

## Improper edge features and extraposition

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# Abstract

The basic goal of this paper is to present the insights from Müller (1995) concerning extraposition in a new guise. Müller (1995) focuses on the distinction between leftward and rightward movement and proposes an account that relies on concepts such as improper movement and barriers. In view of the fact that in particular the notion of the barrier has vanished from current syntactic theory, this paper aims to bring together the original empirical insights and tools from more recent syntactic models. To this end, basic ideas of phase theory (as implemented in Müller (2010, 2011)) are used and slightly modified in such a way that the observed movement patterns can be derived. The basic assumption is that not all types of edge features can be inserted on all phase heads alike, which implies that intermediate movement steps to certain phase edges might be categorically blocked for particular movement types. So we end up with a theory of improper edge feature insertion, which can block extraction in the cases at hand just as barriers and improper movement steps could back in the 1990s.

## 1. Key Features of Extraposition

Extraposition means that a constituent occurs to the right of its canonical position; this is illustrated in (1b), where the complement clause of the noun *claim* has been extraposed (as opposed to (1a)).

- (1) a. The claim [<sub>CP</sub> that the world was round] was made by the Greeks.  
b. The claim t<sub>1</sub> was made by the Greeks [<sub>CP</sub> that the world was round]<sub>1</sub>. (cf. Roberts 1997: 191)

As suggested by the notation in (1b), it is often assumed that extraposition comes about via rightward movement, and this is also the starting point

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of Müller's (1995) analysis.<sup>1</sup> In a nutshell, Müller (1995) proposes that extraposition involves right-adjunction to IP,<sup>2</sup> and this enables us to derive the specific properties of extraposition that constructions involving leftward movement do not share, since the differences follow straightforwardly from the theory of improper movement. In the following subsections we will briefly have a look at three of these properties; in section 2, we will turn to Müller's (1995) account of these facts, before we discuss an alternative, phase-based implementation in section 3. Section 4 concludes the paper.

### 1.1. The Right Roof Constraint

A first restriction on rightward movement that has already been observed by Ross (1967) concerns its clause-boundedness, which has been subsumed under the so-called Right Roof Constraint.

#### (2) *Right Roof Constraint (RRC):*

Rightward movement is always clause-bounded.

This is exemplified in (3), which shows that the extraposed CP cannot be adjoined to a TP embedding the clause in which the former has been base-generated. By contrast, it is well-known that, for example, *wh*-movement, an instance of leftward movement targeting SpecC, can cross clause boundaries with ease (see (4)).<sup>3</sup>

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<sup>1</sup>In general, we can distinguish between three basic types of approaches to extraposition plus mixed approaches (see also Müller 1995: 221 for an overview): (i) there are movement-based analyses (see, for instance, Bierwisch 1963, Baltin 1981 et seq., Müller 1995, Buring & Hartmann 1997, Fischer 2018), (ii) base-generation approaches (see, for instance, Koster 1978, Culicover & Rochemont 1990, Haider 1997), (iii) proposals treating extraposition as a PF-phenomenon (see, for instance, Truckenbrodt 1995, Göbbel 2007), and (iv) mixed approaches that assume in particular that extraposed arguments undergo movement, while extraposed adjuncts are base-generated in the respective position (see, for instance, Fox & Nissenbaum 1999, Kiss 2005, Hunter & Frank 2014; in fact, the latter only addresses adjunct extraposition). Since I want to remain agnostic regarding the latter idea, I will stick to examples involving argument extraposition (although Müller 1995 does not make this distinction).

<sup>2</sup>In the following, I will use the notation TP.

<sup>3</sup>The same holds for German as the translated version in (i) shows:

- (i) Was<sub>1</sub> hast du gesagt [<sub>CP</sub> dachte Sue [<sub>CP</sub> hätten die Griechen t<sub>1</sub> bewiesen]]?  
 what have you said thought Sue would have the Greeks proven  
 'What did you say Sue thought the Greeks had proven?'

(3) *Long extraposition:*

\*[<sub>TP</sub> The proof that [<sub>TP</sub> the claim  $t_1$  was made by the Greeks] was given in 1492 [<sub>CP</sub> that the world was round]<sub>1</sub>].

(cf. Roberts 1997: 191)

(4) *Long wh-movement:*

What<sub>1</sub> did you say [<sub>CP</sub> Sue thought [<sub>CP</sub> the Greeks had proven  $t_1$ ]]?

The sentences in (5a) and (5b) illustrate that the RRC also holds in German; while (5a) involves extraposition within the clause boundary, (5b) shows the attempt to move the extraposed CP into a higher clause – as a result, the RRC is violated and the sentence is correctly predicted to be ungrammatical.<sup>4</sup>

(5) *Extraposition: (a) RRC respected; (b) RRC violated*

- a. Gereon hat immer zugegeben, [<sub>CP</sub> dass [<sub>DP</sub> der Versuch  $t_1$ ] Gereon has always admitted that the attempt scheitern muss, [<sub>CP</sub> mit dem Rad im Berufsverkehr Bahn fail must with the bike in.the rush.hour.traffic train zu fahren]<sub>1</sub>], wenn er guter Laune war. to ride when he good.GEN mood was  
‘When he was in a good mood, Gereon has always admitted that the attempt must fail to take ones bike on the train during rush hour.’
- b. \*Gereon hat immer zugegeben, [<sub>CP</sub> dass [<sub>DP</sub> der Versuch  $t_1$ ] Gereon has always admitted that the attempt scheitern muss], wenn er guter Laune war, [<sub>CP</sub> mit dem fail must when he good.GEN mood was with the Rad im Berufsverkehr Bahn zu fahren]<sub>1</sub>. bike in.the rush.hour.traffic train to ride  
(cf. Müller 1995: 214, (3), for a similar example)

Similarly, topicalization is not clause-bounded; see, for instance, (ii):

- (ii) [<sub>DP</sub> Die Kuhweide]<sub>1</sub> [<sub>CP</sub> dachte Gereon [<sub>CP</sub>  $t_1$  gehört zum Wanderweg]].  
the cow pasture thought Gereon is part of the hiking.trail  
‘Gereon thought that the cow pasture is part of the hiking trail.’

<sup>4</sup>The following examples are all based on data from Müller (1995) with the same underlying syntactic structure; the original data is referred to below the respective examples.

## 1.2. Island insensitivity

In view of the RRC, rightward movement seems to be more restricted than leftward movement at first sight;<sup>5</sup> however, we can observe that there are, on the other hand, also restrictions on leftward movement to which rightward movement does not seem to be sensitive. This is shown in the following examples, which involve movement out of islands: in (6), a CP is moved out of a (complex) subject DP; in (7), a CP is moved out of a complex object DP. As is well-known since Ross (1967), this leads to a violation of the Subject Condition (in (6b)) and/or the Complex NP Constraint (in (6b)/(7b)) in the case of leftward movement (here topicalization, (6b), and scrambling, (7b)); by contrast, the extraposition examples in (6a)/(7a) are grammatical despite the intervening islands.<sup>6</sup>

(6) *Movement of a CP out of a (complex) subject DP:*<sup>7</sup>

(a) *extraposition*; (b) *topicalization*

- a. Gereon hat [<sub>DP</sub> die Tatsache t<sub>1</sub>] interessiert, [<sub>CP</sub> dass man Gereon.ACC has the fact.NOM interested that one in den Yorkshire Wolds gut wandern kann]<sub>1</sub>.  
 in the Yorkshire Wolds well hike can  
 ‘Gereon was interested in the fact that the Yorkshire Wolds are a good place for hiking.’

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<sup>5</sup>There are, of course, also certain types of leftward movement that cannot cross clause boundaries (like DP-movement or scrambling in German, see (i)); however, the restriction does not hold for leftward movement in general.

- (i) \*dass niemand [<sub>VP</sub> Süßigkeiten<sub>1</sub> [<sub>VP</sub> glaubt, [<sub>CP</sub> dass er t<sub>1</sub> mag]]]  
 that nobody sweets thinks that he likes  
 ‘that nobody thinks that he likes sweets’  
 (cf. Müller 1995: 223, (18a), for a similar example (with VP-notation instead of vP))

In fact, Müller’s (1995) account can capture these more fine-grained differences between different types of leftward movement as well (see section 2 for details).

<sup>6</sup>Regarding leftward movement, Müller (1995) takes into account *wh*-movement, topicalization, and scrambling and discusses the observed patterns considering a larger number of island configurations; in the interest of space, I will not address all types of movement in all contexts.

<sup>7</sup>Note that example (5a) from above (which is grammatical) also involves extraposition out of a (complex) subject DP.

- b. \*<sub>[CP Dass man in den Yorkshire Wolds gut wandern kann]<sub>1</sub></sub>,  
       that one in the Yorkshire Wolds well hike can  
       hat Gereon <sub>[DP die Tatsache t<sub>1</sub>]</sub> interessiert.  
       has Gereon the fact interested  
       (cf. Müller 1995: 217, (10), for a similar example)

(7) *Movement of a CP out of a complex object DP:*

(a) *extraposition; (b) scrambling*

- a. Ich habe <sub>[DP die Vermutung t<sub>1</sub>]</sub> geäußert, <sub>[CP dass das Fahrrad  
       I have the assumption uttered that the bike  
       sehr leicht ist]<sub>1</sub>.</sub>  
       very light is  
       ‘I guessed that the bike was very light.’
- b. \*<sub>dass [CP dass das Fahrrad sehr leicht ist]<sub>1</sub></sub> ich <sub>[DP die  
       that that the bike very light is I the  
       Vermutung t<sub>1</sub>]</sub> geäußert habe.  
       assumption uttered have  
       intended: ‘... that I guessed that the bike was very light.’  
       (cf. Müller 1995: 219, (15), for an ex. with adjunct extraction)

### 1.3. Cataphoric pronouns

Finally, it can be observed that sentential pronouns must occur to the left of their associated CP, i.e. these pronouns are obligatorily cataphoric, as the difference between (8a) vs. (8b)/(8c) shows.

(8) *Obligatory cataphoricity of sentential pronouns:*

(a) *extraposition; (b) topicalization; (c) wh-movement*

- a. Gereon hat (es) bedauert, <sub>[CP dass kein Lied von ELO gespielt  
       Gereon has (it) regretted that no song by ELO played  
       wurde].</sub>  
       was  
       ‘Gereon regretted that they did not play an ELO song.’
- b. <sub>[CP Dass kein Lied von ELO gespielt wurde]</sub> hat Gereon (\*es)  
       that no song by ELO played was has Gereon (it)  
       bedauert.  
       regretted

- c. Was hat Gereon (\*es) bedauert?  
 what has Gereon (it) regretted  
 ‘What did Gereon regret?’  
 (cf. Müller 1995: 230, (31), for a similar (a)/(b)-example)

## 2. Müller (1995): The Principle of Unambiguous Binding

The central principle on which Müller’s (1995) account of the observed facts relies is the Principle of Unambiguous Binding (PUB), see (9).

(9) *Principle of Unambiguous Binding (PUB):*

- a. A variable that is  $\alpha$ -bound must be  $\beta$ -free in the domain of the head of its chain (where  $\alpha$  and  $\beta$  refer to different types of positions).  
 (Müller & Sternefeld 1993: 461, Müller 1995: 223)
- b. *Types of positions:*  
 SpecC, SpecT, left-adjunction to XP, right-adjunction to XP

In a nutshell, this means that after the first movement step to an A’-position (which turns the trace into a variable), only positions of the same type may be targeted, following the classification in (9b).<sup>8</sup>

### 2.1. Clause-boundedness

Since locality theory typically only allows extraction across a clause boundary if SpecC is used as an escape hatch, the PUB can now easily derive the data in (3) and (4):<sup>9</sup> long (successive-cyclic) *wh*-movement is perfectly fine since only SpecC positions are used as landing sites, i.e. the PUB is respected (see (10a)); by contrast, movement to SpecC cannot be followed by any instance of

<sup>8</sup>(9b) is based on the assumption that *wh*-movement and topicalization target SpecC, DP-movement targets SpecT, scrambling involves left-adjunction (in the verbal domain), and extraposition right-adjunction (to IP/TP).

<sup>9</sup>The locality theory on which Müller (1995) is based is the barriers framework, and that SpecC is an obligatory escape hatch is motivated as follows: “assuming, for instance, Sportiche’s (1989: 44) approach, CP is a barrier for anything included in C’” (Müller 1995: 215). But note that also in more recent models (like phase theory) SpecC is typically taken to be a relevant landing site for successive-cyclic movement.

right-adjunction – this would violate the PUB, hence it is correctly predicted that extraposition (which involves right-adjunction to TP) is clause-bounded.

(10) *Movement across a clause boundary:*

(a) *wh-movement*; (b) *extraposition*

- a.  $[_{CP} \alpha_1 \dots [_{CP} t'_1 [_{C'} \dots t_1]]] \rightarrow$  PUB respected  
*landing sites*: SpecC, SpecC
- b.  $*[_{TP} [_{TP} \dots [_{CP} t'_1 [_{C'} \dots t_1]]] \alpha_1] \rightarrow$  PUB violated  
*landing sites*: SpecC, right-adjunction (to TP)

## 2.2. Islands

The PUB account of the other two properties is based on the observation that in both cases the problem boils down to the difficulty that an NP barrier has to be overcome. In fact, Müller (1995) analyzes a lot of island data, involving PP and CP extraction from subject NPs and extraction from different types of object NPs (including the extraction of genitive NPs out of NP); what they all seem to have in common is that the moved constituent must move across an NP boundary. Following standard assumptions of the barriers framework, this is problematic since NP forms a barrier and thus disallows extraction; however, one way of circumventing barriers has typically been adjoining to them – and as Müller convincingly argues, NP barriers can be circumvented by right-adjoining to them. This means that a constituent could get out of the discussed islands by first right-adjoining to the respective NP barrier; but, crucially, following the PUB, this may only be followed by movement targeting another right-adjoined position, as is the case with extraposition (see (11a)). Subsequent leftward movement, by contrast, inevitably violates the PUB (see (11b)).

(11) *Movement out of an island with an NP boundary:*

(a) *extraposition*; (b) *leftward movement*

- a.  $[_{TP} [_{TP} \dots [_{NP} [_{NP} \dots t_1] t'_1]] \alpha_1] \rightarrow$  PUB respected  
*landing sites*: right-adjunction (to NP), right-adjunction (to TP)
- b.  $*[_{XP} \alpha_1 \dots [_{NP} [_{NP} \dots t_1] t'_1]] \rightarrow$  PUB violated  
*landing sites*: right-adjunction (to NP), a position to the left

## 2.3. Cataphoric sentential pronouns

As far as sentential pronouns are concerned, Müller (1995) follows Bennis (1986), Vikner (1995) a.o. and assumes that these are NP arguments which take the associated clause as their complement, which is then moved to another position. Again, this means that the CP has to get out of the NP in a first movement step; and in a barrier-based theory this means that the first instance of movement has to be right-adjunction to NP to circumvent the NP barrier. Hence, it is again correctly predicted that this only works in the context of extraposition, where the subsequent movement step occurs to the right, namely to another right-adjoined position, whereas subsequent leftward movement is ruled out by the PUB.

(12) *Cataphoric sentential pronouns:*

(a) *extraposition; (b) leftward movement*

- a. [TP [TP ... [NP [NP es t<sub>1</sub>] ... t'<sub>1</sub>]] α<sub>1</sub>] → PUB respected  
*landing sites:* right-adjunction (to NP), right-adjunction (to TP)
- b. \*[XP α<sub>1</sub> ... [NP [NP es t<sub>1</sub>] ... t'<sub>1</sub>]] → PUB violated  
*landing sites:* right-adjunction (to NP), a position to the left

## 3. From Improper Movement to Improper Edge Feature Insertion

Interestingly, the account of the above-mentioned differences between leftward and rightward movement (i.e. extraposition) is based on the central observation that a constituent cannot move out of CPs or NPs without further ado.

Since Müller's (1995) implementation, almost three decades have passed and meanwhile, locality theory has abandoned the concept of barriers. However, recent syntactic theory still considers CPs and DPs (= the modern version of the NP) to be problematic for extraction; after all, they are commonly considered to be phases,<sup>10</sup> and in order to overcome these without violating the Phase Impenetrability Condition (PIC), constituents have to move successive-cyclically via the phase edges that intervene between their base and target

<sup>10</sup>For CPs (and vPs) this has been claimed from the very beginning (see Chomsky 2000, 2001); DPs have not immediately been in the center of discussion, but in subsequent work they have often been considered to be phases as well (see, for instance, McCloskey 2000, Heck & Zimmermann 2004, Svenonius 2004). Moreover, in proposals that assume that every phrase is a phase, DPs are of course also phases (see, for instance, Müller 2004, 2010, Fischer 2004). In the following, it will be assumed that CPs, vPs, and DPs are phases.



position.<sup>11</sup> As a result, the analysis of our example involving long *wh*-movement (repeated from (4)) now looks as follows:

- (13) *Wh-movement via phase edges:*  
 [<sub>CP</sub> What<sub>1</sub> did you [<sub>vP</sub> t<sub>1</sub><sup>''''</sup> say [<sub>CP</sub> t<sub>1</sub><sup>'''</sup> Sue [<sub>vP</sub> t<sub>1</sub><sup>''</sup> thought [<sub>CP</sub> t<sub>1</sub><sup>'</sup> the Greeks had [<sub>vP</sub> t<sub>1</sub><sup>'</sup> proven t<sub>1</sub>]]]]]]?]

### 3.1. Intermediate landing sites

Strikingly, derivations like (13) standardly involve movement from SpecC back to Specv, which suggests that in the phase model the old notion of improper movement no longer seems to be in the focus of discussion (let alone the more fine-grained system on which the PUB relies) – at least, if we assume that Specv qualifies as A- and SpecC as A'-position.<sup>12</sup> In fact, Chomsky (2000) briefly addresses this issue, and although he argues that derivations like (13) would not raise a problem, he admits that "[o]n some assumptions [...] [this movement] passing through [Specv] is improper movement" (Chomsky 2000: 145, fn. 53).<sup>13</sup>

In any case, a full-fledged theory of improper movement does not seem to exist in the phase model, and one might ask whether there should not be some

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<sup>11</sup>I will adopt the following version of the PIC:

- (i) *Phase Impenetrability Condition (PIC):*  
 The domain of a head X of a phase XP is not accessible to operations outside XP; only X and its edge are accessible to such operations. (Chomsky 2000: 108)

<sup>12</sup>The standard concept of improper movement simply forbids movement from an A'- to an A-position and does not distinguish in addition between different types of A'-positions (unlike the PUB). Since A-positions are traditionally defined as "any position capable of bearing a grammatical function" (Roberts 1997: 148), we would expect Specv to be an A-position while SpecC is not; as a result, movement from SpecC to Specv should be improper.

<sup>13</sup>Roughly speaking, Chomsky argues that the types of features that a phase head bears are responsible for the nature of the projected Spec position: if a head does not bear  $\phi$ -features (as in the case of C), its specifiers are automatically A'-positions since only a head with  $\phi$ -features can project A-specifiers; in the case of v, it is more complicated since different Specv positions are not necessarily of the same type. As v bears  $\phi$ -features, its specifiers qualify as A-positions as long as these  $\phi$ -features have not yet been deleted. However, Chomsky argues that "these would have been deleted phase-internally" (Chomsky 2000: 110) already before specifiers serving as intermediate landings sites would be projected, which would then turn them into A'-positions.

reinterpretation of these old restrictions on successive-cyclic movement – i.e., improper movement might have to be redefined in the light of phase theory.

### 3.2. Triggers for successive-cyclic movement

Another issue that arises in view of the derivation in (13) is the question of what triggers successive-cyclic movement. Given the minimalist doctrine that movement is generally feature-driven, a standard answer has been that so-called edge features (EFs) (or, in other terms, a generalized type of EPP-feature; see also Chomsky 2000) can be inserted more or less freely on phase heads to trigger movement to the respective phase edges.<sup>14</sup> While the concrete nature of these EFs is often neglected in the literature, Müller (2010, 2011) assumes that they are of the same type as the respective target feature – i.e., the intermediate movement steps of long *wh*-movement, for instance, are triggered by *wh*-EFs.<sup>15</sup>

### 3.3. Improper edge features

If we follow this idea that EFs are specified differently for different movement types, we can relate different movement restrictions to these underlying relativized EF specifications. Generally speaking, we get the following scenario: in order to extract a constituent  $\alpha$  out of phase  $\pi P$  using movement type X, we first have to insert an X-EF on the phase head  $\pi$  to trigger movement of  $\alpha$  to the phase edge; only then can the constituent be subsequently X-moved out of  $\pi P$  without violating the PIC. However, assume that not all types of phase heads are compatible with all types of EFs; if there are restrictions on

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<sup>14</sup>Following Chomsky (2000, 2001, 2008)), they can be inserted "if [this] ha[s] an effect on outcome" (Chomsky 2000: 109; Chomsky 2001: 34); see Müller (2010, 2011) for a more extensive discussion of what exactly this means.

<sup>15</sup>This is the implementation (and notation) I will adopt in the following. An alternative would be to assume that successive-cyclic movement to phase edges is triggered by the need of the moving constituent itself to ultimately have certain features checked (as suggested, for instance, in Bošković 2007); in particular, analyses that rely on upward Agree as a standard licensing configuration often adopt this view (see, for instance, Zeijlstra 2012 with respect to successive-cyclic *wh*-movement or Fischer 2018, Fischer & Høyem 2021, 2022, Brodahl et al. 2023 in the context of control). A predecessor along this line has moreover been the principle Phase Balance; see Heck & Müller (2000, 2003), Müller (2004), Fischer (2004) a.o.

this compatibility, we predict that not all types of movement can overcome all kinds of phase boundaries, and extractability will be relativized.<sup>16</sup>

- (14) a. *If X-EF is compatible with phase head  $\pi$ :*  
 $[\pi_P \alpha_{[X]} \pi_{[X-EF]} \dots t_\alpha]$   
 $\rightarrow$  subsequent extraction of  $\alpha$  out of  $\pi_P$  will respect the PIC
- b. *If X-EF is not compatible with phase head  $\pi$ :*  
 $[\pi_P \pi \dots \alpha_{[X]}]$   
 $\rightarrow$  subsequent extraction of  $\alpha$  out of  $\pi_P$  will violate the PIC

### 3.3.1. No rightward movement via CP edges

In the phase model, clause-boundedness boils down to the impossibility of moving out of a CP phase. Following our line of reasoning, this might come about due to the fact that the relevant EF cannot be inserted on the C head. Since *wh*-movement is not clause-bounded, we can conclude that *wh*-EFs are compatible with C (and  $v$ ); as a result, *wh*-movement can target these phase edges as intermediate landing sites and long *wh*-movement is expected to be grammatical (see also (13)).

By contrast, extraposition cannot cross clause boundaries; so whichever feature triggers extraposition (for the sake of simplicity, I will just call it [Ex]), the respective EF does not seem to be compatible with the phase head C. As a result, the corresponding constituent cannot move to the phase's edge and will be stuck inside the CP, since extraction would otherwise yield a violation of the PIC.<sup>17</sup>

<sup>16</sup>That standard phase theory might not leave enough room for the variation that can be observed regarding different movement patterns has also been noted by Keine (2016, 2019). His approach in terms of selective opacity takes the view that the search domain of different probes might vary in size (cf. his notion of horizons) – i.e. "[s]elective opacity requires that a given position be accessible to some operations but not to others" (Keine 2019: 34). With respect to phase theory, he criticizes that "elements at the edge of a phase are accessible to *all* operations; elements in its domain are accessible to *none*" (Keine 2019: 34). The approach developed in this paper, by contrast, sticks to these basic assumptions of phase theory and does not relativize the search domain (nor phases as such), but rather limits the access to the phase edges, which implies that a relevant precondition for extraction might not be met in all cases alike.

<sup>17</sup>I will remain agnostic regarding the question of what the concrete intermediate landing sites are in the case of extraposition; whether this must be a specifier position or might alternatively be an adjoined position (which would be closer to Müller's 1995 original proposal) is not relevant at this point as long as the extraposed phrase moves via all intervening phase edges. In

### 3.3.2. *No leftward movement via DP edges*

On the other hand, we have seen that extraposition is not sensitive to islands that involve a DP boundary – i.e., DP phases do not block extraposition. This indicates that the feature [Ex] is compatible with D-heads, which means that the constituents we want to extrapose can use the edge of DP as an intermediate landing site. This is again different from leftward movement; as Müller (1995) shows in detail, *wh*-movement, topicalization, and also scrambling are blocked by islands that involve DP boundaries (see (6b), (7b), (8b), (8c)). Again, this scenario is predicted if we assume that these types of edge features are not compatible with phase heads of type D; as a result, intermediate movement to the phase's edge is blocked and subsequent extraction would violate the PIC.

In fact, this analysis also accounts for the cataphoricity of sentential pronouns if we follow Müller's (1995) assumption that the sentential pronoun and its associate clause start out as one big DP out of which the CP is then extracted – this implies that the moving CP has to get out of the DP phase in a first step, which involves the insertion of corresponding edge features on the D-head. However, if it is only possible to insert *Ex*-EFs on D (and neither *wh*-EFs nor *top*-EFs nor  $\Sigma$ -EFs), we correctly predict that only extraposition can occur.<sup>18</sup> And since this involves rightward movement, the sentential pronoun surfaces obligatorily as a cataphoric pronoun.

## 4. Conclusion

In this paper, I tried to reconcile phase theory with earlier insights concerning the difference between leftward and rightward movement which were based on a strict version of improper movement (namely the Principle of Unambiguous Binding) and the barriers framework (see Müller 1995). Generally speaking, it is suggested that edge feature insertion, the underlying trigger for intermediate movement, should be relativized. The basic idea is that not all types of EFs can be inserted on all types of phase heads alike; as a result, it follows directly that extraction out of phases is blocked if movement to the corresponding

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fact, different types of EFs might provide different types of escape hatches at the phase's edge; note, however, that (Chomsky 2000: 144, fn. 48) argues that "movement to the edge will be to a Spec position" due to applicable restrictions on adjunction.

<sup>18</sup>I follow Müller's (2010, 2011) notation and assume that the feature triggering scrambling is called [ $\Sigma$ ].

phase edge is not possible – movement out of such a phase would result in a violation of the PIC.

Empirically, this paper set out to capture the data that have already been discussed in Müller 1995: this comprises German (and English) examples that involve extraposition (which is treated as an instance of rightward movement) as well as *wh*-movement, topicalization, and scrambling (which all involve leftward movement). While extraposition (and scrambling in German) are clause-bounded, this does not hold for topicalization and *wh*-movement. This means that extraction out of CPs is only blocked in the former constructions, which suggests that EF-insertion on C is illicit in the case of extraposition and scrambling, but not in the case of topicalization and *wh*-movement. By contrast, all discussed instances of leftward movement were blocked if extraction out of a DP was involved; this suggests that EF-insertion on D is only possible in the case of extraposition, which accounts for the fact that extraposition seems to be insensitive to all kinds of island constraints. In addition, it explains why sentential pronouns are obligatorily cataphoric.

As far as the vP phase is concerned, we can conclude that long movement (out of CPs) automatically involves movement via Specv as well; hence, *top*- and *wh*-EFs are expected to be compatible with the v-head. Since scrambling ultimately targets the vP domain, I suggest that the feature [ $\Sigma$ ] is generally compatible with v (i.e. also as EF), and with respect to extraposition, we can assume that the edge of the vP phase can also be used as an escape hatch in these cases since extraposed material is standardly moved out of the vP into the TP domain.<sup>19</sup> As a result, we would thus get the pattern given in (15)

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<sup>19</sup>In fact, Baltin (1981) argues that not all instances of extraposition target the TP domain; instead, he suggests that constituents that are moved out of an object can only adjoin in the verbal domain, and only material that is moved out of a subject can be adjoined in the TP domain; see (i), which shows that "extraposed object-modifiers are obligatorily *included*" in VP-fronted fragments (see Hunter & Frank 2014: 247).

- (i) John said that he would call [people  $t_1$ ] up [who are from Boston]<sub>1</sub>, and ...  
 a. \*... [<sub>VP</sub> call people up] he did who are from Boston.  
 b. ... [<sub>VP</sub> call people up who are from Boston] he did.  
 (cf. Hunter & Frank 2014: 229, 247)

But since adjunct extraposition (here in the form of a relative clause) is not taken into account in this paper, I will not discuss these data any further and neither the question of whether Baltin's locality restriction extends to argument extraposition or not.

concerning the compatibility of the four types of EFs that we have discussed and the three phase heads C, D, and v.

(15) *Compatibility of EFs and phase heads (in German)*

EF type	compatible phase heads	clause boundaries can be crossed	DP boundaries can be crossed
[wh]	C, v (not D)	✓	*
[top]	C, v (not D)	✓	*
[Σ]	v (not C, D)	*	*
[Ex]	D, v (not C)	*	✓

That this fits the empirical observations from the previous sections is summarized in (16) and (17), in which the respective examples supporting our predictions are listed.

(16) *Extractability out of CP*

extraposition	<i>wh</i> -mvt.	topic.	scrambling
(3), (5b): *	(4), fn. 3, (i): ✓	fn. 3, (ii): ✓	fn. 5, (i): *

(17) *Extractability out of DP*

extraposition	<i>wh</i> -mvt.	topic.	scrambling
(5a), (6a), (7a), (8a): ✓	(8c): *	(6b), (8b): *	(7b): *

If this analysis is on the right track, improper movement no longer relies on the distinction between particular types of positions (an assumption that might already have been called into doubt by Chomsky 2000, where not all positions of the same category (like Specv) are treated alike). Instead, improper movement boils down to the question of which types of features are compatible with which phase heads, and as a result, improper derivations can simply be ruled out by standard locality constraints like the PIC.

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