

2000

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Recommended Citation

Lechner, Winfried (2000) "Conjunction Reduction in Subordinate Structures," *North East Linguistics Society*. Vol. 30 , Article 5.

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Conjunction Reduction in Subordinate Structures

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0. Introduction

There are three different approaches towards the formation of phrasal comparatives (PCs), illustrated in (1):

- (1) a. They played better today than last week
b. Mary eats faster than a tornado (Napoli 1983)

First, *direct analyses* of PCs maintain that the remnant is base-generated as the complement of a prepositional head *than* (Brame 1983; Napoli 1983). Second, according to *mixed theories* (Hankamer 1973; Hendriks 1995; Pinkham 1982), some PCs are base generated while others are derived by a - possibly construction specific - deletion operation which targets clausal comparatives. Finally, *ellipsis analyses* posit that all PCs are truncated clauses underlyingly (Bierwisch 1989; Bresnan 1973, 1975). For the examples under (1), ellipsis analyses postulate the alternative parses in (2), while mixed approaches derive (1)a from (2)b, and treat (1)b as base-generated. (' Δ ' signifies Comparative Deletion, 'CD'; Bresnan 1973).

- (2) a. They played better today than they played Δ last week (Δ = d-good)
b. Mary eats faster than a tornado (is) Δ (Δ = d-fast)

In this paper, I will discuss three types of arguments in favor of a particular version of the ellipsis account. Specifically, these arguments are designed to defend the *Clausal Hypothesis*:

- (3) *Clausal Hypothesis*: All PCs in which the remnant NP does not denote a predicate of degrees are elliptical clauses.

In contrast to radical ellipsis approaches, the Clausal Hypothesis contains the qualification that the choice between base generation and a derivation in terms of ellipsis is governed by considerations of interpretability. Following von Stechow (1984) and Rullmann (1995), I assume that the comparative complement (*than*-XP) denotes a set of degrees, out of which the maximality operator *than* picks the maximal degree. On this conception, the *than*-XP of PCs in which the remnant is realized as a predicate of degrees (*80mph* in (4)a) can be directly assigned a meaningful interpretation ((4)b):

- (4) a. The cheetah ran faster [_{than-XP} than 80mph]
 b. [_{than}](_[80mph]) = $\max\{\lambda d[\text{mph}(d) = 80]\} = 80$

The paper is structured as follows. Section 1 introduces the algorithm which will be employed in the derivation of PCs. Section 2 and 3 present two arguments in support of the Clausal Hypothesis based on generalizations about surface syntactic characteristics of PCs. Section 4 expands on predictions the theory generates for interpretational properties of PCs by investigating the binding theoretic behavior of remnants. Due to limitations of space, I will consider only parts of the evidence from word order, limited to those aspects of PC-formation which provide the basis for the discussion of the binding data in section 4. Furthermore, Subcomparatives will be ignored throughout.

1. Phrasal Comparatives

In principle, an ellipsis account of PCs can pursue one of two strategies. Either PCs are taken to be related to their clausal source by a construction specific operation such as Comparative Ellipsis (Bresnan 1975), or the conditions on the surface shape of truncated *than*-XPs are reduced to ellipsis processes otherwise attested in the grammar. Adopting the latter approach, I propose that the full range of well-formed PCs are the result of the interaction between CD and conjunction reduction operations such as Gapping, RNR and ATB-extraction.¹ On this view, (2)b does not involve any ellipsis apart from CD (Heim 1985). Applied to the examples in (5), this concrete implementation of the Clausal Hypothesis furthermore yields a derivation for (5)a in terms of CD and Gapping, as shown by (6)a, while (5)b is mapped to its underlying clausal source (6)b by CD, ATB-subject extraction and Gapping:

- (5) a. Santa spent more money on gifts than Rudolph
 b. Someone sent more people a postcard than a letter
- (6) a. Santa spent more money on gifts than Rudolph $\text{spent}_{\text{Gapping}} \hat{\Delta}$ on gifts Gapping
 b. Someone_i [_{CP} t_{i,ATB} sent more people a postcard than t_{i,ATB} $\text{sent}_{\text{Gapping}} \hat{\Delta}$ a letter
 ($\hat{\Delta}$ = d-much money/d-many people)

¹ Even though the observation that conjunction reduction can target comparatives is not new (Napoli 1983), the idea of letting PC-formation be entirely driven by Gapping, RNR and ATB-movement has not been explored in the literature so far.

Initial support for the conjunction reduction analysis of (5) comes from the observation that identical deletion processes are attested in contexts of clausal conjunction:

- (7) a. Santa spent 5\$ on gifts and Rudolph spent 3\$ ~~on gifts~~
 b. Someone_i [_{t_i} sent Mary a postcard] and [_{t_i} sent Bill a letter]

Note that in the comparative (6)b as well as in the clausal conjunction (7)b, ATB-extraction ensures that the missing subject inside the *than*-XP and 2nd conjunct respectively is interpreted as a bound variable, and not as a possibly referentially independent indefinite.

An instance of the complex interaction of RNR, ATB-movement and CD is manifest in the reduced (but not phrasal) comparative in (8)a. A first indication that these reduction processes are not restricted to comparatives comes once again from the well-formedness of the corresponding conjunction construction ((8)b):

- (8) a. Someone_i _{t_i} gave more money to John ~~on Friday~~ than _{t_i} gave to Bill on Friday
 b. Someone_i _{t_i} gave 5\$ ~~on Friday~~ to John and _{t_i} gave 3\$ to Bill on Friday

More generally, the Clausal Hypothesis claims that PCs are parsed into structures which fulfill the two requirements that (i) the matrix clause and the *than*-XP are coordinated and that (ii) the 'coordinates' are clauses. As for (i), I assume that a structure sufficiently similar to coordination can be formed by extraposing the *than*-XP, which is base-generated within the minimal functional projection of a comparative DegP (Abney 1987; Corver 1990) to the right periphery by a process I will refer to as *than*-XP Raising ('TR'). Essentially, this amounts to treating *than* as a syntactic coordinator. Condition (ii) is in line with the semantics of von Stechow (1984) adopted here, according to which the *than*-XP denotes a maximized predicate of degrees. The claim that all PCs derive from 'clausal coordination' requires further syntactic justification, though, parts of which will be provided below.²

Turning now to the characterization of the arguments in support of an ellipsis analysis, the overall success of the Clausal Hypothesis depends upon its ability to handle the following catalogue of desiderata: (i) it has to succeed in predicting the positional distribution of phrasal *than*-XPs; (ii) it has to account for restrictions on the surface shape of phrasal *than*-XPs; (iii) it has to demonstrate that the prediction inherent in the Clausal Hypothesis that PCs contain a syntactically projected ellipsis aligns with the empirical facts. Sections 2 to 4 will take up these issues in turn.

2. Positional Distribution of Phrasal *than*-XPs

It has been observed at various points in the literature that phrasal *than*-XPs can - unlike their clausal counterparts - surface in clause final position only (Pinkham 1982). This peripherality requirement for PCs is illustrated by the paradigm of subject comparatives in (9):

² In addition, the Clausal Hypothesis is challenged by various puzzles of over- and undergeneration (Brame 1983; Hankamer 1973; Napoli 1983). See Lechner (1999) for discussion.

- (9) a. More people bought a newspaper than bought a book.
 b. More people bought a newspaper **than a book**.
 c. More people than bought a book bought a newspaper.
 d. *More people **than a book** bought a newspaper.

The direct analysis can account for the contrast between (9)b and (9)d by assuming that PCs are base-generated right-adjoined to the IP-node (Reinhart 1991) or by stipulating that phrasal PCs obligatorily undergo extraposition. On the Clausal Hypothesis, the ill-formedness of (9)d is on the other side explained by a more general prohibition on Backwards Gapping which is also operative in coordinate structures:

- (10) a. Many people bought a newspaper and some ~~bought~~_{Forward Gapping} a book
 b. *Many people ~~bought~~_{Backward Gapping} a newspaper and some bought a book

The two theories differ now in the predications they generate for slightly more complex structures. While the direct analysis locates all PCs in clause-final position, the Clausal Hypothesis leads to the expectation that clause-internal PCs should be licit if the appearance of intraposition can be interpreted as the result of ellipsis inside an extraposed clausal *than*-XP. Consider in this light the ditransitive PCs in (11), focusing on (11)d:

- (11) a. He gave more books to Mary than you gave to Sam.
 b. He gave more books to Mary **than you**.
 c. He gave more books than you gave to Sam to Mary.
 d. He gave more books **than you** to Mary.³

The Clausal Hypothesis relates (11)d to its underlying source (12) by RNR of *to Mary* and Gapping of the verb inside the extraposed *than*-XP:

- (12) He gave more books ~~to Mary~~_{RNR} [than you ~~gave~~_{Gapping} to Mary].

The direct analysis can on the other side capture the contrast between the subject PC (9)d and the ditransitive PC in (11)d only at the cost of additional stipulations.

Data from German provide two further pieces of evidence challenging a base-generation analysis. First, in verb-final languages, it is possible to find manifestations of non-peripheral (i.e. intraposed and *in-situ*) PCs in transitive verb-final contexts:

- (13) a. weil mehr Leute ein Buch **als eine Zeitung** gekauft haben.
since more people a book than a newspaper bought have
 b. weil Hans mehr Bücher **als Peter** gekauft hat.
since John more books than Peter bought has

³ Evidence against an analysis in terms of extraposition of the indirect object PP comes e.g. from the observation that PPs can more generally not be shifted to the right of *than*-XPs:

- (i) a. More people bought a book about phlogiston theory than an expensive watch
 b. *More people bought a book than an expensive watch about phlogiston theory

The ellipsis approach treats the PCs in (13) as the result of RNR operating on full clausal *than*-XPs in extraposed location, as shown by (14):

- (14) a. weil mehr Leute ein Buch gekauft haben_{RNR} [als eine Zeitung gekauft haben].
 b. weil Hans mehr Bücher gekauft hat_{RNR} [als Peter gekauft hat].

Crucially, this strategy of PC-formation in terms of RNR is now unavailable in English. RNR only affects right-peripheral strings. But in English, the verb is realized in medial position, and an extraposed *than*-XP does therefore not supply an appropriate context for reduction of the verb by RNR

Second, German differs from English in that German (marginally) licenses *in-situ* PCs in transitive subject comparatives. That is, (15) forms a minimal pair with (9)d:

- (15) ?weil mehr Leute als ein Buch eine Zeitung gekauft haben.
since more people than a book a newspaper bought have

Again, this disparity lends itself to an ellipsis analysis. Note to begin with that RNR may - for some poorly understood reason - target *in-situ* subject relatives (Hudson 1976):

- (16) ?weil viele Leute [die ein Buch gekauft haben_{RNR}] auch eine Zeitung gekauft haben.
since many people who a book bought have also a newspaper bought have

Whatever the correct analysis of (16), it straightforwardly extends to (15) on the assumption that (15) is derived by RNR:

- (17) ?weil mehr Leute [als ein Buch gekauft haben_{RNR}] eine Zeitung gekauft haben.

Summarizing, the Clausal Hypothesis correctly captures language specific as well as cross-linguistic generalizations about the positional distribution of PCs. The direct analysis is not equipped to handle these correlations without additional amendments, though.

3. Conditions on Deletion

A second type of argument in favor of the Clausal Hypothesis can be drawn from the restrictions on the deletion processes which are (by assumption) implicated in PC-formation. In particular, it can be shown that these operations display identical behavior in coordinate structures and in comparatives. I will consider here only two conditions on Gapping, which will turn out to be of immediate relevance for the discussion in §4.⁴

First, Gapping only affects *isomorphic* contexts in which the antecedent and the Gap are embedded at the same depth inside their respective conjuncts (Hankamer 1979; Hudson

⁴ See Lechner (1999) for a broader survey of data indicating that the conditions on Gapping in conjunction and comparatives match. See also Hendriks (1995), who considers partially overlapping data, but argues in favor of a base-generation analysis. Note also that the parallelism between deletion in comparatives and conjunctions also generalizes, as expected, to non-phrasal reduced comparatives.

1976; Sag 1980). An empirical reflex of *Isomorphism* is manifest in example (18), which lacks the interpretation in terms of narrow ellipsis (18)b:

- (18) . The girls want to visit Otto and the boys Bart
 a. [_{IP} The girls [_{IP} want to visit] Otto] and [_{IP} the boys [_{IP} want to visit] Bart].
 b. * [_{IP} The girls [_{IP} want to visit] Otto] and [_{IP} the boys visit Bart].

Reading (18)a is blocked, because the antecedent is embedded under two clausal nodes, while the Gap is located inside the matrix clause of the second conjunct.

Isomorphism is computed in a parallel fashion in comparatives. This ensures that the subject comparative (19) can be assigned reading (19)a only. Assuming that the matrix clause and the *than*-XP establish a coordinate-like structure created by *than*-XP-Raising (TR), the non-isomorphic representation (19)b fails to converge for the same reason that reading (18)b is unavailable. In both examples, the antecedent is embedded, while the Gap is not.

- (19) More girls want to visit Otto than Bart (\triangle = d-many girls)
 a. [More girls want to visit Otto] than [\triangle want to visit Bart]
 b. *[More girls want to visit Otto] than [\triangle visited Bart]

Interestingly, object comparatives display a wider range of interpretations than their subject counterparts. In addition to the isomorphic construal (20)a, which corresponds to wide ellipsis, (20) can also be assigned the narrow, and apparently non-isomorphic interpretation in (20)b. This contrast between object and subject PCs is puzzling at first sight.

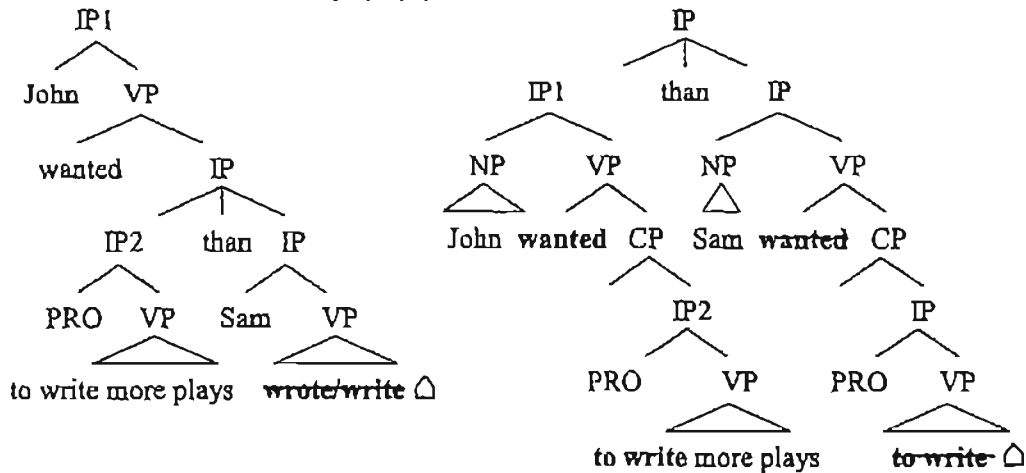
- (20) John wanted to write more plays than Sam (\triangle = d-many plays)
 a. [_{IP1} John wanted [_{IP2} to write more plays than Sam wanted to write \triangle]
 b. [_{IP1} John wanted [_{IP2} to write more plays than Sam wrote \triangle]

But note at this point that Gapping in (20)b violates Isomorphism only on the assumption that the *than*-XP is 'coordinated' with the higher clausal node IP1. The TR analysis provides an alternative derivation, however, in which the *than*-XP undergoes extraposition to the lower node IP2. As illustrated by the tree diagram (21)a, low attachment to IP2 creates a suitable context for Gapping of the embedded predicate (*write*), yielding the narrow interpretation in observance of Isomorphism. Moreover, long TR to IP1, as in (21)b, sponsors the wide ellipsis interpretation:

Conjunction Reduction in Subordinate Structures

461

- (21) a. Narrow Reading (= (20)b) b. Wide Reading (= (20)a)



Crucially, this account also succeeds in excluding the narrow reading (19)b for the subject comparative in (19): TR has to proceed upwards, and can therefore not lower the *than*-XP - which is generated inside the matrix subject - into the embedded clause.⁵

The second defining property of Gapping to be addressed here pertains to the interpretation of remnants in coordinate structures and comparatives, respectively. While non-reduced conjoined clauses freely permit a coreferential construal between R-expressions inside the first conjunct and pronouns inside the second one, Gapping leads to a (focus induced) disjoint reference effect. (I use data from German here since in English, there is a general tendency against pronominal remnants.)

- (22) a. weil Otto_i Maria eingeladen hat und er_j Flanders empfangen hat
since Otto Mary invited has and he Flanders welcomed has
 b. *weil Otto_i Maria eingeladen hat und er_j Flanders eingeladen hat
since Otto Mary invited has and he Flander invited has

The same disjointness effect can now also be detected in PCs (Bierwisch 1989):

⁵ The distribution of wide readings is subject to an array of additional, independent factors. For one, TR over non-restructuring predicates such as *refuse* does not feed a wide reading, as shown by (i):

- (i) Sam refused to send more letters than Bill (Δ = d-many letters)
 a. ?*Sam refused to send more letters than Bill refused to send Δ
 b. Sam refused to send more letters than Bill sent Δ

The absence of the wide construal (ia) can be correlated to the observation that long Gapping in general cannot elide verbal strings which contain non-restructuring verbs (Johnson 1996):

- (ii) ?*Sam refused to send letters and Bill refused to send postcards

- (23) a. Es ist möglich daß Otto_i mehr Leute eingeladen hat als er_i empfangen hat.
it is possible that Otto more people invited has than he welcomed has
 "It is possible that Otto_i invited more people than he_i welcomed"
- b. *Es ist möglich daß Otto_i mehr Leute eingeladen hat als er_i eingeladen hat.
it is possible that Otto more people invited has than he invited has

This observation will turn out to be relevant inasmuch as it indicates that one has to guard against the potential influence of focus when testing possible referential dependencies between remnants and matrix clause internal NPs (see §4, fn.9).

To summarize, the congruent behavior of reduced coordinate structures and PCs w.r.t. Isomorphism, focus induced disjoint reference and various other conditions (Lechner 1999) strongly supports the hypothesis that PCs are generated by the same reduction process which operates in conjunction (Gapping). It is on the other side not *a priori* clear how a direct analysis of PCs could accommodate for the fact that the restrictions on ellipsis in PCs are replicated by the more general restrictions on Gapping in conjunction.⁶

4. Binding Scope of Remnants

The specific implementation of the Clausal Hypothesis adopted here makes precise predictions as to the interaction between ellipsis scope and binding scope in PCs. On present assumptions, (English) PCs are derived by extraposition by TR and Gapping. Gapping is in turn restricted by *Isomorphism*. It follows that the scope of the ellipsis inside PCs is expected to directly correspond to the scope of TR.⁷ In this final section, this prediction will be tested by examining licit coreference relations between NPs (embedded inside) the remnant and NPs generated in the matrix clause. It will turn out that the results straightforwardly support the Clausal Hypothesis, but pose a serious challenge for the direct analysis.

The first context to be considered involves ambiguous object PCs in which the remnant contains an embedded name and the matrix clause contains a pronoun, as in (24):

- (24) [_{IP1} Mary promised him_i] [_{IP2} PRO to invite more people than [John_i's sister]

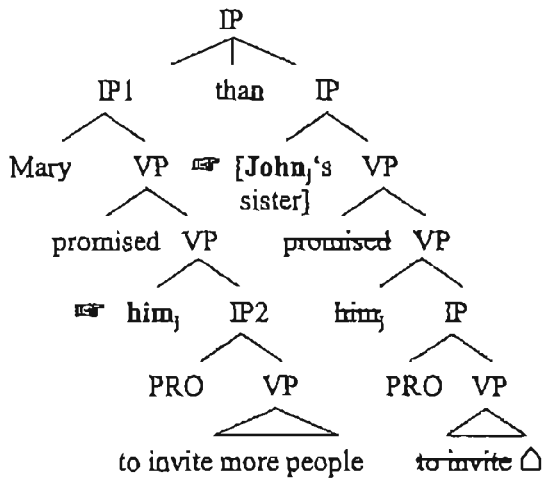
The TR-analysis entails that a coreference relation between the pronoun and the name can be established only if the matrix clause and the *than*-XP are parsed into a coordinate-like structure in which the pronoun does not c-command the name. Such a factorization can be achieved by raising the *than*-XP to the higher IP-node (IP1), resulting in the wide ellipsis construal, which in fact permits coreference ((25)a). The tree in (26)a illustrates the detailed relation between wide TR and wide ellipsis.

⁶ Even if the direct analysis would succeed in doing so, the ellipsis approach leads to a more parsimonious theory, which does not have to resort to additional interpretational mechanisms (Heim 1985).

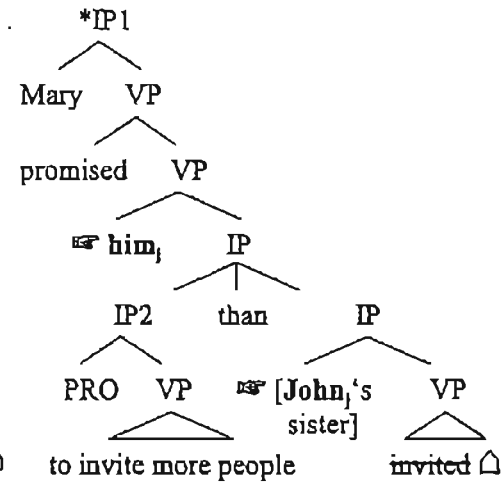
⁷ Gapping differs in this respect from ACD, which permits a disassociation between scope of QR and ellipsis scope due to the non-isomorphic nature of VP-ellipsis (Larson and May 1990).

- (25) a. Mary promised him_j , PRO to invite more people than
 [John_j's sister] promised him_j to invite Δ (Δ = d-many people)
 b. *Mary promised him_j , PRO to invite more people than [John_j's sister] invited Δ

(26) a. Wide Reading



b. Narrow Reading



If the PC is on the other side interpreted with narrow ellipsis, as in (25)b, a Principle C effect can be observed to emerge. As shown by the phrase marker (26)b, coordination at the lower clausal node IP2 leads to a structure in which the name is trapped inside the c-command domain of the pronoun.⁸

PCs embedded under object control verbs display identical behavior. While wide ellipsis obviates disjoint reference effects by wide TR ((27)a), narrow ellipsis induces a Principle C violation ((27)b):

- (27) We convinced him_j , PRO_j to donate more money than [Bill Gates_j's sister]
 a. We convinced him_j , PRO_j to donate more money than
 [Bill Gates_j's sister] convinced him_j to donate Δ
 b. *We convinced him_j , PRO_j to donate more money than
 [Bill Gates_j's sister] donated Δ (Δ = d-much money)

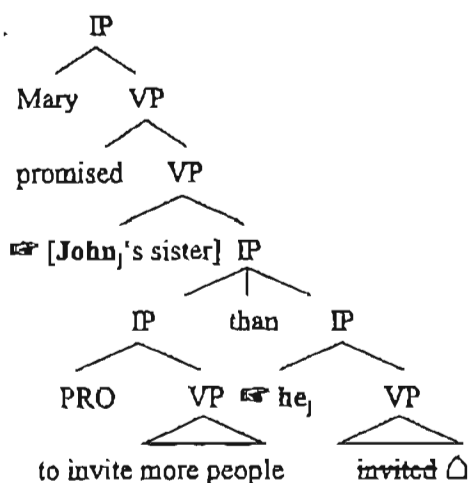
Second, reflexes of the systematic covariation between the scope of TR (i.e. the height of coordination) and binding scope can also be detected by examining the behavior of NPs which have been reconstructed into the ellipsis site via ellipsis resolution (vd. Fiengo and May 1994 for ACD). Relevant contexts are provided by object PCs in which the remnant is realized as a pronoun and in which the matrix clause contains a name. (Again, I use data from German, since pronouns do not make good remnants in English):

⁸ See Culicover and Rochement (1990) on Principle C obviation by relative clause extraposition.

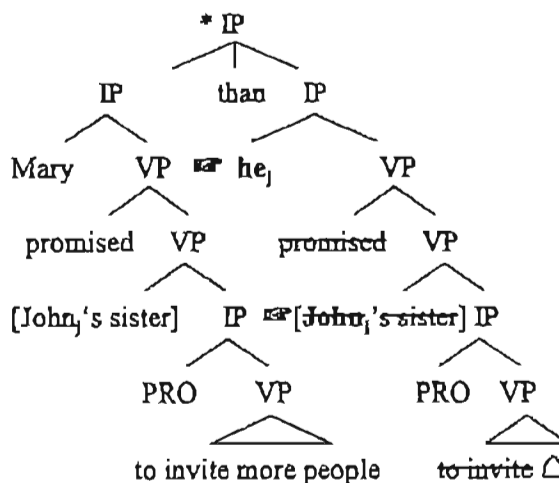
- (28) Maria hat [der Schwester von Hans_j] versprochen mehr Leute einzuladen als er_j
Mary has the sister of John_j promised more people to invite than he_j
 a. Mary promised [John_j's sister] to invite more people than he_j invited \triangle
 b. *Mary promised [John_j's sister] to invite more people than
 he_j promised [John_j's sister] to invite \triangle (\triangle = d-many people)

Here, the relation between size of ellipsis and licit coreference is the opposite of the one observed in the paradigm (24) to (27). To begin with, in the narrow construal (28)a, the name is not part of the Gap, and is therefore free to corefer with the pronominal remnant. (29)a provides the pertaining tree. Broad ellipsis as in (28)b results in a Principle C violation, though, because the (Gapped) R-expression is within the c-command domain of the pronoun (vd. tree (29)b).^{9 10}

(29) a. Narrow Reading



b. Wide Reading



Thirdly, the Gapping analysis correctly captures the fact that the ellipsis site inside PCs preserves local binding domains for the computation of Principle B. Consider to this effect example (30) and its two potential sources in (30)a and (30)b:

- (30) Mary convinced us to send him_j more money than John_j
 a. *Mary convinced us to send him_j more money than John_j sent him_j \triangle
 b. Mary convinced us to send him_j more money than
 John_j convinced us_k PRO_k to send him_j \triangle (\triangle = d-much money)

In the narrow reading (30)a, the pronoun is elided from the local binding domain of its potential antecedent (the remnant *John*). Consequently, it is not possible to establish an

⁹ Notice that it has to be ensured that the name in the matrix clause of (28) is embedded in order to avoid the kind of focus induced disjoint reference effect mentioned in §3 (vd. (23)).

¹⁰ Interestingly, elided names in PCs derived by Gapping do not undergo vehicle change to pronouns. An even clearer manifestation of this property can be seen in simple, unambiguous PCs (vd. (33)).

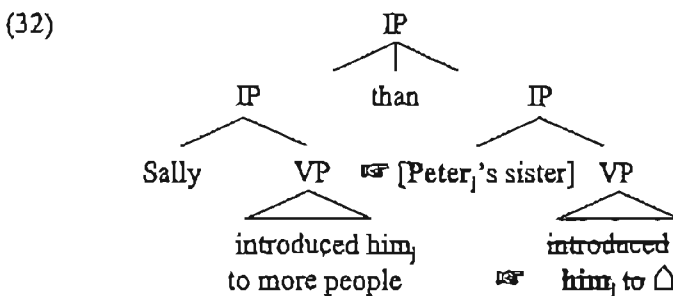
indexical dependence between the remnant and the pronoun. If the PC is on the other side construed with wide ellipsis, as in (30)b, the pronoun and its antecedent are separated by an additional clausal node and coreference becomes readily available.

All the examples discussed so far involved ambiguous object PCs and attested to the fact that the interaction of the Clausal Hypothesis and the TR/Gapping-analysis of PCs succeeds in accounting for the direct match between ellipsis scope, binding scope and scope of TR. But empirical reflexes of the assumption that PCs contain a structured ellipsis site can also be observed in simple, unambiguous PCs, whose interpretation is not a function of the scope of TR. In particular, these contexts illustrate that legitimate referential dependencies between (parts of) the remnant and NPs inside the matrix clause can be determined only on the assumption that the ellipsis in PCs replicates the structural relations of the antecedent clause. These findings provide most straightforward evidence for the claim that PCs project structure during the syntactic derivation, and directly contradict the premisses of the direct analysis.

In the monoclausal PC (31), Gapping has removed a string including the dative pronoun *him* from inside the *than*-XP:¹¹

(31) Sally introduced **him**_i to more people than [*Peter*_j's sister]_{NOM}

As can be seen from the pertaining tree in (32), the pronoun and the name both fulfill their respective binding requirements, licensing coreference between *him* and *Peter*.



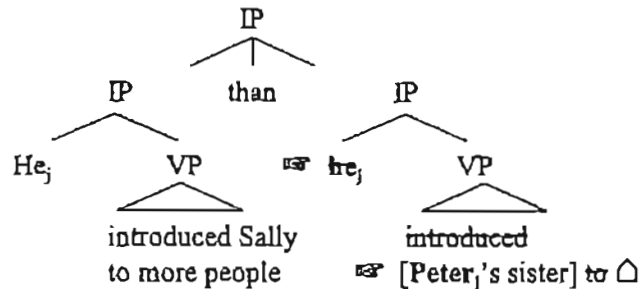
One is now led to expect that once the positions of the embedded name and the pronoun contained inside the *than*-XP of (32) are reversed, Principle C should prohibit coindexing. This prediction is borne out, as witnessed by example (33). In (33), *Peter's sister* serves as the direct object of the *than*-XP, and is accordingly located structurally lower than the elided subject pronoun.¹² The strong disjoint reference effect associated with (33) and the sharp contrast between (31) and (33) presents solid evidence that Binding Theory in PCs is computed on the basis of syntactically projected structure.

¹¹ The PC possesses a second reading - irrelevant for present purposes - which compares the number of people Sally introduced to him to the number of people Sally introduced to Peter's sister.

¹² To be precise, the empty subject pronoun inside the *than*-XP is not elided by Gapping, but has to be analyzed as an ATB-trace. (On ATB-traces see discussion of (5)b in §1.)

(33) *He_j introduced Sally to more people than [Peter_j's sister]_{ACC}

(34)



Thus, binding relations in monoclausal PCs indicate that the internal organization of the *than*-XP mimics the structural relations inside the matrix clause. Such a result is in line with the Clausal Hypothesis, but poses a substantial problem for the direct analysis of PCs.

5. Conclusion

This paper advanced arguments for the Clausal Hypothesis of PC-formation based on the following findings:

- The positional distribution of PCs falls out from a conjunction reduction analysis of PCs.
- Surface syntactic restrictions on deletion inside the *than*-XP are accounted for by the conjunction reduction analysis of PCs.
- Binding properties indicate that PCs contain syntactically projected structure.

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