German Multiple Fronting and Expected Topic-Hood

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Abstract

This papers addresses information-structural restrictions on the occurrence of what is known as "multiple fronting" in German. Multiple fronting involves the realization of (what appears to be) more than one constituent in the first position of main clause declaratives, a clause type that otherwise respects the verb-second constraint of German. Relying on a large body of naturally occurring instances of multiple fronting with the surrounding discourse context, we show that in certain contexts, multiple fronting is fully grammatical in German, in contrast to what has sometimes been claimed previously. Examination of this data reveals two different patterns, which we analyze in terms of two distinct constructions, each instantiating a specific pairing of form, meaning and contextual appropriateness.

1 Introduction

German is classed as a V2 language, that is, normally exactly one constituent occupies the position before the finite verb in declarative main clauses. In what have been claimed to constitute rare, exceptional cases, however, more than one constituent appears to precede the finite verb, as illustrated in (1)–(3):

(1) [Dem Saft] [eine kräftigere Farbe] geben Blutorangen.
to.the juice a more.vivid colour give blood.oranges
'What gives the juice a more vivid colour is blood oranges.' R99/JAN.01605[1]

(2) [Dem Frühling] [ein Ständchen] brachten Chöre aus dem Kreis
to.the spring a little.song brought choirs from the county
Birkenfeld im Oberbrombacher Gemeinschaftshaus.
Birkenfeld in the Oberbrombach municipal.building
'Choirs from Birkenfeld county welcomed (the arrival of) spring with a little song in the Oberbrombach municipal building.' RHZ02/JUL.05073

(3) [Dem Ganzen] [ein Sahnehäubchen] setzt der Solist Klaus Durstewitz
to.the everything a little.cream.hood puts the soloist K. D.
auf
on
'Soloist Klaus Durstewitz is the cherry on the cake.' NON08/FEB.08467

There has been ongoing debate in the theoretical literature concerning the status of examples seemingly violating this V2 constraint. The examples in (4) (from

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[1]Corpus examples were extracted from *Deutsches Referenzkorpus* (DeReKo), hosted at Institut für Deutsche Sprache, Mannheim: `http://www.ids-mannheim.de/kl/projekte/korpora`

Fanselow, 1993) and (5) (from G. Müller, 2004), are similar to (1)–(3) in that both objects of a ditransitive verb are fronted. The grammaticality judgments given by these authors diverge and, as can be seen from G. Müller's assessment of the data, such constructed examples tend to be deemed at best marginal, or even ungrammatical if presented without context.

(4) [Kindern] [Heroin] sollte man besser nicht geben.
to.children heroin should one better not give
'One shouldn't give heroin to children.'

(5) a. ?? [Kindern] [Bonbons] sollte man nicht geben.
to.children candies should one not give
'One shouldn't give candies to children.'

b. * [Dieses billige Geschenk] [der Frau] sollte man nicht geben.
this cheap present to.the woman should one not give
'One shouldn't give the woman this cheap present.'

On the basis of corpus data, St. Müller (2003, 2005) shows that a large variety of syntactic categories, grammatical functions and semantic classes can occur preverbally in such Multiple Frontings (MFs). Building on proposals by Hoberg (1997) and Fanselow (1993), he offers a detailed HPSG analysis that treats the fronted constituents as dependents of an empty verbal head, thus preserving the assumption that the preverbal position is occupied by exactly one constituent (a VP):

(6) $[_{VP}$ [Dem Saft] [eine kräftigere Farbe] $__V]_i$ geben$_j$ Blutorangen $__i$ $__j$.

While this account by itself correctly predicts certain syntactic properties of MFs, such as the fact that the fronted parts must depend on the same verb, it is in need of further refinement. In particular, multiple fronting seems to require very special discourse conditions in order to be acceptable (which is why out-of-context examples often sound awkward). Relying on findings from a corpus of naturally occurring data, we have identified two different information-structural environments in which MFs are licensed. Section 2 briefly sketches these two patterns, which in Section 3 we will analyze as being licensed by two related but distinct constructions, each of them instantiating a specific pairing of form, meaning and contextual appropriateness.

2 Multiple Fronting in Context

2.1 Presentational MF

One of the configurations in which MF is well attested in naturally occurring data is illustrated in (7) and (8), where the (b) line contains the MF structure and the (a) and (c) lines provide the context before and after it, respectively. We call this type *Presentational Multiple Fronting*.

(7) a. Spannung pur herrschte auch bei den Trapez-Künstlern. [...] Musikalisch begleitet wurden die einzelnen Nummern vom Orchester des Zirkus Busch (...)
'It was tension pure with the trapeze artists. [...] Each act was musically accompanied by Circus Busch's own orchestra.'

b. [Stets] [einen Lacher] [auf ihrer Seite] hatte *die Bubi Ernesto Family*$_i$.
always a laugh on their side had the Bubi Ernesto Family
'Always good for a laugh was the Bubi Ernesto Family.'

c. *Die Instrumental-Clowns*$_i$ zeigten ausgefeilte Gags und Sketche [...]
'These instrumental clowns presented sophisticated jokes and sketches.'
M05/DEZ.00214

(8) a. ... wurde der neue Kemater Volksaltar ... geweiht. Die Finanzierung haben die Kemater Basarfrauen übernommen. Die Altarweihe bot auch den würdigen Rahmen für den Einstand von Msgr. Walter Aichner als Pfarrmoderator von Kematen.
'... the new altar in Kemate ... was consecrated. It was financed by the Kemate bazar-women. The consecration of the altar also presented a suitable occasion for Msgr. Walter Aichner's first service as Kematen's parish priest'

b. [Weiterhin] [als Pfarrkurator] wird *Bernhard Deflorian*$_i$ fungieren.
further as curate will Bernhard Deflorian function.
'Carrying on as curate, we have Bernhard Deflorian.'

c. Ihn$_i$ lobte Aichner besonders für seine umsichtige und engagierte Führung der pfarrerlosen Gemeinde. Er$_i$ solle diese Funktion weiter ausüben, „denn die Entwicklung, die die Pfarrgemeinde Kematen genommen hat, ist sehr positiv".
'Aichner praised him especially for his discreet and committed leading of the priestless congregation. He should carry on with his work, "for the development of the Kematen congregation has been very positive."'
I97/SEP.36591

We take Presentational MF to be a topic shift strategy. A new entity (in italics) is introduced into the discourse and serves as a topic in the continuation. On the basis of a close examination of a large quantity of naturally occurring data, we suggest that this presented entity corresponds to the dependent (argument or adjunct) of the verb that is most topic-worthy and is thus most likely to be realized as a topic in other circumstances. We will refer to it as the verb's 'designated topic', and it is, typically, the grammatical subject, but non-subjects may take on this role – as we illustrate immediately below – in the case of e. g. unaccusatives/psych verbs which presumably favor spatio-temporal or experiencer topics. Since focus and newness are not prototypical topic features cross-linguistically, it has been argued that brand new/focal entities often have to be first 'presented' before they can function as aboutness topics (cf. Lambrecht, 1994, for whom the type of phrases introducing

brand new referents into the discourse are lowest on the scale of 'Topic Accessibility'). Interestingly, then, rather than checking/spelling out a discourse function of the fronted material, the motivating factor here is the need to shift material away from the post-verbal domain to maximize the presentational effect. Note that the pattern is not characterized adequately if the description makes reference to the subject, rather than to the 'designated topic'. The reason is that the presented element need not be the subject in all cases, as illustrated in (9b): here, the subject is actually part of the fronted material, while the newly introduced entity is coded as a locative PP. Our analysis in terms of designated topic accommodates these data, since the locative phrase, rather than the subject, plays this role in the case of *herrschen* 'to reign' (in the relevant "existential" reading). It also predicts that a subject can occur among the fronted material in a MF construction iff it is not the verb's designated topic.

(9) a. Gesucht? Schnelle Sprinter
'Wanted: fast sprinters'

b. [Weiterhin] [Hochbetrieb] herrscht am Innsbrucker Eisoval.
further high.traffic reigns at.the Innsbruck icerink
'It's still all go at the Innsbruck icerink.'

c. Nach der Zweibahnentournee am Dreikönigstag stehen an diesem Wochenende die österreichischen Staatsmeisterschaften im Sprint am Programm.
'Following the two-rink tournament on Epiphany-Day there's now the Austrian National Championship in Sprinting coming up at the weekend.' I00/JAN.00911

2.2 Propositional Assessment MF

The second configuration in which MF occurs is best described as *Propositional Assessment MF*. Examples (10c) and (11c) illustrate this type of structure.

(10) a. Bauern befürchten Einbußen
'Farmers fear losses'

b. [Nach Brüssel] [zum Demonstrieren] ist Gerd Knecht *nicht* gefahren
to Brussels to demonstrate is G. K. not gone
'G. K. did not go to Brussels for the demo'

c. aber gut verstehen kann der Vorsitzende des Lampertheimer Bauernverbands die Proteste der Kollegen.
'but the president of the Lampertheim Farmers' Association can well understand his colleagues' protest.' M99/FEB.12802

(11) a. Im Schlussabschnitt war den Berlinern das Bemühen durchaus anzumerken, vor ausverkauftem Haus ein Debakel zu verhindern.
'During the last phase of the match, it was clearly visible that the Berlin players were struggling to fight off a debacle in the packed arena.'

b. [Dem Spiel] [eine Wende] konnten sie aber nicht mehr geben.
to.the match a turn could they however not more give

'However, they didn't manage to turn the match around.'

c. Rob Shearer (46.) traf noch einmal den Pfosten, das nächste Tor erzielten aber wieder die Gäste.
In the 46th minute, Rob Shearer hit the post again, but it was the guests who scored the next goal.' NUZ07/MAI.01360

We analyze Propositional Assessment MF as involving a Topic-Comment structure plus an assessment of the extent to which the Comment holds of the Topic. More precisely, we are dealing with an inverted Topic-Comment configuration, in which the fronted material constitutes (part of) the Comment, while the Topic is instantiated by a discourse-given element in the middlefield. Also in the middlefield, we regularly find an 'evaluative' expression, generally an adverb or particle, frequently but not exclusively negation. It must be prosodically prominent (i. e., it must probably receive the main stress of the sentence), and it expresses/highlights the degree to which the Comment holds for the Topic. Besides *nicht* 'not', particles/adverbs frequently found in *Propositional Assessment MF* include *nie* 'never', *selten* 'rarely', *oft* 'often'.

3 An HPSG account

3.1 Identifying cases of MF

To account for the data within HPSG, it is necessary to appropriately constrain syntactic, semantic, and information-structural properties of a sign whenever it instantiates a multiple fronting configuration. Thus, in order to be able to specify any constraints on their occurrence, instances of multiple fronting must be identified in the first place. Since we base our proposal on Müller's (2005) syntactic analysis of multiple fronting, this is not a major problem: on his approach, the occurrence of elements in the preverbal position in general is modeled as a filler-gap-relation, where the non-head daughter corresponds to the preverbal material (prefield) and the head daughter corresponds to the rest of the sentence (in the topological model of the German sentence, this would be the finite verb, the middlefield, and the right bracket, and the final field). In Müller's (2005) formalization, filler daughters in multiple fronting configurations (and only in these) have a HEAD|DSL value of type *local*, that is, conforming to the analysis sketched in (6) above, they contain information about an empty verbal head, as shown in (12).[2]

(12) $\begin{bmatrix} \textit{head-filler-phrase} \\ \text{NON-HD-DTRS} \left\langle \left[\text{HEAD|DSL} \;\; \textit{local} \right] \right\rangle \end{bmatrix}$

This specification then allows us to pick out exactly the subset of *head-filler*-phrases we are interested in, and to formulate constraints such that they are only

[2]The DSL ('double slash') feature is needed to model the HPSG equivalent of verb movement from the sentence final position to initial position. Cf. the indices in example (6) above.

licensed in some specific information-structural configurations, to which we turn next.

3.2 Information structure features

Various approaches to information structure have been proposed within HPSG, differing both in the features that are assumed to encode aspects of IS, and in the sort of objects these features take as their value (among others, Engdahl and Vallduví, 1996; Wilcock, 2001; De Kuthy, 2002; Paggio, 2005; Webelhuth, 2007). The representation we use here is based on Bildhauer (2008): following proposals such as Krifka (2007), topic/comment and focus/ground are treated as two information structural dimensions that are orthogonal to one another. We thus introduce both a TOPIC and a FOCUS feature, bundled in a IS path, which in turn is an attribute of *synsem*-objects.[3] These take as their value a list of lists of *elementary predications* (*EP*s, for short), as used in Minimal Recursion Semantics Copestake et al. (1999). In the basic case, that is, a sentence that has one topic and a single focus, the TOPIC and FOCUS lists each contain one list of *EP*s, which are structure shared with elements on the sign's RELS-list. In other words, we are introducing pointers to individual parts of a sign's semantic content. By packaging the *EP*s pertaining to a focus or topic in individual lists, we are able to deal with multiple foci/topics. The feature architecture just outlined is shown in (13), and (14) illustrates a possible instantiation of the TOPIC, FOCUS and CONT values.

(13)
$$\begin{bmatrix} \textit{sign} \\ \text{SYNSEM} \begin{bmatrix} \text{LOC} \ \textit{local} \\ \text{NONLOC} \ \textit{nonloc} \\ \text{IS} \begin{bmatrix} \textit{is} \\ \text{TOPIC} \ \textit{list} \\ \text{FOCUS} \ \textit{list} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(14)
$$\begin{bmatrix} \textit{sign} \\ \text{SYNSEM} \begin{bmatrix} \text{IS} \begin{bmatrix} \textit{is} \\ \text{TOPIC} \ \langle\langle \boxed{1} \rangle\rangle \\ \text{FOCUS} \ \langle\langle \boxed{2}, \boxed{3} \rangle, \langle \boxed{4} \rangle\rangle \end{bmatrix} \\ \text{LOC}|\text{CONT}|\text{RELS} \ \langle \boxed{1}, \boxed{2}, \boxed{3}, \boxed{4}, \boxed{5} \rangle \end{bmatrix} \end{bmatrix}$$

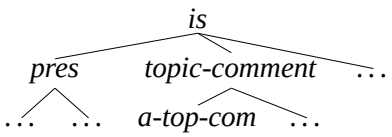
Next, we introduce a subtyping of *is*, given in (15). These subtypes can then be used to refer more easily to particular information-structural configurations, that is, to specific combinations of TOPIC and FOCUS values.[4] The subtypes that are

[3] Information-structure should be inside *synsem* because at least information about focus must be visible to elements (such as focus sensitive particles) that select their sister constituent via some feature (MOD, SPEC, COMPS/SUBCAT). Possibly, the situation is different with topics: we are not aware of data showing that topicality matters for selection by modifiers or heads. We leave open the question whether TOPIC is better treated as an attribute of, say, *sign* rather than *synsem*.

[4] These types are thus used as abbreviations or labels for specific combinations of attributes and their values. From a theoretical perspective, they are not strictly necessary, but we use them here for

relevant for our purpose are *pres* ('presentational') and *a-top-com* ('assessed-topic-comment', a subtype of the more general *topic-comment* type.

(15)



Those *head-filler* phrases that are instances of multiple fronting can then be restricted to have an IS-value of an appropriate type, as shown in (16).

(16) $\begin{bmatrix} \textit{head-filler-phrase} \\ \text{NON-HD-DTRS} \left\langle \left[\text{HEAD|DSL } \textit{local} \right] \right\rangle \end{bmatrix} \quad \rightarrow \quad \left[\text{IS } \textit{pres} \vee \textit{a-top-com} \vee \ldots \right]$

3.3 Modeling Presentational MF

In order to model Presentational MF, we introduce a pointer to the Designated Topic as a head feature of the verb that subcategorizes for it. The feature DT takes a list (empty or singleton) of *synsem*-objects as its value, and it states which element, if any, is normally realized as the Topic for a particular verb. This is not intended to imply that the Designated Topic must in fact be realized as the topic in all cases. Rather, it merely encodes a measurable preference in topic realization for a given verb. The statement in (17) is intended as a general constraint, with further constraints on verbs (or classes of verbs) determining which element on ARG-ST is the Designated Topic.

(17) $\textit{verb-stem} \rightarrow \left[\text{HEAD} \mid \text{DT } \langle\rangle \right] \quad \vee \quad \begin{bmatrix} \text{HEAD} \mid \text{DT } \langle \boxed{1} \rangle \\ \text{ARG-ST} \quad \langle \ldots \boxed{1} \ldots \rangle \end{bmatrix}$

The constructional properties of Presentational Multiple Fronting are defined in (18): the Designated Topic must be located within the non-head daughter and must be focused. Figure 1 shows the relevant parts of the analysis of sentence (7) above.

(18) $\begin{bmatrix} \textit{head-filler-phrase} \\ \text{IS } \textit{pres} \end{bmatrix} \rightarrow \begin{bmatrix} \text{SS} \mid \text{L} \mid \text{CAT} \mid \text{HEAD} \mid \text{DT} \left\langle \left[\text{L} \mid \text{CONT} \mid \text{RELS } \boxed{1} \right] \right\rangle \\ \text{HD-DTR} \mid \text{SS} \mid \text{IS} \mid \text{FOCUS } \langle \boxed{1} \rangle \end{bmatrix}$

3.4 Modeling Propositional Assessment MF

For Propositional Assessment MF, we use a special subtype of *topic-comment*, namely *a(ssessed)-top-com*. We then state that the designated topic must in fact

clarity of exposition.

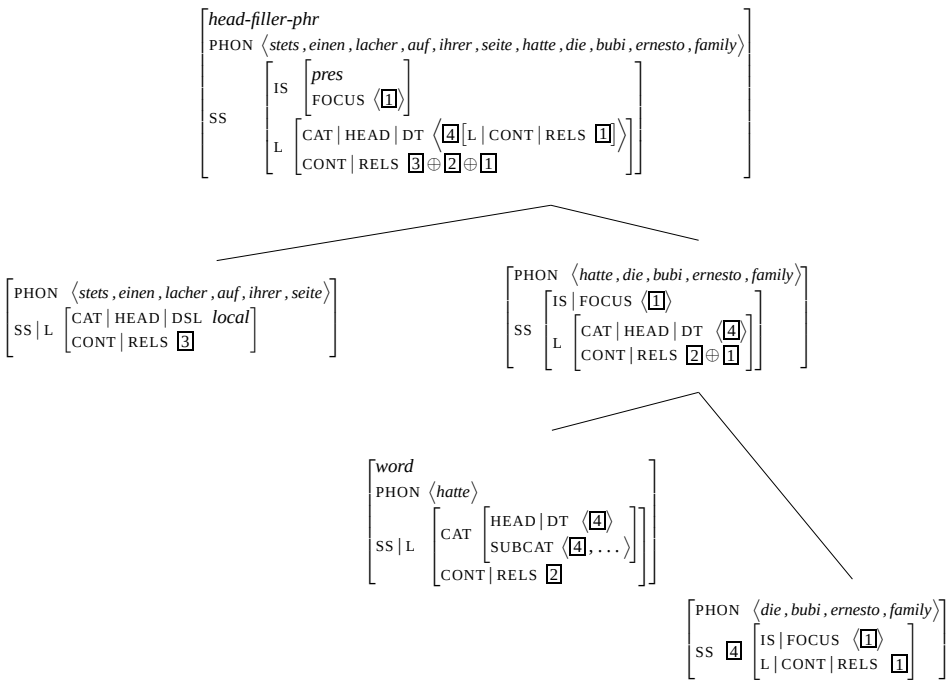


Figure 1: Sample analysis of *Presentational Multiple Fronting*

be realized as the topic, and that it must occur somewhere within the head daughter (which comprises everything but the prefield). Most importantly, the head-daughter must also contain a focused element that has the appropriate semantics (i. e. one which serves to spell out the degree to which the comment holds of the topic; glossed here as *a-adv-rel*). However, the mere presence of such an element on the RELS list does not guarantee that it actually modifies the highest verb in the clause (e. g., it could modify a verb in some embedded clause as well.) Therefore, the construction also adds a handle constraint specifying that the focused element takes scope over the main verb. This handle constraint needs to be added rather than just be required to exist among the head-daughter's handle constraints because the *outscoped* relation need not be an immediate one, i. e., there can be more than one scope-taking element involved. An appropriate handle constraint can be introduced via the C_CONT-feature, i. e. as the construction's contribution to the overall meaning. If the relevant element does not in fact outscope the main verb, the MRS will contain conflicting information and cannot be scope-resolved. In that case, the phrase's semantics will not be well-formed, which we assume will exclude any unwanted analysis due to focussing of the wrong element. The necessary specifications are stated in (19). A sample analysis of sentence (10c) above is given in Figure 2.

(19) $$\begin{bmatrix}\textit{head-filler-phrase}\\ \textsc{ss}\,|\,\textsc{is}\ \textit{a-top-com}\end{bmatrix} \rightarrow \left[\begin{array}{l} \textsc{ss}\ \left[\begin{array}{l}\textsc{l}\,|\,\textsc{cat}\,|\,\textsc{head}\,|\,\textsc{dt}\ \left\langle\left[\textsc{l}\,|\,\textsc{cont}\,|\,\textsc{rels}\ \boxed{1}\right]\right\rangle\\ \textsc{is}\ \left[\begin{array}{l}\textsc{topic}\ \langle\boxed{1}\rangle\\ \textsc{focus}\ \langle\langle\boxed{3}\rangle\rangle\end{array}\right]\end{array}\right]\\ \textsc{c_cont}\,|\,\textsc{hcons}\ \left\langle\left[\begin{array}{l}\textit{qeq}\\ \textsc{harg}\ \boxed{5}\\ \textsc{larg}\ \boxed{4}\end{array}\right]\right\rangle\\ \textsc{hd-dtr}\,|\,\textsc{ss}\,|\,\textsc{l}\,|\,\textsc{cont}\ \left[\begin{array}{l}\textsc{ltop}\ \boxed{4}\\ \textsc{rels}\ \left\langle\boxed{3}\left[\begin{array}{l}\textit{a-adv-rel}\\ \textsc{arg}\ \boxed{5}\end{array}\right]\right\rangle\bigcirc\boxed{1}\bigcirc\textit{list}\end{array}\right]\end{array}\right]$$

4 Conclusion

In the way outlined above, the relative freedom of the fronted material in St. Müller's analysis of German MF is appropriately restricted with respect to the contexts in which MF can felicitously occur. While we are not claiming to have identified these contexts exhaustively, the two configurations modeled here, if taken together, account for the majority of naturally occurring examples in our database. In sum, then, the present paper underlines the importance of examining attested examples in context and demonstrates that it is possible to further constrain a syntactic phenomenon which in the past has even been deemed ungrammatical in many (decontextualized) examples.

References

Bildhauer, Felix. 2008. *Representing Information Structure in an HPSG Grammar of Spanish*. Ph. D.thesis, Universität Bremen, `http://www.hpsg.fu-berlin.de/~fbildhau/diss/felix-bildhauer-diss.pdf`.

Copestake, Ann, Flickinger, Daniel P. and Sag, Ivan A. 1999. Minimal Recursion Semantics. An introduction, manuscript, Stanford University: Center for the Study of Language and Information.

De Kuthy, Kordula. 2002. *Discontinuous NPs in German*. Stanford: CSLI Publications.

Engdahl, Elisabeth and Vallduví, Enric. 1996. Information Packaging in HPSG. In Claire Grover and Enric Vallduví (eds.), *Studies in HPSG*, Edinburgh working papers in cognitive science, No. 12, pages 1–31, Edinburgh: Centre for Cognitive Science, University of Edinburgh.

Fanselow, Gisbert. 1993. Die Rückkehr der Basisgenerierer. *Groninger Arbeiten zur Germanistischen Linguistik* 36, 1–74.

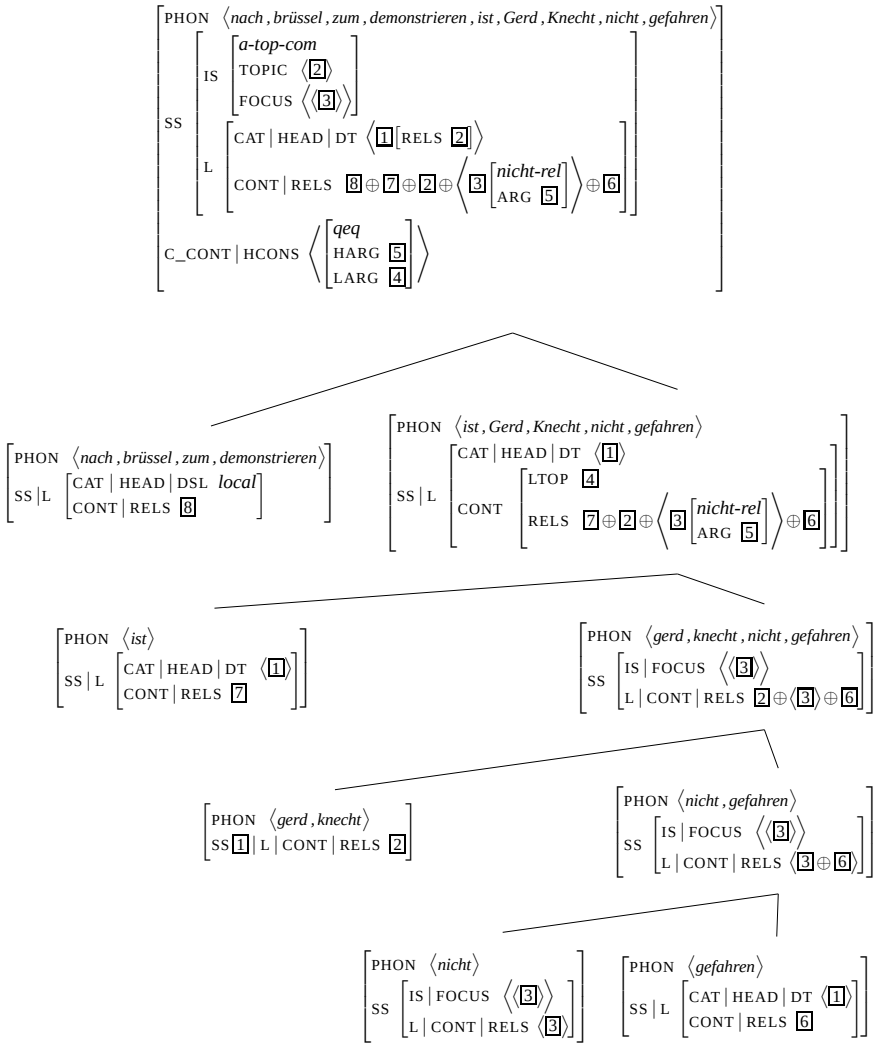


Figure 2: Sample analysis of *Propositional Assessment MF*

Hoberg, Ursula. 1997. Die Linearstruktur des Satzes. In Hans-Werner Eroms, Gerhard Stickel and Gisela Zifonun (eds.), *Grammatik der deutschen Sprache*, volume 7.2 of *Schriften des Instituts für deutsche Sprache*, pages 1495–1680, Berlin, New York: Walter de Gruyter.

Institut für Deutsche Sprache, Mannheim. 2010. Das Deutsche Referenzkorpus DeReKo. `http://www.ids-mannheim.de/kl/projekte/korpora`.

Krifka, Manfred. 2007. Basic Notions of Information Structure. In Caroline Féry, Gisbert Fanselow and Manfred Krifka (eds.), *Interdisciplinary Studies on Information Structure*, Working Papers of the SFB 632, No. 6, pages 13–56, Potsdam: Universitätsverlag.

Lambrecht, Knud. 1994. *Information Structure and Sentence Form. Topic, Focus, and the Mental Representations of Discourse Referents*. Cambridge: Cambridge University Press.

Müller, Gereon. 2004. Verb-Second as vP-First. *The Journal of Comparative Germanic Linguistics* 7(3), 179–234.

Müller, Stefan. 2003. Mehrfache Vorfeldbesetzung. *Deutsche Sprache* 31(1), 29–62, `http://www.hpsg.fu-berlin.de/~stefan/Pub/mehr-vf-ds.html`, October 18, 2010.

Müller, Stefan. 2005. Zur Analyse der scheinbar mehrfachen Vorfeldbesetzung. *Linguistische Berichte* 203, 297–330, `http://www.hpsg.fu-berlin.de/~stefan/Pub/mehr-vf-lb.html`, October 18, 2010.

Paggio, Patrizia. 2005. Representing Information Structure in a Formal Grammar of Danish. In *Proceedings of the 2nd International Workshop on Logic and Engineering of Natural Language Semantics (LENLS2005). Kitakyushu, Japan. June 13–14*.

Webelhuth, Gert. 2007. Complex Topic-Comment Structures in HPSG. In Stefan Müller (ed.), *The Proceedings of the 14th International Conference on Head-Driven Phrase Structure Grammar*, pages 306–322, Stanford: CSLI Publications.

Wilcock, Graham. 2001. Towards a discourse-oriented representation of information structure in HPSG. Paper presented at the 13th Nordic Conference on Computational Linguistics, Uppsala, Sweden.