**Abstract**

This paper analyzes the interrelation of two understudied phenomena of English: discontinuous modifier phenomenon (**so** *willing to help out* **that they called early**; **more** *ready for what was coming* **than I was**) and the complex pre-determination phenomenon (*this delicious a lasagna*; *How hard a problem* (*was it*)?). Despite their independence, they frequently occur intertwined, as in **too** *heavy a trunk* **(for me) to lift** and **so** *lovely a melody* **that some people cried**. This paper presents a declarative analysis of these and related facts that avoids syntactic movement in favor of monotonic constraint satisfaction. It demonstrates how an explicit, sign-based, constructional approach to grammatical structure captures linguistic generalizations, while at the same time accounting for idiosyncratic facts in this seemingly complex grammatical domain.

# 1  Introduction

Two understudied phenomena of English are intimately intertwined but, insofar as they are studied at all, are not usually related. The discontinuous dependent phenomenon (DD) illustrated in (1) and the complex pre-determination (CPD) phenomenon illustrated in (2)[1] are independent. That is, each of these phenomena may occur independently of the other:

(1)  a.  [[**so** willing to help out] **that they called early**]

 b.  [[[**too** far] behind on points] **to quit**]

 c.  [[[**more** ready] for what was coming] **than I was**]

 d.  [[**as** prepared for the worst] **as anyone**]

 e.  [[the **same** courage in the face of adversity] **as yours**]

(2)  a.  [[**this** delicious] a lasagna]. . .

 b.  [[**that** friendly] a policeman]. . .

 c.  [[**How** hard] a problem] (was it)?

 d.  [**What** a fiasco] (it was)!

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[1]CPD is also known as the "Big Mess" Construction. See Berman 1974, Arnold and Sadler 1992, and Van Eynde 2007.

The oddity (the "non-core" property) of DD examples like those in (1) is that they appear to call for a discontinuous constituent analysis. The oddity of CPD examples like those in (2) is that they present an adjective modifying an NP (or DP), rather than a nominal (a common noun phrase or "$\overline{\text{N}}$") – specifically an NP determined by the singular indefinite article *a*.

Although, as we have seen in (1) and (2), DD and CPD may appear independently, they frequently occur intertwined as in (3):

(3)  a.  [[[**too** heavy] a trunk] **(for me) to lift**]

      b.  [[[**so** lovely] a melody] **that some people cried**]

      c.  [[[**more** sincere] an apology] **than her critics acknowledged**]

      d.  [[[**as** good] a singer] **as many professionals**]

Unsurprisingly, the initial lexical licenser determines the three-way distributional distinction displayed in (1), (2) and (3).

Licensers of DD but not CPD include those comparative governors listed in (4):[2]

(4)  *same...as, similar...to, equal...to/with, identical... to/with,* ADJ-*er...than, rather...than, ...else than, ...enough that, ...other than*

Complement-selecting adjectives, verbs, and nouns also participate in DD, as we will see. Licensers of CPD but not DD include:

(5)  *this, that, how*

And licensers of both DD and CPD are listed, exhaustively we believe, in (6):[3]

(6)  *so, too, more, less, as, such*

It is notable that comparative licensers are split between those that do not [(4)] and those that do [(6)] license CPD. There are licensers of CPD but not DD, DD but not CPD, and both DD and CPD.

More than one DD can occur in a clause, as exemplified in (7).

(7)  a.  **so** much *more* satisfied *than the last time* **that he couldn't stop smiling**

      b.  [[[**too** many *fewer*] supporters] *than her opponent* **(for her) to rely on appeals to her base**]

---

[2]See Huddleston and Pullum 2002: 1104.

[3]It should be noted that *such* is different from the other adjective specifiers in (6). In particular, *such*, like exclamative *what*, functions essentially as the portmanteau of a specifier and an adjective.

c. [[[[**enough** *bigger*] an audience] *than last time*] **to require standing room only**]

In examples such as (7) the multiple DDs form nested dependencies. The corresponding crossed dependencies in (8) are impossible:

(8) a. ***so** much *more* satisfied **that he couldn't stop smiling** *than the last time*

b. ***too** many *fewer* supporters **(for her) to rely on appeals to her base** *than her opponent*

c. ***enough** *bigger* an audience **to require standing room only** *than last time*

Other DDs may, however, participate with arguments or modifiers in either nested [(9b,d)] or crossed [(9a,c)] dependencies:

(9) a. Kim was [[[**more** *willing*] **than Pat is**] *to wash the dishes*].

b. Kim [[[is [**more** *willing*] now] *to wash the dishes*] **than Pat is**].

c. I [[[sent out [**more** *books*] yesterday] **than ever before**] *that I really liked*].

d. I [[[sent out [**more** *books*] yesterday] *that I really liked*] **than ever before**].

In general,

(10) **All DD licensers except** *so, too,* **and** *enough* **can participate in crossed dependencies with arguments and other dependents.**

We will need to formulate the lexical entries for the licensers and, critically, the relevant phrasal constructions, in such a way as to account for all the above facts, plus some more to be mentioned.

## 2 Previous Proposals

There are no fully worked out analyses of DD in the syntactic literature, though there are discussions of various aspects of DD. Perhaps the most detailed of these proposal is due to Chae (1992), who extends the GPSG analysis of gap-binding by allowing a word like *too* to transmit its gap-binding potential to a higher node, e.g. to the adjective phrase *too hot* in examples like (11):

(11) This is [[**too** hot] [**to touch** __ ]]_AP.

Binding of the gap takes place when a nonempty SLASH specification and its appropriate licensing specification are both passed up to the same point in the tree, i.e. the AP labelled in (11).

Flickinger and Nerbonne (1992) analyze examples like (12), proposing to allow SUBCAT information to be inherited from multiple daughters in structures like (12):

(12)   An [[**easy** man] [**to please** __ ]]$_{\overline{\text{N}}}$ ...

On their proposal, an $\overline{\text{N}}$ like *easy man* inherits its subcateogrization potential from both *easy* and *man* and hence can select *to please* __ as a complement.

The EXTRA feature was first proposed by Pollard in unpublished work and appears briefly in Pollard and Sag's (1994, p. 368) sketch of extraposition in comparative phrases. Subsequent analyses using the EXTRA feature to analyze various extraposition phenomena in English and German include Keller 1995, Van Eynde 1996, Bouma 1996, Kim and Sag 2005 and Crysmann to appear.

Kiss (2005; see also Wittenburg 1987) treats German relative clause extraposition as an anaphoric dependency, rather than a syntactic one, introducing a feature ANCHORS to pass up a set of indices from NPs within a given phrase, each of which can be associated with an extraposed relative clause at a higher level of structure. See Müller 2004 and Crysmann to appear for assessments of the various alternative approaches.

CPD has been discussed by many researchers in the transformational literature, culminating perhaps in the work of Kennedy and Merchant (2000), who provide a useful review and a comprehensive proposal that even addresses complex predeterminers with *of* (e.g. *how much of a difference*), which we cannot discuss here. However, their proposal is stated in terms of complex structures, a rich array of empty categories, and movement operations whose control they are unable to specify. In particular, as they note (cf. their footnote 28), their analysis seems to require appeal to an unformulated constraint on phonetic form in order to account for the most basic facts of CPD, i.e. the contrasts given in (13) below.

The most successful analysis of CPD to date, in our view, is that of Van Eynde (2007).[4] A key aspect of this analysis, which we follow here in the main, is the replacement of Pollard and Sag's (1994) features MOD and SPEC by the single feature SELECT (SEL). The SEL analysis allows Pollard and Sag's SPR feature to be eliminated, as well.

None of the proposals just mentioned provides a treatment of the interaction of DD and CPD. It turns out, however, that this interaction will follow straightforwardly from the analysis we propose here.

## 3   Analysis

In this paper, we will employ **Sign-Based Construction Grammar** (SBCG), a version of HPSG that blends in key elements of Berkeley Construction Grammar, of the sort developed in such works as Fillmore et al. 1988, Michaelis and Lambrecht 1996, Fillmore 1999, Kay and Fillmore 1999, and Kay 2002. For a more detailed exposition of SBCG than can be presented here, the reader is referred to Sag in press, 2010, and other papers in Boas and Sag 2010.

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[4]This is an outgrowth of earlier work by Van Eynde (1998), which in turn builds directly on Allegranza 1998. See also Van Eynde 2006 and Allegranza 2007.
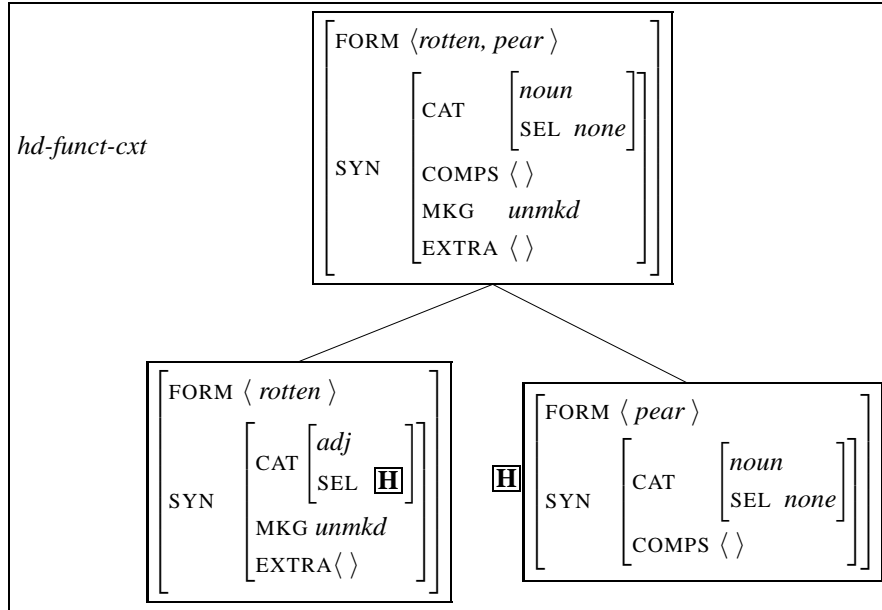
Figure 1: A Head-Functor Construct

In the introduction, we sketched a few of the more salient distributional facts about DDs. We begin the more analytical discussion with CPD structures, as illustrated in (2) and (3). As already noted, the interesting property of these structures is that they contain adjective phrases modifying determined NPs, rather than the usual adjectival modification of undetermined common nominal expressions (CNPs), as illustrated in (13):

(13)  a. a [rotten pear]        (cf. *rotten a pear)

      b. a [mere bagatelle]  (cf. *mere a bagatelle)

      c. the [old book]

      d. her [seven [lonely nights]]

The SBCG representation of the bracketed expression in (13a), a feature structure of type *head-functor-construct*, is given in Figure 1.[5] Beginning with the first daughter (specified as [FORM ⟨*rotten*⟩]) we note that the SYN value has three attributes: CAT, MKG and EXTRA. As indicated, the CAT(EGORY) value is a feature structure of type *adj(ective)*. This feature structure includes a specification for the

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[5]We use familiar HPSG notation for our grammatical descriptions. Resolved feature structure models, by contrast, are presented as boxed attribute-value matrices. Boxed tree structures indicate fully resolved feature structures of (some subtype of) the type *construct*. These are functions from the domain {MTR, DTRS}, where MTR (MOTHER) is *sign*-valued and the value of DTRS (DAUGHTERS) is a list of *sign*s.

feature SEL, whose value is represented by the tag **H**, indicating that this value has been equated with the value of another feature in the same diagram. This analysis provides a unified treatment of modifiers, specifiers, determiners and other "markers" in terms of lexically varying specifications for the SEL feature, which in turn correspond to the varying possibilities for (in this construction) the second daughter. The MKG (MARKING) value of the first daughter, *unmkd* (*unmarked*), reflects the fact that adjectives are so specified lexically. And following Van Eynde (2007), the mother's MKG value is identified with that of the functor daughter.[6]

The EXTRA feature plays a central role in the present discussion. It is a non-local, list-valued feature that provides the mechanism for a wide range of extrapositions (in line with the arguments offered by Keller, Van Eynde, and Bouma), including those illustrated in (14):[7]

(14) a. **It** seems **that your hair is burning**.
(extraposition from subject)

b. They regret **it** very much **that we could not hire Mosconi**.
(extraposition from object)

c. I am **unwilling** when sober **to sign any such petition**.
(extraposition of VP complement)

d. He **lowered** the nitro bottle gently **onto the floor**.
(extraposition of PP complement)

e. **An article** appeared yesterday **about the situation is Kazakhstan**.
(extraposition of PP modifier)

f. **A man** walked in **who was wearing striped suspenders**.
(extraposition of relative clause)

The EXTRA feature thus works much like SLASH (GAP): A lexical entry or lexical construction requires an item on the EXTRA list of a sign. When this sign serves as the daughter of some phrasal construct, its non-empty EXTRA specification becomes part of the mother's EXTRA list and this continues until a higher structure (a *head-extra-construct*) realizes the item as a constituent sign whose mother's EXTRA list is free of the now realized ("extraposed") item. We will see how this works in detail below. For the moment we note that in a *hd-func-cxt* like *rotten pear*, the mother inherits the EXTRA value from the non-head (functor) daughter.

The second daughter ([FORM $\langle pear \rangle$]) is the head daughter, as indicated by the boxed **H** preceding the outer brackets. Its CAT value, as indicated, is a feature structure of type *noun* and its COMPS value is the empty list. The mother sign

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[6]Note that the features LOCAL, NONLOCAL, and HEAD are not just being supressed in our displays. They have in fact been eliminated from the grammar.

[7]We will not attempt to establish this broad claim in the present paper, but we intend the EXTRA feature and the constructions that mention it eventually to cover all the data in (14).

$$\textit{hd-func-cxt} \Rightarrow \begin{bmatrix} \textit{hd-cxt} \\[4pt] \text{MTR} \quad \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{COMPS} & L_1 \\ \text{MKG} & Y \\ \text{EXTRA} & L_2 \end{bmatrix} \end{bmatrix} \\[20pt] \text{DTRS} \quad \left\langle \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{CAT} \ [\text{SEL} \ H \,] \\ \text{MKG} & Y \\ \text{EXTRA} & L_2 \end{bmatrix} \end{bmatrix}, H{:}\begin{bmatrix} \text{SYN} \ [\text{COMPS} \ L_1] \end{bmatrix} \right\rangle \\[20pt] \text{HD-DTR} \quad H \end{bmatrix}$$

Figure 2: Head-Functor Construction

([FORM ⟨*rotten, pear*⟩]) of this construct inherits its CAT and COMPS specifications from the head daughter and its MKG and EXTRA values from the functor (non-head) daughter. The construction that licenses this construct is the Head-Functor Construction, shown in Figure 2.[8],[9]

This construction specifies the inheritance by the mother of the MKG and EX-TRA values from the functor daughter that we observed in the *rotten pear* construct in Figure 1. It also specifies the inheritance by the mother of the COMPS value from the head daughter. The identification of the mother and head-daughter's CAT values is of course absent from (14), since head-functor constructs are a subtype of *headed-construct* (*hd-cxt*), which in turn is constrained by the Head Feature Principle, which guarantees that (in any headed construct) the head daughter's CAT value is identical to the CAT value of its mother. The Head Functor Construction thus licenses adjectivally modified nominals and determined noun phrases, among other local structures.

We now turn our attention to the CPD phenomenon we illustrated in (2)–(3) above. We cannot use the Head-Functor Construction to license CPD noun phrases like [[*so big*] [*a mess*]], because (1) ordinary adjectives, like *big* or *rotten*, select only undetermined nominals, as illustrated in (13a,b), and (2) since SEL is a CAT feature, the Head-Functor Construction would incorrectly require that the mother's SEL value be the same as that of the head daughter.

Van Eynde (2007) has proposed a constructional HPSG solution at the level of the NP. That is, to license a noun phrase like [[*so big*] [*a mess*]] Van Eynde proposes a construction whose mother is a noun phrase and whose first daughter is an adjective phrase marked "degree", which necessitates that it contain a degree

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[8]Space limitations preclude the discussion of semantics in this paper. We have in mind an MRS-style semantics (Copestake et al. 2005), though nothing hinges on this choice.

[9]Van Eynde (2006, 2007) couches his proposal in terms of phrasal types, using the framework of Ginzburg and Sag (2000). For convenience, we refer to his phrasal type constraints as SBCG constructions. The reader should also be aware that Van Eynde posits multiple subtypes of his head-functor phrasal type, a complication that considerations of space require us to ignore here.

cpd-cxt

$$\begin{bmatrix} \text{FORM} \langle \textit{so, big} \rangle \\ \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \textit{adj} \\ \text{SEL} \begin{bmatrix} \textit{noun} \\ \text{MKG } \textit{a} \end{bmatrix} \end{bmatrix} \\ \text{MKG} \quad \textit{deg'} \\ \text{EXTRA} \langle \text{S[MKG } \textit{that]} \rangle \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} \text{FORM} \langle \textit{so} \rangle \\ \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \textit{adv} \\ \text{SEL} \boxed{1} \end{bmatrix} \\ \text{MKG} \quad \textit{deg'} \\ \text{EXTRA} \langle \text{S[MKG } \textit{that]} \rangle \end{bmatrix} \end{bmatrix} \qquad \boxed{1} \begin{bmatrix} \text{FORM} \langle \textit{big} \rangle \\ \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \textit{adj} \\ \text{SEL} \begin{bmatrix} \textit{noun} \\ \text{MKG } \textit{unmkd} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$
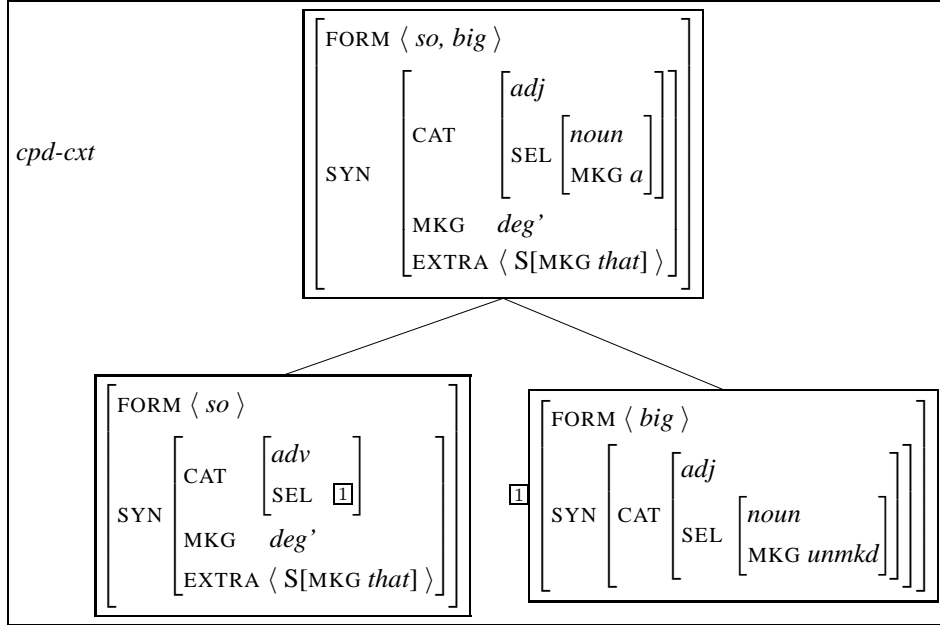
Figure 3: A Complex Pre-Determiner Construct

modifier from the list given in (6), excluding *such* (which is lexically specified to select a singular, indefinite NP). In Van Eynde's (2007) "Big Mess" construction, which is distinct from his Head-Functor construction, the adjectival daughter does **not** select the nominal head; rather the Big Mess construction specifies merely that the indices of the two daughters are identified.

We present here a related analysis that operates inside the adjective phrase, rather than at the NP level. This choice encodes a different intuition, namely that the special property of the CPD phenomenon is the apparent divergence of the selectional potential of an AP from that of its lexical head. On this view, *big* selects an undetermined nominal, but *so big* selects a singular, indefinite NP. The selectional process is the same as in normal adjectival modification: once the special AP *so big* is constructed to select an NP rather than a nominal (CNP) expression, the AP and the NP are combined by the familiar Head-Functor Construction. The need for a special construction arises only in building the AP.[10]

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[10]Our account, unlike Van Eynde's, provides a uniform treatment of Big Mess APs (*so big*) and lexical expressions, e.g. *what*, *such*, and *many*, which may appear in pre-determiner position (*what/such/many a fool!*). That is, *what*, *such*, and *many* can bear exactly the same SEL value as the phrases licensed by the CPD Construction. Although these words select bare plurals (*Such fools!*), which Big Mess APs do not, all these facts could presumably be accommodated in a lexicon with multiple constraint inheritance. However, there is considerable lexical idiosyncrasy in this domain, as Van Eynde observes, and the additional generalization captured by our approach is arguably unimpressive in the light of it. We are not aware of further data that would distinguish our analysis from an appropriate extension of Van Eynde's on empirical grounds.

$cpd\text{-}cxt \Rightarrow$

$$
\begin{bmatrix}
\text{MTR} & \text{SYN} \begin{bmatrix} \text{CAT} & \begin{bmatrix} adj \\ \text{SEL} & \text{SYN} \begin{bmatrix} \text{CAT } noun \\ \text{MKG } a \end{bmatrix} \end{bmatrix} \\ \text{MKG} & deg' \\ \text{EXTRA} & L_1 \end{bmatrix} \\[4ex]
\text{DTRS} & \left\langle \text{SYN} \begin{bmatrix} \text{CAT [SEL } X] \\ \text{MKG} & deg' \\ \text{EXTRA} & L_1 \end{bmatrix}, X: \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} adj \\ \text{SEL} & \text{SYN} \begin{bmatrix} \text{CAT } noun \\ \text{MKG } unmkd \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle
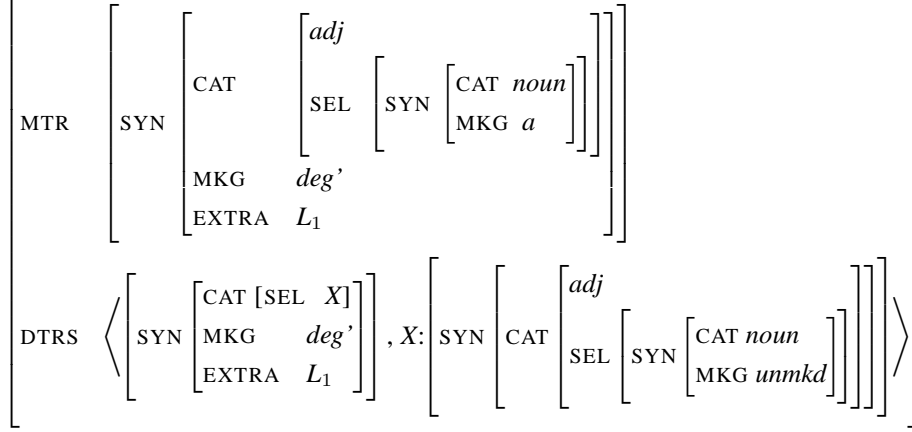\end{bmatrix}
$$

Figure 4: Complex Pre-Determiner Construction

The CPD construct *so big* is shown in Figure 3. Starting with the first daughter ([FORM $\langle so \rangle$]), we note that its category is adverb and that it selects its right sister, indicated by the tag $\boxed{1}$. This constituent is specified as [MKG *deg'*], which is a lexical property of all and only the lexical items listed in (6), other than *such*. The EXTRA list contains a single item, which is a *that*-marked clause. The second daughter ([FORM $\langle big \rangle$]) is of category adjective and selects an unmarked nominal head. The mother of this construct ([FORM $\langle so, big \rangle$]) inherits its MKG and EXTRA values from the first daughter, as in a *hd-func-cxt*. Another similarity with a *hd-func-cxt* is the identification of the type of mother's CAT value (*adj*) with that of the second daughter. But here the parallelism with the Head-Functor Construction breaks down; we note that the second daughter is not the head daughter and the SEL values of the mother and second daughter differ. In particular, since the second daughter reflects the selection restriction of the lexical item *big*, *viz.* [MKG *unmkd*], it must be an undetermined nominal. By contrast, the mother's SEL value is a nominal sign specified as [MKG *a*], i.e. an NP determined by the article *a*.

The CPD Construction is sketched in Figure 4. A construct licensed by this construction is not a headed construct, as we have just seen. Although the category **type** of the mother (*adj*) matches that of the second daughter, the SEL values do not match: the mother selects an NP specified as [MKG *a*], but the second daughter selects a common noun, an NP specified as [MKG *unmkd*]. As in the construct it licenses that we have just considered (Figure 3), the MKG and EXTRA values of the first daughter and the mother are identified. The first daughter is specified as [MKG *deg'*], identifying it as one of the lexical licensers of the CPD phenomenon.

A noun phrase like *so big a mess* is licensed as follows. The AP *so big* is put together by the CPD construction, as we saw in Figures 3 and 4. The NP *a mess* is assembled by the familiar Head-Functor Construction [Figure 2 above]. The AP

*so big* is licensed by the CPD construction in Figure 4, which guarantees that it has the properties sketched in (15):

$$
(15) \quad
\begin{bmatrix}
\text{FORM} & \langle \textit{so, big} \rangle \\[4pt]
\text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{SEL} & \begin{bmatrix} \textit{noun} \\ \text{MKG} \ \ a \end{bmatrix} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

Therefore, the Head-Functor Construction is appropriate to combine *so big* and *a mess* via the former's selection of the latter, with the resulting construct shown in (16):

$$
(16) \quad \textit{hd-func-cxt}
$$
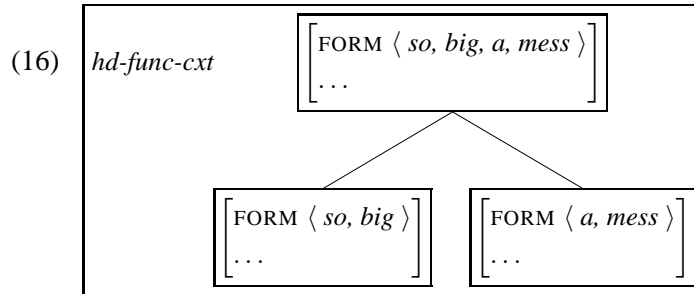
And the mother of the construct in (16) has the properties shown in (17):[11]

$$
(17) \quad
\begin{bmatrix}
\text{FORM} & \langle \textit{so, big, a, mess} \rangle \\[4pt]
\text{SYN} &
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{noun} \\ \text{SEL} \ \ \textit{none} \end{bmatrix} \\
\text{SUBJ} & \langle \, \rangle \\
\text{COMPS} & \langle \, \rangle \\
\text{MKG} & \textit{deg'} \\
\text{EXTRA} & \langle \, \text{S}[\textit{that}] \, \rangle
\end{bmatrix}
\end{bmatrix}
$$

Having put together constructs like *so big a mess*, we now need to account for an extraposed *that*-clause, extraposed in the sense that while it is introduced by *so*, it is only realized following *mess*. Moreover, it need not immediately follow *mess*, as shown in (18):

(18)  [[[**so** big a mess] resulted from the meeting of the committee on the seventeenth of August] **that it took hours to clean it up**].

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[11]Following Müller's (2009) account of predicative NPs, which creates them via a unary ("pumping") construction from nonpredicative NPs, we have a straightforward account of predicative uses, e.g. examples like *She is so big a fan that she bought season tickets*, *Kim is too honest a guy to do that*, etc.

The mechanism for realizing extraposed elements and the positions in which they can be realized will occupy much of our attention for the remainder of this paper.

We noted that in both the Head-Functor Construction and the CPD construction the mother inherits its EXTRA value from the first daughter. The lexical entry for *so* is the source of the eventually extraposed *that*-clause, as shown in (19):

$$(19) \quad \begin{bmatrix} \text{FORM} & \langle\, so\, \rangle \\ \text{SYN} & \begin{bmatrix} \text{CAT} & [\text{SEL } [\text{SYN } [\text{EXTRA } L_1]]] \\ \text{EXTRA} & L_1 \oplus \langle \text{S}[that] \rangle \end{bmatrix} \end{bmatrix}$$

The lexical entry for *so* stipulates that its EXTRA list includes a *that*-clause appended to ($\oplus$) the EXTRA list of the element that *so* selects. That is, *so* says in effect "My extra list consists of the EXTRA list of the element I select followed by a *that*-clause." Various constructions, including the CPD constructions, specify the EXTRA value of the mother in terms of the EXTRA values of the daughters, in the case of the constructions we have seen so far – and also the Subject-Predicate Construction, presented below – the mother's EXTRA value is identified with the EXTRA value of the first daughter. Often the EXTRA list of the selected element will be empty, as in the case of *big*. The result is that when *so* and *big* are combined, the EXTRA value of the mother (*so big*) is just the singleton list containing S[*that*]. The EXTRA values of both *a* and *mess* are the empty list, so the EXTRA value of *a mess* is the empty list. Hence, the EXTRA value of *so big a mess* will consist of the single item S[*that*], which originated on the EXTRA list of the lexical entry for *so*, got "passed up" to *so big* by the CPD Construction and then again to *so big a mess* by the Head-Functor Construction.

How do extraposed elements get off the EXTRA list and realized in the sentence? The extraposition analysis we are proposing follows previous GPSG/HPSG treatments of nonlocal dependencies.[12] At the site of introduction, lexical or constructional constraints ensure that the unrealized element corresponds to an element of the SLASH (or GAP) – or, in this case, EXTRA – list of the minimal phrase containing the gap. General principles then require that this feature specification be inherited by the mothers of successively larger constructs – these phrases form the middle of the filler-gap dependency. Certain constructions then license the presence of these "slashed" phrases, typically introducing a new phrase (the filler) that is identified with the SLASH value of its sister phrase (at the top of the filler-gap dependency). The construction realizing extraposed elements, the Head-Extraposition Construction,[13] is given in (20):

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[12]See Gazdar 1981, Pollard and Sag 1994, Bouma et al. 2001, and Levine and Hukari 2006.

[13]See Pollard and Sag 1994, Keller 1995, Van Eynde 1996, Bouma 1996, Kim and Sag 2005 and Crysmann to appear.
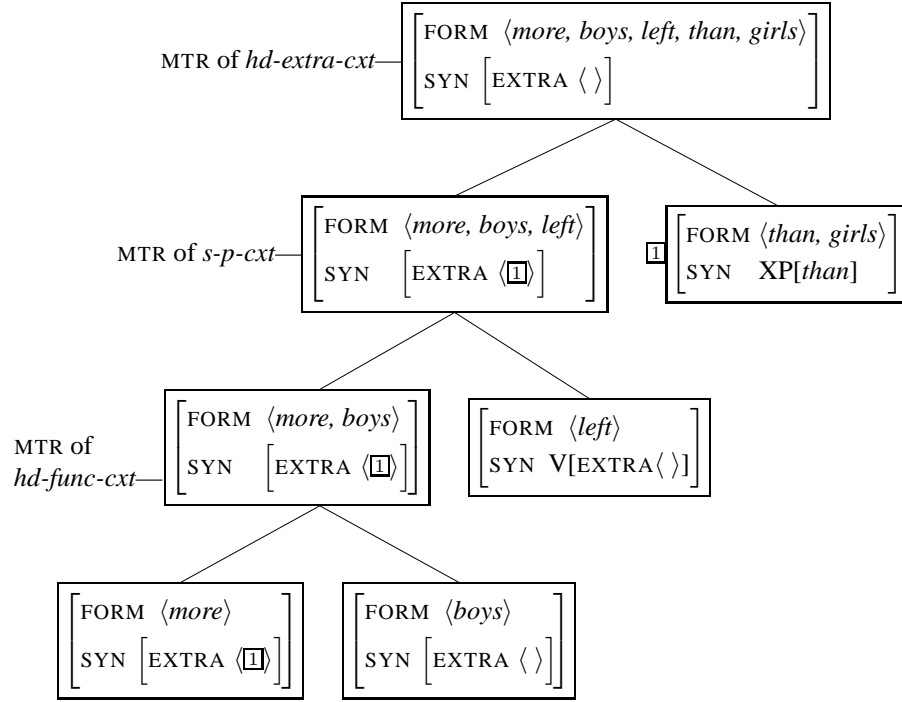
$$
\begin{array}{l}
\text{MTR of } \textit{hd-extra-cxt}\!-\!
\begin{bmatrix}
\text{FORM} & \langle \textit{more, boys, left, than, girls} \rangle \\
\text{SYN} & \begin{bmatrix} \text{EXTRA} \ \langle \ \rangle \end{bmatrix}
\end{bmatrix}
\end{array}
$$

$$
\text{MTR of } \textit{s-p-cxt}\!-\!
\begin{bmatrix}
\text{FORM} & \langle \textit{more, boys, left} \rangle \\
\text{SYN} & \begin{bmatrix} \text{EXTRA} \ \langle \boxed{1} \rangle \end{bmatrix}
\end{bmatrix}
\qquad
\boxed{1}\
\begin{bmatrix}
\text{FORM} & \langle \textit{than, girls} \rangle \\
\text{SYN} & \text{XP}[\textit{than}]
\end{bmatrix}
$$

$$
\begin{array}{l}
\text{MTR of} \\
\textit{hd-func-cxt}\!-\!
\end{array}
\begin{bmatrix}
\text{FORM} & \langle \textit{more, boys} \rangle \\
\text{SYN} & \begin{bmatrix} \text{EXTRA} \ \langle \boxed{1} \rangle \end{bmatrix}
\end{bmatrix}
\qquad
\begin{bmatrix}
\text{FORM} & \langle \textit{left} \rangle \\
\text{SYN} & \text{V}[\text{EXTRA}\langle \ \rangle]
\end{bmatrix}
$$

$$
\begin{bmatrix}
\text{FORM} & \langle \textit{more} \rangle \\
\text{SYN} & \begin{bmatrix} \text{EXTRA} \ \langle \boxed{1} \rangle \end{bmatrix}
\end{bmatrix}
\qquad
\begin{bmatrix}
\text{FORM} & \langle \textit{boys} \rangle \\
\text{SYN} & \begin{bmatrix} \text{EXTRA} \ \langle \ \rangle \end{bmatrix}
\end{bmatrix}
$$

Figure 5: A Head-Extraposition Derivation

(20) **Head-Extraposition Construction:**

$$
\textit{hd-extra-cxt} \Rightarrow
\begin{bmatrix}
\text{MTR} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{COMPS} & L_1 \\ \text{EXTRA} & L_2 \end{bmatrix} \end{bmatrix} \\
\text{DTRS} & \left\langle H : \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{COMPS} & L_1 \\ \text{EXTRA} & \langle X \rangle \oplus L_2 \end{bmatrix} \end{bmatrix}, X \right\rangle
\end{bmatrix}
$$

The Head-Extraposition Construction in (20) realizes the initial element of the EXTRA list of the head (first) daughter as the second daughter. The EXTRA list of the mother is the EXTRA list of the head daughter minus the element realized as the second daughter. This means that the order of elements on a non-singleton EXTRA list corresponds to the linear order of those elements in a binary-branching head-extraposition derivation.

The combination of the three lexical and constructional processes is exemplified in Figure 5. Starting at the lower left, we see that *more*, in combining with

*boys*, records on its EXTRA list the requirement for a *than*-phrase, represented by the tag $\boxed{1}$, adding this element to the empty EXTRA list of its selected sister *boys*. The Head-Functor Construction identifies the EXTRA list of its functor daughter *more* with that of the mother of the construct it licenses (*more boys*). When *more boys* and *left* combine in accordance with the Subject-Predicate Construction, the EXTRA list of the first (non-head) daughter *more boys* also becomes the EXTRA list of the mother *more boys left* (because the EXTRA list of the head daughter must be empty) – see below. The construct combining *more boys left* and *than girls* is licensed by the Head-Extraposition Construction [(20)], which realizes the sole member of the head daughter's EXTRA list (the XP[*than*]) as the second daughter *than girls* of the highest construct in Figure 5. The EXTRA list of this construct's mother is the empty list.

Extraposed elements obey certain ordering restrictions, as we saw in examples (7)–(9) above. In order to specify where extraposed elements can be realized we need to consider further constructions. First, we note that some extraposed complements, either arising within the VP or extraposed from the subject, can be permuted with arguments of predicates and also with other extraposed elements, such as relative clauses:

(21)  a.  Kim was **more** *willing* **than Pat** *to wash the dishes*.

     b.  Kim was **more** *willing to wash the dishes* **than Pat**.

     c.  I sent out **more** *books* yesterday *that I really liked* **than ever before**.

     d.  I sent out **more** *books* yesterday **than ever before** *that I really liked*.


(22)  a.  **More** *books* arrived *that I actually liked* **than I expected**.

     b.  **More** *books* arrived **than I expected** *that I actually LIKED*.

As noted earlier, not all extraposed elements have this property. In particular, as summarized in (10) above, complements of *too, so* and *enough* do not permute with arguments or other extraposed dependents, as shown again by the examples in (23):

(23)  a.  The boys are **so** *proud* now *of their achievements* **that they've become unbearable**.

     b.  *The boys are **so** *proud* now **that they've become unbearable** *of their achievements*.

     c.  Nichelle is **so** much *taller* now *than Beavis* **that people think she's in middle school**.

     d.  *Nichelle is **so** much *taller* now **that people think she's in middle school** *than Beavis*.

Two things need to be explained about the data of (21)–(23): (1) the fact just mentioned, that comparative complements permute while *so, too* and *enough* complements don't, and (2) the prior fact that some extraposed complements permute with elements that are patently extraposed. We account for the latter fact, the crossed dependencies in (21a) and (22b) – by postulating two unary lexical constructions. The first "moves" arguments from the COMPS list to the EXTRA list; the second allows nouns to be constructed that have a relative clause on their EXTRA list.[14] An initial sketch of these constructions is given in (24) and (25):[15]

(24) **Complement Extraposition Construction:**

$$
comp\text{-}extra\text{-}cxt \Rightarrow
\begin{bmatrix}
\text{MTR} &
\begin{bmatrix}
word \\
\text{SYN} &
\begin{bmatrix}
\text{SUBJ} & \langle \text{NP} \rangle \\
\text{COMPS} & L_1 \\
\text{EXTRA} & L_2 \oplus \langle X \rangle
\end{bmatrix}
\end{bmatrix} \\
\text{DTRS} &
\left\langle
\begin{bmatrix}
word \\
\text{SYN} &
\begin{bmatrix}
\text{SUBJ} & \langle \text{NP} \rangle \\
\text{COMPS} & L_1 \bigcirc \langle X \rangle \\
\text{EXTRA} & L_2
\end{bmatrix}
\end{bmatrix}
\right\rangle
\end{bmatrix}
$$

(25) **Nominal Modifier Extraposition Construction:**

$$
nm\text{-}extra\text{-}cxt \Rightarrow
\begin{bmatrix}
\text{MTR} &
\begin{bmatrix}
word \\
\text{FORM} & \langle Y \rangle \\
\text{SYN} &
\begin{bmatrix}
\text{CAT} & noun \\
\text{COMPS} & L_1 \\
\text{EXTRA} & L_2 \oplus \langle X[\text{SEL } Z] \rangle
\end{bmatrix}
\end{bmatrix} \\
\text{DTRS} &
\left\langle Z :
\begin{bmatrix}
word \\
\text{FORM} & \langle Y \rangle \\
\text{SYN} &
\begin{bmatrix}
\text{CAT} & noun \\
\text{COMPS} & L_1 \\
\text{EXTRA} & L_2
\end{bmatrix}
\end{bmatrix}
\right\rangle
\end{bmatrix}
$$

The Complement Extraposition Construction "pumps" a daughter (intuitively, one that is a "predicator") with an item *X* (anywhere) on its COMPS list to a mother

---

[14]A relative clause otherwise functions as a nominal modifier selecting the nominal it modifies via SEL; see Sag submitted.

[15]In (24), $\bigcirc$ denotes the "shuffle" relation, as opposed to the append relation ($\oplus$) used in (25) and in (19) and (20) above. See Reape 1994.

$$
comp\text{-}extra\text{-}cxt \quad
\begin{bmatrix}
\text{FORM } \langle\, proud \,\rangle \\[4pt]
\text{SYN} \quad
\begin{bmatrix}
\text{COMPS } \langle\ \rangle \\
\text{EXTRA } \langle\, \text{PP}[of] \,\rangle
\end{bmatrix}
\end{bmatrix}
$$

$$
\begin{bmatrix}
\text{FORM } \langle\, proud \,\rangle \\[4pt]
\text{SYN} \quad
\begin{bmatrix}
\text{COMPS } \langle\, \text{PP}[of] \,\rangle \\
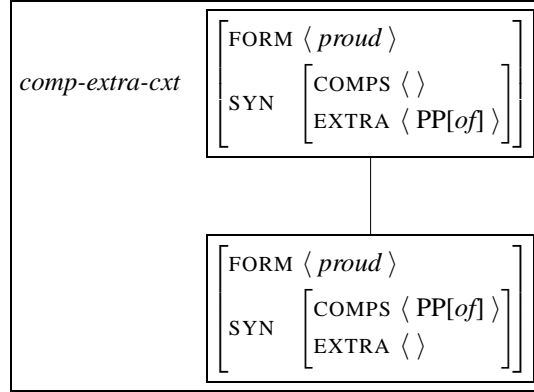\text{EXTRA } \langle\ \rangle
\end{bmatrix}
\end{bmatrix}
$$

Figure 6: A Complement Extraposition Construct

predicator where *X* appears as the last element of the EXTRA list and is absent from the COMPS list. As the final element on the EXTRA list, *X* is the last element on the list to be realized by the Head Extraposition Construction [(20) above] and hence appears in the sentence after any other elements realized from this list.[16] Multiple extraposition dependencies typically arise when one of these extraposition dependencies interacts with one of the extraposition dependencies induced lexically (by *so*, *more*, etc.). A *comp-extra-cxt* (a post-lexical construct in the terminology of Sag 2010) is illustrated in Figure 6, where the daughter's COMPS list contains a PP[*of*], and its EXTRA list is empty. The mother's COMPS list is empty – the PP[*of*] appears on the EXTRA list.
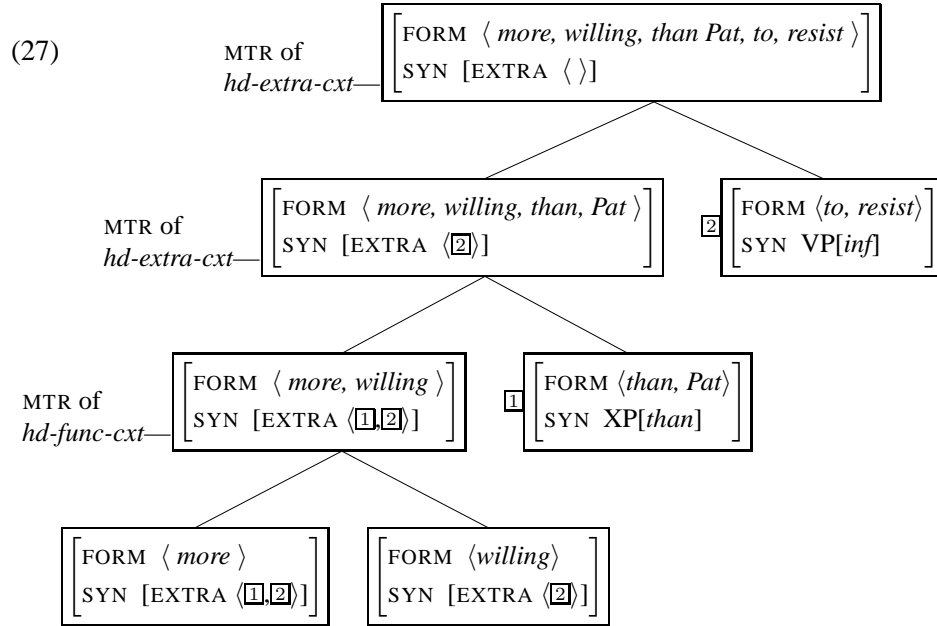
Let us now return to the fact that, unlike other extraposed modifer complements (such as *than*- or *as*-phrases), *so*, *to* and *enough* complements never participate in crossed dependencies. We account for this via the lexical entries shown in (26):

(26) a.
$$
\begin{bmatrix}
\text{FORM } \langle\, so \,\rangle \\[4pt]
\text{SYN} \quad
\begin{bmatrix}
\text{CAT} \quad \begin{bmatrix} \text{SEL } [\text{SYN } [\text{EXTRA } L_1]] \end{bmatrix} \\
\text{EXTRA } L_1 \oplus \langle \text{S}[that] \rangle
\end{bmatrix}
\end{bmatrix}
$$

b.
$$
\begin{bmatrix}
\text{FORM } \langle\, more \,\rangle \\[4pt]
\text{SYN} \quad
\begin{bmatrix}
\text{CAT} \quad \begin{bmatrix} \text{SEL } [\text{SYN } [\text{EXTRA } L_1]] \end{bmatrix} \\
\text{EXTRA } L_1 \bigcirc \langle \text{XP}[than] \rangle
\end{bmatrix}
\end{bmatrix}
$$

We have already seen that *so* adds its S[*that*] complement at the right end of the EXTRA list, ensuring that it will be realized highest (hence latest, rightmost) in the structure of any element realized from the same list. Note that the entry for *more* is

---

[16]Because the Head-Extraposition Construction is binary, only one extraposed element is introduced at each level of structure. Hence, multiple extrapositions involve a nested, left-branching derivational structure.

the same, with the important difference that the XP[*than*] complement is added not at the end, but at an arbitrary position within the selected element's EXTRA list (as specified by the use of $\bigcirc$, rather than $\oplus$). This arrangement allows complements of comparative modifiers to be realized either earlier (hence lower, to the left) or later (hence higher, to the right) of other elements realized from their list – except for *so/too/enough* complements, as illustrated in (27):

(27)

MTR of
*hd-extra-cxt*—
$$\begin{bmatrix} \text{FORM } \langle \textit{more, willing, than Pat, to, resist} \rangle \\ \text{SYN } [\text{EXTRA } \langle \rangle] \end{bmatrix}$$

MTR of
*hd-extra-cxt*—
$$\begin{bmatrix} \text{FORM } \langle \textit{more, willing, than, Pat} \rangle \\ \text{SYN } [\text{EXTRA } \langle \boxed{2} \rangle] \end{bmatrix}$$
$$\boxed{2}\begin{bmatrix} \text{FORM } \langle \textit{to, resist} \rangle \\ \text{SYN } \text{VP}[\textit{inf}] \end{bmatrix}$$

MTR of
*hd-func-cxt*—
$$\begin{bmatrix} \text{FORM } \langle \textit{more, willing} \rangle \\ \text{SYN } [\text{EXTRA } \langle \boxed{1},\boxed{2} \rangle] \end{bmatrix}$$
$$\boxed{1}\begin{bmatrix} \text{FORM } \langle \textit{than, Pat} \rangle \\ \text{SYN } \text{XP}[\textit{than}] \end{bmatrix}$$

$$\begin{bmatrix} \text{FORM } \langle \textit{more} \rangle \\ \text{SYN } [\text{EXTRA } \langle \boxed{1},\boxed{2} \rangle] \end{bmatrix}$$
$$\begin{bmatrix} \text{FORM } \langle \textit{willing} \rangle \\ \text{SYN } [\text{EXTRA } \langle \boxed{2} \rangle] \end{bmatrix}$$

We have seen that *so/too/enough* complements must follow comparative complements if they reside on the same EXTRA list. However, if the comparative element is within the subject NP and the *so/too/enough* licensor is within the VP of a subject-predicate clause, then it is in fact required that the *so/too/enough* dependent linearly precede the *than*-phrase (extraposition is bounded by the VP):

(28)  a.  **More** girls were <u>*so*</u> happy *that they cheered* **than boys**.

b. *****More** girls were <u>*so*</u> happy **than boys** *that they cheered*.

We account for this by formulating the Subject-Predicate Construction as shown in Figure 7. A construct licensed by the Subject-Predicate Construction is a headed construct with a mother and two daughters. The mother's syntax specifies it to be non-inverted and finite, with empty SUBJ and COMPS lists and, crucially in the present context, an EXTRA list that is identified with that of the first (subject) daughter. The subject daughter satisfies the subject valence requirement (*Y*) of the head VP daughter, The EXTRA list of the latter must be empty, ensuring that any

$$s\text{-}p\text{-}cxt \Rightarrow \begin{bmatrix} hd\text{-}cxt \\[2pt] \text{MTR} \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{VFORM} & fin \\ \text{INV} & - \end{bmatrix} \\ \text{SUBJ} & \langle\,\rangle \\ \text{EXTRA} & L \end{bmatrix} \end{bmatrix} \\[4pt] \text{DTRS} \left\langle Y\!:\,[\,\text{EXTRA}\ L\,]\,,\ H\!: \begin{bmatrix} \text{SYN} \begin{bmatrix} \text{SUBJ} & \langle\,Y\,\rangle \\ \text{COMPS} & \langle\,\rangle \\ \text{EXTRA} & \langle\,\rangle \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 7: The Subject-Predicate Construction

extraposed elements that arise within the VP of a subject-predicate construct are realized within that VP.

Finally, we note that it is not just subject-predicate clauses that inherit the extraposition potential of their first daughter. This is also true of filler-gap constructions:

(29) a. [[[How many **more** talents] did she have] **than the other candidate**]?

b. [[[Which **candidate**] did he support] **who had signed the legislation**]?

c. [[[How many **soups**] he had sampled] **that he didn't like**]!

d. [[[**So** eager] was he to see the comet] **that he stayed up all night**].

# 4 Conclusion

In this paper, we have seen that the complex pre-determination ("Big Mess") phenomenon and the discontinuous dependency phenomenon are independent – either may occur in a sentence without the other. Nevertheless we find them frequently intertwined because there are seven lexical entries (*so*, *too*, *more*, *less*, *as*, *such*, and *how*) that contain features which play key roles in both constructions. The CPD phenomenon requires a special construction (in our analysis or the alternative suggested in Van Eynde 2007); the DD phenomenon follows from the properties of certain lexical licensors and the grammatical mechanisms that govern exptaposition in general. The details of the distribution of DD complements derive from the interaction of (1) a general construction for realizing elements of the EXTRA list, (2) specifications on phrasal constructions determining the contents of the mother's EXTRA list as a function of the EXTRA lists of the daughters, and (3) various lexical specifications for relevant lexical licensors. We believe that the general approach we have adopted here has provided a vehicle for the precise representation of these phenomena in a way that has allowed us to abstract the significant generalizations

they present, to elucidated their interactions with other aspects of grammar, and to thereby explicate the interaction of the idiosyncratic, the general, and the gray area in between.

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