An HPSG Treatment of *it* Extraposition without Lexical Rules

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This paper deals with alternations of the type:

(1) That Sandy snores bothers Kim.

(2) It bothers Kim that Sandy snores.

In transformational grammar such alternations are described in terms of movement: the *that* clause is base-generated in the canonical subject position, as in (1), and then moved to the right[1], leaving behind the pleonastic *it*, as in (2), cf. (Rosenbaum, 1967) and (Model, 1991). Since movement transformations are not attractive from a computational point of view, the treatment which will be proposed in this paper is monostratal, as in Generalized and Head-driven Phrase Structure Grammar.

1 The standard treatment in Head-driven Phrase Structure Grammar

In standard HPSG[2] *it* extraposition is described in terms of a lexical rule. The starting point is the lexical entry for the use of *bothers* in nonextraposed cases:

(3) *bothers*

$$\left[\begin{array}{ll} \text{CAT}\,|\,\text{SUBCAT} & \langle \text{S}[\textit{comp}]{:}\boxed{1},\ \text{NP}_{\boxed{2}}\rangle \\ \text{CONTENT} & {}_{\textit{psoa}}\left[\begin{array}{ll} \text{RELATION} & \textit{bother} \\ \text{BOTHERED} & \boxed{2} \\ \text{SOA-ARG} & \boxed{1} \end{array}\right] \end{array}\right]$$

[1] Some authors have argued for movement in the other direction. In (Jackendoff, 1977), for instance, the *that* clause is base-generated in the rightmost position and then — optionally — moved leftward to the subject position. He calls this movement 'intraposition'.

[2] Throughout the paper, I will assume that the standard HPSG treatment is the one of Pollard and Sag (1994).

In words, *bothers* is subcategorized for an NP complement and for a clausal subject which is introduced by a complementizer. Semantically, it expresses a two-place relation in which the complement corresponds to the bothered one and the subject to the state of affairs (SOA) which is bothering.

Besides, there is a second entry which accounts for the use of *bothers* in extraposed cases. It is derived from the first entry by means of a lexical rule: “The Extraposition Lexical Rule removes an S[*comp*] from a SUBCAT list, replacing it by NP_{it}, and appends the S[*comp*] to the end of the SUBCAT list, preserving role assignment.” (Pollard and Sag, 1994, p. 150) When applied to *bothers* this yields the following entry:

(4) *bothers*

$$\begin{bmatrix} \text{CAT} \mid \text{SUBCAT} & \langle \text{NP}_{it},\ \text{NP}_{\boxed{2}},\ \text{S}[comp]{:}\boxed{1} \rangle \\ \text{CONTENT} & {}_{psoa}\begin{bmatrix} \text{RELATION} & \textit{bother} \\ \text{BOTHERED} & \boxed{2} \\ \text{SOA-ARG} & \boxed{1} \end{bmatrix} \end{bmatrix}$$

In this case the state of affairs corresponds to the most oblique complement, whereas the subject does not have a semantic role. This is made explicit by the type of its index: in contrast to the indices of NPs like *Kim* and *you*, which are of type *referential*, the one of the expletive pronoun is of a type sui generis, i.e. *it* [3]. Since the lexical rule does not specify the position of the S[*comp*] on the SUBCAT list, it also covers the extraposition of object clauses, as in:

(5) We deeply regret that he has been fired.

(6) We regret it very much that he has been fired.

While the HPSG treatment is computationally more attractive than a transformational movement analysis, it is not without problems either. One problem is that it does not account for the agreement between subject clause and finite verb in non-extraposed cases. A second problem is that it erroneously predicts that the extraposed clauses in sentences like (2) and (6) behave like complements. And a third problem concerns the lexical rule, which is too restricted in some respects and too general in other respects. Each of these problems will be discussed in a separate section and an alternative will be developed which not only provides a solution for the problems, but also avoids the use of an extraposition lexical rule. The latter is an advantage, since lexical rules are both formally and computationally problematic.

[3]Another NP with a nonreferential index is the existential *there*.

2 Subject clauses as nominal objects

For modelling the agreement between subject and finite verb, standard HPSG makes use of coindexation. The first element on the SUBCAT list of a verb like *bothers*, for instance, is assigned the index [*3rd*, *sing*], and because of the Subcategorization Principle this index has to be token-identical to the one of the subject. This accounts for:

(7) This fly bothers/*bother me.

However, since clauses do not have an index it does not account for:

(8) That Sandy snores bothers/*bother Kim.

One way to account for this contrast is to assume that [*3rd*, *sing*] is the default value for finite verbs in English. In other words, it is the value which is assigned whenever the subject does not have an index. However, apart from the fact that the HPSG formalism does not allow default specifications, this assumption makes the wrong prediction in the case of subjectless finite clauses. Imperative clauses, for instance, are finite, as demonstrated in (Warner, 1993), but they normally lack a subject. As a consequence, if finite verbs take the default value when there is no subject to agree with, then one would expect the imperative to be [*3rd*, *sing*], but it is not. The same remark applies to other finite clauses without subject, such as the elliptical *don't know* and *want a drink?*, which are respectively first and second person (Quirk et al., 1985, pp. 896–897). Another problem for the default treatment can be illustrated with:

(9) That the earth is round and that it turns around the sun is/are not immediately obvious.

If clausal subjects have no index, one would expect the default value for the finite verb, but in that case one erroneously rules out the [*3rd*, *plur*] form as ungrammatical.

A more straightforward way to bring the facts in line with the theory of agreement of Pollard and Sag (1994) is to assume that *that* clauses have a [*3rd*, *sing*] index. This does not only account for the contrast in (8), but also for the one in (9), since the conjunction of singular objects may yield a plural one.

As for the origin of the index, there are basically two options. One is that it is projected from the clause's finite verb, but this option has to be ruled out since it erroneously predicts that the verb is invariably of the third person singular, as in (10):

(10) That you left without saying anything bothers her a lot.

The other option is that it is projected from the complementizer. This is more plausible since the complementizer has no plural or non-3rd person counterparts, and since its omission causes ungrammaticality:

(11) *Kim snores bothers Sandy more and more.

This ungrammaticality is readily explained if one assumes that it is the complementizer which introduces the index, since subjects need an index in order to be coindexed with the finite verb.

However, if the complementizer introduces the [*3rd*, *sing*] index, then it cannot be treated as a marker, as proposed in (Pollard and Sag, 1994, pp. 44–46), for if it is a marker, then the CONTENT value of the [COMP + S] combination is identical to the one of the clause without complementizer. As a consequence, since the latter is of type *psoa* (parametrized state of affairs), the former will be of type *psoa* as well and hence lack an index. The only way to allow the complementizer to introduce the index is to treat it as the semantic head. Given the classification of headed structures in standard HPSG, this implies that it has to be either a head or an adjunct.

If it is a head, it determines both the CATEGORY and the CONTENT values of the combination, giving rise to a complementizer phrase (CP), as in GB, cf. (Chomsky, 1986). A problem with this treatment, though, is that it does not account for the contrast in:

(12) I demand that he leave/*leaves at once.

As pointed out in (Pollard and Sag, 1994, p. 44), the choice of the VFORM value of the subclause is determined by the matrix verb, and in order to model this the VFORM value of the *that* clause should be present in the latter's SYNSEM value, but if the complementizer is the syntactic head, it won't, since complementizers do not have VFORM values.[4]

If the complementizer is treated as an adjunct, this problem does not arise, for in that case the CATEGORY value of the combination is determined by the verbal projection. Adopting the adjunct analysis, the AVM of the complementizer can be defined as follows:

(13) $$\begin{bmatrix} \text{CAT}\,|\,\text{HEAD} & {}_{\textit{determ}}\begin{bmatrix}\text{MOD S}[\textit{finite}]{:}\boxed{1}\ \text{PSOA}\end{bmatrix} \\ \text{CONTENT} & {}_{\textit{npro}}\begin{bmatrix} \text{INDEX} & {}_{\textit{ref}}[\textit{3rd,sing}] \\ \text{RESTR} & \{\boxed{1}\} \end{bmatrix} \end{bmatrix}$$

[4]In an as yet unpublished paper on English relative clauses, Sag proposes to treat the complementizers as heads nonetheless; in order to explain the contrast in (12), he assumes that the complementizers have VFORM values. The one of *that*, for instance, is *finite* and the one of *for* is *infinitive*. It could be wondered, though, whether there is any independent evidence for treating the complementizers as verbal elements. *That*, for instance, has clearly more in common with determiners than with verbs, as will be argued presently.

In words, *that* combines with a finite[5] clause of type *psoa* and has a CONTENT value of type *nominal-object*, more specifically of the subtype *nonpronominal* (= *npro*); the latter's index is [*3rd*, *sing*] and its set of restrictions includes the *psoa* of the clause.

Since the CONTENT value of the [COMP + S] combination is token-identical to the one of the adjunct, the addition of the complementizer has the effect of turning a state of affairs into a nominal object[6]. The resulting object is of a hybrid nature: while verbal from a syntactic point of view, it is nominal from a semantic point of view. In that respect, there is a resemblance with the non-predicative PP's which HPSG treats as prepositional from a syntactic point of view but as nominal from a semantic point of view.

As for the speech part of the complementizer, I assume that it is a determiner[7]. This may seem puzzling to those who are accustomed to think of determiners and complementizers as totally different types of signs, but in this case the similarity is actually quite obvious. Notice, for instance, that the complementizer is homonymous to a demonstrative determiner, and that the NPs which are introduced by the latter, as in *that small window*, have to be [*3rd*, *sing*] as well. As a matter of fact, it has been argued in (Jespersen, 1927, p. 32) that the complementizer diachronically derives from the demonstrative.

Further evidence for the determiner status is provided by the fact that also other Germanic languages have determiners which combine with verbal projections. In Dutch, for instance, the complementizer *dat* is homonymous to a singular neutre demonstrative, and the definite neutre article *het* (= *the*) is not only combined with nominal projections, but also with verbal ones, as in:

(14)	Ze	zijn	de	vensters	aan	het wassen
	They	are	the	windows	on	the wash
	'They are washing the windows'					

In this use, *het* combines with a verbal element, more specifically an infinitive, and yields a verbal projection. The verbal nature of *aan het wassen* is a.o. clear from the fact that its object complement is an NP, and not a PP, as would have been the case if *aan het wassen* were nominal.

Adopting the assumption that *that* clauses are nominal objects we have to modify the AVMs of those verbs which take a *that* clause as their subject.

[5] I assume that 'finite' covers both the indicative and the subjunctive.

[6] Because of the change of CONTENT value, the complementizer cannot be applied iteratively: *that* cannot be combined with a *that* clause, since the latter does not match its CAT|HEAD|MOD value.

[7] In the sort hierarchy of Pollard and Sag (1994) determiners have a SPEC value rather than a MOD value. However, since the function of these features is identical, i.e. to specify the constraints which a nonhead imposes on its head daughter, I do not make this distinction.

Instead of defining the value of their clausal argument as an object of type *psoa*, it has to be defined as an index, as in the case of NP arguments. As applied to *bothers*, this gives the following result:

(15) *bothers*

$$\left[\begin{array}{ll} \text{CAT}\,|\,\text{SUBCAT} & \langle \text{S}[\textit{finite}]_{\boxed{1}[3rd,sing]},\ \text{NP}_{\boxed{2}}\rangle \\ \text{CONTENT} & {}_{psoa}\left[\begin{array}{ll} \text{RELATION} & \textit{bother} \\ \text{BOTHERING} & \boxed{1}\ \textit{ref} \\ \text{BOTHERED} & \boxed{2}\ \textit{ref} \end{array}\right] \end{array}\right]$$

In this analysis the presence of a complementizer in the subclause is not signalled by the syntactic feature [COMP], but by the presence of the index.

An interesting consequence of this modification is that it provides the means to capture a generalization which is missed in standard HPSG, i.e. the fact that predicates which take a *that* clause as their subject can also take a normal referential NP:

(16) a. That Kim snores bothers Sandy.

b. This fly bothers Sandy.

(17) a. That the earth is round is not immediately obvious.

b. This conclusion is not immediately obvious.

This generalization can be captured by leaving the syntactic category of the subject underspecified. Instead of requiring either an NP or a finite S, one can require an XP with a referential index.

Although it is a slight digression from the main line of exposition, it is worth pointing out that the analysis of *that* clauses can straightforwardly be extended to the treatment of *to* infinitives. Like the *that* clauses, they can appear in the subject position and require a [*3rd*, *sing*] verb:

(18) To make mistakes is/*are human.

Furthermore, since the same sentence without *to* is ungrammatical, it seems logical to regard *to* as the element which introduces the index. In formal terms, this can be made explicit by treating it as a nominalizing adjunct:

(19)
$$\left[\begin{array}{ll} \text{CAT}\,|\,\text{HEAD} & {}_{prep}\left[\text{MOD VP}[\textit{inf}]\text{: } \boxed{1}\ \text{PSOA}\right] \\ \text{CONTENT} & {}_{npro}\left[\begin{array}{ll} \text{INDEX} & {}_{ref}[\textit{3rd, sing}] \\ \text{RESTR} & \{\boxed{1}\} \end{array}\right] \end{array}\right]$$

In this AVM, VP[*inf*] stands for bare infinitive; the presence of *to* is not made explicit by the VFORM value, but by the presence of the index. In contrast to *that*, *to* is not treated as a determiner but rather as a preposition. For this assumption pleads the fact that it is homonymous to the preposition *to* and that many English prepositions do not only combine with NPs but also with VPs. [8]

Interestingly, since the resulting VPs are XPs with a referential index, it is predicted that the predicates which can take a *that* clause as their subject can also take a *to* infinitive, and this is indeed the case:

(20) a. To have to get up early every day bothers him more and more.

b. To find out what has been going on is not immediately obvious.

Summing up, the treatment of subject clauses as nominal objects not only solves the agreement problem, but also paves the way for capturing a generalization which is missed in the standard HPSG treatment, i.e. the fact that predicates which can take a *that* clause as their subject can also take a referential NP. Furthermore, this treatment can straightforwardly be extended to *to* infinitives.

3 Extraposed clauses as dislocated modifiers

While the previous section concerned the analysis of nonextraposed subject clauses, this one focusses on their extraposed counterparts. In the HPSG literature there are currently two main positions on the treatment of extraposed clauses. The standard position is that extraposition is a local phenomenon and that extraposed clauses are complements. The alternative position is that extraposition is a nonlocal phenomenon. In this section I will first argue against the former and then adopt the latter as a starting point for an analysis in which extraposed clauses are treated as dislocated nonrestrictive modifiers.

3.1 Extraposed clauses as complements

In (Pollard and Sag, 1994) extraposed clauses are treated as complements. This correctly predicts that their presence is obligatory and that they have to follow the lexical head.

(21) a. *It seems to me.

b. *It that Sandy snores bothers Kim.

[8] This analysis is at odds with the standard PSG assumption according to which *to* is a nonfinite auxiliary, cf. (Pullum, 1982). For arguments against this assumption, see (Van Eynde, 1994, pp. 44–46).

At the same time, though, this treatment does not square well with the rest of the grammar. One problem concerns the interaction with VP adjuncts. In English, the standard position of such adjuncts is before or after the VP, but not in between the verb and its complements:

(22) a. He often [takes a shower] in summer.

b. *He [takes often a shower] in summer.

c. *He often [takes in summer a shower].

This constraint is made explicit in (Pollard and Sag, 1994) by the requirement that the head sister of an adjunct be phrasal, which means that the head has to be saturated with respect to its complements before it takes any adjuncts:

(23) a. HEAD-ADJUNCT SCHEMA:

$$\text{XP} \rightarrow \underset{\text{ADJUNCT}}{\text{Y}'' \left[\text{MOD } \boxed{1}\right]}, \quad \underset{\text{HEAD}}{\boxed{1}\ \text{XP}}$$

b. HEAD-COMPLEMENT SCHEMA:

$$\text{XP} \rightarrow \underset{\text{COMPS}}{\boxed{2}}, \quad \underset{\text{HEAD}}{\text{X}^0 \left[\text{COMPS } \boxed{2}\right]}$$

As a consequence, if extraposed clauses were complements, one would expect the VP adjuncts to occur either before the verb or after the subclause, as in:

(24) a. It very much [bothers Kim that Sandy snores].

b. We very much [regret it that he has been fired].

(25) a. *It [bothers Kim that Sandy snores] very much.

b. *We [regret it that he has been fired] very much.

However, the post-VP position is ungrammatical and the pre-VP position is rather marked in comparison with the more commonly used:

(26) a. It bothers Kim very much that Sandy snores.

b. We regret it very much that he has been fired.

A possible way out in this case is to allow for the interleaving of complements and adjuncts in the VP, but in that case one will need special measures to rule out the ungrammatical:

(27) a. *He takes often a shower in summer.

b. *It bothers very much Kim that Sandy snores.

A second problem for the complement analysis is exemplified by:

(28) a. It started getting clear last year that he was not the right man for the job.

b. She kept regretting it for years that she had not turned him down.

What distinguishes these sentences from the ones above is that the adjuncts *last year* and *for years* do not apply to the VPs which are headed by *getting clear* or *regretting it*, but rather to the higher VPs *started getting clear* and *kept regretting it*. As a consequence, if one takes word order seriously, the *that* clauses should be sisters of the higher VP as well, as in:

(29) a. It [[[started getting clear] last year] that he was not the right man for the job].

b. She [[[kept regretting it] for years] that she had not turned him down].

In order to make sure then that the extraposed clause is recognized as a complement of *getting clear* or *regretting it* one has to assume that the SUBCAT lists of *kept* and *started* inherit all elements which are still present in the SUBCAT list of their verbal complement, i.e. not only the one which corresponds to the subject, but also the ones which correspond to those complements for which the embedded verb is not yet saturated. This type of structure sharing, which is known as argument composition or generalized raising, has been described in detail in a number of articles by Hinrichs and Nakazawa, but the phenomena for which these authors propose the generalized raising device, such as verb clustering and auxiliary flip in German, do not occur in English. Furthermore, if English raising verbs were allowed to inherit the non-subject complements of their VP complement, special measures would have to be taken to exclude sentences like:

(30) *He started wearing last year a hat.

A third problem with the complement analysis is that it makes the wrong predictions with respect to extractability. Whereas object clauses can be topicalized, as predicted by the Complement Extraction Lexical Rule in (Pollard and Sag, 1994, p. 378), the extraposed clauses cannot:

(31) a. That Kim would lose from Jack, nobody had expected.

b. *That Sandy snores, it bothers Kim more and more.

c. *That Sandy snores, Kim resents it more and more.

A similar contrast holds for the extractability of the subject; whereas it is possible to extract the subject from a complement clause, as in:

(32) a. We think John has arrived.

b. Who do you think [_ has arrived] ?

such extraction causes ungrammaticality in the case of extraposed clauses:

(33) a. It is a pity he doesn't know Russian.

b. *Who is it a pity [_ doesn't know Russian] ?

A fourth piece of evidence against the complement analysis will be given at the end of Section 4[9].

3.2 Extraposed clauses as subjects

As an alternative for the complement treatment, one could take a lead from a wide-spread practice in descriptive grammar and treat sentences with extraposed subject clauses as having two subjects, cf. a.o. (Quirk et al., 1985, p. 1391). Making use of the distinction between SUBJ and COMPS lists, as in (Pollard and Sag, 1994, Chapter 9), the AVM of *bothers* would then look as follows:

(34) *bothers*

$$\left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \text{HEAD} & \textit{verb} \\ \text{SUBJ} & \langle\ \text{NP}_{it},\ \text{S}[\textit{fin}]_{\boxed{1}}\ \rangle \\ \text{COMPS} & \langle\ \text{NP}_{\boxed{2}}\ \rangle \end{array}\right] \\ \text{CONT} & \left[\begin{array}{ll} \text{RELATION} & \textit{bother} \\ \text{BOTHERING} & \boxed{1} \\ \text{BOTHERED} & \boxed{2} \end{array}\right] \end{array}\right]$$

This analysis fits in better with the rest of the grammar, for it does not necessitate any interleaving of adjuncts and complements in the VP, and it does not rely on any other types of raising than the independently needed subject raising in order to account for:

(35) a. It kept bothering her for years that Sandy snores.

b. It started getting clear last year that he was not the right man for the job.

In spite of these advantages, though, there are some indications that the subject analysis is not appropriate either. First, notice that if the extraposed clause is a subject, it should precede the VP, but it does not:

[9] The arguments given in this paragraph apply to English. For an argumentation which is based on Dutch, see (Bouma, 1996).

(36) *It that Sandy snores bothers Kim.

Second, the extraction of subparts of the subject is constrained by the condition that a lexical head's subject can only be slashed if also one of its complements is, cf. the Subject Condition of Pollard and Sag (1994, p. 350). This accounts for the contrast in:

(37) a. *Which rebel leader did [rivals of _] assassinate the British consul ?

b. Which rebel leader did [rivals of _] assassinate _ ?

Interestingly, while the negative part of this constraint also holds for the subject clauses which appear in subject position, it does not hold for the ones which are extraposed:

(38) a. *Who did you say [to bribe _] is impossible ?

b. Who did you say it is impossible [to bribe _] ?

Third, since English allows the extraction of subjects from complement clauses, as in:

(39) a. Who do you think [_ left] ?

b. None of them we thought [_ would be present].

one would expect this possibility to exist for subject clauses as well, and while this is indeed the case for the ones in subject position, it does not exist for the ones in extraposed position:

(40) a. That we reach the top today we all agree [_ is impossible].

b. *That we reach the top today we all agree [it is impossible _].

In sum, extraposed subject clauses (or VPs) do not behave like subjects in terms of linear order, they do not observe the Subject Condition and they should be excluded from the Subject Extraction Lexical Rule which Pollard and Sag (1994, p. 349) employs to model the extraction of subjects from complement clauses. It is clear then that the subject treatment is not really convincing.

3.3 Extraposed clauses as dislocated nonrestrictive modifiers

If extraposed subject clauses are neither complements nor subjects, then it follows that they are not subcategorized for. At the same time, though, they are clearly not optional, for phrases like *it seems to me* and *it bothers her* are not complete without an extraposed *that* clause.

Therefore, in order to make their presence obligatory and in accordance with the nonlocal treatments in recent work by Frank Keller, Stefan Müller and Gosse Bouma, I will assume that they are selected via the NONLOCAL mechanism. Furthermore, since the subject clause should only be selected in this way if the subject position is taken by anticipatory *it* (otherwise, it is simply subcategorized for via the SUBCAT feature), I will assume that it is the pronoun which introduces the nonlocal dependency.

As a starting point let us take the AVM which Müller (forthcoming, p. 200) assigns to the anticipatory pronoun[10]

(41)
$$\begin{bmatrix} \text{LOCAL} & \begin{bmatrix} \text{CATEGORY} & \text{NP}[\mathit{nom}] \\ \text{CONTENT} & {}_{\mathit{npro}}\begin{bmatrix} \text{INDEX} & {}_{\mathit{ref}}[\mathit{3rd},\ \mathit{sing}] \\ \text{RESTR} & \{\ \boxed{1}\ \} \end{bmatrix} \end{bmatrix} \\ \text{NONLOCAL}\,|\,\text{INHER}\,|\,\text{EXTRA} & \langle\ \text{S}[\mathit{finite,that}]{:}\boxed{1}\ \rangle \end{bmatrix}$$

In this analysis it is the pronoun which provides the first argument of the verb rather than the extraposed clause. For this reason, its index is of type *referential*[11]; this index is constrained by a set of restrictions which includes the CONTENT value of the extraposed *that* clause. The latter's presence is anticipated by the NONLOCAL|INHER|EXTRA value. In combination with the requirement that the INHER|EXTRA list has to be empty in the AVMs of fully saturated finite clauses, this has the effect of making the presence of an extraposed clause obligatory.

This analysis avoids the pitfalls of the complement and subject treatments, but it has the rather infelicitous consequence that the pronoun's CONTENT value is of type *nonpronominal*: this is due to the fact that its restriction set includes the CONTENT value of the extraposed clause, so that it cannot be empty. It is obvious, though, that such an analysis is not in line with the fact that *it* behaves like a pronoun in all other respects.

As an alternative, I will assume that the relation between *it* and the *that* clause should not be modelled in terms of restrictive modification, but rather in terms of nonrestrictive modification. A prototypical example of nonrestrictive modification is the [NP + NP] combination in sentences like:

(42) a. He lives in Monrovia, the capital of Liberia.

b. We paid a visit to the castle, a splendid example of Bavarian rococo.

That such combinations are headed is clear from an example like the Italian:

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[10] I have taken the liberty of transposing Müller's analysis of the German *es* to the English *it*.

[11] The assumption that anticipatory *it* is referential, in the sense that it fills an argument position, is also argued for in the transformational analyses of Bennis (1986) and Koster (1987, p. 262), as well as in the monostratal analysis of Kathol (1995).

(43) La Divina Commedia, il capolavoro di Dante, è stata scritta nel 1300.
The Divina Commedia, the masterpiece of Dante, is been written in-the 1300.
'The Divina Commedia, Dante's masterpiece, was written in the 14th century.'

In this example the past participles agree in number and gender with the first NP, which is feminine, and not with the second one, which is masculine.

One of the main differences between nonrestrictive and restrictive modifiers concerns the type of their CONTENT values. Whereas the latter are of type *psoa*, the former are of type *nominal-object*. A consequence of this difference is that restrictive modifiers have no index of their own and hence share the one of the head noun, whereas nonrestrictive modifiers have their own index so that their PERSON, GENDER and NUMBER values are not necessarily identical to the ones of their head, as in the Italian example above, or as in the English one below:

(44) They managed to neutralize his brains, his most precious possession.

In this case the head NP is plural, whereas the apposed one is singular. In spite of this lack of index agreement, though, the two NPs do refer to the same entity; in other words, they are not coindexed, but they are coreferential. In HPSG terms, this implies that the relation between a head and its nonrestrictive modifier should not be modelled in terms of the addition of further restrictions to the head's index, but rather in terms of anchoring relations between mutually independent indices in the CONTEXT|BACKGROUND value.

Adopting this modification and applying it to the relation between anticipatory *it* and an extraposed *that* clause, the AVM of the former can be represented as follows:

(45)
$$\left[\begin{array}{ll} \text{LOCAL} & \left[\begin{array}{ll} \text{CATEGORY} & \text{NP}[\textit{nom}] \\ \text{CONTENT} & {}_{\textit{ppro}}\left[\begin{array}{l} \text{INDEX } \boxed{1}\ {}_{\textit{ref}}[\textit{3rd, sing}] \\ \text{RESTR } \{\ \} \end{array}\right] \\ \text{CONTEXT} & \left\{\left[\begin{array}{ll} \text{RELN} & \textit{anchor} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2}\ \textit{ref} \end{array}\right]\right\} \end{array}\right] \\ \multicolumn{2}{l}{\text{NONLOC}\,|\,\text{INHER}\,|\,\text{EXTRA } \{\ \text{S}[\textit{finite}]_{\boxed{2}}\ \}} \end{array}\right]$$

In this analysis the pronoun has an empty RESTRICTIONS set, as is normal for pronouns, and its index is anchored to the one of the extraposed clause. Since it is part of the CONTEXT|BACKGROUND value, the anchoring statement is propagated up the tree in accordance with the Principle of

Contextual Consistency, cf. (Pollard and Sag, 1994, p. 333). The selection of an extraposed finite clause is part of the NONLOCAL|INHER value, and percolated up the tree in accordance with the Nonlocal Feature Principle.

The constraints on this percolation are somewhat stricter than for the leftward looking SLASH feature. Whereas the latter's members can be propagated across clause boundaries, the members of the rightward looking EXTRA feature cannot cross clause boundaries. Compare:

(46) a. Which man [did you say [she claimed [she had seen __]]] ?

b. *That [[it] didn't bother her anymore] is obvious [that her children snore].

This limitation, which was first described in (Ross, 1967), can be phrased in HPSG terms as follows:

(47) THE RIGHT ROOF CONSTRAINT:
For any *synsem* object, if the LOCAL|CATEGORY value is a fully saturated verbal projection, then the NONLOCAL|INHERITED|EXTRA value must be token-identical to the NONLOCAL|TO-BIND|EXTRA value.

In (Kathol, 1995, p. 299) the existence of this constraint is treated as an argument against the nonlocal analysis of extrapostion. However, while the distribution of the EXTRA feature is indeed more constrained than the one of the SLASH feature, it is at the same time less constrained than the one of the NONLOCAL|REL feature, which is used for relating relative pronouns to their antecedents, as in:

(48) Here is the minister [[in [the middle [of [whose sermon]]]] the dog barked].

The propagation of this feature is restricted by the Clausal Rel Prohibition, i.e. the requirement that "the INHER|REL value of S must be empty" ((Pollard and Sag, 1994, p. 220)), and hence more limited than the one of the INHER|EXTRA feature. As a consequence, if the Clausal Rel Prohibition is not an argument against the nonlocal status of REL, then the Right Roof Constraint cannot be an argument against the nonlocal status of EXTRA.

For the combination of the extraposed clause with its matrix clause one can use the same general format as the one which is used in (Pollard and Sag, 1994, p. 164) for the combination of fillers with heads. The only difference concerns the kind of NONLOCAL feature, i.e. EXTRA instead of SLASH:

(49)

$${}_{\textit{head-extra-str}}\begin{bmatrix} \text{HEAD-DTR}\,|\,\text{SYNSEM} & \begin{bmatrix} \text{LOC}\,|\,\text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBCAT} & \langle\ \rangle \end{bmatrix} \\ \text{NONLOC} & \begin{bmatrix} \text{INHER}\,|\,\text{EXTRA} & \{\boxed{1},\dots\} \\ \text{TO-BIND}\,|\,\text{EXTRA} & \{\boxed{1}\} \end{bmatrix} \end{bmatrix} \\ \text{EXTRA-DTR}\,|\,\text{SYNSEM}\,|\,\text{LOCAL} & \boxed{1} \end{bmatrix}$$

Finally, we need an LP statement which stipulates that EXTRA-daughters are linearly preceded by their heads.

In sum, the treatment of extraposed *that* clauses as dislocated nonrestrictive modifiers can easily be integrated in the rest of the theory, since it does not make use of any other principles than the ones which are independently needed for the treatment of other phenomena.

4 Underspecification

Having discussed both the non-extraposed and the extraposed variants of sentences with clausal subjects, I now return to the device which is used to relate them, i.e. the Extraposition Lexical Rule. In the formulation of Pollard and Sag (1994, p. 150) it "removes an S[*comp*] from a SUBCAT list, replacing it by NP_{it}, and appends the S[*comp*] to the end of the SUBCAT list, preserving role assignment."

The problem with this rule is that it is both too general and too limited. It is too general, since it is not prevented from applying to its own output and hence from producing SUBCAT lists with more than one NP_{it}, and it is too restricted, in the sense that it misses the generalization that predicates which are subcategorized for a *that* clause cannot only take the anticipatory *it* instead, but any kind of referential NP:

(50) a. That Kim snores bothers Sandy.

b. It bothers Sandy that Kim snores.

c. This fly bothers Sandy.

Both of these problems are avoided in the present treatment. The former does not arise since the object in the NONLOCAL|INHER|EXTRA value of anticipatory *it* is required to be a clause (or a VP), and the latter is solved by the use of underspecification. In the case of *bothers*, for instance, it suffices to relax the constraint on the speech part value of the first element in the SUBCAT list and to require that its index be *referential*, as in:

(51)
$$\begin{bmatrix} \text{CAT}\,|\,\text{SUBCAT} & \langle\ \text{XP}_{\boxed{1}[3rd,sing]},\ \text{NP}_{\boxed{2}}\ \rangle \\ \text{CONTENT} & {}_{psoa}\begin{bmatrix} \text{RELATION} & bother \\ \text{BOTHERING} & \boxed{1}\ ref \\ \text{BOTHERED} & \boxed{2}\ ref \end{bmatrix} \end{bmatrix}$$

Defined like this, the BOTHERING role can be supplied by a referential NP, an S[*comp*], a *to*-infinitive or the anticipatory *it*; in the latter case, the presence of an extraposed S[*comp*] is not required by the verb, but by the interaction of the pronoun's AVM with the Right Roof Constraint.

The underspecification technique can also be used for verbs like *regret*, which allow for the same range of possibilities in the object position:

(52) a. We all regret that you did not come.

b. He regrets it very much that you can't come.

c. I still regret my rudeness.

As for verbs which require extraposition, such as *seems* and *appears*, it suffices to put tighter constraints on the SYNSEM value of the first element in its SUBCAT list. Instead of any kind of phrase with a referential index it should be limited to anticipatory *it*, and this is easy to formulate since the SYNSEM value of the latter is unique, cf. its nonempty NONLOCAL|INHER|EXTRA value.

Apart from being more accurate from an empirical point of view, the underspecification approach is also more attractive from a methodological point of view, since it does not necessitate the postulation of separate lexical entries for the different uses of the same verb. Instead of having a rather specific lexical entry for one use and deriving another equally specific entry for the other use, there is just one entry which generalizes over both. For computational purposes, this is a welcome result since it avoids the proliferation of lexical entries with the same phonological or orthographic form. [12]

Another advantage of the underspecification approach is that it further minimizes the use of derivational devices in the grammar. In contrast to the lexical rule approach which literally derives lexical entries from other more basic lexical entries, the underspecification approach does not make any distinction between basic and derived. In this sense it can be seen as the next step in a development which leads from the elimination of transformations via the elimination of metarules to the elimination of this last vestige of derivationalism, i.e. the lexical rules. That such elimination would not only be desirable from a methodological point of view but also from a formal one is clear from the remark by Pollard and Sag (1994, p. 395) that "we lack as yet any satisfactory declarative formalization. The fundamental difficulty here is that lexical rules must be seen as implicative relationships between lexical entries; but lexical entries themselves are constraints on feature structures (not feature structures themselves), so evidently a higher-order formalism must be developed within which such relationships can be expressed." In other words, also from a formal point of view, the lexical rules are the odd man out in an otherwise declarative framework.

In view of these considerations, I see it as an extra argument in favour of the present treatment that it avoids the use of an *it* extraposition lexical rule. Indirectly, this provides another argument against the complement

[12] As Gosse Bouma pointed out to me, lexical rules do not lead to a proliferation of homographs if they are applied at run time and hence treated as nonbranching phrase structure rules. Notice, though, that the proliferation problem is then shifted to the grammar, where it resurfaces as the problem of avoiding a proliferation of nonbranching expansions.

treatment of extraposed clauses, for if the SYNSEM values of the extraposed clauses figure on the SUBCAT list of verbs, the only plausible way to exploit the possibilities of underspecification is to make the presence of *it* optional, as in ⟨(NP[*it*],) NP[*acc*], S[*finite*]⟩, but this erroneously admits sentences like:

(53) *Bothers Kim that Sandy snores.

In other words, the complement analysis does not square well with the underspecification approach. As a consequence, to the extent that the latter is preferable to the lexical rule approach, the complement analysis is less felicitous than the alternative nonlocal analysis.

5 Conclusion

This paper has provided a monostratal treatment of *it* extraposition which is based on underspecification. The starting point of the discussion was the treatment in (Pollard and Sag, 1994, pp. 145–155). This treatment has been shown to face a number of problems. First, it does not account for the agreement between finite verbs and *that* clauses in subject position; second, its complement analysis of extraposed clauses does not square well with the rest of the grammar, and third, the lexical rule which is used to derive entries for verbs with extraposed complements is at the same time too general and too limited. As an alternative, it has been proposed to treat *that* clauses as verbal projections with a nominal CONTENT value, to analyse extraposed clauses as dislocated nonrestrictive modifiers, and to capture the effect of the *it* extraposition lexical rule in terms of the computationally more attractive method of underspecification.

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