Extraposition and Prosodic Monsters in German

Caroline Féry

Abstract In this chapter, the implications of extraposition for syntax–prosody interface are examined in a recursive theory of prosodic structure. It is shown that extraposition in German often improves the prosodic structure of a sentence. The prosodic grammar has its own rules and constraints, which can have an impact on syntax in the following way: If two syntactic structures are in competition for expressing the same content, and at the same time one of them is clearly preferred in terms of prosodic structure, the latter one is chosen. Only a theory allowing recursivity on a regular basis can reveal the formal influence of prosody on syntax. If entire syntactic constituents are parsed in entire prosodic constituents, a clause located in the middle field violates *Layeredness* and *Equal Sisters*. Such a constellation is called a "prosodic monster." In the case of prepositional phrases (PP) extraposition, recursion of prosodic domains is avoided, but no prosodic monster is at play. Extraposition is not always available: it is blocked by an accented constituent intervening between the antecedent or reconstructed position and the extraposed constituent. In the last part of the chapter, an optimality-theoretic approach is proposed that accounts for extraposition as a prosody-driven operation.

Keywords Syntax–prosody interface · Extraposition · Optimality theory · Recursivity in prosodic structure

1 Introduction

This chapter explores Fodor's insight that prosody plays a crucial role in language processing. It is assumed here that the role of prosody in processing reflects its role in grammar. It focuses on extraposition in German, which presents a clear application of this insight. In a version of grammar inherited from the T-model of grammar (see, for instance, Chomsky 1981), phonology cannot influence syntax. According to this model, the interpretation of a sentence should derive from the lexicon and the syntactic structure, and prosody should only redundantly interpret the established

C. Féry (✉)
Institute of Linguistics, Goethe University Frankfurt, Frankfurt am Main, Germany
e-mail: caroline.fery@gmail.com

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meaning. Chomsky and Halle (1968) initiated a line of research in which morphosyntactic constituents are mapped into prosodic domains in a cyclic way. Lexical phonology (Kiparsky 1982) distinguishes between lexical and postlexical phonology, and the creation of phonological domains proceeds from small to large. Within each cycle, morphosyntax affects phonology but not vice versa. Nearly all models investigating the syntax–prosody interface have done so by choosing a specific syntactic structure and showing how prosody is mapped to it, avoiding in this way the question of how prosody can shape syntax. Early syntax–prosody-mapping models like Nespor and Vogel's (1986) relation-based account also allow only one direction of mapping, and the so-called readjustment rules or rhythmic rules are strongly limited by syntax. Similarly, edge-based models (Selkirk 1986) do not allow a symmetric interaction between syntax and prosody. Prosodic domains are created from syntactic inputs. In accounts using syntax–phonology-mapping constraints like *Align* and *Wrap* (Truckenbrodt 1995a), readjustment and variation are not easy to handle; as a consequence of the evaluation, there is one optimal candidate that cannot be changed. Information structure is shown to play a role, but mostly in respecting the prosodic domains created by syntax: Focus and givenness can only delete existing prosodic domains or create additional ones. As a result, the unique function of prosody is to represent and interpret sentence structure. If this view is correct, it is unexpected that prosody may influence one or the other reading of an ambiguous sentence or that it could influence syntax at all.

In important studies on syntactic parsing in reading, Fodor (1998, 2002a, b) refutes the view that prosody is limited to interpretation of the syntax, even in silent reading. She discusses concrete examples showing how "implicit" prosody affects syntactic decisions. In the implicit prosody hypothesis (IPH), a reader projects a prosodic structure onto what is read silently. This hypothesis claims that the projected prosodic structure may affect the interpretation of a sentence. Fodor (2002b) gives the following example: "A reader may create a boundary for one reason (e.g., optimal phrase length), but the boundary may be understood as present for another reason (e.g., alignment with syntax). Under the latter construal, the prosodic break can be relevant to syntactic structure assignment: it can bias the resolution of a syntactic ambiguity just as a prosodic break in a spoken sentence does." An area of application of this hypothesis concerns ambiguous attachment of relative clauses, as for example in the sentence *Mary met the friend of the actress who was drinking tea,* where the relative clause can be attached to *friend* (high attachment) or to *actress* (low attachment). A prosodic break between *actress* and the relative clause increases the probability of high attachment. If a specific language assigns a left boundary at the beginning of a relative clause for reasons other than for disambiguation, then the preference will be for high attachment in general. This is because in many languages, the presence of a prosodic break in this position correlates with a high attachment preference.

Fodor and Nickels (2011) examine cases of "heavily nested" syntactic structure in two center-embedded relative clauses, like *The elegant woman that the man I love met lives in Barcelona*. They propose that such sentences can be adjusted to create a flat structure for prosody. Where phrase length cooperates with syntactic

alignment, no mismatch takes place, and comprehension is facilitated. This is what they call "productive interaction between syntax and prosody online." Problems appear when phrase lengths induce a prosodic structure that mismatches the syntactic structure. Fodor (2002b) suggests that the *AlignR XP* constraint in English (Selkirk 2000) is an instance of a more general right-alignment phenomenon sensitive to the number of right-edge syntactic brackets between adjacent words. She interprets this constraint as a graded constraint that reflects the configurational relations in the syntactic tree: "the pressure to insert a prosodic break (and perhaps the intensity of the acoustic realization of the break) is greater where the structural discontinuity in the tree is greater (i.e., more right brackets together)."

Some aspects of Fodor's IPH are straightforwardly adopted in the remainder of the chapter. Additionally, it will be shown that syntax can be modeled by prosody, in the same way as prosody is modeled by syntax. There is thus a shift in perspective between Fodor's main interest and the point of view of the major part of the literature concerning the role of prosody in grammar on the one hand, and the role of prosody in the elaboration of syntactic structures as it is examined in the present chapter on the other hand. It will be shown with extraposition in German that prosody not only has an effect in the processing of sentences, ambiguous or not, but that it also influences syntax in production. If a constituent may be optionally extraposed, prosody is often the motor behind the decision to extrapose. Not extraposed ("in-situ" or "intraposed") embedded clauses create prosodic structures that mismatch the syntactic structure, such as those described by Fodor. Extraposition is applied to avoid such mismatches, in which case prosody acts as a facilitating factor for a syntactic operation. This can be compared on the one hand to the example discussed by Fodor in which the presence of a prosodic boundary before a relative clause facilitates high attachment (a syntactic structure), and on the other hand with Fodor and Nickels' center-embedded examples which may cause disruption between syntax and prosody. In both cases, the interface between syntax and the formation of prosodic domains has a role to play and this interface between syntax and prosody may be facilitated or disrupted.

Despite extensive evidence to the contrary (see, for instance, Ladd 1990; Ishihara 2003; Féry 2011), non-recursivity has been a guiding theme in mainstream prosody research. Due to the fact that prosody is realized in real time and that the speech stream cannot easily represent hierarchical structure, it has been assumed that prosodic structures cannot be recursive. This assumption is a consequence of the fact that most of the data considered for the creation of syntax–prosody interaction are structurally very simple. Once it is recognized that recursion is a feature of prosody, the similarity between recursion in syntax and in prosody becomes obvious and possible interactions between the two can no longer be denied; see, for instance, Kentner (2012) and Kentner and Féry (2013) for subtle interactions between syntax and prosody.

The present chapter is dedicated to the role of prosody in extraposition. Studies investigating the choice between extraposition and in-situ position in German have been heavily influenced by the work of Hawkins (1994), who shows that in English the distance between the head of a relative clause and the relative clause

itself plays a more important role than the length of the relative clause.[1] This result was reproduced for German by Uszkoreit et al. (1998), who verify Hawkins' locality-based prediction by analyzing relative clauses in two written corpora. They demonstrate that the probability that the relative clause is in-situ increases when the distance between the head and the relative clause increases. Uszkoreit et al. (1998) and Konieczny (2000) show that speakers nevertheless prefer in-situ relative clauses, even when extraposition only crosses one word (a participle). This result may be due to the fact that perception of the sentences investigated in the form of spoken speech was not involved. Speakers had to judge written sentences, and normative factors may have played a role. Once spoken data are involved, extraposed relative clauses are often judged better than non-extraposed ones (see Poschmann and Wagner 2014).

The prosodic theory developed in this chapter locates itself in approaches seeking to replace performance accounts based on length by more detailed models that allow different grammatical factors to figure into the preference for extraposition over in-situ position. Further factors, not investigated in detail here, are information structure, the difference between restrictive and nonrestrictive relative clauses, more precisely the question of how the relative clause is related to the at-issueness of the main clause, and the syntactic relation between the main verb and the head of the relative clause.

In Section 2, it is shown that clause extraposition may be (partly) interpreted as a prosody-driven syntactic effect repairing a less than perfect syntax–prosody interface. In the version of the syntax–prosody interface used in the present chapter, that is, recursively embedded prosodic domains corresponding one-to-one to syntactic constituents, an in-situ clause triggers a prosodic structure in which an intonation phrase (ι-phrase) is embedded into a lower prosodic constituent, a prosodic phrase (Φ-phrase). The result is an ill-formed prosodic structure called a "prosodic monster." One way of resolving the problematic structure explored in this chapter is to extrapose the embedded clause. However, if the prosodic structure of a sentence with an in-situ clause does not contain a prosodic monster, there is no pressure to extrapose the clause, or the pressure decreases. This happens when the final portion of the main clause, located after the embedded clause, is heavy enough to form a Φ-phrase all by itself. A further factor acting on the decision whether to extrapose or not is the need to keep an embedded clause adjacent to its antecedent. This applies to relative clauses, or to complement clauses with a nominal antecedent, but not to complement clauses, which can be located before or after the verb: they are adjacent to the verb in both cases.

Section 3 examines extraposition of prepositional phrases (PP), an optional operation. When the PP is a possessive attributive or an argument, *Non-Recursivity,* another well-formedness constraint on the prosodic structure, is violated in the case

[1] I do not dwell on proposals for English, since extraposition in German is truly different from extraposition in English, due to the verb-final properties of German. Uszkoreit et al. (1998) observe that most German extraposed relative clauses are separated from their antecedent by the verb only. In English, extraposition usually crosses an adverb, like *yesterday*. The kinds of constituents that can be extraposed also differ in the two languages.

of in-situ location of the PP, causing a mild pressure to extrapose. The pressure to extrapose is even milder when the PP is an adjunct.

If extraposition delivers better prosodic patterns than in-situ position, this option should be allowed on a principled basis. But this is not what is observed. In many cases, extraposition produces a structure that is less acceptable than the in-situ one. In Section 4, the limit of extraposition is addressed. It is shown that an accented noun intervening between a relative clause and its antecedent or between a PP and its reconstructed position heavily degrades the structure. The data discussed in Section 4 demonstrate that prosody can also have a blocking influence on a syntactic operation. If extraposition renders parsing more difficult than non-extraposition, or if its application degrades the prosodic structure, extraposition does not apply.

Section 5 returns to the original question, namely whether prosody merely serves an interpretative function or whether it can generate structure independently. In a first step, it is shown that purely syntactic accounts, which assume either movement from a preverbal underlying position, or base generation in the postverbal position in all cases, are largely inconclusive. A plausible alternative approach allows relative clauses and complement clauses to be generated in different positions in the sentence, in which case several options as to the linearization of constituents may be considered as equivalent from the point of view of syntax. In a second step, an optimality-theoretic (OT) account is proposed: *Match* constraints regulate the syntax–prosody interface, and a number of well-formedness constraints further act on the prosodic structure. In short, prosody plays an important role in grammar and is integrated as an active component of grammar.

The language investigated is German, because of word order issues that render extraposition particularly productive and interesting in this language. Some of the generalizations are relevant for English grammar, too, but others do not hold in English, see footnote 1.

2 Extraposition of Clauses and Prosody

Before showing the prosodic role of extraposition, it is important to make a strict distinction between three kinds of postfield positions in German, because extraposition is only one of them. Altmann (1981); Averintseva-Klisch (2006) and Ott and de Vries (to appear) distinguish between extraposition, right dislocation, and afterthought, in German and in other Germanic languages, and show how they differ in their syntactic and prosodic properties. Of the three constructions, only extraposition is described by these authors as being a true constituent of the main clause. It is intonationally integrated into its host sentence, i.e., it continues the tone movement of the host sentence. Neither right dislocation nor afterthought is part of the intonation contour of the main clause. Both of them build a separate prosodic unit (optionally separated from the clause by a pause). A right-dislocated constituent may have a clause-like accent of its own, or not, and it often triggers clitic-doubling. An afterthought always has an accent of its own. A further important difference

between extraposition and the other two constructions is that in the latter cases an adverb like *nämlich* "namely," *also* "well," or *ich meine* "I mean" can be inserted after the main clause, whereas this insertion is not possible in extraposition. In the following, we are only concerned with extraposition. The constituents that can be extraposed are extremely limited: Clausal complementizer phrases (CP) and PP can easily be extraposed, but nominal, adjectival, and verbal phrases (DPs, APs, and VPs) cannot, or only exceptionally.[2]

The examples in (1) show that a sentence containing a *dass*-complement clause is much more acceptable when the complement clause is postverbal, as in (1a), than when it is in-situ, as in (1b). An in-situ clausal complement is often heavily degraded as compared to its extraposed version (but see Sternefeld 2008 and Section 5 for examples of in-situ complement sentences that are acceptable).

(1) a. Sie hat niemandem erzählt, dass sie an dem Tag spät nach Hause kam.
she has nobody told that she on that day late to home came
"She didn't tell anybody that she came home late on that day."
b. *?Sie hat niemandem, dass sie spät nach Hause kam, erzählt.

In (3), the same sentences as in (1) are provided with prosodic structure, assuming that syntactic and prosodic constituents are subject to a strict one-to-one mapping, as proposed by Féry (2011) for German. In the following, the *Match* constraints proposed by Selkirk (2011) are used for demonstrating the prosodic properties of clause extraposition. These constraints are used because of their simplicity and straightforwardness. The *Match* constraints are formulated in (2). They assume that a grammatical word, a syntactic phrase and a clause roughly correspond to the three higher prosodic constituents, prosodic word (ω), prosodic phrase (Φ), and intonation-phrase (ι), respectively.

(2) Match Constraints (Selkirk 2011, p. 439)
a. *Match Clause*
A clause in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ι, in phonological representation.
b. *Match Phrase*
A phrase in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it Φ, in phonological representation.
c. *Match Word*
A word in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ω, in phonological representation.

Match Phrase requires a constituent formed by a predicate and its arguments (the VP) to be phrased in a prosodic phrase (Φ-phrase). However, in (3b), this Φ-phrase partly consists of the complement clause, itself an intonation phrase (ι-phrase) by

[2] An example of an exceptional DP extraposition appears in (12) below.

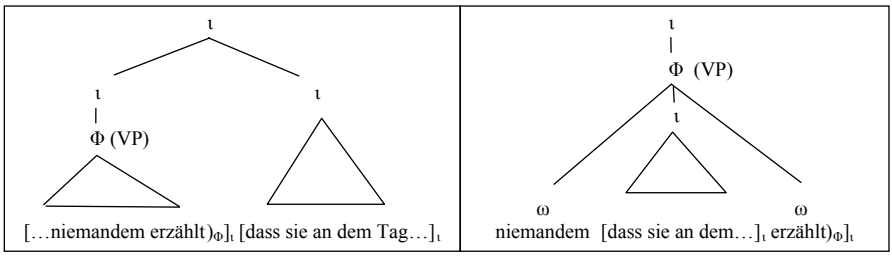


Fig. 1 Extraposition as avoidance of a prosodic monster (*dass*-complement)

virtue of *Match Clause*.[3] As a result, a hierarchically higher prosodic constituent is embedded in and dominated by a lower level constituent. It should be noticed that the function words *sie* and *hat* are too light to form their own Φ-phrase and are included in the adjacent Φ-phrase.

(3) a. [(Sie hat niemandem t_i erzählt)$_\Phi$]$_\iota$ [dass sie an dem Tag spät nach Hause kam]$_\iota$.
she has nobody told that she on that day late to home came
"She didn't tell anybody that she came home late on that day."
b. *?[((Sie hat niemandem)$_\Phi$, [dass sie spät nach Hause kam]$_\iota$ erzählt$_\omega$)$_\Phi$]$_\iota$.

Figure 1 illustrates how the prosodic structure favors extraposition of complement clauses: When the *dass*-clause is extraposed, as in (3a) and Fig. 1 left panel, the main clause and the embedded clause each form their own ι-phrase. They project ι-phrases at the higher level of the hierarchy by virtue of being clauses.[4] The sequence of two ι-phrases itself forms a larger recursive ι-phrase. However, when the complement clause is in-situ as in (3b) and the right panel of Fig. 1, the Φ-phrase formed on the VP *niemandem erzählt* "told nobody" is interrupted by the ι-phrase formed by the complement clause. The verb does not form a Φ-phrase by itself; it is only a ω-word. In this case, besides the Φ-phrase on the object, the Φ-phrase mapped to the VP dominates a ω-word and an ι-phrase. In her paper on extraposition in German, Hartmann (2013) shows with numerous naturally occurring examples that sentences like (3b) are avoided in German. She assumes that a final single ω-word cannot be parsed into the preceding prosodic constituent, and that it does not form a Φ-phrase all by itself.[5] These assumptions are taken for granted here. In the present proposal, the verb is parsed into a larger Φ-phrase. The ungrammaticality is a result of the prosodic imbalance between the prosodic constituents and the way they are layered. In particular, a constraint called LAYEREDNESS (from Selkirk

[3] Selkirk (2011, p. 453) makes a distinction between *Match* (illocutionary clause, ι) and the more general *Match* (clause, ι). In the following, the distinction between the two doesn't play any role and is ignored in the remainder of the chapter.

[4] This differs from many accounts in the literature in which the apprehension of prosodic constituents is guided by the phonetic cues associated with them (see Schubö 2010; Elfner 2012; Myrberg 2013, etc.).

[5] However, it is not clear in her approach why the same structure does not lead to ungrammaticality in the case of relative clauses.

1996), prohibiting a category of a certain level to dominate a higher category, is violated. Moreover, an additional constraint called EqualSisters (from Myrberg 2013) is also violated in this configuration. EqualSisters requires that the prosodic constituents dominated by a higher constituent are at the same level; see Section 5 for formal definitions and further illustrations.

The examples in (4) show that a relative clause can also appear in-situ, i.e., right after its antecedent, or be extraposed, in which case it is postverbal. Both the extraposed and the in-situ locations are felicitous in German, even though the in-situ version (4b) is degraded as compared to the extraposed variant (4a). Due to *Match Phrase*, the object of the main verb and the relative clause form an additional Φ-phrase by virtue of being a DP, albeit a complex one.

(4) a. $[[(\text{Sie hat ihre Mutter getroffen})_{\Phi}]_{\iota}\ [\text{die an dem Tag mit Freunden unterwegs war}]_{\iota}]_{\iota}$
she has her mother met who on that day with friends out was
"She met her mother who was out with friends on that day."

b. $^{?}[[(\text{Sie hat }((\text{ihre Mutter})^{\Phi}\ [\text{die an dem Tag mit Freunden unterwegs war}]_{\iota})^{\Phi}$
$\text{getroffen})_{\Phi}]_{\iota}]_{\iota}$

Figure 2 illustrates the difference in prosodic structure between the two versions of (4). In the left panel, the relative clause is extraposed, and the Φ-phrase formed by the object and the transitive verb is not interrupted. As before, both the main clause and the embedded clause project ι-phrases at the higher level of the hierarchy. But when the relative clause is in-situ, as in the right panel of Fig. 2, Layeredness is violated in the DP. The object of *getroffen,* thus *ihre Mutter,* forms a Φ-phrase because of *Match Phrase,* and the relative clause forms an ι-phrase because of *Match Clause*. Additionally, the DP plus the relative clause also form a Φ-phrase.[6] The verb by contrast does not form a Φ-phrase by itself. *Equal Sisters* is violated twice, in the Φ-phrase formed by the DP and in the Φ-phrase formed by the VP.

Comparing extraposition of a sentential complement with extraposition of a relative clause, it is striking that extraposition improves the acceptability of sentences with a sentential complement much more than in the case of a relative clause. There is a difference in acceptability between the two versions of (1), which is absent in (4). Extraposition of a relative clause is never obligatory: A preverbal relative clause may be degraded but is always acceptable. Besides the difference in prosodic structure, to which we return in Section 5, it must also be noticed that the relative clause has an antecedent, as opposed to a complement clause, which has none. The presence of an antecedent provides a strong syntactic motivation for a

[6] In the example, the relative clause is nonrestrictive because of the antecedent *Mutter* "mother," denoting a unique person, and I assume that, in this case, *ihre Mutter* "her mother" is a Φ-phrase mapped to the DP to which the relative clause is adjoined. A restrictive relative clause would be attached to the N *Mutter,* forming a prosodic monster one level down the hierarchy. It is sometimes assumed that a restrictive relative clause extraposes more easily than a non-restrictive relative clause. This may be due to the difference in the level at which the prosodic monster is formed (see also Section 4 for some comments on the influence of accent structure, definiteness and restrictivity on extraposition).

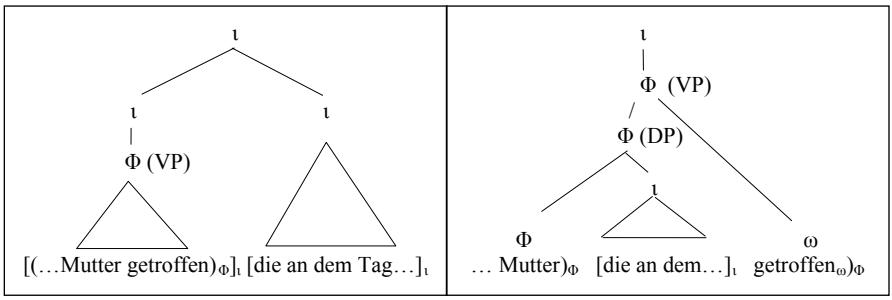


Fig. 2 Extraposition as avoidance of a prosodic monster (relative clause)

relative clause to be adjacent to its antecedent. The antecedent anchors the entire object with its relative clause in the preverbal position, as they form a syntactic and a prosodic constituent together, as shown in Fig. 2. This constituent is lacking in the case of a complement clause. In the OT account in Section 5, the preference for a relative clause and its antecedent to be adjacent is captured by a constraint called ADJACENCY, formulated in (27).

That this analysis is on the right track is further confirmed by the following observation. A *dass*-complement can follow a noun, a demonstrative or a quantifier, as shown in (5) with a noun. In this case, the complement clause behaves like a relative clause and can remain head-adjacent, even if the part of the main clause following the complement clause is very short and consists of only one ω-word. The embedded clause is thus quite acceptable in the preverbal position. The extraposed version is of course even better; see (5b).

(5) a. ?[Anna hat (die Behauptung, [dass sie in der Nacht ihre Mutter im
Anna has the claim that she in the night her mother on.the
Treppenhaus gesehen hat]$_{\iota}$, bestritten)$_{\Phi}$]$_{\iota}$.
staircase seen has denied
"Anna denied the claim that she met her mother on the staircase that night."

b. [Anna hat (die Behauptung bestritten)$_{\Phi}$]$_{\iota}$, [dass sie in der Nacht ihre Mutter im Treppenhaus gesehen hat]$_{\iota}$.

In further cases, the in-situ version of sentences with embedded clauses sounds at least as good or even better than the extraposed version. Consider (6), in which the final part of the main clause consists of two words, *nicht erzählt* "not told," instead of just one. Augmenting the verb with an adverb improves the in-situ variant of this sentence. This is because now the adverb plus the verb form a Φ-phrase. In (6) and Fig. 3, the relative clause is inserted *between* two Φ-phrases. The adverb carries the nuclear stress of the main sentence, which is then adjacent to the verb. The top Φ dominates two lower Φ-phrases and an ι, and a prosodic monster is avoided. Additionally MINIMALBINARITY (MINBIN) is fulfilled, a constraint to the effect that a Φ-phrase needs at least two ω-words to be well formed (Ghini 1993; Selkirk 2000). It is fulfilled in Fig. 3 by *nicht erzählt*. See Section 5 for a formal demonstration.

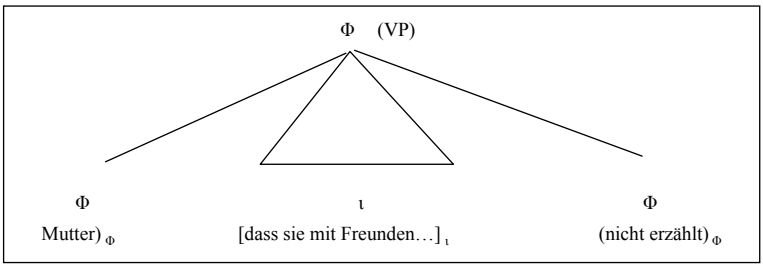


Fig. 3 No prosodic monster in a *dass* complement with nominal antecedent: *MinBin* is fulfilled

(6) [(Sie hat ihrer Mutter)$_{\Phi}$ ([dass sie mit Freunden unterwegs war]$_{\iota}$ (nicht erzählt)$_{\Phi}$)$_{\Phi}$]$_{\iota}$
she has her mother that she with friends out was not told
"She did not tell her mother that she was out with friends."

It has been shown in this section that a prosodic account of extraposition can explain the difference between nearly obligatory extraposition of complement clauses and optional extraposition of relative clauses. Extraposition is nearly obligatory when an embedded structure creates a prosodic monster. In the case of a relative clause, extraposition is optional because extraposition destroys the preferred adjacency between the antecedent and the relative clause. In this case, the need for continuous constituents conflicts with the need to avoid prosodic monsters.

3 The Prosodic Structure of PP Extraposition

As in the case of clauses, extraposition of prepositional phrases improves the prosodic structure of the sentence as a whole. However, it is rarely obligatory, and only rarely preferred. The prosodic structure of the in-situ versions of PPs involves a Φ-phrase mapped to the PP and often embedded into a larger Φ-phrase, depending on the syntactic role of the PP. Recursion of Φ-phrases is often found in German and does not lead to ungrammaticality by itself. Nevertheless, a PP readily extraposes, creating in this way a prosodically balanced structure, as shown below.

In illustrating PP extraposition, a syntactic distinction will be adopted from Frey (2012), who distinguishes between attributive, argumental, and adverbial PPs. Both syntactic and prosodic structures differ between these three kinds of PP. We start with attributive PPs, as in *von ihrer Mutter* "of her mother" in (7). The attributive PP is part of the DP whose head it characterizes, and it is embedded into the larger DP when it is in-situ. Such a PP can be extraposed, as in (7a), or in-situ, as in (7b); there is not much difference in acceptability.

(7) a. [(Maria)$_{\Phi}$(wollte (das Kleid)$_{\Phi}$ tragen)$_{\Phi}$ (von ihrer Mutter)$_{\Phi}$]$_{\iota}$
Maria wanted the dress wear of her mother
"Maria wanted to wear her mother's dress."
b. [(Maria)$_{\Phi}$(wollte (das Kleid (von ihrer Mutter)$_{\Phi}$)$_{\Phi}$ tragen)$_{\Phi}$]$_{\iota}$

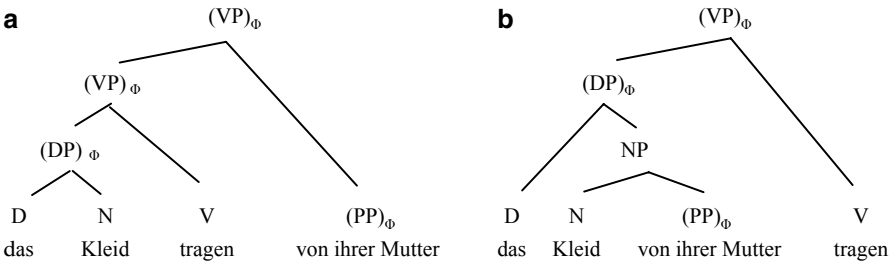


Fig. 4 Extraposition of an attributive PP

Compare Fig. 4 illustrating the prosodic structure of the two versions with the syntactic structure added. In the case of PP extraposition (left panel and (7a)), there is a lower segment of the VP consisting of the head of the object and the verb, thus *das Kleid tragen,* allowing them to build a Φ-phrase to the exclusion of the attributive PP. Even if *Kleid* "dress," the head of the argument noun phrase, does not carry the nuclear accent in this case, it has a special role in being preverbal: it is the head of the argument-predicate complex. The higher VP segment includes both the lower VP and the attributive PP. In the in-situ case (right panel and (7b)), the entire argument is immediately preverbal. The VP is complete with the PP intervening between the noun *Kleid* "dress" and the verb. As a result, the head noun *Kleid* is separated from the verb by the possessive attributive, which carries the default nuclear accent. In this case, the PP *von ihrer Mutter* "of her mother" is a Φ-phrase, embedded in the Φ-phrase of the entire object, which is itself embedded into the Φ-phrase of the VP. In both cases, recursion of the Φ-phrase applies, although in different ways. Both before and after extraposition, the PP is a subpart of the prosodic constituent from which it originates, i.e., the Φ-phrase matching the higher VP segment. However, it is recursively embedded in the case of preverbal location and juxtaposed in the case of extraposition.

The first version contains two more or less equally balanced Φ-phrases (the VP and the PP), but the PP is separated from the noun it modifies; see Section 5 for a more formal analysis. The second version contains one long recursive Φ-phrase (the VP). The two versions elicit subtle differences in meaning. When the attributive is discourse-given, (7a) is much better; (7b) is avoided when both the attributive and the final verb are unaccented. If the attributive PP is new, both versions are fine.[7]

If the possessive attributive constituent is a genitive DP as in (8), extraposition is ungrammatical.

[7] In the example (i) from Haider (2010, quoted from Max Frisch), the extraposed PP is unaccented, and thus potentially right dislocated.

(i) (Sie will (nichts mehr)$_{\Phi}$ wissen)$_{\Phi}$(davon)$_{\Phi}$
she wants nothing more know it-of
"She does not want to know anymore about this."

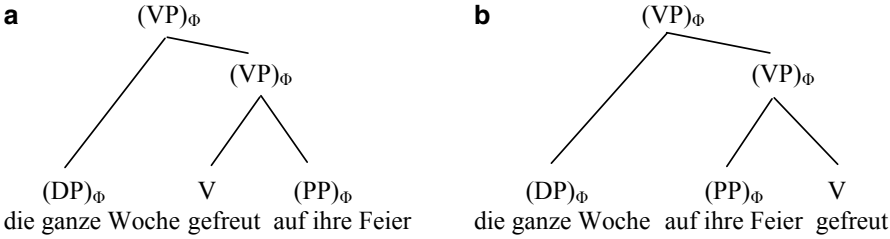


Fig. 5 Extraposition of an argumental PP

(8) a. [(Maria)$_{\Phi}$ (wollte (das Kleid (ihrer Mutter)$_{\Phi}$)$_{\Phi}$ tragen)$_{\Phi}$]$_{\iota}$
Maria wanted the dress her.GEN mother wear
"Maria wanted to wear her mother's dress."
b. *[(Maria)$_{\Phi}$(wollte ((das Kleid)$_{\Phi}$ tragen)$_{\Phi}$)$_{\Phi}$(ihrer Mutter)$_{\Phi}$]$_{\iota}$

I assume that the explanation for the ungrammaticality of (8b) is located in syntax, and not in prosodic structure, since the DP in (8) has the same prosodic form as the PP in (7): the reason for the ungrammaticality of (8b) is that a genitive complement has to be adjacent to its head, and thus it cannot be extraposed on independent grounds. Notice also that the genitive DP in (8) gets its case from the noun and not from the verb, so that an explanation in terms of case assignment should be general enough to account for such a restriction. And a DP is introduced by a functional element, the article, in the same way as PPs and CPs are also introduced by functional elements, so that this cannot explain the difference between the extraposability of the constituents, at least not without additional stipulations.

The next example, in (9), involves an argumental PP. (9a) shows an extraposed PP *auf ihre Feier* "to her party," and (9b) an in-situ one.

(9) a. [(Anna)$_{\Phi}$ (hatte sich (die ganze Woche)$_{\Phi}$(gefreut (auf ihre Feier)$_{\Phi}$)$_{\Phi}$)$_{\Phi}$]$_{\iota}$
Anna had REFL the whole week rejoiced on her party
"Anna had been looking forward to her party the whole week."
b. [(Anna)$_{\Phi}$ (hatte sich (die ganze Woche)$_{\Phi}$ ((auf ihre Feier)$_{\Phi}$ gefreut)$_{\Phi}$)$_{\Phi}$]$_{\iota}$

Except for the relative position of the verb and its argument and thus the position of the metrical head, there is no difference in phrasing between (9a) and (9b), see Fig. 5. In both cases, *auf ihre Feier* forms a Φ-phrase together with the verb, in addition to forming its own Φ-phrase. In other words, the argument and the verb are prosodically integrated in a joint Φ-phrase. There is thus one level of embedding less than in the case of an attributive PP. Notice that the adverbial *die ganze Woche* "the whole week" and the participle do not form a single Φ-phrase together to the exclusion of the argument (see Gussenhoven 1992; Truckenbrodt 2006 and Féry 2011 for the difference in phrasing between arguments and adjuncts).

The extraposed version in (9a) is again preferred when the argument is given in the context, or at least when it has a different information structural role from the preceding constituent. When the argument is immediately preverbal, as in (9b), the

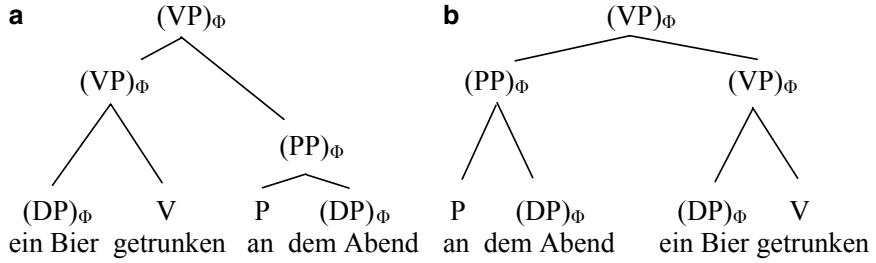


Fig. 6 Extraposition of an adverbial PP

nuclear accent of the argument–predicate complex is located on this preverbal constituent. This version is preferred in a context where the sentence is all-new, and it is slightly awkward when the argument is given and the verb needs the nuclear accent.

Finally, when the PP is an adverbial adjunct, as in (10), no integration between verb and adjunct is expected. In other words, the PP and the verb are in different Φ-phrases from the start, regardless of word order. In (10a), the temporal adverbial *an dem Abend* "in the evening" is extraposed, and in (10b), it is in-situ. The argument *ein Bier* "a beer" is preverbal in both cases, and this argument forms a Φ-phrase with the verb. The adverbial PP is located before the object in the in-situ word order, as shown in (10b). The prosodic versions are shown in Fig. 6. It is unsurprising that both orders, the non-extraposed and the extraposed one, are more or less equivalent in their acceptability. Argument and verbal head are adjacent in both cases. And as before, the extraposed version is the best one if the adjunct is given. In the b version it may also be a (contrastive) topic; see Frey (2004).

(10) a. $[(\text{Anna})_{\Phi}\ ((\text{hatte}\ (\text{ein Bier})_{\Phi}\ \text{getrunken})_{\Phi}\ (\text{an dem Abend})_{\Phi})_{\Phi}]_{\iota}$
Anna had a beer drunk at the evening
"That evening, Anna had a beer."
b. $[(\text{Anna})_{\Phi}\ (\text{hatte}\ (\text{an demAbend})_{\Phi}\ ((\text{einBier})_{\Phi}\ \text{getrunken})_{\Phi})_{\Phi}]_{\iota}$

A directional or locational adverb is usually preverbal, i.e., located after the argument of the verb and it thus intervenes between the argument and the predicate. It is often unaccented, and does not block the integration between object and verb; see Féry (2011) for an OT analysis. Haider (2010) cites a sentence with an extraposed locational adjunct PP, (11a), from Thomas Mann. The locational PP can also appear between the preverbal object and the verb, as in (11b), forming a recursive prosodic structure. However, and differently from the attributive PP in (7), the adjunct can be unaccented even if it is not part of the background.

(11) a. $(\text{Morgen})_{\Phi}\ (\text{soll}\ \text{ich}\ (\text{den Dienst})_{\Phi}\ \text{antreten})_{\Phi}\ (\text{in diesem Haus})_{\Phi}$
Tomorrow shall I the service begin in this house
"Tomorrow I shall begin my service in this house."
b. $(\text{Morgen})_{\Phi}\ (\text{soll ich}\ (\text{den Dienst})_{\Phi}\ (\text{in diesem Haus})_{\Phi}\ \text{antreten})_{\Phi}$

In the case of an adjunct PP, the ability to extrapose is probably due to the adverbial status rather than to the PP status. In (12), an adverbial DP is extraposed. Such adverbial DPs bear intrinsic (nonstructural) case, as opposed to the structural case of arguments as discussed for (8).

(12) [Weil ((Maria)$_{\Phi}$ (geschlafen hat)$_{\Phi}$)$_{\Phi}$ (den ganzen Vormittag)$_{\Phi}$]$_{\iota}$
Because Maria slept has the whole morning
"Because Maria slept the whole morning."

In summary, the answer provided in this chapter for extraposition is based on the prosodic needs of a sentence, which may conflict with the syntactic preferences. On the syntactic side, there is a strong preference for constituents to be continuous, and for arguments to be on the left side of the verb in order to be properly governed, at least in the embedded word order. There is also a preference for the verb to be sentence final. On the prosodic side, extraposition results in fulfillment of LAYEREDNESS and *Non-Recursivity* and an overall more balanced prosodic structure than in the case of in-situ; see Section 5. The choice between extraposition and non-extraposition of PP can be the result of a trade-off between these conflicting tendencies.

4 Prosodic Limits of Extraposition

So far, it has been shown that extraposition may improve the prosodic structure of an entire sentence. In this section, we turn to examples that show that extraposition of a relative clause or of a PP may lead to less acceptable results than an in-situ version of the same sentence. This happens when a potential intervener is located between an extraposed constituent and its antecedent or its reconstructed position. A potential intervener is an accented full maximal projection (XP), usually a DP. A constraint called NOINTERVENER is formulated in (13) for ease of reference. This constraint forbids the presence of an accented intervener—the accented XP in (13)—between the antecedent of an extraposed constituent or its reconstructed position (… t_i…) and its actual position (…YP_i…). It is to be interpreted as a violable OT constraint, thus as expressing a preferred option, rather than a strict prohibition.[8]

(13) NOINTERVENER: No intervener between antecedent or reconstructed position and extraposed relative clause
×
*… t_i…(XP)$_{\Phi}$(….YP_i…)$_{\Phi}$

The main idea of NOINTERVENER is to account for the fact that the distance between an extraposed constituent relative to its reconstructed position is not as relevant as the presence of an intervening potential antecedent.

[8] The absence of prosodic boundaries around t_i leaves it open whether there are additional boundaries. Moreover, ι-phrase boundaries separate XP and YP in the case of clause extraposition.

Consider first an example involving PP extraposition, adapted from Truckenbrodt (1995b, p. 510). NoIntervener accounts for the difference in felicity between (14a) and b in the following way: Sentence (14a) satisfies NoIntervener because there is no intervener between the reconstructed position *t* and the extraposed constituent. Sentence (14b) does not satisfy NoIntervener because the DP *Buch* "book" intervenes between the reconstructed position *t* and the extraposed constituent. In such a constellation, the participle is not accented. Accented words are indicated with small caps. Note that the status of the extraposed constituent as accented or not is immaterial.

(14) a. (Anna)$_{\Phi}$ (hat einem KOLLEGEN)$_{\Phi}$ (ein BUCH *t* gekauft)$_{\Phi}$ (von Chomsky)$_{\Phi}$.
Anna has a.DAT colleague a book bought by Chomsky
"Anna has bought a book by Chomsky for a colleague."
b. ??/*(Anna)$_{\Phi}$ (hat einem KOLLEGEN *t*)$_{\Phi}$ (ein BUCH gekauft)$_{\Phi}$ (aus Italien)$_{\Phi}$.
Anna has a.DAT colleague a book bought from Italy
"Anna has bought a book for a colleague from Italy."

The following examples illustrate relative clause extraposition. In (15a), there is no intervener between the relative clause and its antecedent, whereas there is one in (15b), and it is this difference that accounts for the ill-formedness of (15b).

(15) a. [(Linda)$_{\Phi}$ (hat dem KIND)$_{\Phi}$(das KLEID *t* geschenkt)$_{\Phi}$]$_{\iota}$ [(das sie selbst
Linda has the.DAT child the dress given that she herself
ausgesucht hatte)$_{\Phi}$]$_{\iota}$.
chosen had
"Linda gave the child the dress that she had chosen herself."
b. ??/*[(Linda)$_{\Phi}$ (hat dem KIND *t*)$_{\Phi}$ (das KLEID geschenkt)$_{\Phi}$]$_{\iota}$ [(das gestern
Linda has the.DAT child the dress given who yesterday
geweint hat)$_{\Phi}$]$_{\iota}$.
cried has
"Linda gave the dress to the child who cried yesterday."

Numerous similar cases of ill-formed extraposition of a relative clause are well known from the literature, some of which are reproduced here. In all examples, the source of the infelicity is the intervener separating the relative clause from its antecedent; see also Bader, this volume, and Poschmann and Wagner (2014) for experimental confirmation of this observation for German. (16a–b) are from Haider (1994). (16c) is from Lenerz (1977, p. 34); see also Altmann (1981, p. 176).[9]

[9] The account presented here contrasts with the formula (i) proposed by Truckenbrodt (1995b:503), which claims that only the distance in terms of prosodic constituents counts for extraposition.
(i) [$_{\pi}$… XP…] → [$_{\pi}$… t$_{i}$…] [$_{\pi}$ XP$_{i}$].
Extraposed constituents are separated from their base position by exactly one phonological constituent of the same size as themselves. When the movement is too short or too long, extraposition is no longer allowed. XP is a syntactic category that is mapped into the prosodic category π. π is either a Φ-phrase or an ι-phrase: An extraposed PP is a Φ-phrase and an extraposed clause is an ι-phrase. However, Frey (2009) shows that (i) both overgenerates and undergenerates. For

(16) a. ??/*[(Maria)$_{\Phi}$ (hat dem KOLLEGEN *t*)$_{\Phi}$(ihre FREUNDIN vorgestellt)$_{\Phi}$]$_{\iota}$
Mary has the.DAT colleague her.ACC friend introduced
[(der im LOTTO gewonnen hat)$_{\Phi}$]$_{\iota}$.
who in-the lottery won has
"Mary introduced her friend to the colleague who won in the lottery."

b. [Maria hat ihre FREUNDIN dem KOLLEGEN *t* vorgestellt]$_{\iota}$ [der im Lotto gewonnen hat]$_{\iota}$.

c. ??/*[(Peter hatte der FRAU *t*)$_{\Phi}$ (eine ROSE geschenkt)$_{\Phi}$]$_{\iota}$ [die schwanger war]$_{\iota}$.
Peter had the woman a rose given who pregnant was
"Peter gave a rose to the woman who was pregnant."

Altmann (1981) and Inaba (2007) claim that every intervening DP can in principle block extraposition; see also Bolinger (1992) for similar remarks for English. However, Kathol and Pollard (1995) cite the following exception to the general blocking by any intervening DP: directional or locational adverbs can be unaccented, even when they are new in the context (see Féry 2011 for a prosodic analysis of such adverbials); compare (17) and also (18) from Truckenbrodt (1995b). In such cases, NOINTERVENER is fulfilled since there is no accented potential antecedent intervening between the extraposed constituent and the antecedent.

(17) Wir haben das BUCH *t* ins Regal gestellt [das ich gestern gekauft habe]$_{\iota}$
we have the book on.the shelves put that I yesterday bought have
"We put the book that I bought yesterday on the shelves."

(18) [Anna hat zwei BÜCHER *t* auf einen Tisch gelegt]$_{\iota}$ [die sie am Dienstag
Anna has two books on the table put which she on Tuesday
aus Italien mitgebracht hat]$_{\iota}$.
from Italy brought has
"Anna put two books that she brought from Italy on Tuesday on the table."

Lenerz (1977, p. 35) observes that the relative clause can be extraposed across a full DP when the determiner is accented, as in (19a).[10] Wiltschko (1997, p. 387) makes the same claim and cites the pair in (19 b–c). She attributes the grammaticality of (19b) to the restrictiveness of the relative clause. It is true that an accent on the determiner strongly correlates with a restrictive reading. However, the reason for the improvement of these sentences relative to those in (16) is the absence of an accented DP between the antecedent and the relative clause, as the reader with knowledge of German can verify. The nuclear status of the accent on the determiner

instance, in both cases in (15), the extraposed relative clause is adjacent to the ι-phrase containing the antecedent and thus to the ι-phrase from which the relative clause originates, in agreement with (i), which thus predicts that both versions of (15) should be equally acceptable. The same comment holds for all sentences in (16).

[10] Bader (this volume) finds that accent on the determiner improves the acceptability of a sentence with extraposition, as compared to accent on the noun.

correlates with the absence of postnuclear accents after the pitch accent. If there is no accented intervener, NoIntervener is satisfied.

(19) a. Peter [hatte DER Frau eine Rose/sie geschenkt] [die schwanger war]$_t$.
b. [Den Mann *t* gesehen] hat Peter gestern auf der Party [der Bier trinkt]$_t$.
the man seen has Peter yesterday on the party who beer drinks
"Peter saw the man who drinks beer at the party yesterday."
c. ??/*[Den Mann *t* gesehen] hat Peter gestern auf der Party [der Bier trinkt]$_t$.

NoIntervener often accounts for the sequencing of embedded clauses. The sentences in (20), adapted from Wiltschko (1997, p. 381), contain two extrapositions, a relative clause and a *dass*-complement. NoIntervener accounts for the preference for (20a) over (20b) if it is assumed that embedded clauses contain at least one accented word.

(20) a. weil Anna einer Frau t_1 t_2 gesagt hat [die sie KANNTE$_1$]$_t$ [dass
because Anna a.DAT woman said has who.FEM she knew that
sie JEMANDEN getroffen hat$_2$]$_t$.
she someone met has
"Because Anna told a woman she knew that she met someone."
b. * weil Anna einer Frau *t* gesagt hat [dass sie JEMANDEN getroffen hat]$_t$
because Anna a.DAT woman said has that she someone met has
[die sie KANNTE]$_t$.
who.FEM she knew

If the reconstructed position is the same, two extraposed clauses can come in both orders. The following examples are again from Wiltschko (1997, p. 381). t_1 t_2 may come in both orders. Notice that the in-situ version, with both embedded sentences in the preverbal position, is barely acceptable if at all. One embedded clause is a *dass*-complement and the other one is a comparative clause.

(21) a. Peter hat schneller t_1 t_2 gesagt, [$_{ARG}$ dass er sich langweilt]$_t$ [$_{COMPAR}$ als ich
Peter has more.quickly said that he REFL bored.is]$_t$ than I
erwartet hatte.
expected had
"Peter said more quickly than I had expected that he was bored."
b. Peter hat schneller gesagt, [$_{COMPAR}$als ich erwartet hatte]$_t$ [$_{ARG}$dass er sich langweilt]$_t$.

To sum up, this section has been concerned with accented elements intervening between an extraposed element and its antecedent (in the case of a relative clause) or its reconstructed position (in the case of a complement clause or a PP). It has been shown that such an intervener always drastically reduces the grammaticality of extraposition, and that in the case of a relative clause an accented DP is particularly problematic. Some further prosodic effects also play a role, such as accents on other constituents. Additional syntactic and semantic principles influencing the order of two extraposed clauses, like binding and information structure, cannot be discussed in this chapter.

5 An OT Analysis of Extraposition

5.1 The Role of Syntax

If it is assumed that the canonical licensing direction for verbs in German is to the left (see for instance Frey 2012; Haider 2010; Hartmann 2013 and Sternefeld 2008 for this claim), extraposition of sentential complements is bound to be a syntactically marked construction as compared to in-situ location of complements. As a result, the near obligatoriness of extraposition in (1) is difficult to explain in a purely syntactic model. To make this point even clearer, compare the preverbal position of a nominal argument with the ungrammatical extraposition of this argument in (22). As shown in (22c), topicalization is not a problem for argumental DPs in German.

(22) a. Anna hat ihrer Mutter die Geschichte erzählt.
Anna has her mother the story told
"Anna told her mother the story."
b. *Anna hat ihrer Mutter erzählt die Geschichte.
c. Die Geschichte hat Anna ihrer Mutter erzählt.

All approaches assuming that extraposition is movement to the postfield must assume at the same time that it is a less marked syntactic option for a relative clause to be adjacent to its head than to be extraposed. It can safely be claimed that no movement approach has ever considered an extraposed constituent as syntactically better than its in-situ counterpart. As a result, it has sometimes been claimed that extraposition is a postsyntactic phenomenon; see Chomsky (1986, p. 40) for the view that "extraposition is indeed a phonetic form (PF) rule."[11]

The difficulty of finding a straightforward explanation for extraposition in purely syntactic terms is even broader. It is fair to say that although the body of literature on the subject is huge, it is largely inconclusive: Neither A-movement nor Ā-movement nor base-generation delivers satisfactory explanations. One reason for this relates to the diversity and the complexity of the individual factors bearing on extraposition in syntax, as shown by several authors (see, for instance, Büring and Hartmann 1997 and Culicover and Rochemont 1990).

According to Haider (2010, p. 205) and Frey (2012), even though the canonical direction of licensing by verbs is to the left, extraposed PPs may be base-generated postverbally as locally dependent elements, with an obligatory antecedent relation. This may also hold for relative, complement, comparative, and resultative clauses. An argument for the view that argument clauses (CP complements) are generated after the verb is illustrated with an example from Müller (1998, p. 166) that shows that a preverbal argument clause can be ungrammatical rather than merely infelicitous.

[11] Chomsky lists three reasons for this judgment. First, the usual constraints on movement operations are not operational for extraposition. Second, the movement has no configurational-structural effect. Third, extraposition is in principle not obligatory, but optional.

(23) a. (Ich weiß nicht) wen_i er gesagt hat [$_{CP}$ dass Claudia t_i geküsst hat].
I know not whom he said has that Claudia kissed has
"I don't know who he said that Claudia has kissed."
b. *(Ich weiß nicht) wen_i er [*CP* dass Claudia t_i geküsst hat] gesagt hat.

To assume only one underlying position for each constituent may be misleading. An alternative solution is to assume that the position of a CP argument is intrinsically optional. In this case, the position of a dependent clause is not regulated once and for all in syntax; rather in many cases, both pre- and postverbal locations are possible options. In this case, the decision as to which surface position a clause occupies in a specific case may be driven by prosody (or by semantic, or information structural factors) in an OT fashion. Such an approach is in line with the prosodic approach developed in this chapter, which claims that the prosodic factors entering into the decision to extrapose a phrase or not may be decisive.

5.2 The Role of Prosody

This section proposes an OT approach to PP and clause extraposition to account for the prosodic component of the operation; see Prince and Smolensky (1993/2004) and McCarthy and Prince (1993a, b) for OT. Several OT constraints have been introduced above. It is now time to show how they interact formally in grammar and how they affect the data on extraposition. It is assumed that syntax delivers alternative linearizations of the constituents under examination, providing in this way the candidates to be evaluated. In other words, the candidates shown in the tableaux below are the result of the possible linearizations according to the syntactic constraints on linearization. The fact that the syntactic constraints are not shown in the tableaux does not imply that they are lower or higher ranking than the prosodic constraints. On the contrary, it is assumed here that syntax and prosody are working hand in hand and simultaneously. We concentrate in this chapter on the prosodic constraints, and ignore the syntactic constraints. In all the examples considered below, syntax provides two linearizations of embedded clauses and PPs: in-situ and extraposed. Note that there may be further relevant candidates delivered by the syntax, but they are of no concern here.

The candidates are assigned a prosodic structure through the effect of the *Match* constraints. The *Match* constraints from Selkirk (2011) were formulated in (2). They straightforwardly assume that a grammatical word, a syntactic phrase, and a clause roughly correspond to the three higher prosodic constituents, ω-word, Φ-phrase, and ι-phrase, respectively. The effects of the *Match* constraints are counterbalanced by well-formedness constraints imposing restrictions on the form of the relevant prosodic domains, as well as on the relations between them. These constraints evaluate the resulting prosodic domains, and choose among several candidates those that fulfill the well-formedness constraints best. Some of the well-formedness constraints were introduced and illustrated above; they are formulated

in (24); see Ghini (1993); Nespor and Vogel (1986), and Selkirk (1996, 2000) for the original formulations.

(24) a. Non-Recursivity: A prosodic constituent C_n does not dominate another constituent of the same level C_n.

b. Layeredness: A prosodic constituent C_m does not dominate a constituent of a higher level C_n, n>m.

c. Headedness: A constituent C_n dominates a constituent of the immediately lower level C_{n-1}. (A prosodic constituent has a head on the immediately higher level.)

d. Exhaustivity: No C_n immediately dominates C_{n-2}. (No prosodic constituent is skipped.)

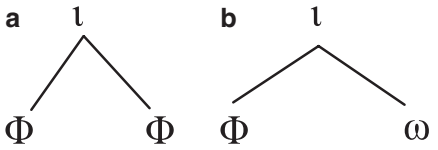
e. MinimalBinarity: A prosodic constituent C_n dominates at least two C_s. (A prosodically binary constituent is better balanced than a simple one.)

Myrberg (2013) proposes the constraint EqualSisters, which posits that the sister constituents of a dominating prosodic constituent are at the same level of the prosodic hierarchy. Headedness and Exhaustivity in (24c) and d independently account for the fact that the two sisters are preferably of the immediately lower category.

(25) EqualSisters (Myrberg 2013, p. 75)
Sister nodes in prosodic structure are instantiations of the same prosodic category.

(26)a fulfills EqualSisters, and (26)b violates this constraint.

(26)



As was shown in Section 2, a prosodic monster violates both Layeredness and EqualSisters.

An additional constraint in (27), called Adjacency, requires adjacency between a relative clause or an attributive PP and its nominal head (the antecedent). The fact that the relative clause or the possessive attributive is to the right of its head is regulated by independent (syntactic) principles that are of no concern here.

(27) Adjacency: A relative clause or a possessive attributive is adjacent to its antecedent.

In the following, it is shown how in-situ complement clauses and relative clauses violate the relevant well-formedness constraints, and how they are thus suboptimal as compared to the corresponding extraposed versions. In Tableau 1 (T1) the input

T1 DP+V+*dass*-Compl(1)		Layered	EqSis	Adj	MinBin
a. ☞	Ex (1a): [(…DP V)$_{\Phi}$]$_{\iota}$ [*dass*-Compl]$_{\iota}$				
b.	In (1b): [(…DP [*dass*-Compl]$_{\iota}$ V$_{\omega}$)$_{\Phi}$]$_{\iota}$	*!	**		
c.	In (1b): [(…DP [*dass*-Compl]$_{\iota}$(V)$_{\Phi}$)$_{\Phi}$]$_{\iota}$	*!	**		*

In-situ version: [(Sie hat niemandem, [dass sie spät nach Hause kam]$_{\iota}$ erzählt$_{\omega}$)$_{\Phi}$]$_{\iota}$

consists of a verb, an argument of the verb, and a complement clause of the verb, not linearized relative to each other. The extraposed and the in-situ versions of sentence (1) are the candidates to be evaluated for their prosodic well-formedness. The *Match* constraints are high ranking (see below for some additional remarks to this effect), and they are not violated in the tableaux of this section. For reasons of space, they are not shown. However, see below for elements of a solution to the problem of prosodic monsters implying violation of *Match*.

Candidate a. is the extraposed version, and it does not violate any of the well-formedness constraints in the tableau. It does violate Non-Recursivity and Headedness but these constraints are relatively low ranking in German.

Candidates b. and c., the suboptimal in-situ versions, violate Layeredness and EqualSisters. The latter constraint is violated twice in each candidate, because the top Φ-phrase dominates a Φ-phrase, an ι-phraseand a ω-word; see Fig. 1. Each adjacent pair of constituents constitutes a violation of EqualSisters. Candidate c shows that the main verb in the in-situ version is too light to form a Φ-phrase all by itself: it violates MinimalBinarity. It is important to realize that the well-formedness constraints are violable. It is proposed here that Layeredness is higher ranked than EqualSisters, Adjacency, and MinimalBinarity, though the exact ranking maybe subject to revision when more structures are considered.[12]

In Tableau 2 (T2), the input consists of a DP, a relative clause, and a verb, not linearized. Again, the two linearizations shown in candidates a. and b. are the results of the syntactic constraints. The extraposed version a. violates Adjacency, and the in-situ version b. violates Layeredness once and EqualSisters twice. This time, one of the violations of EqualSisters is caused by the Φ-phrase of the VP, which dominates a Φ-phrase and a ω-word, while the second violation comes from the Φ-phrase of the DP, which dominates a Φ-phrase and an ι-phrase; see Fig. 2. To account for

T2 [DP+*RelCl*+V]$_{VP}$(4)		Layered	EqSis	Adj	MinBin
a. ☞	Ex (4a): […(DP V)$_{\Phi}$]$_{\iota}$ [*RelCl*]$_{\iota}$			*	
b.	In (4b): […(DP [*RelCl*]$_{\iota}$ V$_{\omega}$)$_{\Phi}$]$_{\iota}$	*!	**		

In-situ version: [Sie hat ((ihre Mutter [die an dem Tag mit Freunden unterwegs war]$_{\iota}$)$_{\Phi}$ getroffen)$_{\Phi}$]$_{\iota}$

[12] Below, Non-Recursivity is added for PP extraposition. For now, this constraint is ignored: it is violated a number of times in all candidates. However, it is relatively low ranking and it never decides between the candidates in Tableaux 1, 2, and 3.

T3 *dass-Compl*+Φ-phr. (6)		Layered	EqSis	Adj	MinBin
a. ☞	Ex (6a): …$(\Phi)_{\Phi}]_{\iota}$ [*dass*-Compl]$_{\iota}$				
b.	In (6b): …[*dass*-Compl]$_{\iota}(\Phi)_{\Phi}]_{\iota}$		*!*		

In-situ version: [(Sie hat ihrer Mutter)$_{\Phi}$([dass sie mit Freunden unterwegs war]$_{\iota}$ (nicht erzählt)$_{\Phi}$)$_{\Phi}$]$_{\iota}$

the fact that the in-situ version may sometimes be preferred, it is assumed that other constraints may play a role; see below for the role of NoIntervener.

The in-situ versions considered in Tableaux 1 and 2 display unbalanced prosodic structures. It was shown with sentence (6) that as soon as the second part of the main clause is a Φ-phrase, there is no prosodic monster anymore; see Fig. 3 illustrating this. In the in-situ version, the adverb *nicht* separates the verb from its complement. The extraposed version is optimal in T3 since the in-situ variant violates EqualSisters. As in the case of T1, other constraints not considered here may force the in-situ version to be chosen in some circumstances. In-situ version b. does not violate Layeredness since the highest ι-phrase dominates one ι-phrase and two Φ-phrases (Table 3).

Since violation of the well-formedness constraints resulting in a prosodic monster is dependent on the result of *Match,* and *Match* requires that a clause is always mapped by an ι-phrase, and that a VP or a DP is always mapped by a Φ-phrase, a different kind of solution is conceivable, namely one that changes the prosodic constituency of the syntactic elements, in violation of *Match*. More generally, the question here is whether a clause could be downgraded to a Φ-phrase, or an XP could be upgraded to an ι-phrase, so that no prosodic monster arises in those configurations. In such a case, there would be no violation of Layeredness and no pressure of the prosody on syntax. Prosodic downgrading is expressed in (28).

(28) Prosodic Downgrading: $(\ldots\ [\ldots]_{\iota}\ \ldots)_{\Phi} \rightarrow (\ldots\ (\ldots)_{\Phi}\ \ldots)_{\Phi}$

Infinitive-CPs may escape the need to form ι-phrases, in which case they are indeed downgraded, as illustrated in (29) (from Sternefeld 2008, p. 410). As a result, they do not obligatorily extrapose. Infinitives form verbal complexes with the finite verbs of the main clause, especially modals. This also happens in syntax and in semantics.[13]

(29) [(Weil er (es zu vernichten)$_{\Phi}$ anordnete)$_{\Phi}$]$_{\iota}$
because he it to destroy ordered
"Because he ordered it to be destroyed."

Another conceivable option to escape violation of Layeredness consists in downgrading the Φ-phrase formed on the syntactic phrase comprising the embedded clause to an ι-phrase, as shown in (30). In a conceivable but different implementation of the *Match* constraints, as soon as a Φ-phrase contains an ι-phrase, it would

[13] Generally it can be said that the less embedded sentences participate in the at-issueness of the main clause, the more likely they are to be separate ι-phrases (see Potts 2005 and Selkirk 2011), and vice versa. However, since at-issueness is not prosodic, we do not try to address it in detail here.

become an ι-phrase itself, and thus respect LAYEREDNESS. However, except for the sake of avoiding a violation of LAYEREDNESS, there is no reason for such a step, in particular no intonational one. This solution strikes me as ad-hoc.

(30) Prosodic upgrading: $(\ldots\ [\ldots]_{\iota}\ \ldots)_{\Phi} \rightarrow [\ldots\ [\ldots]_{\iota}\ \ldots]_{\iota}$

Various models of syntax–prosody disallow embedding of prosodic constituents in each other, and eliminate this possibility from the start. A strict application of ALIGNMENT and NON-RECURSIVITY is illustrated in (31) (see Selkirk 2000 and Truckenbrodt 2006 among others). The result is a sequence of prosodic constituents of the same size, but no embedding of constituents into each other. Such an approach denies that the syntactic structure is reflected in the prosodic structure and favors a flat and non-isomorphic model of prosodic structure. Selkirk (2000) and Truckenbrodt (2006) propose that prosodic constituency may be deleted in postfocal and postnuclear material as a result of the absence of metrical prominence in this part of a sentence.

(31) Result of ALIGNMENT + NON-RECURSIVITY: $(\ldots\ [\ldots]_{\iota}\ \ldots)_{\Phi} \rightarrow (\ldots)_{\Phi}\ [\ldots]_{\iota}(\ldots)_{\Phi}$

Turning now to extraposition of PPs, no prosodic monster is at play here. It was shown in Section 4 that LAYEREDNESS is not violated by in-situ PPs, and that the pressure to extrapose a PP is much less than in the case of clauses. As a result, extraposition of PPs is always optional. To account for PP extraposition, NON-RECURSIVITY and ADJACENCY are equally ranked. MINIMALBINARITY is not shown anymore since it is irrelevant for the following cases. Tableaux 4, 5, 6 illustrate the three types of PPs that were discussed in Section 4. T4 shows a possessive attributive PP, T5 an argument PP, and T6 an adjunct PP. In T4, one candidate violates NON-RECURSIVITY and the other ADJACENCY. In T5, both candidates violate NON-RECURSIVITY, and in T6, no constraint is violated. As a result, in each case, both candidates are optimal.

T4 DP of PP+V (7) Attrib. PP	LAYERED	EQSIS	ADJ	NORECURS
a. ☞ Ex (7a): $(\text{DP V})_{\Phi}(PP)_{\Phi}]_{\iota}$			*	
b. ☞ In (7b): $(\text{DP }(PP)_{\Phi}\ \text{V})_{\Phi}]_{\iota}$				*

Ex version: $[(\text{Maria})_{\Phi}(\text{wollte }((\text{das Kleid})_{\Phi}\ \text{tragen})_{\Phi})_{\Phi}(\text{von ihrer Mutter})_{\Phi}]_{\iota}$

T5 *PP*+V (9) Argument PP	LAYERED	EQSIS	ADJ	NORECURS
a. ☞ Ex (9a): $(\text{V }(PP)_{\Phi})_{\Phi}]_{\iota}$				*
b. ☞ In (9b): $((PP)_{\Phi}\ \text{V})_{\Phi}]_{\iota}$				*

Ex version: $[(\text{Anna})_{\Phi}(\text{hatte sich (die ganze Woche})_{\Phi}(\text{gefreut})_{\Phi}(\text{auf ihre Feier})_{\Phi})_{\Phi}]_{\iota}$

T6 *PP*+VP (10) Adjunct PP	LAYERED	EQSIS	ADJ	NORECURS
a. ☞ Ex (10a): $(\text{VP})_{\Phi}(PP)_{\Phi}]_{\iota}$				
b. ☞ In (10b): $(PP)_{\Phi}(\text{VP})_{\Phi}]_{\iota}$				

Ex version: $[(\text{Anna})_{\Phi}((\text{hatte (ein Bier})_{\Phi}\ \text{getrunken})_{\Phi}(\text{an dem Abend})_{\Phi})_{\Phi}]_{\iota}$

T7 DP [DP *RelCl*]$_{DP}$ V (15a)	NoInterv	Layer	EqSis	Adj
×× a. ☞Ex (15a): (DP)$_{\Phi}$(DP *t* V)]$_{\iota}$ [(*Rel Cl*)]$_{\iota}$				*
×× b. In (15a): (DP)$_{\Phi}$(DP [(*R Cl*)]$_{\iota}$V)$_{\Phi}$]$_{\iota}$		*!	**	

Without interv.: [(Linda)$_{\Phi}$(hat dem Kind *t*)$_{\Phi}$(das Kleid*t* geschenkt)$_{\Phi}$]$_{\iota}$ [(das sie selbst ausgesucht hatte)$_{\Phi}$]$_{\iota}$

T8 [DP *RelCl*]$_{DP}$ DP V (15b)	NoInterv	Layer	EqSis	Adj
××	*!			*
a. Ex (15b): (DP *t*)$_{\Phi}$(DP V)]$_{\iota}$ [(*R Cl*)]$_{\iota}$				
××		*	**	
b. ☞In (15b): (DP)$_{\Phi}$(DP *t* V)$_{\Phi}$]$_{\iota}$ [(*R Cl*)]$_{\iota}$				*

With intervener: [(Linda)$_{\Phi}$(hat dem Kind *t*)$_{\Phi}$(das Kleid*t* geschenkt)$_{\Phi}$]$_{\iota}$ [(das gestern geweint hat)$_{\Phi}$]$_{\iota}$

The selection of one candidate over the other must be made by other constraints (regulating the information structure for instance), not shown here.

Finally, let us turn briefly to the effect of NoIntervener, as formulated in (13). This constraint is higher ranking than the other prosodic well-formedness constraints. Tableau 7 illustrates first a sentence without an intervener. It is assumed that each DP is accented, as shown in the candidates. The relative clause is not separated from its antecedent by an accented DP, whether the relative clause is in-situ or extraposed. As a result, the evaluation takes place as in T2 and the extraposed candidate is optimal. Tableau 8 shows a similar sentence, but this time with an intervener: The relative clause is separated from its antecedent by an accented DP. NoIntervener eliminates the candidate with an extraposed relative clause, even though it violates Layeredness and EqualSisters.

This short overview of an OT approach to the prosodic facts considered here ends the technical part of this chapter. The last section contains a short conclusion.

6 Conclusion

This chapter has investigated the prosodic aspects of extraposition of clauses and PPs, and their influence on syntax. First, a facilitation factor has been identified. It has been shown that extraposition takes place when the prosodic structure of the entire sentence improves, in the sense that the in-situ version violates some well-formedness constraints on the prosodic structure that the extraposed version does not. Avoidance of a prosodic monster, defined as a constellation violating Layeredness and EqualSisters, is achieved by extraposition. A prosodic monster arises

in a sentence containing a relative clause or an argument complement, where a Φ-phrase dominates the ι-phrase mapped on the embedded clause. Moreover, it was also shown that extraposition of a PP usually improves the prosodic structure of the sentence, but that extraposition of a PP is nonetheless always optional. When a PP is in-situ, no well-formedness constraint is fatally violated.

The second factor is a blocking one. Prosodic constraints can limit or block extraposition. First, syntax can block extraposition, as was shown with the ungrammaticality of extraposing an argumental DP in (22b). Second, extraposition is not available when an accented XP intervenes between an antecedent and relative clause, i.e., between an extraposed constituent and its reconstructed position; see (15) and the other examples of Section 4.

There is a long tradition in syntax of explaining extraposition from a purely syntactic perspective. However, syntactic approaches have to choose between movement and base-generated theory, and it has been amply demonstrated in the literature that neither approach can account for all cases of extraposition. As already claimed by Fodor (1998, 2002a, b), a view of prosody that limits its role to the interpretation of syntax is not satisfactory, because the effects demonstrated in this chapter are not due exclusively to syntax; see also Frazier et al. (2006) for the role of prosody in general. What we need is a theory of the syntax–prosody interface that allows a true interaction between the two.

An OT model has been proposed in the chapter that achieves this aim. When speakers elaborate a syntactic structure, they need to plan the corresponding prosodic structure at the same time. A theory like *Match* sketched above requires the syntactic structure to be mapped to abstract prosodic structures, which are layered, headed and recursive (see Féry 2011 for an analysis along these lines for German). Prosody has fewer constituents than syntax, although the constituents are organized in a stricter way than those of syntax. The prosodic structure is regulated by well-formedness constraints. In planning a sentence, a speaker tries to fulfill NoIntervener, Layeredness, Headedness, EqualSisters, MinimalBinarity, and Non-Recursivity, as well as other constraints regulating well-formedness of prosodic constituency. If these principles would be violated too badly in a concrete case, the speaker produces an alternative.

In this chapter, it has been amply demonstrated that prosody plays a role in choosing between competing syntactic structures. Fodor's work has opened a new avenue of research in this direction and this chapter has proposed a new application.

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