arises from the different types of semantic objects the degree head can combine with. English has a ‘richer’ system of comparatives not because it has the privilege of binding degree variables, but for the reason that

the lexicon of English includes a degree comparison version of the degree head *more*. Essentially the same conclusion has been reached for independent reasons in Bhatt and Takahashi (2007, 2011; see section 5.3.2).

A strong empirical argument for Kennedy’s assumption that degree abstraction is also implicated in the analysis of Japanese comparatives is supplied by the contrast between the well-formed attributive comparative (169)a and its synonymous, yet unacceptable clausal variant (165)b:

- (169) a. Taroo-wa [Hanako yori] nagai kasa-o katta. [Kennedy 2009: (37)]
 Taroo-TOP Hanako YORI long umbrella-ACC bought
 ‘Taroo bought a longer umbrella than Hanako.’
- b. [Taroo-wa₁ [[Hanako yori]₂ [_{<d,<e,t>>} λ₂ λ₁ t₁ bought a t_{1,d}-long_{<d,<e,t>>} umbrella]]]
- c. [(169)b] =
 [[**more/-er**₃](**Hanako**)]([λdλx.x **bough a d-long umbrella**])(**Taroo**)=
 max(λd.Taroo bought a d-long umbrella) >
 max(λd.Hanako bought a d-long umbrella)

For (169)a to be compositionally interpretable, *yor*i as defined in (168) needs to combine - in that order - with the individual marking the standard of comparison (*Hanako*); a gradable property of type <d,<e,t>>; and the subject (*Taroo*). But the surface constituency (169)a fails to provide a suitable adjective meaning. It follows that both the *yor*i-XP and the subject need to undergo covert movement in such a way as to produce the required relation, resulting in the LF-representation (169)b. As the LF-fragment in (169)b reveals, the subject *Taroo-wa*₁ is separated from its λ-binder by the *yor*i-phrase. This unorthodox representation is an instance of what Barker (2007) calls *parasitic scope*.

Returning to the debate about the source of cross-linguistic variation, Kennedy notes that movement of the *yor*i-XP in (169)b involves degree abstraction, which in turn confirms that Japanese does not indiscriminately lack degree binding in the syntax. This finding is not consistent with the parameter formulated in Beck et al. (2004), yet compatible with Kennedy’s relativized version (167).

Two further sets of observations corroborate the assumption that Japanese has object language degree variable binding (*explicit comparison*). First, Kennedy notes that the distinction between explicit and implicit comparison correlates with a number of linguistic diagnostics. For instance, differential measure phrases are acceptable with explicit comparison constructions only:

- (170) a. ??Compared to Lee, Kim is 10cm tall. [Kennedy (2009): (58)]
 b. Kim is 10cm taller than Lee.

But differential comparatives similar to (170) are also attested in Japanese. Hence, Japanese arguably has degree abstraction. Second, as will be illustrated in the next and final subsection, this conclusion receives further, indirect support from the behavior of phrasal comparatives.

5.2.3. Japanese vs. English II: phrasal comparatives

The definition of *more/-er*₃ in (168) was originally intended by Heim (1985) to render phrasal comparatives such as (171) interpretable without having to stipulate elliptical nodes. As was already seen in the discussion of (169), in the attributive construction (171)b, the subject (*Sue*) and the unit [*-er than Ann*] moreover need to end up in a configuration of parasitic scope, illustrated in (171)c:

- (171) a. Sam is taller than Bill.
 b. Sue read a better poem than Ann.
 c. Sue₁ [*-er than Ann*]₂ [_{<d,<e,t>>} λ₂ λ₁ t₁ read a t_{1,d} - good_{<d,<e,t>>} poem]

Lechner (2004) demonstrates that this movement is not reflected in changes in c-command in German and English, indicating that these languages lack base-generated phrasal comparatives and the individual comparison three place degree head *more/-er*₃. Specifically, contrasts such as (172) are unexpected on the direct analysis, because it generates LF-representations (cf. (173)) which are undistinguishable with respect to the c-command relations between the two terms to be construed coreferentially ((172) is from Bhatt and Takahashi 2007):

- (172) a. *More people introduced *him*₃ to Sally than to *Peter*₃'s sister.
 b. More people introduced *Peter*₃ to Sally than to *his*₃ sister.
 (173) a. Sally₁ [*-er than Peter*₃'s sister]₂ [λ₂ λ₁ d₂-many people introduced *him*₃ to t₁]
 b. Sally₁ [*-er than to his*₃'s sister]₂ [λ₂ λ₁ d₂-many people introduced *Peter*₃ to t₁]

Conversely, the disjoint reference effect in (172)a falls squarely within the bounds of the ellipsis analysis of phrasal comparatives (Lechner 2004). As detailed below, the name is c-commanded by the coreferential pronoun inside the reconstructed *than*-XP only in (174)a:

- (174) a. *More people introduced *him*₃ to Sally than ~~introduced *him*₃~~ to *Peter*₃'s sister.
 b. More people introduced *Peter*₃ to Sally than ~~introduced *Peter*₃~~ to *his*₃ sister.

Adopting a slightly modified version of the diagnostics used in Lechner (2004), Bhatt and Takahashi (2007, 2011) observe that not all languages behave like English. In Hindi-Urdu, Japanese and Chinese, phrasal comparatives are derived by the individual comparison three-place degree head *more/-er*₃. Among others, this is reflected by the fact that Hindi-Urdu is more permissive than English in the coreference patterns it admits in phrasal comparatives analogous to (172)a. For a string like (175), the ellipsis analysis would incorrectly rule out coreference between *Ravi* and *him*, because the name would c-command the pronoun in the reconstructed ellipsis site (*than Atif showed him*₃ *Ravi*₃'s sister's picture)

- (175) Atif-ne [*Ravi-kii*₃ behen-kii foto]-se *us-ko*₃ [Bhatt and Takahashi 2011: (35)]
 Atif-ERG Ravi-GEN sister-GEN picture-than he-DAT
 Mohan-kii behen-kii foto zyaadaa baar dikhaa-ii
 Mohan-GEN sister-GEN picture more times show-PERF
 ‘Atif showed Mohan’s sister’s picture to *him*₃ more times than *Ravi*₃’s sister’s picture.’

Bhatt and Takahashi’s results have two important implications. First, languages differ in the way they treat the nominal complements of *than*. Languages like Hindi-Urdu and Japanese interpret the NP following *than* as the complement of relational *more/-er*₃ ((168)), while English and German reconstruct a clausal frame into which the remnant is fit inside the degree clause. Second, Bhatt and Takahashi’s compelling arguments for the direct analysis in Hindi-Urdu and Japanese further strengthens the case for the kind of covert movement process resulting in degree abstraction which was seen to be required by the individual comparison analysis (see LFs (169)b and (173)). From this, it can be concluded that binding of syntactically represented degree variables is also available in Japanese.

In sum, the source of typological variation in comparatives appears to be located in the lexicon, in particular in the different choices different languages make for the degree head (*more/-er*) and the degree particle (*than*). Further discussion of universals and variation in the morphosyntax of comparatives can, among others, be found in Bobaljik (2012).

6. CONCLUSION

This chapter discussed selected aspects of the syntax of CD and subdeletion construction, giving special consideration to (i) the internal organization of the matrix clause and the comparative complement; (ii) the external distribution of the degree complement; (iii) the mapping from syntax to semantics (transparent LFs); (iv) empirical differences between CD and CSD; (v) strategies that have been pursued in the analysis of CD and CSD; (vi) cross-linguistic variation in comparative formation.

As has become apparent, the findings in the literature so far have made it possible to delineate the contours of a rich theory of CD: CD consists in movement of some type that eliminates the gradable property from inside the comparative complement. In addition, the *than*-XP embeds an empty operator chain abstracting over a degree variable. By contrast, no consensus has emerged yet concerning the correct analysis of subdeletion. Prominent remaining questions in this are: Can CSD be subsumed under CD? Why do subdeletion constructions require a coordinate parse? Which conditions (morphological, syntactic, semantic) govern the choice of the particular semantic mechanism (relational vs. A-not-A) used in deriving the comparative interpretation? Even though substantial progress has been made, more issues in these complex domains are open to debate than ever before. Finally, it should be noted that even though the results reported here might give the impression of unity, the field is more diversified and interesting than the limits of this survey might suggest.

APPENDIX: BRESNAN CD/CSD TRANSFORMATION

Bresnan (1975) argues that only the maximal subphrase of the compared constituent identical to a corresponding subphrase of the head undergoes CD. This generalization on the deleted part follows from Bresnan’s Relativized A-over-A Condition (RAOAC; Bresnan 1975, 1976a, 1976c). The RAOAC states that a phrase of type A (= the target predicate) affected by a transformation must be maximal with respect to the values assigned to the elements in the structural description of the transformational rules that are the context predicates (i.e., the constant factors not operated on by the rule). Maximalization is a function of the syntactic features (+/-N, +/-V) that are mentioned in the structural description.

Bresnan’s (1975) rule of CD is given in (176):

(176)

$[Y'']$	X''	W_1	$[S'']$	W_2	$[Y'']$	X''	W_3	W_4	$4 \leq 1$
	1	2		3		4	5	6	→
	1	2		3		∅	5	6	

The Y'' and X'' -constituents in the Structural Description represent (material inside) the compared elements; the X and Y ‘barred’ variables are restricted to measure-phrase constituents: N'' , A'' , Q'' . W is a variable over labeled bracketings. The Y'' -constituent contained within the comparative clause (S'') is the target predicate, i.e. the constant factor operated on by the deletion rule. Finally, the leftmost Y'' , the head of the comparative construction, functions as the context predicate.

If W_1 and W_3 are null (which amounts to a situation in which $X'' = Y''$), the deletion rule removes the entire compared constituent within the comparative clause. This instantiates CD. When W_1 and W_3 are overt, the deletion removes only part of the compared constituent, viz. the left-branch modifier, resulting in Subdeletion. In line with the maximalization requirement on the target predicate, that part of Y'' must be deleted which is maximally identical to the context predicate:

(177) a.

She has $[_{NP}$	$[[_{QP}$	as many] friends $][_{S'}$	as I had $[_{NP}$	$[_{QP}$	x-many] friends $][_{S'}$			
	1	2		3	4	5	6 =	→
							∅	
	1	2		3	∅	5		
She has as many friends as I had --								

b.

She has $[_{NP}$	$[[_{QP}$	as many] friends $][_{S'}$	as I had $[_{NP}$	$[_{QP}$	x-many] enemies $][_{S'}$			
	1	2		3	4	5	6 = ∅	→
	1	2		3	∅	5		
She has as many friends as I had – enemies								

Thus, depending on the value of W_1 and W_2 , the deletion rule in (176) yields a Subdeletion construction ((177)a) or a regular comparative ((177)b).

Notes

1. Already the earliest generative accounts of comparatives (Hankamer 1971; Bresnan 1972) suggest that comparative formation is analogous to relative clause formation and involves a movement rule.

2. The *than*-XP of (26) is mapped to a function that collects all degrees d such that d is a degree to which the door is wide. If the door is 3ft wide, the set includes all rational numbers on the scale of length from 0 to including 3ft.

3. LF movement may affect the interpretation of expressions *inside* the *than*-XP. It has for instance been suggested that QR is responsible for the ambiguity of Russell's yacht sentence *I thought that your yacht was larger than it is*. See however Hoeksema (1983) and Heim (1985) for problems with such a movement analysis.

4. Again, there is a parallelism to be drawn seen in analogy to free relatives, where the quantificational force is usually attributed to a relative external head.

5. Syntactically, Deg-GQ corresponds to the Deg'-node. If one wishes to avoid dislocation of X' -nodes, the AP *long* can also be relocated into a functional projection above DegP (Corver 1997) prior to QR. Then, it will be DegP that moves.

6. Unlike Bhatt and Pancheva's version, in which *-er* combines with the degree complement first, this lexical entry for *-er* is conservative. See Bhatt and Pancheva (2004, 2007) for discussion.

7. The AP *might*, in analogy to NP, be further embedded in functional structure. For the nominal domain, this might yield (iia) (see e.g. Abney 1987; Ritter 1991) and for APs a structure like (iib) (see Abney 1987; Corver 1991a, 1997a,b, 2013):

- (ii) a. $[_{DP} D [_{QP} Q [_{NP} N]]]$
 b. $[_{DegP} Deg [_{QP} Q [_{AP} A]]]$

8. The maximality analysis is syntactically just as promiscuous as the quantificational one in that a suitable version of *-er* is compatible with all three parses in (41). What these observations demonstrate is that semantic considerations provide only an incomplete guide in deciding among different phrase structure analyses of the DegP.

9. See also Sag (1976). The correlation is also known as the *Ellipsis-Scope Generalization*:

- (i) When a degree clause β is extraposed from a degree head α , the scope of α is exactly as high as the merger site of β . (Bhatt and Pancheva 2004: (39))

10. The same observation has been made for phrasal comparatives in Lechner (1999, 2004: 199).

11. Chomsky suggests that languages which do not admit *wh*-phrases in the comparative clause differ from those which do only in the application of a local deletion rule targeting the *wh*-phrase in SpecCP.

12. It should be noted that many Dutch speakers find (56)a acceptable.

13. Another test distinguishing between the two analyses of *of*-comparatives (subdeletion vs. CD) is based on the parallelism constraint on subdeletion (George 1980; see discussion of (145)). If *of*-comparatives are instances of subdeletion, mixing the grammatical functions for the comparative NP and the subdeletion site should lead to ungrammaticality. This expectation seems to be borne out:

(i) *More of the linguists were invited by Sam than I invited of the biologists.

14. This updated rendering does not follow the letter, yet the spirit of Grimshaw (1987).

15. Note that the CD counterpart of (102)b is ungrammatical, attesting to another difference between CD and CSD:

(i) *John is as many women's lover as he is [_{NP} [_{NP} \triangle] enemy].

On attributive CSD see Kennedy and Merchant (2000).

16. Kennedy and Merchant (2000) establish two cross-linguistic generalizations: (i) there is a direct correlation between left-branch extractions in interrogatives and the acceptability of attributive CD constructions, and (ii) languages in which left-branch extractions are impossible can bypass this constraint by eliding a constituent that includes the extraction site.

17. As Bresnan (1976c) observes, there are examples involving subdeletion in a sentence-internal comparative clause which are quite acceptable:

(i) a. I can tell you that fewer women than there are fingers on my right hand, passed.

b. He has as many women as he has horses, in his stable.

She further remarks that certain examples featuring CD in sentence-internal position sound awkward:

(ii) a. More women than \triangle flunked, passed.

b. I gave as many women as I had \triangle in my courses, A's.

18. Donati (1997) devises an analysis that subsumes comparatives under free relatives. See also Izvorski (1995).

19. Similar examples have been observed for French in Kayne (1981):

(i) Marie a écrit autant d'articles que Jean de livres

Mary has written as-many of articles as John of books

'Mary has written as many articles as John has written books.'

20. Ruys (1992) showed that such asymmetric extractions are licit, if the moved operator ATB-binds a variable in both conjuncts.

21. For limitations of the A-not-A analysis see Schwarzschild (2008), among others.

22. Hendriks (1994) notes that von Stechow's (1984) semantics for multiple Subdeletion constructions fails for cases like (i), for which it wrongly predicts the interpretation in (ii):

- (i) More doors are higher than windows are wide.
- (ii) The number of high doors exceeds the number of wide windows and the height of the doors exceeds the width of the windows.

See Meier (2001) for discussion.

23. Kennedy (2002) notes that it is also possible to find mixed multiply-headed comparatives, i.e., comparatives involving both CD and subdeletion:

- (i) a. Christmas makes as many people as happy as it makes \triangle_{CD} [\triangle_{CSD} unhappy].
b. Max persuaded more people to buy more cars than you persuaded \triangle_{CD} to buy [\triangle_{CSD} trucks].

Moreover, multiple CD becomes licit if the second application of CD targets an adverbial:

- (ii) We fly to more destinations more often than we ever have.

(adapted from a British Airways commercial)

24. In Russian, *than* is phonetically empty.

25. The small clauses analysis has, for essentially the same reasons, first been formulated in Lechner (2004: 181).

26. Whether English also has individual comparison depends on whether phrasal comparatives are analyzed as base generated or as reduced clausal comparatives. The emerging consensus is that for English, the latter option is correct. See also section 5.3.2.

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