Adjacency, PF, and extraposition

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1. Dutch[1]

In the OV Germanic languages, certain verbs selecting infinitival complements (roughly, the restructuring predicates) appear to form a tight *cluster* with the heads of their complements. This is particularly striking in Dutch, where clustering is overtly signaled in some contexts by an inversion of the order of the two verbal heads (assuming a head-final base order). This inversion motivated the original movement (verb raising) analysis in Evers (1975) whereby the embedded verb adjoins to the selecting head, as indicated in (1b). An alternative analysis without syntactic head movement, offered by Haegeman and Van Riemsdijk (1986), takes the inversion to be a PF phenomenon, as sketched in (1c).[2]

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[1] Our thinking about syntax, and about verb clusters/verb raising in particular, has greatly benefited from many discussions with Henk, and from his many writings on the topic. We are very pleased to be able to offer this paper to the Festschrift. For additional discussion of the ideas presented here, we would also like to thank Hubert Truckenbrodt and the audience of the workshop on *Infinitives* in Konstanz (September 2004).

[2] For Haegeman and Van Riemsdijk, inversion was preceded by a process of rebracketing or reanalysis, which we have indicated in (1c). For most cases, it is also possible to treat inversion as linearizing syntactic V, VP projections, without any prior rebracketing operation, on the assumption that material from the lower VP has first moved out, leftwards (see Wurmbrand to appear). We will proceed on the assumption that inversion is a PF process, and take no stand on whether or not it is fed by a distinct reanalysis operation.

See Wurmbrand (to appear) for a review of the various theories that have been proposed, and the papers collected in É. Kiss and Van Riemsdijk (2004) for recent proposals. There is extremely widespread (but not unbounded) variation among speech varieties and across verb classes in terms of the orders that are permitted (see Wurmbrand 2004); this variation is orthogonal to the point to be made here.

(1) a. *dat   hij een verhaal   belooft   te vertellen*
         that   he   a story   promised   to tell
         'that he promised to tell a story'
     b. dat hij [een verhaal t_i [belooft   [te vertellen]$_i$]
     c. dat hij [[een verhaal   te vertellen] belooft]
         ([[een verhaal   [**te vertellen belooft**]   reanalysis)
                 [[een verhaal   [**belooft te vertellen**   ]   inversion (PF)

As Van Riemsdijk (1998) discusses, inversion in Dutch interacts with extraposition in an interesting way. As (2a) shows, the infinitival complement clause as a whole may undergo extraposition (we treat the infinitival clause as a VP, though nothing hinges here on this choice). When this happens, a further instance of extraposition within the infinitival clause is possible; this is illustrated by movement of the PP to the right edge of VP (2b).

(2) a. dat   hij t_i probeert [$_{VP}$ de emmer   **met een lepel**   leeg
         that   he   tried   the bucket   with a spoon   empty
         te scheppen]$_i$
         to scoop
         'that he tried to scoop the bucket empty with a spoon'
     b. dat   hij probeert [[$_{VP}$ de emmer t_i leeg   te scheppen]
         that   he   tried   the bucket   empty   to scoop
         met een lepel$_i$]
         with a spoon
         'that he tried to scoop the bucket empty with a spoon'

Note that extraposition of the entire infinitival VP as in (2a) is not the only option. As (3a) shows, it is also possible for the infinitival clause to remain in the position preceding the selecting verb *proberen*, 'try', but when this happens, the inversion process identified above (however it is to be formally described) is obligatory.[3] Exactly in this configuration, though,

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[3] There is a continuing debate about whether the inversion in (3a) involves reordering just among the heads ('verb raising') or is a special case of reordering of a maximal VP projection where the remaining material from within the VP complement has undergone leftwards movement, such as scrambling. Examples such as (3a) are perhaps the best cases for the view that at least sometimes, reordering targets something smaller than a VP, since resultative predicates such as *leeg* are typically unavailable for scrambling. On these grounds, we assume that at least some projection of the infinitival VP remains in complement position in (3),

PP-extraposition within the (now headless) infinitival clause is prohibited. (For ease of exposition, we have assigned a trace position to the infinitival verb in (3b), though if inversion is a PF process, there should be no trace here.) Note that extraposition from a base such as (3a) is in principle possible, however, it must take the PP all the way to the edge of the main clause (3c).

(3) a dat   hij de emmer   **met een lepel**   leeg   probeert
        that he   the bucket with a spoon   empty   tried
        te scheppen
        to scoop
        'that he tried to scoop the bucket empty with a spoon'
     b. *dat   hij [[de emmer t_{PP} leeg t_i] **met een lepel**] probeert
        that   he   the bucket   empty   with a spoon   tried
        te scheppen$_i$
        to scoop
        'that he tried to scoop the bucket empty with a spoon'
     c. dat [hij de emmer   leeg   probeert te scheppen]
        that   he   the bucket   empty   tried   to scoop
        met een lepel
        with a spoon
        'that he tried to scoop the bucket empty with a spoon'

Van Riemsdijk (1998) describes this interaction as an adjacency constraint on cluster formation/inversion – (3b) is blocked since the PP intervenes between the base position of the infinitive and the higher verb. In other words, extraposition blocks inversion. Since extraposition is in general optional, this phrasing might suggest that extraposition within an unmoved infinitival complement is free to occur, and simply blocks inversion when it does. But this is not correct, as (4) shows.

(4)   *dat   hij [[de emmer t_{PP} leeg   probeert] **met een lepel**]
         that   he   the bucket   empty   tried   with a spoon
         te scheppen$_i$
         to scoop
         'that he tried to scoop the bucket empty with a spoon'

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as indicated, though remaining agnostic about the X'-level of the inverted infinitival verb.

The example in (4) is excluded because, as already noted, inversion is obligatory in Dutch in this context. The complement of a verb like *proberen* 'try' must either extrapose or it must undergo inversion. Thus, one might perspicuously restate the problem the other way around, namely, by saying that inversion (an obligatory process) blocks extraposition (an otherwise optional process).

Now, if inversion is a PF operation, then the interaction just described would appear to be a case of 'look-ahead' – the PF acting as a filter on syntactic derivations. Extraposition (syntax) is blocked if it will have a deleterious consequence for a subsequent component (PF). On some interpretations, this would constitute a rejection of the position that PF is solely an interpretive component (Chomsky 1965 et seq.), and thus such look-ahead should not be countenanced.

We suggest that it is possible to maintain both the PF character of inversion and the syntactic nature of extraposition, while successfully navigating around the look-ahead problem. The key to the proposed solution is a version of the 'copy theory of movement' under which movement occurs in the syntax, creating a chain of copies (or occurrences) of the moved element, but where the choice of copy to pronounce is made at PF, and is thus subject to PF considerations, including string adjacency (as suggested in Bobaljik 1995, 2002 and Bošković 2001).

Viewed from this perspective, we may maintain that extraposition is always optional, as far as the syntax is concerned. As an instance of syntactic movement, extraposition creates a chain of copies or occurrences of the moved item. It is the role of PF, not syntax proper, to determine which member of the chain (which copy) receives phonetic instantiation. In line with the proposals of Bobaljik (1995, 2002) and Bošković (2001), we suggest that the default is to pronounce the higher copy, unless doing so would interfere with some other phonological constraint. We assume that Van Riemsdijk's adjacency constraint on PF-inversion is one such other phonological constraint (but see below for a suggestion on how it may be derived). Thus (5) is an economy condition, at PF.[4]

(5)   Pronounce the highest copy (unless doing so would violate another PF condition).

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[4] This is called *Speak Up* in Bobaljik (1995), building on work of David Pesetsky. In Bobaljik (2002), this is replaced by a slightly different proposal (*Minimize LF:PF Mismatch)*, but the difference is of no real consequence here.

Our proposal then is sketched in part in (6). The first line of the example shows syntactic extraposition targeting the right edge of the infinitival complement, creating two copies/occurrences of the PP. Since inversion is obligatory, the PF adjacency requirement overrides the PF economy condition in (5) and forces the exceptional pronunciation of the lower copy and thus deletion (indicated by strikethrough, of the higher copy). Inversion then applies without hinderance. Importantly, the only non-trivial rule-interaction here is within PF, there is no PF constraint on syntactic movement.

(6)   syntax [de emmer **met een lepel**   leeg   te scheppen
                 the bucket   with a spoon   empty   to scoop
                 met een lepel] probeert]
                 with a spoon   tried
         'that he tried to scoop the bucket empty with a spoon.'
         PF [[de emmer **met een lepel** leeg te scheppen ~~met een lepel]~~
             probeert]   (Copy deletion)
         PF   [[de emmer **met een lepel** leeg probeert te scheppen]
                                                                   (Inversion)

2. German

Converging evidence for this account, and reason to believe that inversion is in fact somewhat of a red herring in the formulation of the problem, comes from what might be called *Haider's Puzzle* in German, as it has been raised in a series of works by Hubert Haider (most recently Haider 2003). In German, for the class of VP-complementation structures (modals, auxiliaries and other restructuring predicates) extraposition to the right edge of an in situ infinitival is blocked. We illustrate here with relative clause extraposition – compare (7a-b) to PP-extraposition in Dutch in (3b).

(7) a. *daß   er [$_{VP}$ [$_{VP}$ [jenen t$_{REL}$] etwas   gegeben]
         that he   those   something give
         [die ihn   darum gebeten haben] hat]
         who him   for.it asked   have   has
         'that he gave something to those who asked him for it'
     b. *daß   er [$_{VP}$ [$_{VP}$ [jenen t$_{REL}$] etwas   ] [die ihn   darum
         that he   those   something   who him   for.it
         gebeten haben] gegeben hat]
         asked   have   given   has

c. daß   er   [$_{VP}$ [$_{VP}$ [jenen   t$_{REL}$]   etwas   gegeben]   hat]
that   he   those   something   given   has
[die   ihn   darum   gebeten   haben]
who   him   for.it   asked   have

Just as in Dutch, when the infinitival clause is itself moved (here by VP-topicalization), the relative clause extraposition in question is licit, as (8) shows.

(8) a. [[$_{VP}$ jenen   etwas   gegeben]   [die   ihn   darum   gebeten
                those   something   given   who   him   for.it   asked
haben]]   hat   er   noch   nie
have   has   he   yet   never
'He has never yet given something to those who asked him for it.'
      b. [[$_{VP}$ jene   zu verstehen]   [die   ihn   kritisieren]]   hat   er   noch
                    those   to understand   who   him   criticize]]   has   he   yet
nie   versucht
never   tried
'He has never tried to understand those who criticize him.'

While the German facts look strikingly similar to the Dutch puzzle addressed above, one point of difference is that there is no clear evidence for cluster formation in the German cases at issue (see Wurmbrand 2005). In particular, there is no inversion, as there is in Dutch – the word order in German is exactly what is expected from the (right headed, VP-complementation) structure in the syntax. Truckenbrodt (1995) has addressed the German facts by proposing that extraposition is itself a PF operation, and that it is both driven by, and blocked by, considerations of phonological phrasing.

Truckenbrodt's argument for treating extraposition as a PF process comes from a careful study of intonational phrasing in German. Specifically, he suggests the constraint on extraposition in (9).

(9)   Let XP be a syntactic category that is canonincally mapped into the prosodic category π upon extraposition (where π is either the phonological phrase or the intonational phrase in the following). The extraposition from NP will take XP as far as out of a prosodic constituent of the same cateogry π.
         $(\dots \text{XP} \dots)_\pi \Rightarrow (\dots t_i \dots)_\pi (\text{XP}_i)_\pi$ (Truckenbrodt 1995: 503)

According to (9), an extraposed phrase of a particular prosodic category has to be placed immediately outside of the phrase (of the same prosodic category) it originates in (unlike syntax, phonological phrasing is not recursive). The constraint is violated if movement is either too short (i.e., if the extraposed phrase does not leave the prosodic phrase it originates in) or too long (i.e., if the extraposed phrase moves out of more than one prosodic phrases of the same category). The relevant part for our purpose here is the effects (9) has on movement that is too short.

This constraint together with the properties of prosodic phrasing in German then derives the facts considered above. As shown in (10), a series of clause final verbs/auxiliaries which belong to one clausal domain is mapped into one single prosodic phrase π, whereas a VP in topicalized position, even if not the topmost VP in its original position, constitutes a separate prosodic phrase.

(10) a.   Clause final VPs
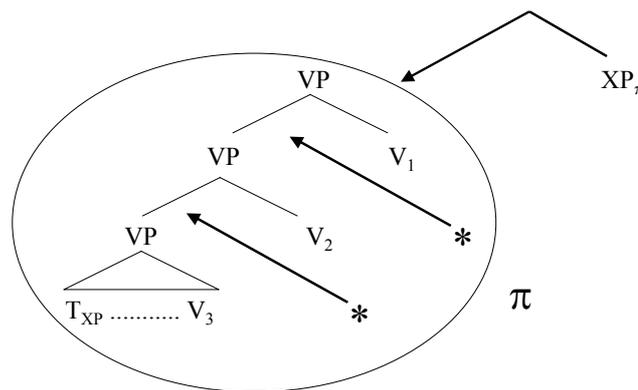
b.   Topicalized VP
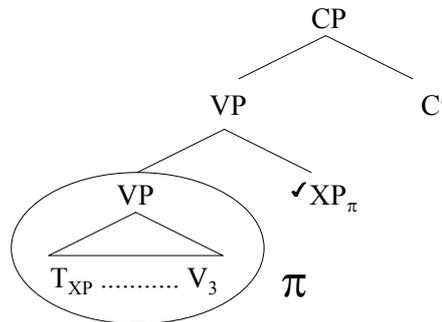
The evidence for this prosodic phrasing comes from various prosodic properties, including phrasal stress and the distribution of boundary tones (the reader is referred to Truckenbrodt 1995 for details). These facts provide clear evidence that all clause-final verbs/auxiliaries in a mono-clausal construction are part of one single prosodic phrase, whereas topicalized phrases are prosodic phrases on their own. Returning now to Haider's Puzzle, the contrasts follow from Truckenbrodt's constraint in (9): extraposition cannot target any of the intermediate VPs in (10)a, since this would disrupt the prosodic phrasing, whereas extraposition to the VP in topicalized position in (10)b is possible. Since extraposition has to leave the prosodic phrase it originates in, movement to any of the intermediate VPs in (10)a would be too short. Since the topicalized VP in (10)b, on the other hand, is a separate prosodic phrase, extraposition can attach to that VP. We now have an understanding of the prosodic factors that constrain extraposition in German.

Truckenbrodt stated the constraint as if extraposition itself was constrained by prosodic phrasing. Yet this leaves us with the same potential for a look-ahead problem that the Dutch data presented. By adopting the copy theory of movement, as above, we may instead assume that extraposition, qua syntactic movement, applies freely, but that the prosodic factors constrain the choice of copy to pronounce at PF. We might then restate Truckenbrodt's proposal as (11), maintaining the remainder of Truckenbrodt's theory unchanged.

(11)   Choice of copy in an extraposition chain:
        Pronounce the higher copy ... unless doing so interrupts the maximal parsing of the remaining material into a prosodic phrase.

This, of course, is nothing other than the PF economy condition in (5), but where the interaction is with independently detectable properties of prosodic phrasing, rather than the PF-adjacency condition on inversion. Among the antecedent proposals for PF-regulation of copy choice mentioned above, the proposal here can in particular be seen as the complement to Bošković's (2001) proposal for Serbo-Croatian second position clitics. Bošković argues that clitics obey a non-peripherality constraint at PF, whereby they cannot occur at the edge of an intonational phrase. The copy-pronunciation algorithm he proposes will choose the highest copy (of a clitic) if that does not conflict with the anti-peripherality constraint, but where the highest copy is phrase-peripheral, a lower copy is instead pronounced. Our interpretation of Truckenbrodt's proposal, given

in (11) is the flip-side of this coin. Extraposed elements, constituting independent prosodic phrases, obey a peripherality constraint: they cannot be embedded inside another prosodic phrase. Thus, where the highest copy is not peripheral, a lower copy is instead pronounced.

3. Summary

We have offered a more or less unified account of curious restrictions on extraposition in Dutch and German. In both languages, regardless of whether or not inversion applies (as it does in certain constructions in Dutch), the sequence of clause final verbs cannot be interrupted by extraposed elements, even though the intermediate VP nodes that must be posited in these structures are in principle targets for extraposition. The constraining factor in both cases is a PF condition, as recognized by Van Riemsdijk (for Dutch) and Truckenbrodt (for German), but in each case, this appears to raise an issue of PF actively constraining syntactic derivations, rather than simply interpreting them. We have suggested that the copy theory of movement, under which the choice of copy to pronounce is ultimately a PF decision, provides a solution for both puzzles, by keeping the interesting rule interaction to a single component, namely PF. In this, we have extended previous proposals along the same lines. We may ask in passing to what degree the two solutions proposed here may be even further unified. If Dutch intonational phrasing turns out to be similar enough in relevant respects to German intonational phrasing, then the inversion phenomenon in Dutch may truly be a red herring, as we hinted at above. Rather than an inversion rule constrained to adjacency, the relevant PF condition that blocks pronunciation of the higher copy of the moved element could be the same for both languages, namely, the prosodic phrasing requirements discussed by Truckenbrodt. We do not know enough about Dutch intonational phrasing to commit to this position at this time.

As a final note, we observe that the *pièce de résistance* of this proposal, of course, would be clear syntactic (or semantic) evidence that extraposition has (or can have) applied in a structure like (6), even though in surface form, the sentence would be indistinguishable from one in which no extraposition applied (compare the Lower Right Corner effect in Bobaljik 2002 and the interaction of extraposition and NPI licensing in English in Fox and Nissenbaum 1999). However, a host of factors conspire with the result that we cannot see how to construct decisive examples for Dutch and German. And thus, we offer this squib as merely an appetizer, hopefully sufficiently tantalizing to warrant further work.

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