CONSTITUENCY, IMPLICIT ARGUMENTS, AND SCOPE IN THE SYNTAX-SEMANTICS OF DEGREE CONSTRUCTIONS

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ABSTRACT. We propose an adjunction-based analysis of comparative (and similar) constructions that captures the morphological and semantic relation between comparative heads (e.g., *-er*, *as*) and comparative clauses (e.g., those headed by *than* or *as*). Primarily motivating this proposal are the syntactic similarities that we observe between comparative constructions and other adjunction structures in grammar. Specifically, we propose that comparative clauses adjoin to the extended projection of the NP or VP containing the comparative morpheme, and enter into an agreement relation with that morpheme. This agreement relation is the overt morphological reflex of the head of the comparative clause taking scope over, and semantically valuing an implicit argument introduced by the comparative morpheme. We argue in detail that such a proposal is to be preferred over classic alternatives that posit a complementation rather than adjunction relation, such as Bresnan (1973) and Bhatt and Pancheva (2004). Our account captures the data motivating these alternatives, as well as familiar and novel data that such accounts do not predict.

Keywords. comparatives, degree constructions, extraposition, late-merger, implicit arguments, syntax-semantics interface

1. Introduction

In this paper we argue that comparative clauses of the sort underlined in (1a) are related only indirectly to the degree head in bold. The comparative clause adjoins to the extended projection of the phrase containing the degree head, as sketched in (1b).[1] On this analysis, degree heads and comparative clauses never form a constituent at any level of representation.

(1) a. Bruce played long**er** songs than Becky did.
    b. Bruce played [[long**er** songs] than Becky did]

This proposal contrasts mainly with two types of approaches found in the literature, wherein comparative clauses necessarily directly combine with the comparative morpheme (either as its complement or as a specifier as in Abney 1987, Corver 1990, and Kennedy 1999), and their non-adjacency is derived via special syntactic mechanisms.

[1]Although we focus mostly on the relation between the comparative morpheme *-er* and its corresponding *than*-phrase, the analysis proposed here is predicted to straightforwardly extend to relations like those in (i-iii) and the like:

i. John is as tall as Mary is.

ii. Ivy ate so much pie that she got sick.

iii. Frank played with such gusto that he passed out.

Bresnan (1973) posits that a comparative clause headed by *than/as* merges directly with the degree head *-er/as* before undergoing obligatory extraposition, as shown in (2). Obligatory extraposition is a unique operation, as we discuss below. Other versions of this approach in which the comparative clause is a specifier to the degree head are similar enough for present purposes: all necessarily posit that the degree head and comparative clause combine directly.

(2) a. Bruce played long[-er than Becky did] songs.
b. Bruce played long[-er t] songs [than Becky did]

Bhatt and Pancheva (2004) propose that the desired constituency and word order is derived via covert movement of the degree head followed by countercyclic late merger of the comparative clause as its complement in the derived position, as seen in (3). This sort of counter-cyclic merger (see Lebeaux 1990, Chomsky 1993, Fox and Nissenbaum 1999, Fox 2002, among others) runs counter to a foundational axiom of syntactic structure building, the Extension Condition (Chomsky 1995).

(3) a. Bruce played long-er songs.
b. Bruce played long-t songs [er than Becky did]

We propose that, instead, degree heads do not take comparative clauses as complements, and in fact never directly combine with them. Instead, comparative clauses (when present) adjoin in the extended projection of the relevant lexical category, the semantic consequence of which is the valuation of an implicit argument of the degree head. As we will show in detail, this proposal not only captures the data motivating more traditional accounts, but also novel data that these accounts do not predict.

We begin in section 2 with a discussion of the central facts on comparative constructions, our syntactic analysis of those facts, and a review of how these data captured on previous approaches. In section 3, we compare the predictions of these three accounts. Section 4 offers our semantic analysis, including novel meaning-based empirical support for an implicit argument-based approach. Section 5 concludes.

2. Approaches to comparative syntax

2.1. Basic facts

In English, degree heads and the heads of comparative phrases pattern together. Simply put, if the degree head is *-er*, then the head of the comparative phrase must be *than*, (4a). The same constraint holds of the degree head *as* and its concomitant phrasal head *as*, (4b).[2]

[2]In some languages, there are no proprietary comparative phrase heads for different types of degree heads. In Hungarian for instance, the same word is used for both *-er* and *as* (examples from Kenesei, Vago & Fenyvesi 1998):

i. Anna érdekes-ebb volt, **mint** Péter.
Anna interesting-COMP was than Peter
'Anna was more interesting than Peter'

ii. Anna olyan érdekes, **mint** Péter.
Anna such interesting as Peter.
'Anna was as interesting as Peter'

Such data motivate a direct relation between degree heads and comparative clauses: the most straightforward way for two elements to 'communicate' with one another is via direct syntactic merger.

(4) a. Jill likes more books {than/*as} Roger does.
b. Jill likes as many books {*than/as} Roger does.

Importantly, however, comparative clauses never appear directly adjacent to their corresponding degree head. That is, whatever the nature of their morphological and semantic relatedness, this can never be expressed through linear adjacency in English, (5). Data such as (4) and (5) thus illustrate the central issue for comparative constructions: degree heads and comparative phrases must in some ways be tightly related, but in other ways, they must be less so.

(5) *Bruce played longer than Becky (did) songs.

For the sake of concreteness and brevity, in what followes we focus primarily on comparatives in the nominal domain. The approach extends to degree heads found elsewhere in the clausal architecture, for example those involving degree heads attached to nouns, adjectives, verbs, and adverbs, (6).

(6) a. Ivy ate more cookies than James did.
b. Ivy ate chewier cookies than James did.
c. Ivy ran more than James did.
d. Ivy ran faster than James did.

2.2. An adjunction analysis

We propose that the *than*-phrase (be it clausal or not) adjoins to the same projection that the host of the degree head does. In short, *than*-phrases adjoin to NPs or VPs in a manner exactly parallel to phrases that are uncontroversially adjunctive in nature. In (7) and (8) below, we see instances of both clausal and non-clausal adjunction to VPs and NPs respectively. In (9) and (10) we posit the analogous structures for verbal and nominal comparatives.

(7) a. Jane $[_{VP}\ [_{VP}$ ate dinner] [after she arrived home]]
b. Jane $[_{VP}\ [_{VP}$ ate dinner] [in her kitchen]]

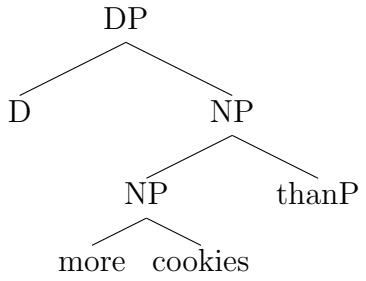
(8) a. Jane saw the $[_{NP}\ [_{NP}$ man] [who wore a red hat]]
b. Jane saw the $[_{NP}\ [_{NP}$ man] [with a hat]]

(9) a. Jane $[_{VP}\ [_{VP}$ ate quicker] [than Jack did]]
b. Jane $[_{VP}\ [_{VP}$ ate quicker] [than Jack]]

(10) a. Jane saw a $[_{NP}\ [_{NP}$ taller man] [than Jack did]]
b. Jane saw a $[_{NP}\ [_{NP}$ taller man] [than Jack]]

When the comparative morpheme attaches to the noun (like in (6a)) or when it attaches to an adnominal modifier (as in (6b)), the *than*-phrase adjoins to the NP. When the comparative morpheme attaches to the verb (6c) or when it attaches to an adverb (6d), the *than*-phrase adjoins to the VP. This is shown in the stuctures below:

(11) a.



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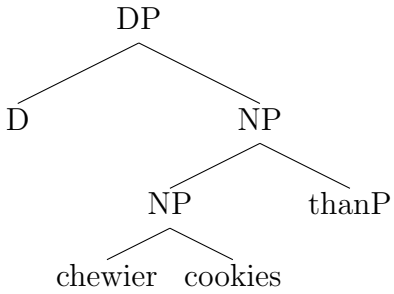

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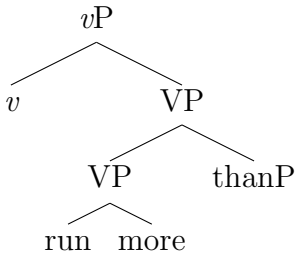

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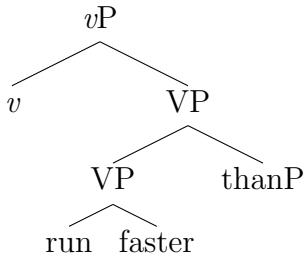


By rightward adjoining to NPs or VPs, the adjunction approach handles the basic linear order facts of the construction. Recall (5), which shows that it is unacceptable for the *than*-phrase to intervene between the comparative morpheme and the noun. If the *than*-phrase may only attach to the NP in the manner of an adnominal PP or relative clause CP, then it follows that this sort of sentence would be correctly ruled out.[3] More generally, the *than*-phrase should always appear to the right of either the NP or VP that hosts the comparative morpheme, all else being equal.

[3]Superficially, the example below looks as if the *than*-phrase is attached with the adverb and that they comprise a constituent (to the extent that it is acceptable).

i. ?Quicker than Brooke, Iris ran indeed.

However, we would analyze this sentence as an instance of VP fronting wherein the V-head has already head-moved to *v*. As such, it patterns like the analogous example wherein to verbal adjuncted are fronted.

i. ?Quickly in the park, Iris ran indeed.

This leads to the question of how that particular, long-distance structural relation is mediated. As far as syntax is concerned, the question is how the pattern in (4) arises. We posit that the form of the *than*/*as*-phrase and the comparative/equative morpheme are established by a non-local agreement relation.

This agreement holds between the head of the *than*-phrase and the degree head in a manner exactly parallel to other, uncontroversial cases. Take for example adjective agreement in German, in which nominal adjuncts agree in gender (among other things) with their head, (12). Similarly, the head of a relative clause in German agrees with the head it modifies: in (13) we see gender and number agreement between the two.

(12) ein großes Bier
a large-NEUT. Beer
'a large beer'

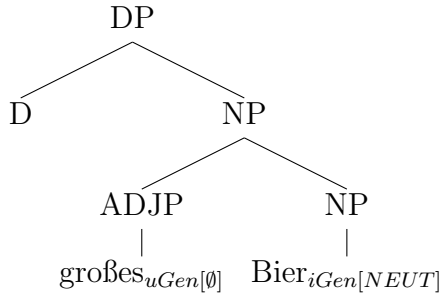
(13) die Kekse die ich gegessen habe
the.PL cookies.PL that.PL I eaten have
'the cookies that I ate'

The neuter marking on the adjective in (12) is not inherent to that adjective (largeness is not inherent neuter), but comes about via an agreement operation of the sort espoused in Chomsky (2000, 2001) and Pesetsky and Torrego (2004), among others. The adjective enters the derivation with an uninterpretable gender feature, and the nominal enters with an interpretable version of the same feature. The value of that interpretable feature (neuter) is demonstrably inherent to the noun, rather than to the adjective *groß*.

Because of this alignment, the adjective probes its c-command domain to agree with its matching valued and interpretable feature, as sketched in (14), abstracting away from the status of the neuter *es* suffix.

(14) a. ein großes Bier

b.



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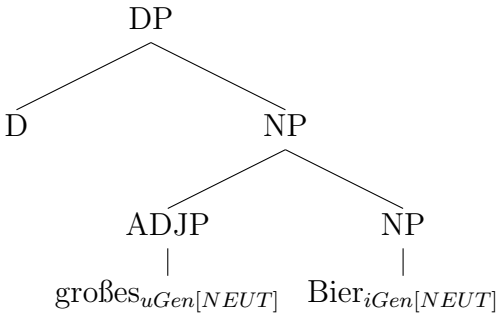
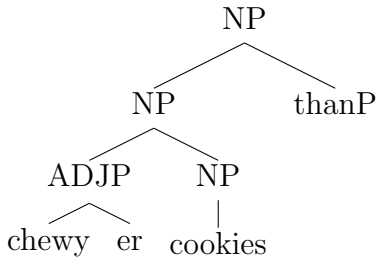


The same logic, we suggest, holds for the comparative construction. Parallel structural relations are present here, as in the slightly more articulated representation of (6b) above,

(15).[4] The head of the adjunct c-commands the element that it will agree with. Additionally, there is no locality boundary (or phasal node) them, the most liberal set of which would include CP, *v*P, DP, and PP. Only an AdjP and a segment of an NP separate them, not enough to constitute a barrier.

(15)



The form of the *than*-head is determined via agreement with the degree head, whose form is fixed and encodes the basic comparative semantics. The relation between the thanP and the degree head in (15) is exactly analogous with the relation between a nominal head and a modifying adjunct that agrees with it in some feature. Take it as an intuitive stipulation for now that the *than*-head is semantically 'light' and the degree head is semantically 'heavy'; we discuss the semantics in detail in section 4.

Let's see how this works. For a sentence like (16), the degree head bears an interpretable degree feature. This feature will be instantiated by a particular value, in this case a comparative value.[5] The relevant aspects of (16), prior to agreement, are shown in (17). Here, for expository ease, we label the thanP as 'thanP', even though prior to agreement its form will not yet have been determined.[6] After agreement takes place, the result will look like the treelet in (18).

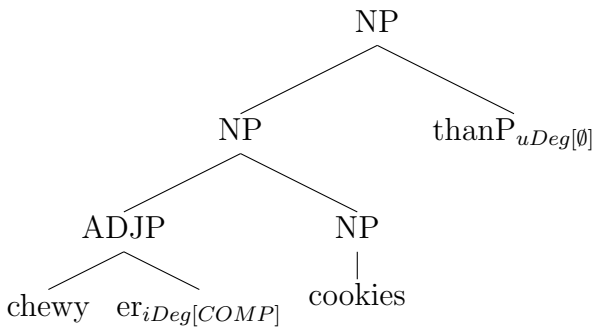
(16) Jill ate chewier cookies than Audrey did.

[4]Here we take the adjective *chewy* to project when merged with the degree head, however this assumption is not crucial to any particular argument in this section.

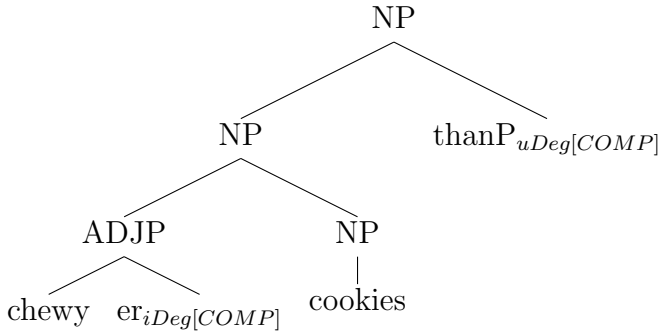
[5]Other, analogous heads will have different values. For example an *as* head will bear the value 'equitive' and an *so* head (as in '...so tall that...') will bear the value 'extent'. Each of these different values will shape the form of the head of the relevant phrase in the same way as *-er*.

[6]The agreement relation between the degree head and the head of the comparative phrase recalls an analysis found in Alrenga, Kennedy, and Merchant 2012. These authors seem to presuppose an adjunction account of the comparative clause, albeit without presenting support or justification. Moreover, their analysis relies on agreement that works in the opposite direction. That is, the form of the degree head is determined via agreement with the head of the comparative phrase. In this sense the degree head probes upward to agree with the comparative head. However, such upward agreement has been shown to not be tenable (Preminger 2013). Furthermore, if the form of the degree head is determined by the head of the comparative clause, then there is nothing determining the form of the left-conjunct degree heads in the coordination examples we discuss presently. Were this the case, either a default degree head should be used or the sentences should be ungrammatical, neither of which is true.

(17)



(18)



This is the essence of our syntactic approach. There is no direct composition of the *-er* head and the *than* phrase. Instead, the *than* phrase adjoins to either the NP or VP and, from a distance, probes for a degree head which in turn determines the form of its head. This analysis is exactly parallel to other agreement processes, for example that which fixes gender on German adjectives.

Next, we discuss how other approaches handle the basic facts, and then compare the predictions of adjunction- versus non-adjunction-based approaches.

2.3. Moving apart overtly

If one assumes that the degree head and comparative phrase must directly compose at some level of representation, one simple means of achieving this is for them to merge together prior to moving apart. This approach is the more traditional of the two to be discussed here, and has been advanced in various forms by Chomsky (1965), Selkirk (1970), Bresnan (1973, 1975), Carlson (1977), Abney (1987), Larson (1988), Corver (1990, 1993), Izvorski (1995), Lechner (1999), Kennedy (1999, 2002), Heim (2000), and Grosu and Horvath (2006), among many others.

Differences within this type of approach concern whether the comparative phrase is a complement or a specifier of the degree head, yet all assume direct (i.e., non-adjunct) composition in some or other fashion. In what follows, we ignore this difference between the sub-varieties of the approach. A simplified sketch of how the degree head and comparative clause are composed on this account is given in (19).

(19) Bruce played long[-er than Becky did] songs

At this point, an apparent selectional restriction of the degree head is satisfied by the correct choice of comparative clause head (either as a specifier or a complement). As such, the basic facts concerning the correlation of *-er* and *than* is accounted for.

The other basic fact, the non-adjacency of the degree head and the comparative clause, requires extra syntactic work. Here, approaches in this vein must either employ a rule of obligatory extraposition of the comparative phrase (as in e.g. Bresnan 1973) or some sort of indirect constraint that is met only if the comparative phrase happens to have extraposed (as in Grosu and Horvath 2006). The result of this movement is the simplified (20). The precise landing site of the extraposed element is not immediately important.

(20) Bruce played long[-er t] songs [than Becky did].

This style of approach thus relatively easily handles the tension described above. The morphological and semantic issues are taken care of covertly and, in this instance, prior to movement. The cost of the approach is the stipulation of obligatory extraposition. Such a requirement is not necessary, of course, if the relevant elements were never directly merged to begin with.

2.4. Coming together covertly

If the cost of obligatory extraposition is too high for one's theoretical budget, the direct composition of the degree head and comparative phrase can be achieved by other means. Bhatt and Pancheva (2004) present a solution wherein the two elements directly combine, just not in a position that would require extraposition.

The non-adjacency of the elements is accounted for first in the logic of this analysis. Prior to its composition with the comparative clause, the degree head covertly raises to a peripheral position as seen in (21a).[7] The representation in (21a) has no effect on externalization. What is produced is, among other things, the string in (21b). As a result of this movement, it is possible merge the comparative phrase to that silent element as a complement and in turn effect the correct overt non-adjacency.

(21) a. [Bruce played long-t songs] -er
b. Bruce played longer songs

With the groundwork laid for the non-adjacency facts in (21a), the comparative clause merges counter-cyclically (i.e., not at the root) to the silent copy of the degree head as shown in (22a). Again, the degree head that it is attached to is not pronounced. As such, the string produced will be like that in (22b).

(22) a. [Bruce played long-t songs] [-er [than Becky did]]
b. Bruce played longer songs than Becky did

The representation in (22a) captures the second basic fact: *-er* and the *than* are in a tight head-complement relation. Such a representation, as we noted above, requires the assumption that the degree head selects for the form of the head of the comparative phrase.

A potential advantage of this approach is the Williams (1974) scope generalization concerning extraposition, which states that the overt position of an extraposed element correlates with the scopal position of that which it modifies. In the present case, the comparative

[7]Bhatt and Pancheva maintain that the exact landing site of this covert raising is variable. The discussion of their analysis here does not rely on any particular landing site being used. Additionally, Alrenga, Kennedy, and Merchant 2012, like Pinkal 1990 before them, propose an account that may adopt Bhatt and Pancheva's late-adjunction approach, though this is not crucial for them.

clause modifies the degree head, and so it is expected that the scope of the degree head will be as high as the overt position of the comparative clause. Bhatt and Pancheva make this generalization a prediction of their analysis, and to the extent that it holds, their approach is to be preferred over others that must treat it as independent or coincidental. We discuss this point in detail below.

Immediately questionable, however, is the reliance on counter-cyclic complementation. Although some adopt late-merger (Lebeaux 1990, Chomsky 1993, Fox and Nissenbaum 1999, Fox 2002 among others), none propose that complements should be able to merge counter-cyclically, but only adjuncts. This component of the analysis should be considered a potential liability, and not an obvious advantage.

3. Empirical and theoretical comparison

We have introduced three approaches to comparatives, each of which can handle the central tension they display: morphological correlations despite enforced non-adjacency. Our approach holds that non-adjacency results from adjunction, and the morphological (and semantic) pattern from an agreement relation. The previous approaches take the morphological and semantic relation to follow from complementation, and non-adjacency from other, less anodyne operations (obligatory extraposition, or late merger of complements).

We now compare the predictions of these competing analyses, and their naturalness or simplicity where they are otherwise empirically indistinguishable. We first compare the analyses as pertains to the particular novelties of our approach: adjunction and agreement. Following this, we compare the analyses based on pre-established empirical effects, and issues inherent to the older accounts. Despite this ordering, we do not intend any deep priority in the argumentation.

3.1. Adjunction

A wealth of data supports the idea that *than*/*as* clauses are adjuncts, as we have proposed, as opposed to arguments, as on the previous approaches.

If it is an adjunct, the *than*-phrase should enjoy certain properties. One property of adjuncts is that they are always optional, as in (23). Arguments, on the other hand, are only optional relative to the particular lexical value of the head in question. That is, the particular lexical value of the verb in (24a) optionally takes an argument whereas the lexical value in (24b) requires one.

(23) Jill ate pork (on Tuesday).

(24) a. Jill ate (something).
b. Jill devoured *(something).

The comparative clause is similarly always optional as can be seen in (25) (cf. section 4). Importantly, the optionality of the comparative clause holds independently of particular lexical heads. In this sense, comparative clauses pattern more like adjuncts than they do arguments.

(25) a. Bruce played longer songs (than Becky did).

b. Jim is just as tall (as his cousin is).

c. Jill is such an unpredictable person (that we never know what she will do).

Non-adjunction analyses demand that the *than*-phrase argument of the *-er*-head be optional. However, arguments of functional heads are not generally allowed to be optional. For example, the arguments of prepositions and coordination require their arguments to be present, no matter how much the context otherwise supports their absence.[8,9]

(26) a. Brooke was the only other person around. Jack spoke to *(her).

b. Rodney and Dana were the only other people around. Jack saw him and *(her).

Additionally, the particular form of the ostensible complement to the degree head is variable. That is, although it is possible for a degree head to be understood relative to a comparative clause headed by *than*, it is also possible for this relativization to arise with a variety of clause-types like in (27) and (28).[10]

(27) Compared to how many dresses John owns, Mary owns more.

(28) Even if you count Mary's skirts as dresses, John still has more suits.

Further, the clause that the degree head is relativized to need not even arise within in the same sentence as the degree head (cf. Hendriks 1994).

(29) Mary owns twenty dresses. John owns more/as many suits.

The fact that the semantic role of comparative clauses can be provided by what are plainly adjuncts, (27) and (28), or across sentence boundaries, (29), means that the relations between degree heads and comparative clauses is not of a type that requires the locality of a head-complement relation.

Another parallel between comparative clauses and adjuncts in general comes from the fact that both can extrapose to the right beyond their initial attachment site. In (30), we see that an adnominal adjunct (the relative clause) can extrapose to a position outside of the DP. In (31), we see that an adnominal *than*-phrase can similarly arise outside of its original DP. Under the adjunction approach, this parallelism is trivially predicted, since both of the extraposed elements in (30) and (31) are taken to be adjuncts.

(30) Ivy ate cookies on Saturday that James bought.

(31) Ivy ate more/chewier cookies on Saturday than James did.

On a Bresnan-style extraposition analysis, this parellelism is relatively easy to capture: if the *than*-phrase obligatorily extraposes, there is no reason to suppose that it cannot extrapose as far as any other extraposable element. Yet, such an account requires the *than*-phrase to be uniquely classed as an element that is required to extrapose. On a Bhatt and Pancheva-style analysis, the parallelism is also not difficult to explain: the degree head may covertly QR a greater distance (leading to an extraposition-like effect) or a shorter distance (leading to no such effects).

[8]Here we take syntactic absence to be relevant, and not phonological deletion, which can occur with NP arguments of certain determiners (e.g. possessives: *John's (car)*.

[9]For the comparative case, it would be possible for non-adjunction analyses to invoke a kind of pro-form or ellipsis of the *than*-phrase; we rule out these possibilities in section 4.

[10]This essentially semantic observation does not amount to the claim that the syntax of these modifiers is uniform. See Fults 2006 and Kennedy 2009 for discussion.

However, both of these explanations lack a certain simplicity and naturalness. On our account, *than*-phrase extraposition is optional, and attributable to its membership in the broader category of 'adjunct'. The parallelism with adnominal adjunct extraposition can be taken at face value, and no additional machinery is required.

Setting such arguments aside, our approach distinguishes itself empirically as well. Consider that there are constraints on the extraposition of complements that either do not hold of adjuncts, or are irrelevant to them. (32) shows that the extraposition of a nominal's complement over an already extraposed complement to an adjective is unacceptable.

(32) *Robert wrote similar t_i books t_j [to mine]$_i$ [of poetry]$_j$

Contrast (32) with the more acceptable (33), in which a relative clause extraposes over the already extraposed complement (or is simply base-generated at a position higher than the landing site of the extraposed element).

(33) Robert wrote similar t_i books (t_j) [to mine]$_i$ [that no one ended up buying]$_j$

When the relevant phrase is not a relative clause, but a *than*-phrase, the result is also acceptable. That is, the *than*-phrase patterns with the adnominal adjective, not the complement, (34). It is difficult to account for this fact on any account in which the *than*-phrase is an NP-internal complement. For example, if *than*-phrases are obligatory extraposed, comparatives should pattern like (32).

(34) Robert wrote more similar t_i books [to mine]$_i$ [than anyone else I know]$_j$

If complements can late-merge covertly, instead, then it should be possible for sentences like (32) to be acceptable with a head noun that could in principle QR. That is, instead of the bare plural *books*, with *every books* it should be possible for the complement *of poetry* to merge late in the relevant higher position, and thus surface to the right of the already extraposed element. However, as seen in (35), this is not the case.

(35) *Robert wrote every similar t_i book t_j [to mine]$_i$ [of poetry]$_j$

Finally, the previous approaches require that *than*-phrases are licensed as an argument of the *-er* morpheme. Yet, *than*-phrases can arise with expressions like *different* and *other*, which apparently do not contain an instance of this morpheme, (36).[11]

To capture this, such theories would require a disjunctive licensing condition (*than*-phrases are licensed by *-er* or *different* or *other*...). On our analysis, *than*-phrases are licensed just when they c-command an expression with an interpretable degree feature. It is reasonable to think that *different* and *other* satisfy this condition.

(36) a. Audrey is different than I expected.
b. The result was something other than what I expected.

We have provided some examples of how our analysis of the *than*-phrase as an adjunct accounts for certain aspects of its behavior simply. If it is an adjunct, it should function like one; and, to the extent that it does, our account captures it without further remark.

[11]Though it is indeed the case that both *different* and *other* contain the string *er* there is no other evidence, etymological or otherwise, that these are instances of an *-er* morpheme. Further in a parallel case we see that *as*-phrases can be liecnsed by words like *same*:

i. Jill is the same height as me.

3.2. Agreement

On our approach, the morphological correlation between the degree head and comparative phrase is not one of subcategorization, but rather non-local agreement. This allows us to make some positive predictions.

Recall from the previous section that mis-matches between the degree head and the comparative clause are not generally possible, as shown in (37).

(37) a. *Bruce played longer songs as Becky did.
b. *Becky is as tall than Bruce is.

This sort of restriction is common amongst other instances head-complement relations, such as the ones in (38), where the verbs *claim* and *ask* require their complement clauses to be interrogative or declarative, respectively.

(38) a. Becky claimed {*whether/that} Jill was late.
b. Becky asked {whether/*that} Jill was late.

However, with comparative clauses, the morphological relation need not hold across coordination. Rather, the morphological match need only be with the nearest degree head, (39)-(40). The comparative clause fulfills the same semantic role to both conjuncts despite the morphological mismatch.[12]

(39) a. Becky is as tall or taller {than/*as} Bruce is.
b. Becky is taller or as tall {*than/as} Bruce is.

(40) a. John owns as many or more suits {than/*as} Mary owns dresses.
b. John owns more or as many suits {as/*than} Mary owns dresses.

These facts contrast with those of true complementation, (41). The restriction here still holds across coordination, and is not simply satisfied by the linearly proximate conjunct.

(41) a. *Bruce either claimed or asked whether Jill was late.
b. *Bruce either asked or claimed that Jill was late.

One could perhaps posit that the relation between the first conjunct and the comparative clause in (39)-(40) is subject to fewer constraints than the first conjunct and the subordinate clause in (41). That is, for some yet unspecified reason, these constraints are specially violated in (41) but not in (39)-(40).

[12]It should be noted that not every language can coordinate predicates in this way. In German, the head of the *than* or *as* phrase cannot be omitted and is required to show up in each conjunct:

i. *so großoder größer als...
as big or bigger than
'as big or bigger than...'

ii. so großwie oder größer als...
as big as or bigger than
'as big as or bigger than'

The acceptable example above however is an example of non-constituent coordination and should be analyzed as an instance of right node raising, the explanation for which is independently problematic (see Larson 2012).

Such an explanation of the unacceptability of (41) is not likely to be correct, however. In (42), both conjuncts can independently combine with the shared string, so it cannot be that a specific violation occurrs with respect to the first conjunct and the shared material. Nevertheless, the results are uninterpretable.[13] As such, it cannot simply be that (39) and (40) are acceptable due to the independent compatibility of the coordinands and the shared *than*-phrase.

(42) a. *Bruce either promised or persuaded Jill to leave.
b. *Bruce either persuaded or promised Jill to leave.

This seems to be an issue particular to long-distance agreement, rather than to complementation, as seen in uncontroversial cases. This sort of non-local "agree with the closest linearly" strategy seems to only be generally applicable when an "agree with both" strategy or an "agree with the sum" strategy is not available.

Agreeing with both conjuncts is unproblematic, as seen in (43), and agreeing with the sum likewise, (44). In (43), there is no conflict in the form of the degree head (or the form of its interpretable feature): they are both *-er*. As such, the choice of *than* is clear. In (44), it is not the case that either *Becky* or *Bruce* on their own bear plural feature, however, it is possible to agree with the 'sum' of their singular person features and effect plural agreement on the verb.

(43) Becky is taller and smarter than everyone else in the class.

(44) Becky and Bruce are quite tall.

In the case of degree heads, neither of those approaches is feasible, and agreement with the closest head is forced. This parallels other (crucially non-complement) types of agreement. Such examples can be seen in (45) from Polish. Here, as with disjunction generally, it is not possible for the verb to agree with the subject cumulatively; the verb is forced to agree with the nearest conjunct. Similar facts are seen with number agreement in English in (46).

(45) Jan albo Marie {poszła/ *poszedł} do szkoły
Jan.MASC or Marie.FEM went.FEM/ went.MASC to school
'Jan or Marie went to school.'

(46) a. Jim or some of Mary's friends are/*is going to be there.
b. Some of Mary's friends or Jim is/*are going to be there.

Although there is no clear theoretical reason why such recourse should be made (though see Boskovic 2009 for an approach), the pattern of agreement found between degree heads and comparative clauses parallels that of long-distance agreement examples like subject-verb agreement, more than it does instances of subcategorization-based dependencies.

The extent to which the relation between the degree head and the comparative clause acts like an agreement relation, and not one of subcategorization, militates against non-adjunction analyses. Those predict that the comparative clause (qua argument of the degree head) should relate to the degree head in a manner familiar to subcategorization. But as we have seen here, this is not the case.

[13]These sentences are either uninterpretable or at least effect a zeugma-like reading like in (i) below. The relevant comparative examples do not effect any such zeugma-reading.

i. The magician exhausted her repetoire and herself.

3.3. Arguments against complementation plus extraposition

The sort of obligatory extraposition from a functional head that Bresnan (1973) proposes is a unique operation in syntax, and as such it is difficult to argue against by comparing it to other instances of the same. The fairest tack is to compare the constraints or lack thereof on comparatives with those of other extraposed elements.

Sub-extraction from extraposed elements is not acceptable (see Drummond 2009 among others). This is seen in (47) where the object of an extraposed prepositional phrase has been extracted, and the result is unacceptable. Extraction from a comparative clause is similarly illicit, as seen in (48).

(47) *What$_i$ where you talking t$_j$ yesterday [about t$_i$]$_j$

(48) *Who did Bruce play longer songs than t did?

Yet, it is unclear whether this is due to a restriction on extraction from extraposed elements (as Bresnan would predict) or due to a restriction on extraction from clausal adjuncts (as we would predict).

The closest comparison with such an example can be made not with a comparative clause, but with a comparative phrase like that in (49). This avoids the confound discussed above, and is more parallel to (47), as comparative clauses have been previously analyzed as preposition-like (see e.g. Pancheva 2006, 2009 and references therein). However, the extraction from a comparative phrase is acceptable and as such patterns more similarly to subextraction from within an un-moved adjunct like that in (50).

(49) Who$_i$ did Bruce play longer-t$_j$ songs [than t$_i$]$_j$?

(50) What did Bruce hit the ball with t?

Additionally, on Bresnan's account the rightward movement of the comparative clause stems from a left branch as shown in (51). (We address Bhatt and Pancheva's version in the next section.)

(51) [[longer-t$_j$] [songs]] [than Becky did]$_j$

However, extraposition from a left branch is not generally allowed, even very locally. Take the pronominal relative clauses found in German seen below, which have articulated enough left branches so as to make sub-extraction a logical possibility.

(52) ein zu dem Körper nicht passendes Gesicht
a to the body not fitting face
'a face that does not fit the body'

The left branch relative clause *zu dem Körper nicht passendes* cannot be sub-extracted from via extraposition as seen in (53). In this sense, extraposition from within a left branch is not only not obligatory, it is impossible.

(53) *ein [t$_j$ nicht passendes] Gesicht [zu dem Körper]$_j$
a not fitting face to the body
'a face that does not fit the body'

Such extraposition is still not possible even when the pronominal modifier cannot arise with its complement. That is, the complement of the adjunct *proud* in (54a) cannot arise

when that adjective is being used as a pronominal modifier. This might be a situation parallel to comparative clauses which similarly cannot arise in the pronominal position. However, extraposition in this case is ruled out as well, (54b).

(54) a. *the proud of his son man.
b. *the proud man of his son.

In short, the obligatory extraposition of the comparative clause fails to find grammatical analogues in similar situations. Not only is the operation that Bresnan proposes apparently unique in the particular, it also seems to run afoul of general constraints on movement.

3.4. Arguments against complementation via late merger

The Bhatt and Pancheva approach to comparative clauses avoids some of the worries of the Bresnan approach. Nevertheless, there are problems with this approach as well. We illustrate these by building on challenges raised by Grosu and Horvath (2006).

The late-attachment approach holds that the comparative clause attaches to the derived position of a head that moves covertly. This mechanism ensures that the overt comparative clause will take scope exactly as high as the degree head, and further, that the degree head will take scope as high as the overt attachment site of the comparative clause.

Grosu and Horvath (2006) discuss an example originally from Heim (2001), in which the degree head can take scope lower than the overt position of the comparative complement. A modified version of their (23) is reproduced as (55).

(55) (Context: Last year, junior faculty needed to publish 5 papers.)
This year, non-tenured faculty members need to publish [fewer papers than {that/5} *in LI* to get an extension of contract.

In (55), the comparative complement necessarily scopes below the non-finite IP, as it comes to the left of the embedded verb's modifier *in LI*. However, the degree head can be interpreted as scoping outside of the embedded IP, above *need*: that is, the sentence can require that papers numbering less than 5 are required to be published (e.g., perhaps the minimum requirement is 3 papers).

This type of argument can be generalized. In order for the wide scope reading to be licit, it must be the case that the degree head had moved beyond the embedded IP, and that the comparative complement has attached to it. In (56), however, the high scope reading is still possible, even if the comparative complement is trapped within the embedded IP (or, perhaps VP) and does not evade ellipsis.

(56) This year, junior faculty at State U needed to publish fewer papers than {that/5} to get an extension of contract, and junior faculty at Ivy U needed to (do so) as well.

Another example is (57), where the comparative phrase is within the fronted nominal and as such should not be able to take scope out of it. Contrary to the predictions of Bhatt and Pancheva, this sentence allows the high scope reading where the minimum requirement happened to be less than 5.[14]

[14]Independent of the interpretation of this sentence, it is important to note that sentences like (57) require the *than* clause to be able to attach relatively low in its surface position. While this is not a problem for Bhatt and Pancheva's analysis, the syntactically similar analysis of Alrenga, Kennedy, and Merchant 2012

(57) Fewer papers than 5, they were required to publish.

These points are no different in kind from the one made by Grosu and Horvath. But there are additional problems. One concerns the alternative means to relativize the degree head. We noted above that sentential-level adjuncts can suffice to play (at least roughly) the semantic role of a *than*-phrase, compare (58a) and (58b). Indeed, this is confirmed by the illicitness of stacking both the *than*- and *compared to*-clauses, which is semantically anomalous, (59).

(58) a. Mary owns more dresses than John does.

b. Compared to how many dresses John owns, Mary owns more.

(59) ?? Compared to how many dresses John owns, Mary owns more than Bill does.

Without saying more, Bhatt and Pancheva would have to claim that the degree head takes as its complement something that is clearly a sentential adjunct: how else could the semantic role normally provided by a complement be fulfilled? Yet, this would require that a single element can be both a complement and an adjunct, which we take to be an untenable assumption.

Even if the degree head were to take *compared to*-clauses as complements (in order to fill the requisite semantic role), the high scope reading of the comparative would be forced, since the degree head would need to raise at least as high as the sentence level. Yet, a low scope reading of (60) is still possible (given the context and relevant readings from above): this sentence can mean that the maximum number of papers that can be published this year is lower than five.

(60) Compared to the previous year's 5, junior faculty are required to publish fewer papers this year.

Finally, consider again cases where two phrases containing degree heads are coordinated, yet there is only one comparative clause, e.g. (61). Here, there are two distinct degree heads, one that morphologically merges with *large*, and one that merges with *old*. The comparative clause is semantically associated with both.

(61) Heather bought larger books and older pictures than Genevieve did.

Under the extraposition-style account, the *than*-clause here must undergo across-the-board (ATB) extraposition from the complement position of those heads, as seen in (62); this is no different than other instances of ATB movement.

(62) Heather bought larger-t books and older-t pictures [than Genevieve did]

The covert head movement account requires one of two things, though. Either only one of the degree heads undergoes covert raising to take the comparative clause as its complement, or they both move ATB-wise. These options are shown in (63a) and (63b) respectively.

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requires clausal attachment of the comparative position in its surface position. This leads to the incorrect prediction that the comparative clause should not be subject to fronting of a structurally lower element (as it would not form a constituent). This problem applies to the example in (57) as well as (i) and (ii) below:

i. [More students than I expected] Joe brought t with him.

ii. Jones said that he would eat more cookies than I expected and [eat more cookies than I expected], he did t

(63) a. Heather bought large-er books and old-t pictures [-er than Genevieve did]
b. Heather bought large-t books and old-t pictures [-er than Genevieve did]

The first option is not possible, as it would run afoul of the coordinate structure constraint (Ross 1967), which precludes extraction from within one conjunct.[15] The second option is not viable either as it has be shown that covert ATB movement is not possible generally in work by Cho and Zhou (1999), Wu (1999), Bošković and Franks (2000), and Citko (2005).

Recall from the previous section that the Bhatt and Pancheva account relies on the possibility of late-attached complements. Previous researchers have proposed a version of this for adjuncts and it is extended here for complements. However, proponents of late-adjunction hold short of allowing arguments to merge late for various reasons, the most straightforward of which is the fact that complements but not adjuncts obligatorily reconstruct.

This is seen in example (64) below, following Lebeaux (1988), as well as van Riemsdijk and Williams (1981) and Freidin (1986). The complement of the nominal in (64a) necessarily reconstructs in the base position of the wh-element and effects a Principle C violation. The adnominal adjunct in (64b) is allowed to have merged late to the head noun and thus can avoid reconstruction, and in turn the binding-theoretic violation.

(64) a. *Which argument that John$_i$ is a genius did he$_i$ believe?
b. Which argument that John$_i$ made did he$_i$ believe?

Even if such an operation as late complementation were allowed, it would make incorrect predictions concerning similar Principle C effects as those above. If comparative clauses can late-merge in a structurally high peripheral position, then it should be possible for an R-expression to avoid Principle C effects if contained within such clauses. This is not the case, as seen in (65).

(65) *Jane gave him$_i$ more apples than Jack$_i$ could eat.

In short, late-merger of complements is not only an important departure from previous late-attachment theories, but it leads to questionable predictions. An adjunction approach avoids these concerns.

3.5. Scope and antecedent contained deletion

There are two apparent advantages to the previous accounts that one might question whether our account can handle. The first, mentioned above, is the extraposition-scope generalization of Williams (1974). The second is that *than*-phrases can evade infinite regress problems in antecedent-contained deletion contexts. We now show that both of these properties can be captured on our adjunction approach.

[15]Even if the coordinate structure constraint were not to hold for covert movement like this, this sort of analysis would raise a problem of motivation. If it is possible for the comparative clause to bear a long-distance semantic relation with the un-moved degree head in the first conjunct, this sort of relation should be possible generally, and much of the motivation for a head-complement analysis of degree head and comparative complement would be thereby superfluous.

Similar concerns would hold if both degree heads could move covertly from within the coordinate structure, but not in an ATB fashion. The result would be two distinct degree heads, only one of which bears a complement (see Hendriks 1994 for such an analysis). Again, the possibility of a relation between the comparative clause and the complementless degree head would undermine the motivation for an obligatory head-complement relation in the first place.

Williams' (1974) generalization states that the overt position of an extraposed element correlates with the scopal position of that which it modifies. Bhatt and Pancheva posit that this generalization holds of comparative clauses: the comparative clause seems to take scope precisely as high as the degree head. Assuming this subtle fact is true (cf. Grosu and Horvath 2006), it is clearly possible under an adjunction account, as adjuncts are uniformly interpreted as moving along with that which they are adjoined to.

This happens more transparently with overt movement as seen in (66), but it also holds for covert movement. If one assumes covert movement of quantified expressions (in the sense of May 1977), and that adjuncts can serve as restrictions on quantifiers, then the fact that inverse scope is possible for (67a) with the adjunct restricting the quantifier suggests a covert syntax like that in (67b), where the adjunct has moved just as high as the head it modifies.

(66) [Which picture that Jill painted] did Jerry criticize t.

(67) a. Some teacher praised every student with red hair.
b. [every student with red hair] some teacher praised t
c. Every x: x a student with red hair [some teacher praised x]

As such, there is no reason to suspect that an adjunction analysis of comparative clauses is incapable of capturing the same facts that Bhatt and Pancheva do. As adjuncts, *than*-phrases are allowed free extraposition outside of the verb phrase that they arise in. Thus, they can evade a potential antecedent-contained deletion driven infinite regress problem:

(68) a. Bruce played longer songs than Becky did (did = played longer songs than Becky did and so on)
b. Bruce [VP played longer songs t] than Becky did (did = played longer songs t)

Given our account, the extraposition of the comparative clause-internal VP-deletion is obligatory to avoid regression problems like this. As such, we make a prediction: it should not be possible for a comparative clause with internal VP-deletion to front along with its host phrase. Instead, if it has extraposed, it no longer functions as a movable constituent with its host.

This prediction is met. We can see that comparative phrases and clauses can normally front together as a constituent, (69). However, it is not possible to front the comparative phrase when it contains VP-deletion. Instead, it must remain behind in its extraposed position, (70).[16]

(69) More songs than Becky likes, Bruce played.

(70) a. * More songs than Becky did, Bruce played.
b. More songs, Bruce played than Becky did.

That these data do not categorically support non-adjunction-based accounts leads to the conclusion that our adjunction-based approach is a viable alternative. Yet, so far we have

[16]The unacceptability of (70a) cannot be attributed to the Backwards Anaphora Constraint of Langacker 1969 and Ross 1967, which prohibits anaphors from preceding their antecedents (here the VP-ellipsis is the relevant anaphor). This constraint is voided when the anaphor has moved to its linearly preceded position:

i. Before Becky managed to, Bruce ate the cookies.

only derived the first basic fact of comparative constructions: the morphological relation between the heads of degree clauses and *-er/as* themselves. For a complete account, we must derive their semantic relation.

4. Semantics and scope

The syntactic relation that obtains between degree heads and degree clauses is indirect: the two do not form a constituent, but are related by an agreement process. How are the interpretations of degree constructions derived?

We show directly that part of the meaning of *-er/as* is a definite implicit argument, in the sense of null complement anaphora (NCA; Hankamer & Sag 1976). Building on this observation, we present an analysis in which the implicit argument is valued by the contextual assignment of values to variables; when present, degree clauses provide this value. Our account thus ties agreement in comparatives to implicit argument valuation.

4.1. Degree heads have implicit arguments

Sentences that exhibit NCA (in the sense described by Williams 2012) are those that contain expressions with a semantic dependent that is unexpressed in the clause. These semantic dependents are grammatically distinct from what may be achieved existential closure, silent pronouns, demonstratives, or syntactic elisions.

The verb *eat*, unlike the semantically similar *devour*, allows for its understood object to go unexpressed, as shown in (71).

(71) a. John ate (the pizza).
b. John devoured *(the pizza).

What we are calling NCA verbs, those like *win* and *notice*, similarly allow for their understood arguments to go unexpressed. However, these arguments have a different status. Without a syntactically expressed object argument, *eat* is interpreted just as if its argument were existentially bound, as in (72). This is not the case with *win* (73b) or *notice* (73b): these verbs intuitively take something definite from the context as their antecedent.

(72) There was a party.
John ate. $\sim$ John ate something.

(73) a. There was a contest.
John won. $\not\sim$ John won something.
b. Mary shaved her head.
John noticed. $\not\sim$ John noticed something.

A similar effect can be observed with the degree heads *as* and *-er* when they appear without a degree clause.

(74) John is 5 feet tall.
a. Mary is taller. $\not\sim$ Mary is taller than someone/some height.
b. Mary is as tall. $\not\sim$ Mary is taller than someone/some height.

NCA arguments do not appear to be prominal in nature, if those are expected to be interpreted like overt pronouns. Given the context in (75), what Lee won in (75a) is understood to be the bet he made by putting chips on 17. This meaning is unavailable with the pronoun *it* in (75b), where the understanding is that he (bizarrely) won the number 17, or some other contextually salient prize. The interpretation of (75a) parallels that obtained with an overt definite description ((75c); Condoravdi & Gawron 1996).

(75) Lee put chips on 17...
  a. and won.
  b. # and won it.
  c. and won the bet.

The same can be shown with the NCA verb *notice*. (76a) is understood as saying that the fact that Mary shaved her head was noticed. In contrast, in (76b) with the pronoun *it*, what is noticed is Mary's head, not *the fact that* her head is shaved. Again, the interpretation of (76a) parallels what you get with an overt definite description (76c).

(76) Mary shaved her head.
  a. John noticed.
  b. # John noticed it.
  c. John noticed the fact that Mary shaved her head.

Such "missing information" need not be supplied by a DP. With the adjective *ready*, the understanding of NCA in (77a) can be replicated using a *for*-phrase with a definite description (77c), but again, not with an overt pronoun (77b) (Williams 2012:129).

(77) Tipper has an interview and Al is going on a trip.
  a. Tipper is ready and Al is ready.
  b. # Tipper is ready for it and Al is ready for it.
  c. Tipper is ready for the interview and Al is ready for the trip.

At first blush, comparatives do not appear to show the NCA pattern in this respect. (78a), with no overt *than*-clause, is interpreted parallel to any of (78b), (78c) or (78d).

(78) Mary is five feet two inches tall.
  a. John is taller.
  b. John is taller than her.
  c. John is taller than the degree to which Mary is tall.
  d. John is taller than that.

However, NCA is not equivalent to pronouns or null demonstratives (Gauker 2012). Let's first see the case with demonstratives. While (79a) is not a contradiction, (79b) is. Williams (2012) points out that this interpretation is the same as that which obtains with an overt definite article that is the same in both conjuncts (79c).

(79)
  a. $\top$ Tipper is ready for this and Tipper is not ready for that.
  b. $\bot$ Tipper is ready and Tipper is not ready.
  c. $\bot$ Tipper is ready for her/the event and Tipper is not ready for her/the event.

The same can be shown for comparatives. While (80a) with overt demonstratives is not a contradiction, describing only the upper and lower bounds on the number of cookies Mary ate, the sentence without an overt *than*-clause is a contradiction, (80b). The same obtains when we include a *than*-clause with an overt definite description of the amount demonstrated, which must remain the same in both clauses (80c).

(80) a. ⊤ Mary ate more cookies than this and she ate less cookies than that.
b. ⊥ Mary ate more cookies and she ate less cookies.
c. ⊥ Mary ate more cookies than the number I am demonstrating and Mary ate less cookies than the number I am demonstrating.

Further, implicit arguments with NCA verbs display binding properties that the corresponding structures with demonstratives or overt pronouns disallow. With *win*, what is won covaries with the occasions specified by the *whenever*-phrase (81a). It can covary with content that is merely inferrable from the (syntactically inaccessible) restrictor of an *every*-NP (81b). With overt pronouns, such readings are not possible: with *it* in (81a), what is won is again the number 17 (the bound reading) or some other contextually salient prize (the deictic reading). The same obtains for NCA with *notice* (82).

(81) a. Whenever John puts chips on 17, he wins (#it).
b. Every man who put chips on 17 won (#it).

(82) Whenever Mary shaves her head, John notices (#it/#that).

Only when the *than-*/*as*-clauses are missing do the degree heads show binding parallel to that seen with NCA verbs. The *whenever*-clause in (83) ranges over mountain-climbing competitions that John participates in, which implies (for each competition) some number of mountains he climbed. In (83a), the number of mountains such that John vows to climb more than that many next time covaries with the number of mountains implied by the modifier. With an overt demonstrative, this covarying reading is impossible: (83b) can only mean that there is some particular number (unmentioned in the co-text) that John vows to climb more mountains than. There are no grammatical resumptions using pronouns in such contexts (83c).

(83) Whenever John enters a mountain-climbing competition,
a. he vows to climb more/as many mountains next time.
b. # he vows to climb more than that/as many as that next time.
c. * he vows to climb more than him/himself/he did next time.

Such data also suggest that NCA is not a form of ellipsis, since there is no overt material (syntactically accessible or otherwise) that could resolve it. There are more convincing examples that confirm this suspicion (see Hankamer & Sag 1976, Grimshaw 1979, and Depiante 2000 for the non-comparative examples). For instance, while extraction is possible from an elision site as in (84a), it is not possible from a null complement (84b). The sentence in (84b) is ungrammatical on the intended interpretation, i.e. that equivalent to (84a).

(84) **Q** Who have the investigators noticed t was lying?
a. **A** I'd rather hear who you have noticed t was lying.
b. **A'** # I'd rather hear who you have noticed t.

Again, the same obtains with degree heads. Extraction is possible from a *than*-clause as in (85a), but not when the head of that clause is absent, as in (85b). That is, (85b) is ungrammatical on the interpretation equivalent to (85a).

(85) **Q** Who did the baker bake more pies than t?
  a. **A** I'd rather hear who you have baked more pies than t.
  b. **A'** # I'd rather hear who you have baked more pies.

Based on these data, we conclude that part of the meaning of degree heads is a definite implicit argument, as with NCA expressions like *win*, *notice*, and *ready*. Implicit arguments can receive their values from the linguistic or extralinguistic context. Having no evidence that the implicit argument is pronominal in nature, we hypothesize that it is not syntactically represented. Instead, it is contained in the functional denotation of the degree head.[17]

4.2. Valuing an implicit argument

We base our analysis on that sketched Williams (2012), who was concerned to capture the interpretive parallels between NCA and overt definite descriptions. We propose that part of the meaning of the degree head is a Fregean definite description, represented here by the ι operator. ι picks out the maximal degree d from a contextually-provided set of degrees (represented by a function of type $\langle d,t\rangle$), indicated by $A(\delta)$, where δ is a variable representing the implicit argument of these heads.

(86) i. $[\![\text{-er}]\!]^A = \lambda g\lambda x.g(x) > \iota d[A(\delta)(d)]$ $\langle\langle e,d\rangle,\langle e,t\rangle\rangle$
  ii. $[\![\text{as}]\!]^A = \lambda g\lambda x.g(x) \geq \iota d[A(\delta)(d)]$ $\langle\langle e,d\rangle,\langle e,t\rangle\rangle$

These representations assume interpretations for the degree predicate *many* and gradable adjectives like *tall* as in (87).[18] **tall** is a function that maps individuals to their heights, # is a function that maps pluralities to their cardinalities.

(87) i. $[\![\text{tall}]\!]^A = \lambda x.\mathbf{tall}(x)$ $\langle e,d\rangle$
  ii. $[\![\text{many}]\!]^A = \lambda x.\#(x)$ $\langle e,d\rangle$

When they occur without a *than* or *as*-clause, *-er/as* receive a value for δ directly from the assignment function A. We posit that, when (88i) is uttered, the function given schematically in (88ii) is made salient. When (89i) is uttered following this, we posit that an 'appropriate A' assigns that function as the value of δ, as in (89ii). We assume this process is parallel to any reasonable hypothesis that explains data like that in (90) and (91); cf (92).

(88) i. John is 5 feet tall.
  ii. $\lambda d.\mathbf{tall}(\text{John}) \geq d \;\&\; d = 5$

[17]This proposal thus differs fundamentally from that offered by Alrenga et al 2012, for whom the assumed implicit argument *is* syntactically represented. As noted above, to establish the requisite relationship between that argument and the *than*-clause, they require either that these clauses merge with *-er* and then raise (which we have shown in the previous sections is not possible), or that some other mechanism accomplishes this. If syntactically null arguments are pronominal in nature, then the semantic evidence presented in this section suggests that the implicit argument of degree heads are not represented syntactically.

[18]See Kennedy 1999 and references therein. The alternative, relational formulation of type $\langle d,\langle e,t\rangle\rangle$ could be adopted, making the requisite adjustments to (86) and (87).

(89) i. Mary is taller.
ii. $[\![\text{Mary is taller}]\!]^A = \top$ iff $\mathbf{tall}(\text{Mary}) > \iota d[\mathbf{tall}(\text{John}) \geq d \;\&\; d = 5]$

(90) Mary met a_i man. $\text{The}_{i/*j}$ man was wearing a hat.

(91) a. There is a man.
b. There is another man.
c. # The man left.

(92) a. John has a height.
b. Mary has a height.
c. # Carl is taller.

Degree clauses, when present, necessarily value δ. As can be observed by (93), set of degrees introduced in prior context cannot "override" the semantic contribution of the degree clause: (93a,b) are ungrammatical on the interpretation where Mary's height is compared to John's.

(93) John is 5 feet tall.
a. # Mary is taller than Susie is.
b. # Mary is as tall as Susie is.

Here is how we propose to capture this. The function of *than/as* is to trigger a syncategorematic rule like that in (94).[19] With the complement CP interpreted as (the characteristic function of) a set of degrees, type $\langle d, t\rangle$, the *than/as* head triggers a rule that plugs that set into the the free variable δ borne by the comparative heads *-er/as*, via A. In effect, the 'previous' assignment of a value to δ by A is 'overwritten' with the denotation of CP. More technically, $[\![\text{XP}]\!]^A$ will be interpreted relative to a variant of A which has the value $[\![\text{CP}]\!]$ in its δ-position. Thus, *than* and *as* are semantically 'light' in that their only role is only to trigger the rule in (94).

(94) $[\![\text{XP [than/as CP]}]\!]^A = [\![\text{XP}]\!]^{A[\delta \to [\![CP]\!]^A]}$

If this type of syncategorematic rule is not specific to comparatives, then this analysis predicts that it should be possible in general to value definite implicit arguments by later adjuncts. There is some suggestive evidence that this is the case (the data in (95) are based on examples by R. Schwarzschild, p.c.). In (95a), what Jack won is understood to be *the race*. (95b) has an interpretation where what is not noticed is *the fact that* John's fly is open. Finally, in (95c) Tipper is ready for the interview.

(95) a. Jack won even though he didn't want to compete in the race.
b. Nobody noticed when John walked into the room with his fly open.
c. Tipper was ready, despite the fact that she hadn't been told in advance that there was going to be an interview.

To see how our analysis works in the case of comparatives, consider (96). We assume that there is a *wh*-operator in the *than*-clause (Chomsky 1977) which, as standardly assumed, has the semantic effect of triggering a λ-abstraction over degrees. We further assume the presence of a null operator, COMP, whose semantic role is to relate the degree-trace in the comparative clause to **tall** (see Kennedy 1999 for ABS, cf. Bale's 2008 COMP).

[19]Thanks to Y. Sudo (p.c.), for discussion of this specific formulation.

(96) Mary is taller than John is.
LF: [Mary is [[tall -er] [than Op_i John is t_i ABS tall]]]

The interpretation of the *than*-complement is, given these assumptions, as in (97).

(97) $[\![Op_i \text{ John is } t_i \text{ COMP tall}]\!]^A = \lambda d.\mathbf{tall}(\text{John}) \geq d$

The combination of *than* with this expression has no immediate semantic effect, given the present formulation; rather, the semantic composition must 'wait' until this complex has combined with the AP *taller*. The denotation of AP in (96) is as in (98), combining the lexical entries in (86i) and (87i) by Functional Application (see e.g. Heim & Kratzer 1998).

(98) $[\![[_{AP} \text{ taller}]]\!]^A = \lambda x.\mathbf{tall}(x) > \iota d[A(\delta)(d)]$

The derivation of the interpretation of AP combined with the adjunct *than*-clause is as in (99). The result is a property of individuals that are tall to some degree greater than the maximal degree to which John is tall.

(99)
i. $[\![\text{AP [than/as CP]}]\!]^A = [\![\text{AP}]\!]^{A[\delta \to [\![CP]\!]^A]}$ by (94)
ii. $= [\![\text{AP}]\!]^{A[\delta \to [\lambda d'.\mathbf{tall}(\text{John}) \geq d']]}$ by (97)
iii. $= \lambda x.\mathbf{tall}(x) > \iota d[[\lambda d'.\mathbf{tall}(\text{John}) \geq d'](d)]$ by (98)
iv. $= \lambda x.\mathbf{tall}(x) > \iota d[\mathbf{tall}(\text{John}) \geq d]$ λ-conversion

When this expression is composed with the denotation of the subject *Mary*, as in (100), the derived truth conditions are such that (96) is predicted to be judged true just in case a strictly greater-than relation obtains between Mary's height and John's. This replicates the standard semantics for adjectival comparatives; the only difference is the compositional process.

(100) $[\![(96)]\!] = \top$ iff $\mathbf{tall}(\text{Mary}) > \iota d[\mathbf{tall}(\text{John}) \geq d]$

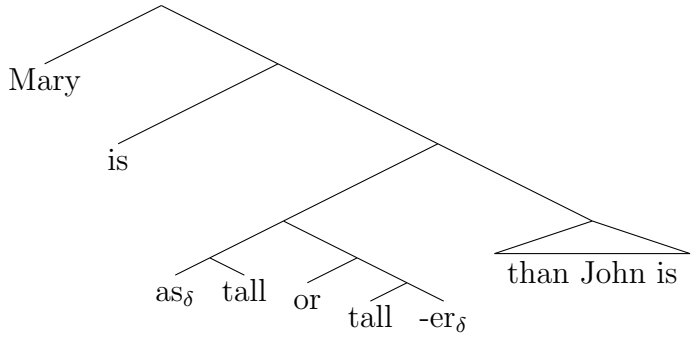
We have also seen that a single comparative clause, when present, can value multiple degree heads. Moreover, it must: in the context of (101), neither of (101a) or (101b) can be interpreted as comparing Mary's with Bill's height, which is contextually given. They can only be read as comparing Mary's height with John's.

(101) Bill is five feet eleven inches tall.
a. Mary is as tall or taller than John.
b. Mary is taller or as tall as John.

Here is what we have to posit in order to derive this result. First, the relevant parts of the structure of (101a) are represented in (102), where the *than*-clause merges after the disjunctive phrase is formed, c-commanding both *-er* and *as*. Second, the implicit arguments of *-er* and *as* have the same variable name, δ.[20]

[20]We suspect that this result could be ensured by a greater precisification of the relationship between rules like that in (94) and syntactic agreement processes.

(102)



The derivation of the interpretation of (102) is given in (103). For simplicity, we assume a meaning for *or* which takes two predicates of type $\langle e, t\rangle$, and returns a predicate of the same type. The semantic value of the CP complement for this sentence is the same as the previous example, so we do not repeat it. Combining the *than*-clause with the XP in (103vi) gives the result in (103vii). The result of composing the subject is as in (102): the sentence in (101b) is thus predicted to be judged true just in case Mary's height strictly exceeds, *or* meets or exceeds John's height, as desired.

(103)
i. $[\![\text{or}]\!]^A = \lambda R \lambda S \lambda x.R(x) \vee S(x)$
ii. $[\![\text{tall -er}]\!]^A = \lambda x.\mathbf{tall}(x) > \iota d[A(\delta)(d)]$
iii. $[\![\text{or tall -er}]\!]^A = \lambda S \lambda x.\mathbf{tall}(x) > \iota d[A(\delta)(d)] \vee S(x)$
iv. $[\![\text{as tall}]\!]^A = \lambda x.\mathbf{tall}(x) \geq \iota d[A(\delta)(d)]$
v. $[\![\text{as tall or tall -er}]\!]^A = \lambda x.\mathbf{tall}(x) > \iota d[A(\delta)(d)] \vee \mathbf{tall}(x) \geq \iota d[A(\delta)(d)]$
vi. $[\![[\text{as tall or tall -er}]\ [\text{than John is}]]\!]^A =$
$\lambda x.\mathbf{tall}(x) > \iota d[\mathbf{tall}(\text{John}) \geq d] \vee \mathbf{tall}(x) \geq \iota d[\mathbf{tall}(\text{John}) \geq d']$
vii. $[\![(102)]\!] = \top$ iff:
$\mathbf{tall}(\text{Mary}) > \iota d[\mathbf{tall}(\text{John}) \geq d] \ \vee \ \mathbf{tall}(\text{Mary}) \geq \iota d[\mathbf{tall}(\text{John}) \geq d']$

For reasons of space, we do not provide the derivations of the interpretations for e.g. *more cookies* and *run more/faster*. The basic architecture that we have presented applies, mutatis mutandis, straightforwardly to these cases.

This account appeals to an indirect semantic process for composing degree heads with degree clauses. Yet, we maintain that this process is the semantic reflex of the same syntactic relation that is responsible for ensuring morphological agreement between the degree clause head, *than/as*, and the comparative morphemes *-er/as*. Before concluding, we show that our account can capture the scope data that motivated Bhatt and Pancheva's (2004) account.

4.3. Scope ambiguities in comparatives

Bhatt & Pancheva argue for their countercyclic late merger approach in part based on data purporting to show that the scope of *-er* is exactly as high as the surface syntactic position of a *than*-clause. They suggest, recall, that this is the result of applying QR to *-er*, raising it from its surface position to CP at LF. This section shows that the relevant data can be understood to follow from the fact that degree clauses optionally extrapose.

One of the easier examples that Bhatt and Pancheva consider is given in (104). (104a) and (104b) each have two readings. The first (the "incoherent claim") may be paraphrased as 'John will claim tomorrow: the degree to which Mary is tall is greater than the degree

to which Mary is tall'. The second (the "coherent mistaken claim") may be paraphrased as 'John will claim: that the degree to which Mary is tall tomorrow is greater than the degree to which she is tall (in fact/today)'. (104c), in contrast, has only the second reading.

(104) a. John will claim that Mary is taller than she is **tomorrow**.
b. John will claim **tomorrow** that Mary is taller than she is.
c. John will claim that Mary is taller **tomorrow** than she is.

On our analysis, these data reflect an attachment ambiguity of *tomorrow* that affects (104a)-(104b) but not (104c). The structure corresponding to the incoherent claim is as in (105a), and the structure corresponding to coherent mistaken claim is as in (105b). (105a) locates the *claiming* tomorrow (it attaches to the matrix clause), and what will be asserted is the contradictory 'Mary is taller than she is'. The structure in (105b) doesn't locate the claiming at any time other than the future of the utterance time, and the claim is 'Mary is taller (at the claiming time) than she will be tomorrow (after the claiming time)'. The structure in (105c) corresponds to the sentence in (104c). The surface word order indicates that the degree clause has extraposed, and it is unable to reconstruct (Hunter & Frank 2012); consequently, (104c) unambiguously describes a claiming in which Mary's height changes between the time of the claiming to the following day.

(105) a. John will [[claim that Mary is tall er than she is] tomorrow]
b. John will claim that Mary [[is tall er than she is] tomorrow]
c. John will claim that Mary [[[is tall er] tomorrow] than she is]

This analysis is possible on our account, because the semantic effect of combining the *than*-clause with the sentence is only to bind the implicit argument of *-er*; this clause can attach at a higher or lower level, and that valuation will still be possible. All that changes is how much material from outside of the *than*-clause is used to determine an appropriate value for δ.

For another example, Bhatt & Pancheva describe how (106a) is ambiguous in a way that (106b) is not. The two readings that they suggest are available to (106a) are paraphraseable as: 'John read more books than Mary published in her life before you read more books than Mary published in her life', and 'The number of books that John read before you read that many exceeds the number of books that Mary published in her life'. As they discuss, (106b) bears only the second reading.

(106) a. John read more books than Mary published in her life **before you did**.
b. John read more books **before you did** than Mary published in her life.

We can account for these data in a manner related to the discussion of ACD discussed in section 3.2. The ambiguity of (106a) arises due to the degree clause optionally extraposing from NP to VP. If it extraposes, the ellipsis site in the *before*-clause can take the inner VP (sans reconstruction) as its antecedent (107a). Otherwise, it can take the unextraposed version (107b). The lack of ambiguity in (106b) is forced because the surface word order requires extraposition of the *than*-phrase to a VP position outside of the *before*-clause. Since it cannot reconstruct, the ellipsis site can only take as its antecedent a VP without a *than*-phrase, as in (107c).

(107) a. John [[read more books t] than Mary published in her life] before you did

b. John [read [more books than Mary published in her life] before you did]
c. John [[read more books t] before you did] than Mary published in her life

Finally, a sentence like that in (108) has the readings in (108a) and (108b). On our account, these are again straightforwardly derived by optional extraposition of the *than*-clause: either the *than*-clause remains where it is base-generated at the VP headed by *work* (delivering reading (108a)), or it extraposes to the VP headed by *tell* (delivering reading (108b)).

(108) Mary's father tells her to work harder than her boss does.
a. Mary's father tells Mary: work harder than your boss works.
b. Mary's father tells Mary: work harder than your boss tells you to work.

This analysis introduces a potential wrinkle, in that it requires the ability of *than*-phrases to extrapose from a lower clause to a higher clause. Allowing for this movement would seem to counter-predict the lack of ambiguity of (104c): why isn't it possible that *tomorrow* adjoins to the matrix verb phrase, and the *than*-phrase has extraposed from the lower clause to the right of that adjunct?

Yet, the difference is just a matter of tensed versus untensed clauses, such that extraposition is not possible from a tensed clause as in (104c), though it is possible from a non-tensed clause as in (108).[21] In support of this, observe that the tensed version of (108) in (109) is unambiguous, having only the interpretation paraphrased in (109a).

(109) Mary's father says that she works harder than her boss does.
a. Mary's father says: she works harder than her boss does.
b. * Mary's father says: she works harder than her boys says she works.

This point relates to one made by an anonymous reviewer for *LI*, who understands the strongest argument for Bhatt and Pancheva's/William's generalization to come not from the data discussed so far in this section, but from the observation that Principle C is obviated in sentences like (110). (110) has a coreferential reading precisely because the *than*-clause is higher than the coindexed pronoun. On our account, this is the result of extraposition of the *than*-clause to the matrix VP.

(110) Her father tells her$_i$ to work harder than Mary$_i$'s boss does.
a. * Mary's father tells Mary: work harder than your boss works.
b. Mary's father tells Mary: work harder than your boss tells you to work.

Such obviation is not possible when the comparative is inside of a tensed clause, as shown in (111). As with (110), the narrow ellipsis interpretation in (111a) is out as it represents a Principle C violation. However, the broad ellipsis interpretation in (111b) is out, too. This is expected, if *than*-clauses cannot extrapose across tensed clause boundaries.

(111) * Her father says that she$_i$ works harder than Mary$_i$'s boss does.
a. * Mary's father says: Mary works harder than her boss works.
b. * Mary's father says: Mary works harder than her boss says she works.

[21] Again, this prohibition on extraposition out of a tensed clause does not distinguish our approach from a QR-based approach. QR has also long been noted to be prohibited across tensed clauses (see Hornstein 1995 and Johnson 2000) as has extraposition (see Ross 1967 and Drummond 2009).

In sum, the data that Bhatt and Pancheva (2004) cite as evidence for differing heights of the degree head do not necessarily provide this evidence. Degree heads can remain in situ, while the observed ambiguities (or lack thereof) are the result of whether degree clauses themselves remain in situ, or extrapose. The syntactic and semantic consequences are reflected in how much clausal material can be taken as an antecedent for ellipsis in the degree clause.

5. Conclusion

We have argued that comparative clauses headed by *than* and *as* are adjuncts to the NPs or VPs containing the comparative heads *-er* and *as*. We contrasted this view primarily with those of Bresnan (1973) and Bhatt & Pancheva (2004). Our major claim, from the perspective of syntax, was that an adjunction-based approach can achieve broader empirical coverage than the alternatives, while only appealing to syntactic mechanisms that are independently required.

The price of this simplicity was the application of a syncategorematic rule in the semantics, the consequences of which should be explored further. Based on the semantic evidence that degree heads have an implicit argument in the sense of Null Complement Anaphora, we invoked this rule to value such arguments. However, we noted that there is some evidence that something like it applies more broadly to the class of NCA expressions.

Another potentially relevant area is in the domain of 'response stance' verbs (Cattell 1978), including *deny*, *confirm*, *verify*, and *admit*. There is some initial evidence that the apparent subordinate clauses in (112) are actually adjectival in nature, more like adjuncts than arguments. First, they are (weak) islands for extraction, (113), much like would be expected of clausal adjuncts (Szabolcsi and den Dikken 1999). Second, it seems to be acceptable for there to be an overt pronoun in the canonical object position of these verbs, interpreted as coextensive with a subsequent clause, compare (114a) and (114b).

(112) Brooke denied/confirmed/verified/admitted that Jill had behaved poorly.

(113) * How did Brooke deny/confirm/verify/admit that Jill had behaved?

(114) a. ? Brooke denied/confirmed/verified/admitted **it** that Jill had behaved poorly.
b. * Brooke said **it** that Jill had behaved poorly.

Finally, one might wonder whether there are locality restrictions on the application of this rule. As we have presented it, it is unbounded: it doesn't matter how far the implicit argument the rule values is from where the rule is applied. The answer to this question will likely turn on an examination of sentences like those in (115) (Y. Sudo, p.c.; cf. Hendriks 1994). We leave this matter for future research.

(115) a. John met a [more famous linguist who is married to a less famous linguist] yesterday than my undergraduate advisor.
b. John [moved as wide a desk next to a longer bed] yesterday as/than he is tall.

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