

A DP-shell for comparatives

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In this paper I propose a new phrase structure for comparatives. Specifically, I argue that the comparative determiner projects a shell structure. This account has the advantage of specifying locally the relationship between the comparative determiner and its two arguments by base-generating them within the same maximal projection: the determiner is the head, and its two arguments fill the specifier and the complement positions. The new structure allows for a compositional semantics of comparatives.

1. Are comparatives conjoined structures?

Various proposals have been put forward in the literature regarding the structure of comparatives. It is agreed upon that comparatives come in two forms: *phrasal*, as in (1), and *clausal*, as in the corresponding sentences in (2):^{1,2}

- (1) a. Chris is more tolerant *than* her.
b. Pauline writes as often *as* him.
c. Peter drank less coffee *than* her.
- (2) a. Chris is more tolerant *than* she is.
b. Pauline writes as often *as* he does.
c. Peter drank less coffee *than* she did.

Where analyses differ from one another is in the treatment of *than/as*: as a conjunction or as a head of a PP/CP. No one disputes the status of *than* and *as* in phrasal comparatives: they are uniformly recognized as prepositions, subcategorizing for a particular type of complement, a DP, and assigning structural case to it.³ It is in clausal comparatives that Hankamer (1973) and Napoli (1983), among others, have proposed that *than* and *as*

¹A reduced form of the comparative, as in (i), is sometimes considered a *phrasal* comparative (i.e. Napoli 1983, Heim 1985, Moltmann 1992). I agree with Hankamer 1973 that sentences like (i) are clausal comparatives that involve ellipsis:

(i) Susan gave more presents to Ann than to Stephanie.

²The sentences in (1) and (2) further illustrate that comparatives can be adjectival, adverbial, and nominal, depending on the category of the compared constituents.

³Moltmann 1992 proposes a three-dimensional structure for comparatives according to which both phrasal and clausal comparatives involve simultaneous subordination and coordination.

are conjunctions. For Corver (1990, 1993) only a subset of clausal comparatives, namely subcomparatives, involve coordination.⁴

The proposal that I develop here is incompatible with the analysis of comparatives as coordinated clauses. Therefore I will briefly present an argument, not discussed before, that makes the conjunction account untenable; I will refer the reader to Keenan (1987), Moltmann (1992) among others, for further arguments that support the conclusion drawn here.

An unattractive consequence of analyzing clausal *than/as* as a conjunction is the introduction of non-uniformity in what are otherwise very similar constructions. In addition, such an analysis is directly contradicted by the movement facts in (3b) and (4b):

- (3) a. [John couldn't possibly be more surprised] *than* [Mary was disappointed]
 b. More surprised than Mary was disappointed, John couldn't possibly be.
- (4) a. [[Steve has written more books] *than* [Mark has ever read.]]
 b. How many more books than Mark has ever read has Steve written?

If the comparatives in (3a) and (4a) had the conjoined structure that is shown here, then the (b) examples would be predicted to be ungrammatical, because they would involve movement of non-constituents. But of course (3b) and (4b) are perfectly acceptable. Note that (3) is a subcomparative, so that even Corver's version of the conjunction analysis is contradicted.

Therefore, I conclude that *than* and *as* are not conjunctions. I will assume instead with Larson (1988a) that they are prepositions and not complementizers, as suggested in Hankamer (1973) and Larson (1987).⁵ This distinction is not crucial for the analysis advocated here and this is why I will not go into details to justify it. I will note, however, that treating phrasal and clausal *than* and *as* differently ignores the fact that these have the same form in a number of languages besides English. In Bulgarian, for instance, *ot* 'from' is a preposition used independently of the comparative construction, as evident from (5a); (5b) shows that *ot* is used both in phrasal and in clausal comparatives.⁶

- (5) a. Tja e *ot* Sofia, no *ot* četiri godini živee tuk.
 she is from Sofia but from four years lives here
 'She is from Sofia but she has been living here for four years.'
- b. Ivan verovatno e po-točen *ot* neja / *ot*kolkoto e tja.
 Ivan probably is more-punctual than her / than-how-much is she
 'Ivan is probably more punctual than her/than she is.'

Furthermore, in a language like Russian, where no preposition is needed in phrasal comparatives (and the second compared DP appears in an oblique case) there is no equivalent of *than/as* in clausal comparatives:

⁴In subcomparatives only a subpart of the second compared constituent is non-overt:

(i) We read more books than they read newspapers.

⁵Note that Larson 1987 considers clausal *than* and *as* to be underlying prepositions functioning as complementizers.

⁶The fact that *ot* is written as one word with the following *wh*-phrase should not be considered evidence against its independent status. If anything, this is consistent with the view that *ot* in clausal comparatives is a preposition, since it is a common orthographic practice in Bulgarian to have the preposition and the following *wh*-word written together (e.g. *dokoga* 'till when', *otkoga* 'since when').

- (6) Ja vyše ego / čem on.
 I taller him-GEN / what-INSTR he-NOM
 ‘I am taller than him/than he is.’

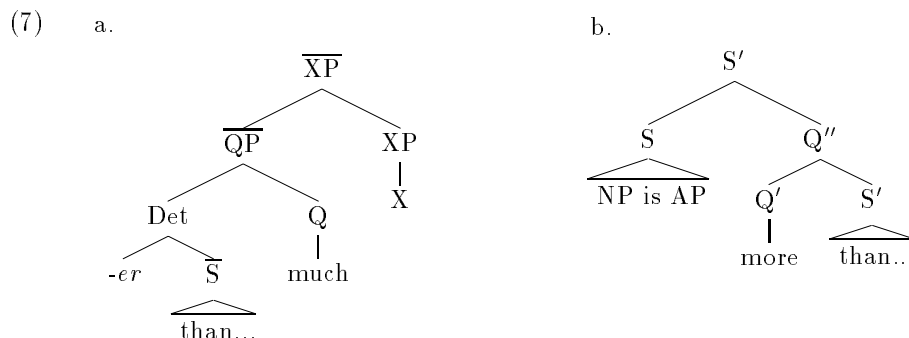
The Russian facts illustrated in (6) would have to be considered entirely coincidental if we accept the view that clausal and phrasal *than/as* are of a different syntactic category.

Adopting the view that *than* and *as* are prepositions in both comparative constructions, the phrasal and the clausal one, is most economical and allows for a unified treatment of comparatives. Of course, accepting this means that we have to extend the subcategorization frame of prepositions and allow them to have clauses as complements. That this is independently needed for prepositions like *before*, *after*, *since* and *until* is argued in Geis (1970), Larson (1990) and Johnson (1988).

2. The attachment site of the comparative PP: Previous analyses

The assumption that *than* and *as* are not conjunctions but prepositions limits the possible structures for comparatives. Still several options remain to be considered. Is the comparative PP an argument of the comparative determiner or an adjunct to the constituent formed by the comparative determiner and the first compared element? If the former, how is the surface word order achieved; if the latter, where exactly is the PP adjoined? These will be the questions that I will address next, first discussing existing analyses and then, in section 4, proposing a novel structure for comparatives.

The earlier syntactic theories of comparatives (Bresnan 1973, Hendrick 1978) propose that the *than/as*-phrase forms an underlying constituent with the comparative determiner and that this constituent modifies the first comparative argument. That this is desirable from a semantic point of view will become clear in section 3.2. An attractive syntactic result is that the discontinuous dependencies *more/less...than* and *as...as* can be accounted for easily. However, the proposed structures depend on movement operations which are problematic. Bresnan’s and Hendrick’s analyses are illustrated in (7a, b):



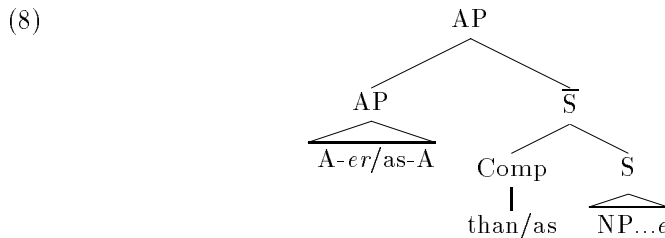
Under Bresnan’s account in (7a), the *than*-phrase (for her an \bar{S}) obligatorily extraposes out of (what is effectively) the specifier position of AP and adjoins to that AP (\bar{AP} in her system). The problem is that this movement is not motivated by anything apart from the need to derive the correct surface word order, and also that such a left-branch extraction is in principle excluded in English: *very easily recognizable* \rightarrow **very recognizable easily*.

For Hendrick (1978), who discusses only adjectival comparatives, the constituent formed by the comparative determiner and the *than*-phrase is effectively adjoined at the sentence

level. Movement of the comparative determiner out of the adjunct phrase into the specifier position of AP is required to derive the correct word order. Again, this movement is both unmotivated independently of word order considerations and impossible to justify theoretically. In addition, the underlying representation would be wrong if extended to nominal comparatives (see section 4.3).

Later accounts of the comparative construction try to remedy the inherent problems of these early proposals. In examining the more recent analyses of comparatives, my purpose is to emphasize the fact that there is a trend towards closer representation of the semantic constituency in the syntax. The proposal that I eventually develop is a logical continuation of this tendency towards a compositional semantics for comparatives.

Larson (1987) considers the *than/as*-phrase (for him an \bar{S}) an adjunct attached to the maximal projection of the first compared constituent.⁷



The main objection against the structure in (8) is that the relationship that it proposes between the comparative determiner and its first argument, on the one hand, and the *than/as*-phrase on the other, is far too loose. Arguably, this relationship is much closer than that between a phrase and its appositive modifier. For one, the comparative determiner and its first argument cannot have an independent meaning. Even if the *than/as*-phrase is not overtly present, as in the bare comparative (9), it is ‘understood’: that is, additional information has to be taken into consideration in the calculation of the meaning of the comparative construction:

- (9) John used to visit me more often.

Taken in isolation, (9) receives a default interpretation as if it is continued by *than he does now*. The non-overt PP will be interpreted differently if the preceding discourse segment is different, as illustrated in (10a,b):

- (10) a. Peter visits me most Sundays. John used to visit me more often (*than Peter does now*).
 b. John visits her once a week. John used to visit me more often (*than he visits her now*).

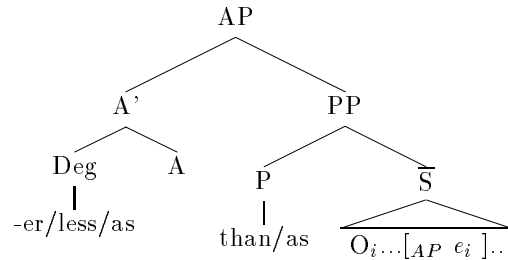
Thus the claim is that the structure in (8) is not an adequate representation of the comparative construction.⁸

⁷ Although the structure is proposed for adjectival comparatives, presumably Larson would accept it for adverbial and nominal comparatives as well.

⁸ This line of reasoning is related to the argumentation that has been advanced in favor of a syntactic distinction between restrictive and non-restrictive relative clauses (Partee 1975, Jackendoff 1977). The proposal is that restrictive relatives are attached at the level of N' while appositives are adjoined higher, to the NP. Among the differences that this syntax is supposed to capture is the observation that the head of an appositive relative has reference independent of its modifying clause, while the head of the non-restrictive relative does not. See Srivastav 1991 on why the syntactic distinction must still be maintained despite the arguments of Bach and Cooper 1978 that an appropriate semantics is available for restrictives attached at the level of NP.

A different structure is proposed in Larson (1988a) (again for adjectival comparatives). The relevant representation is given in (11):⁹

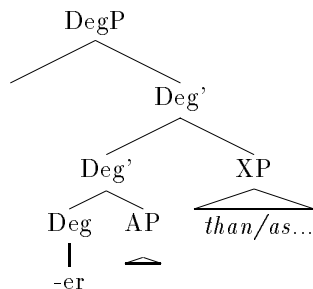
(11)



One of the changes from (8) is in the treatment of *than* and *as*: they are no longer analyzed as complementizers but as prepositions. The other change is in the attachment of the *than/as*-phrase. In (11) it is treated as a specifier of the first compared constituent, though to the right. The move is towards a representation of a closer relationship between the two compared constituents.

Finally, consider the analyses proposed by Abney 1987 and Corver 1990:

(12)



An important step is taken towards representing the semantic compositionality in the syntax. The comparative determiner is the head of the whole construction and not simply a modifier of the first compared constituent. The first semantic argument of the comparative determiner is placed in a syntactic argument position. The *than/as*-phrase is adjoined even lower.

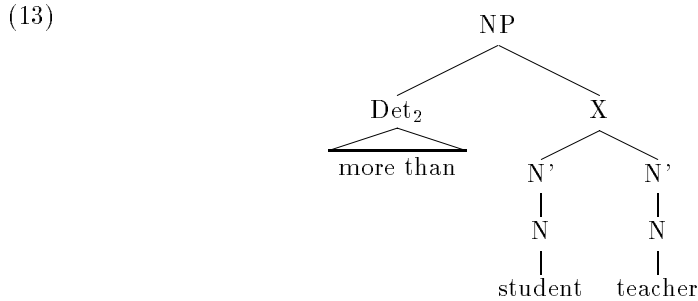
A common syntactic problem of the later analyses is that there is no way from the proposed structures to account for the fact that the choice of quantifier determines the choice of preposition, i.e. that *more/less...than* and *as...as* are fixed constructions. With respect to semantic compositionality the problems are two: first, the accounts do not represent a direct relation between the comparative determiner *more/less/as* and its second argument, the *than/as*-phrase; second, none of the accounts combines *more/less* with *than*, and *as* with *as*, in the syntax, allowing them to combine in the semantics in a compositional way. The purpose of the following section is to present arguments in favor of treating *more/less...than*, and *as...as* as complex determiners and to show that the comparative determiner and the *than/as*-phrase form a semantic constituent.

⁹The null O in COMP is the second compared constituent that has been extracted from the comparative clause, assuming the *wh*-movement analysis of clausal comparatives of Chomsky 1977.

3. The semantics of comparatives

3.1. The semantic constituency of *more/less...than* and *as...as*

Keenan (1987) proposes that at the level of semantic interpretation, *more than* forms a constituent.¹⁰ A phrase like *more students than teachers* for him is a complex NP that has the following structure:



The representation in (13) (Keenan's (1b)) is not the overt syntax but rather the structure off which the interpretation of the phrase is read. Leaving aside the question of the constituent nature of X, I want to use the insight of Keenan's analysis and show how it can be relevant for deciding on a syntactic structure for comparatives.

Keenan suggests that up to the internal analysis of Det_2 and X, the structure in (13) is identical to that of 'simple' NP's like *every doctor*. The difference is that *every* is a one-place determiner (Det_1), while *more than* is a two-place determiner, (Det_2). The primary attraction of analyzing *more than* as a Det_2 is that it satisfies a universal semantic constraint, *conservativity*. Rather informally, conservativity is defined as in (14) (Keenan's (4)):

- (14) A Det_1 d is semantically conservative iff for all N's P and Q , $[d Ps]$ are Qs iff $[d Ps]$ are both Ps and Qs .

The definition in (14) can be extended to Det_2 :

- (15) A Det_2 d is semantically conservative iff for all N's P , R and Q , $[d (Ps, Rs)]$ are Qs iff $[d Ps]$ are both Ps and Qs , and $[d Rs]$ are both Rs and Qs .

Considering *more than* in particular, we obtain the following equivalences:

- (16) a. More students than teachers are vegetarians.
 b. More students are both students and vegetarians than teachers are both teachers and vegetarians.

Since the sentences in (16) are equivalent, *more than* as a two-place determiner is conservative.

It can be further illustrated that an analysis which postulates that *more...than teachers* is a complex one-place determiner which modifies *students* cannot be correct because this complex determiner would fail conservativity. Indeed, (17b) and (17c) (Keenan's (7a,b)) are not logically equivalent, which indicates that the structure proposed in (17a) cannot be the correct one:

¹⁰Although the discussion in this section uses only examples with *more than*, Keenan's proposal applies also to *less than* and *as as*.

- (17) a. [*Det* more...than teachers] students
 b. More students than teachers are vegetarians.
 c. More students than teachers are both students and vegetarians.

In the cases where there is one vegetarian student, (17c) will be trivially satisfied because no teacher can be both a student and a vegetarian. Of course, (17b) does not need to be true in such circumstances.

Similarly, an attempt to treat *more students than* as a complex determiner taking *teachers* as an argument fails the test of conservativity. (18b) and (18c) (Keenan's (8a,b)) are not equivalent:

- (18) a. [*Det* more students than] teachers
 b. More students than teachers are vegetarians.
 c. More students than teachers are both teachers and vegetarians.

Clearly, no student can be both a teacher and a vegetarian so (18c) can never be true; no such requirement holds for (18b).

Another semantic argument for treating *more than* as a complex determiner comes from the role of nominal modifiers in restricting the domain of predication. For NP's with one-place determiners, the semantic effect of modifiers such as PP's, AP's, and relative clauses is to further restrict the set of individuals that are being predicated of. That is, the underlined phrases in *every student at the party*, *most tall students* and *many students who study semantics* restrict the set of individuals quantified over in addition to the noun *student(s)*. Or in other words, assuming a Lewis/Kamp/Heim approach to quantificational structures, the noun and all its modifiers form the restrictive clause of the determiner. Consider now the sentences in (19) (Keenan's 14):

- (19) a. More students than teachers at the party signed the petition.
 b. The number of students who signed the petition is greater than the number of teachers at the party who signed the petition.
 c. The number of students at the party who signed the petition is greater than the number of teachers at the party who signed the petition.
 d. *The number of students at the party who signed the petition is greater than the number of teachers who signed the petition.

The sentence (19a) can have two possible interpretations; these are given in (19b) and (19c). The point illustrated here is that the adverbial modifier *at the party* can enter the restrictive clause of either the second N, *teachers*, only, or the restrictive clauses of both N's. The first option results in the meaning (19b), the second in the meaning given in (19c). Sentence (19d) is an impossible interpretation of (19a).

The analysis which treats *more...than teachers* as a determiner modifying *students* predicts the truth conditions expressed in (19d): [*Det*₁ *more...than teachers*] [*RC* *students at the party*]. The analysis proposing that *more students than* is a one-place determiner can account only for the reading in (19b) but not for the other possible reading, the one in (19c), since the semantic partitioning is [*Det*₁ *more students than*] [*RC* *teachers at the party*]. This shows that both of these accounts are unable to capture the semantics of the comparative construction.

If however, Keenan argues, we accept that *more than* is a complex determiner of a double-headed NP, then the reading in (19c) is accounted for. Each of the two heads will be quantified over and the adverbial modifier can be included in both of these domains of quantification or in only the second one. That is, the adverbial modifier can restrict both nominals: [Det_2 *more than*] [RC (*student, teacher*) *at the party*] or only the second one [Det_2 *more than*] [RC *student, (teacher at the party)*]. The reading in (19d) will be impossible to generate.

Keenan remains non-committal as to whether the semantically motivated analysis of multiply headed NP's should be incorporated into the syntax or not. As he points out, the constituent nature of *more than* can be expressed only at LF (providing some necessary transformation operations take place), leaving comparatives with a discontinuous structure in the overt syntax. Alternatively, if the semantics of the construction is to be represented syntactically, then the necessary structure needs to be found that is able to represent NPs with multiple heads.

It is possible to preserve the spirit of Keenan's analysis without actually accepting his idea of double-headed NPs. Instead, we can adopt a DP-analysis, following Abney (1987), and argue that it is actually the determiner that is the head of a given nominal maximal projection. In fact Keenan suggests in a footnote (his fn.1) the option of treating *more than* as a lexical item that subcategorizes two common nouns. Certainly such a view is truer to the semantics of determiners in general and of the comparative Det_2 in particular. The challenge then will be to come up with the syntactic structure that reflects Keenan's semantic analysis.

3.2. The steps in the semantic composition

It has been argued in the semantic literature (Cresswell 1976, Heim 1985, among others) that the comparative operator first forms a semantic constituent with the *than/as*-phrase; only after that does this constituent combine with the first comparative argument to be interpreted as a degree description instantiating the degree variable in the first comparative argument.

Let us illustrate this claim with an example. A sentence like the one in (20a) differs from *John is 6 feet tall* only in the internal structure of the predicate. Both sentences assert that John is of a certain height but they instantiate the extent of his height in different ways: *6 feet* versus *less than Bill is (tall)*. The likely LF of the comparative is given in (20b); we see from the bracketing that the comparative determiner and its second argument, the *than*-phrase, form a constituent to the exclusion of the first comparative argument, *tall*. The interpretation of the comparative is given in (20c).¹¹

- (20) a. John is less tall than Bill is.
 b. John is [[*less (than)*] [wh-tall_i Bill is t_i]] [tall]]
 c. $\exists y$ [[$y < ix$ [Bill is x -tall]]] \wedge [John is y -tall]]

The assumption is that scalar adjectives come with a degree variable: *tall'*(d). This degree variable is instantiated by *6 feet* in *John is 6 feet tall*. The constituent formed by

¹¹The semantic representation follows Heim 1985. Cresswell 1976 proposes that the variable in the *than*-phrase is bound by a λ -operator. For further arguments in support of treating the complement of *than* as definite description (of a maximal degree) see von Stechow (1984).

the comparative determiner and its second argument plays the same function as *6 feet*: it functions as a degree description.¹²

Scalar adverbs can also be assumed to contain a degree variable. So, in a comparative like (21a), the comparative determiner first combines with the *than*-phrase and the two together instantiate the variable in the first comparative argument, $well'(d)$:

- (21) a. Jane speaks French better than Jill does.
 b. Jane speaks French $[[more(than) [wh\text{-}well_i \text{ Jill speaks French } t_i]] [well]]$
 c. $\exists y [[y > \iota x [\text{Jill speaks French } x\text{-well}]] \wedge [\text{Jane speaks French } y\text{-well}]]$

In the function that it performs, the constituent formed by the comparative determiner and the *than*-phrase is not different from a modifier like *very* in *Jane speaks French very well*.

And finally, the same steps in the semantic composition are followed in the interpretation of nominal comparatives. As the LF in (22b) illustrates, the comparative determiner of (22a) combines with the *than*-phrase to form a cardinality description functioning similar to a numeral in its interaction with the first comparative argument, *articles* (cf. *John read 5 articles*). Note that I am proposing that plural count nouns contain a cardinality variable (and mass nouns have an amount variable) that is being bound by the constituent formed by the comparative determiner and the *than/as*-phrase.

- (22) a. John read more articles than Bill did.
 b. John read $[[more(than) [wh\text{-}many\text{ articles}_i \text{ Bill read } t_i]] [articles]]$
 c. $\exists y [[y > \iota x [\text{Bill read } x\text{-many articles}]] \wedge [\text{John read } y\text{-many articles}]]$

Thus it has been established here that contrary to what the syntactic structures in (8), (11), and (12) propose, the comparative determiner does not form a constituent with its first argument but rather with the *than/as*-phrase.

In this section we have seen that the semantics of comparatives necessitates the recognition of the constituent status of *more than* itself and of *more than* in combination with the second comparative argument, the complement of *than*, to the exclusion of the first comparative argument. None of the later analyses discussed in section 2 accounts for this constituent structure in the overt syntax. Furthermore, no independently motivated operations can derive the desired constituent structure on the way to LF. As such, these accounts are semantically inadequate. The earlier theories are to be preferred on semantic grounds yet they have inherent syntactic flaws that cannot be ignored.

4. A new syntax for comparatives

The task of this section is to provide the syntactic structure that can accommodate comparative determiners and their arguments, remaining true to the semantics. The proposed analysis follows the basic insight behind Keenan's account that comparatives involve a complex two-place determiner. Unlike Keenan, however, I treat only *more*, *less*, and *as* as Det_2 's. Their close relationship with *than* and *as*, though, is preserved and is shown to

¹²The question arises as to what happens in a sentence like *John is tall*. Note that this sentence doesn't simply assert the existence of a degree to which John is tall, that is, it is not trivially true. For cases like this von Stechow 1984 proposes that the degree variable is bound by an invisible *pos*-operator (where *pos* stands for 'positively'). Thus *John is tall* asserts that John is among the tall individuals within some context-dependent comparison class.

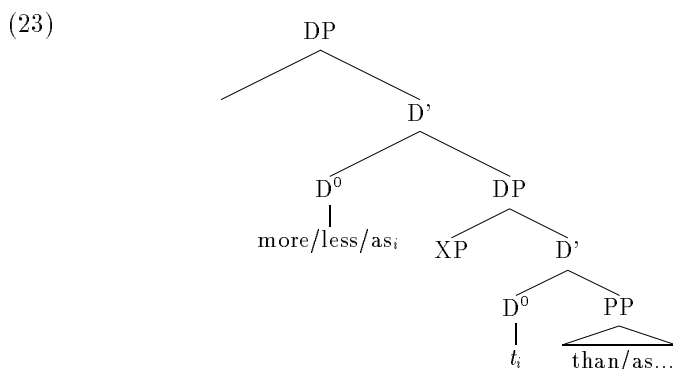
follow from the general grammatical principle of subcategorization. The constituency of the comparative determiner and the *than/as*-phrase is also reflected in the proposed syntactic structure.

4.1. The DP-shell

Det₁'s like *every* or *most* are represented in a DP-system (Abney 1987) as heads selecting a maximal projection. Extending this analysis to two-place determiners creates a problem at first: X'-theory provides for only one complement position to a head.

Exactly the same problem exists for the proper representation of verbs taking double objects. In Chomsky (1981), for instance, the second object is taken to be a VP-specifier to the right. (Note the analogy with the structure in (11).) Larson (1988b) proposes a new syntax for double-object verbs both to account for structural asymmetries between the two objects and to derive the semantics compositionally. His particular proposal is that the verb projects a shell with the two internal arguments in the specifier and complement positions in the lower VP. Verb movement from the lower to the higher V⁰ ensures the correct word order.

The new structure that I am proposing for comparatives is analogous to Larson's treatment of double-object verbs. The specific claim is that the comparative determiner projects a DP-shell as illustrated in (23):



In the lower DP, the comparative determiner is base-generated as a head, the first compared element, marked as XP, is projected as a specifier, and the comparative PP is projected as a complement. The surface order is derived through head-movement of the comparative determiner to the higher D⁰.¹³

The term D⁰ is meant only as a useful notation for a semantic determiner; no claims are made about the categorial status of its maximal projection. (See section 5 for further discussion.)

Certain restrictions need to be placed on the first comparative argument, the XP in the specifier position of the lower DP. In nominal comparatives, for instance, it cannot be a DP; the XP there can only be an NP without a determiner. This is not a stipulation of

¹³Richard Larson (p.c.) informs me that in an unpublished work (Fall of 1988 MIT seminar, Spring of 1993 Indiana University Syntax seminar and talks at CUNY and Stony Brook) he had proposed a shell analysis for comparatives that is very similar to the structure that I am proposing here. The projection of the arguments is as in (23) and head-movement of the determiner is motivated by case-considerations. Since the present analysis was developed independently of Larson's and since I am not aware of all the details of his account, I will not attempt to make comparisons here. The reader is referred to Larson (in progress) for his perspective on the subject.

the present theory, since exactly the same restriction (modulo the position in the phrase structure) applies to the argument of one-place determiners: note the ungrammaticality of **every the student*. Similarly, in adjectival and adverbial comparatives the XP can only be a bare AP/AdvP; phrases like *6 feet tall* and *very quickly* will be precluded from appearing in comparatives. Again this is not something peculiar to the DP-shell structure; one-place determiners like *very* take only bare APs/AdvPs (**very 6 feet tall* is ill-formed as well). In other words, the XP argument has to contain a free degree or an amount variable.

The fact that the comparative determiner has a PP complement is not controversial. Independently of the comparative construction we have cases of determiners subcategorizing for PP's: *some (of the NP)*, *most (of the NP)*. (Note also that the semantic analysis adopted here, following von Stechow 1984, Heim 1985, treats the complement of the preposition *than/as* as a definite degree description, which is another common feature with the partitive DPs.)

The specifier of the higher DP hosts modifiers of the comparative head. These are given in italics in (24):

- (24) a. We read *seven* more books than they read magazines.
 b. She is *10cm* less tall than Mary.
 c. John can type *three times* as fast as Mary can.

There is a sense in which these modifiers are arguments of the comparative determiner. Some semantic theories of comparatives explicitly take into account 'differential' degrees (Hellan 1981, von Stechow 1984). The higher specifier in the shell is motivated by the need to accommodate the 'differential' phrase.

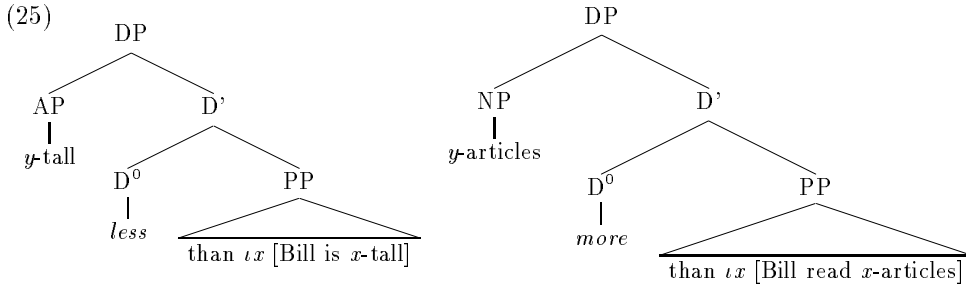
The movement of the determiner from the lower D^0 to the higher D^0 is triggered by the need of the higher DP to receive information regarding its categorial status. The claim is that the embedded head position is invisible to the governing verb and if the comparative determiner doesn't raise, the DP-shell will not be able to satisfy the subcategorization requirements and selectional restrictions of this verb.¹⁴ (For additional discussion see section 5.) Note that unlike the movement operations proposed by Bresnan (1973) and Hendrick (1978), the head-movement of the comparative determiner is licit as it complies with the Head-Movement Constraint.

4.2. Advantages of the DP-shell structure

The DP-shell has a number of advantages over previous accounts. On the syntactic side, we now have an account of the fixed cooccurrence of *more/less...than* and *as...as*. These discontinuous dependencies can be explained as the result of the different subcategorization properties of the comparative determiners, as in each case the D^0 determines the head of its complement PP. Furthermore, the relationship between the comparative determiner and each of its arguments is specified over a local syntactic domain. As far as semantic compositionality is concerned, the DP-shell accounts for the semantic constituency of *more/less...than* and *as...as*, advocated by Keenan (1987), without creating problems for the discontinuous surface order *more/less/as XP than/as YP*. The fact that the comparative determiner forms a semantic constituent with the second argument, the *than/as*-phrase, to

¹⁴The same question about the trigger arises in connection with V-Raising in the VP-Shell. Larson proposes that V needs to be governed by Infl, in order to receive tense and agreement information, and be able to assign case; also each argument in the shell must be governed by its head at some point in the derivation.

the exclusion of the first argument is also captured by the new syntactic structure. The steps in the semantic composition are illustrated in (25) for adjectival and nominal comparatives (with only the lower DP represented):



As it is clear from the structure in (25), the comparative determiner (available for interpretation at the place of its trace) combines with the *than/as*-clause first; the resulting constituent, D', then combines with the XP in specifier position.

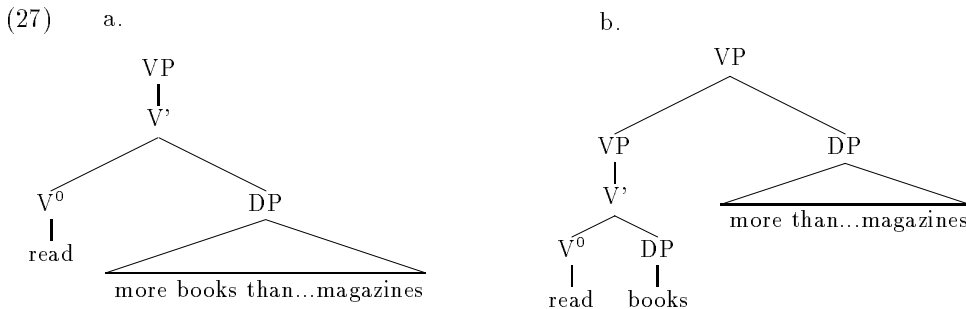
The structure proposed in (23) is thus to be preferred to the previous syntactic analyses of comparatives as it evades the problems that they face and conforms to the principle of semantic compositionality.

4.3. Apparent optionality of D⁰-raising

It is necessary to examine some further details of the DP-shell analysis. Pairs of sentences like the following might lead one to believe that the raising of the comparative determiner is not obligatory:

- (26) a. We read more books than they read magazines.
 b. We read books more than they read magazines.

However, these sentences have different meanings. The interpretation of (26a) is *The number of books that we read is greater than the number of magazines that they read*; (26b) means something like *We read books on more occasions/for a longer period of time than they read magazines*. In (26a) *books* is an argument of the comparative determiner and the comparative DP is an argument of the verb *read*. In (26b) the comparative DP is an adverbial modifier to the VP *read books*. The different structures are illustrated in (27a, b):



Evidence that the two determiners in (26) have different arguments comes from the fact that they take different modifiers. The comparative determiner in (26a), which has a countable argument *books*, takes *many* and does not allow *much* as a modifier. Exactly the

opposite is true of the comparative determiner in (26b), which takes a null adverbial as its argument.¹⁵ The different behavior of the two determiners can be seen in (28):

- (28) a. We read many/*much more books than they read magazines.
 b. We read (*many) books *many/much more than they read magazines.

Furthermore, as became clear in sections 3.2 and 4.1, the first comparative argument needs to be a bare XP without a determiner. Note the ungrammaticality of determiners with *books* in (29a) and their acceptability in (29b):

- (29) a. We read more (*the/*most) books than they read magazines.
 b. We read the/most books more than they read magazines.

This contrast indicates again that (26a) and (26b) have different structures.

And finally, note that extraction of *books* is possible only from the structure in (27b). The interpretation of the following sentence clearly corresponds only to the reading in (26b) and not to (26a):

- (30) What did you read more than they read magazines?

Therefore we may conclude that D^0 -raising is not optional. Clearly, this is a desirable result if we want to derive the movement of the determiner from the need of the shell-projection to satisfy the subcategorization requirements of the governing verb.

5. Refining the proposal

Having outlined the DP-shell analysis, I now turn to the question of how the three types of comparatives, nominal, adjectival, and adverbial, are to be handled uniformly in the new system.

The label D^0 was used so far pretheoretically, simply as a convenient syntactic notation for a semantic determiner. Work subsequent to Abney has shown that we need a more articulated phrase structure for determiners in nominal phrases (Giusti 1992, among others). I will not discuss here what the status of the comparative determiner is with respect to the heads of the possible quantifier and measure phrases discussed in the literature. What I want to focus on is the extent to which the lexical features of the comparative head determine the properties of the shell-projection.

The problem goes beyond the question of whether a more appropriate notation for the shell-projection is DP or QP. Note that the comparative head was labeled D^0 with no intention of implying that its projection has nominal status at all. In the theories of Abney (1987) and Corver (1990), for example, the comparative determiner in adjectival comparatives is assumed to be a Deg^0 head. The challenge to a unified theory of comparatives is to account for the featural and distributional differences between nominal, adjectival, and adverbial comparative shells. Externally, the shell-projections have the properties of the first compared constituent: in (31a), an adjectival comparative, the comparative shell behaves and is interpreted as a predicate adjective; similarly, in (31b) the shell-projection has the meaning and the distribution of an adverbial; (31c) and (31d) have comparative shells that are direct objects, receive case and θ -role and are undoubtedly nominal projections.

¹⁵The fact that it is the type of the first compared constituent (countable vs. uncountable) that determines the type of modifier (*many* vs. *much*) can be easily handled in terms of spec-head agreement: the comparative determiner must agree in the relevant features with its lower and higher specifiers.

- (31) a. John is taller than Mary is.
 b. John is talking louder than Mary is.
 c. John drank more coffee than Mary did.
 d. John counted more typos than Mary did.

Since adjectival and adverbial comparatives are comparing degrees (degrees of tallness in (31a) and degrees of loudness in (31b)) it makes sense to assume that their shell-projections are headed by a Deg⁰. Distributionally though, they still behave differently. As for nominal comparatives, they cannot even be interpreted as DegP's; in (31c) we are comparing amounts and in (31d) cardinality of sets. And syntactically, nominal comparatives behave like DP's.

One solution might be to claim that the comparative determiner is ambiguous between a Deg⁰ and a D⁰ (with possibly further distinctions between adjectival and adverbial Deg⁰, and between countable and uncountable D⁰). Some evidence for lexical ambiguity comes from the following set of examples from Bulgarian:¹⁶

- (32) *po-bârz* *po-bârzo* *poveče* kartini
 more-quick more-quickly more pictures
 'quicker' 'more quickly' 'more pictures'

We see that adjectival and adverbial comparatives have a common comparative head which is different from the head projecting the nominal shell. In English different determiners can be seen as well, although the distinction is between countable vs. uncountable compared constituents:

- (33) a. John is *less* tall than Mary is.
 b. John drank *less* coffee than Mary did.
 c. John read *fewer* books than Mary did.

To posit ambiguity in the comparative determiner though is not a very attractive and insightful solution. The phenomenon is in fact more general; semantic determiners like *so* and *very* take both adjectives and adverbs as complements: *so quick*, *so quickly*, *very loud*, *very loudly*; definite articles do not discriminate between count and mass nouns: *the books*, *the coffee*. Abney (1987) and Grimshaw (1991) have both developed proposals that allow for an XP embedded in a determiner phrase of some sort (nominal DP or DegP) to be visible for the selectional requirements of the higher verb.¹⁷

I adopt a similar 'transparency' analysis for the categorial feature specification (and hence distribution) of the comparative DP-shell. The particular claim is that D⁰ is unspecified for the relevant features (nominal, adjectival, or adverbial). Thus the neutral D⁰ can project any of these three types of constituents in its lower specifier. Spec-head agreement in the lower DP projection is responsible for the specification of the relevant features on the determiner. Head-raising of the determiner ensures that the categorial features are transmitted to the higher DP. Thus in effect the first comparative argument becomes 'visible' outside the shell. The mechanism just outlined allows for a unified account of adjectival, adverbial, and nominal comparatives.

¹⁶Although in the case of *po-malko kartini* 'less pictures' we have a more articulated structure of the determiner (literally 'more-little pictures').

¹⁷Some examples of visibility outside the determiner projection are the agreement facts of *the dog is*, *the dogs are* and the semantic selection in *They gathered an army together*.

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References

- Abney, S. 1987. The English Noun Phrase in its sentential aspect. [Ph.D. diss, MIT.]
- Bach, E. and R. Cooper. 1978. The NP-S analysis of relatives and compositional semantics. *Linguistics and Philosophy* 2, 145-50.
- Bresnan, J. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4, 275-343.
- Chomsky, N. 1977. On Wh-movement. *Formal syntax*, ed. by P. Culicover, T. Wasow, & A. Akmajan. Academic Press, New York.
- — — 1981. *Lectures on Government and Binding*. Foris, Dordrecht.
- Corver, N. 1990. The syntax of left branch extractions. [Ph.D. diss. Tilburg University.]
- — — 1993. A note on subcomparatives. *Linguistic Inquiry* 24, 773-81.
- Geis, M. 1970. Adverbial subordinate clauses in English. [Ph.D. diss. MIT.]
- Giusti, G. 1992. La sintassi dei sintagmi nominali quantificati. [Ph.D. diss. University of Venice.]
- Grimshaw, J. 1991. Extended projection. [Ms. Brandeis University.]
- Cresswell, M. J. 1976. The semantics of degree. *Montague grammar*, ed. by B. Partee. Academic Press, New York.
- Hankamer, J. 1973. Why there are two than's in English. *Chicago Linguistics Society* 179-91.
- Heim, I. 1985. Notes on comparatives and related matters. [Ms. University of Texas.]
- Hellan, L. 1981. *Towards an integrated analysis of comparatives*. Narr. Tübingen.
- Hendrick, R. 1978. The phrase structure of adjectives and comparatives. *Linguistic Analysis* 4, 255-98.
- Jackendoff, R. 1977. \bar{X} *syntax: A study of phrase structure*. MIT Press, Cambridge, MA.
- Johnson, K. 1988. Clausal gerunds, the ECP, and Government. *Linguistic Inquiry* 19, 583-609.
- Keenan, E. L. 1987. Multiply-headed Noun Phrases. *Linguistic Inquiry* 18, 481-90.
- Larson, R. 1987. 'Missing prepositions' and the analysis of English free relative clauses. *Linguistic Inquiry* 18, 239-66.
- — — 1988a. Scope and comparatives. *Linguistics and Philosophy* 11, 1-26.
- — — 1988b. On the double object construction. *Linguistic Inquiry* 19, 335-91.
- — — 1990. Extraction and multiple selection in PP. *The Linguistic Review* 7, 169-82.
- — — (in progress). The projection of DP and DegP structure. [Ms. SUNY, Stony Brook.]
- Moltmann, F. 1992. Coordination and comparatives. [Ph.D. diss, MIT.]
- Napoli, D. J. 1983. Comparative ellipsis: A phrase structure analysis. *Linguistic Inquiry* 14, 675-94.
- Partee, B. 1975. Montague Grammar and Transformational Grammar. *Linguistic Inquiry* 6, 203-300.
- Srivastav, V. 1991. Wh-dependencies in Hindi and the theory of grammar. [Ph.D. diss, Cornell University.]
- von Stechow, A. 1984. Comparing semantic theories of comparison. *Journal of Semantics* 3: 1-77.