Appendices to 'The ups and downs of head displacement'

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APPENDIX A: Phase extension and Holmberg's Generalizaion

The Minimalist literature contains several related proposals to the effect that upward head displacement (formalized as Head Movement) licenses phrasal movements that are otherwise not possible. All these proposals have in common the hypothesis that upward head displacement of the head H of a phase P to a higher head extends the phase defined by H, so that extraction of elements from P that is otherwise banned by Chomsky's (2000) Phase Impenetrability Condition (PIC) is made possible. We refer to this family of phenomena as *phase extension*, following den Dikken (2006:81–152, 2007). Other accounts along these lines include Gallego's (2006) phase sliding (see also Gallego and Uriagereka 2007) and Bošković's (2015) phase collapsing. See also Chomsky 1993:13–19 and Fox and Pesetsky 2005 for related proposals that do not involve redefining phase boundaries.

Under GenHM, phase extension can be implemented in two different ways. First, we can supplement our analysis with the proposal that, along the lines of the works cited above, the boundaries of a phase are redrawn when the head of the phase establishes a GenHM relation with a higher head. This would predict that downward and upward head displacement would have the same phase-extending capabilities, since they are the result of the same syntactic operation. A second possibility is that phase extension is a postsyntactic effect, which predicts that downward and upward head movement behave differently with respect to phase extension, since, under our analysis, downward and upward head displacement have different postsyntactic properties. Following Fox and Pesetsky 2005, we claim that the latter account is correct, by concentrating on the set of phenomena that fall under Holmberg's Generalization (Holmberg 1986:165–240, Vikner 2005).[1] The rationale behind focussing on Holmberg's Generalization is that it is the only detailed case study in which upward and downward head displacement have been compared with respect to phase extension in a single language or language family: in MSc, upward displacement of the main verb licenses object shift, but downward displacement to the verb does not. As argued in detail in Fox and Pesetsky 2005 (based in large part on data in Holmberg 1999), the crucial difference between upward and downward displacement that results in the licensing of object shift has to do with postsyntactic linearization. As we show below, Fox and Pesetsky's (2005) cyclic linearization account of Holmberg's Generalization is compatible with GenHM, which we take to be futher evidence for the view of head displacement adopted here.

One of the basic contrasts covered by Holmberg's Generalization is the following. In a V2 sentence in which the main verb is in C due to upward head displacement, the verb's

[1] Holmberg (1986) refers to the generalization as the *phonetic adjacency condition*. The first use of *Holmberg's Generalization* in this sense is in Collins and Thráinsson 1993:135.

object can be shifted outside the VP to the left of adverbs such as negation (1), but in a non-V2 sentence (2), the main verb stays in VP, and object shift is not possible (we represent unpronounced positions in head chains as traces for expository purposes only).

(1) Jag kysste **henne** inte $[_{VP}\ t_{kysste}\ t_{henne}\ ]$
I kissed her not
'I didn't kiss her.' Swedish (Holmberg 1999:1)

(2) *... att jag **henne** inte $[_{VP}$ kysste $t_{henne}\ ]$
that I her not kissed
'... that I didn't kiss her.' Swedish (Holmberg 1999:1)

As shown in Holmberg 1986, 1999, this correlation between the possibility of object shift and the position of the main verb outside VP is only partial, and part of a more general pattern of order preservation: all VP-inernal material that precedes an object in a sentence without object shift must also precede the object in a corresponding sentence in which the object is shifted. In the examples above, the relevant VP-internal material is the main verb: if the verb surfaces in C, object shift preserves the base verb-object order (1), but if the verb surfaces in VP, object shift reverses the order, which is not licit (2). Thus, the explanation for the correlation between the directionality of head displacement of the verb and object shift has to do with the surface effect of the displacement, and not directly with the specific syntactic operation underlying it.

This predicts that upward head displacement of the verb is neither sufficient, since other VP-internal material may contribute to blocking object shift, nor necessary, since syntactic operations other than head displacement may contribute to preserving the base verb-object order. Both predictions are confirmed, as shown in Holmberg 1986, 1999, and Fox and Pesetsky 2005.

Fox and Pesetsky (2005) account for these patterns based on the hypothesis that post-syntactic linearization is done cyclically, that is, it is interleaved with the syntactic derivation at particular structural points (this is their implementation of Chomsky's (2000) derivation by phase). These *cyclic spellout domains* include VP and CP: as the syntax incrementally builds clause structure, it ships the structure to be processed postsyntactically whenever it constitutes a spellout domain. Postsyntactic processing includes linearization of the syntactic objects in the spellout domain, and, crucially, the linear order of elements determined at a given application of Spellout is preserved in later stages in the derivation. Application of Spellout in higher domains may add other linear relations, but never delete or alter previously established ones. This derives order preservation in the particular case of object shift, under the assumption that this operation involves direct extraction of the object to its VP-external surface position, that is, it does not involve an intermediate VP-internal step. When VP is spelled out, the relative order of its subconstituents is fixed; in particular, any element that precedes the object at this stage (e.g. the verb) must do so as well at later applications of Spellout. Thus, if the object moves out of the VP, any such element must displace to an even higher position, in order to be consistent with the linear order fixed at the VP domain.

This account of Holmberg's Generalization does not rely on the specific syntactic mechanism underlying head displacement, but on its effect on linearization. The contrast between upward and downward head displacement observed in (1–2) is simply due to the fact that the verb precedes the shifted object under upward displacement, but follows it under downward displacement. The analysis is thus compatible with GenHM, under the hypothesis that Head Chain Pronunciation is part of the process of postsyntactic linearization. When the VP is spelled out in both (1) and (2), V^* is not in a GenHM relation with any higher head, and the order verb-object is fixed (recall from subsection 3.2 that V is strong in MSc, and so is C in V2 sentences):[2]

(3) $[_{VP}\ V^*\ \text{Obj}\ ]$

V_m

Ordering imposed at VP: $V_m \prec \text{Obj}$

In the CP domain, the object is extracted from VP, and V^* enters into a GenHM relation with T. No other relevant operations apply in a non-V2 sentence (2), and since V^* is strong, the $[V_m–T_m]$ complex is spelled out in V^* (i.e. downward head displacement):

(4) $[_{CP}\ C\ [_{TP}\ \text{Sbj}\ T\ \text{Obj}\ \text{Adv}\ [_{VP}\ V^*\ t_{Obj}\ ]]]$

$V_m–T_m$

Ordering imposed at VP: $\mathbf{V_m} \prec \mathbf{Obj}$ (from (3))
Ordering imposed at CP: $C_m \prec \text{Sbj} \prec \mathbf{Obj} \prec \text{Adv} \prec \mathbf{V_m} \prec T_m$

This yields an ordering conflict in which the verb both precedes and follows the object, resulting in ungrammaticality. On the other hand, in a V2 sentence (1), T enters into an additional GenHM relation with C^*, forming a complex head $[V_m–T_m–C_m]$ that is spelled out in C^*, as the latter is strong:

(5) $[_{CP}\ \text{Sbj}\ C^*\ [_{TP}\ t_{Sbj}\ T\ \text{Obj}\ \text{Adv}\ [_{VP}\ V^*\ t_{Obj}\ ]]]$

$V_m–T_m–C_m$

Ordering imposed at VP: $\mathbf{V_m} \prec \mathbf{Obj}$ (from (3))
Ordering imposed at CP: $\text{Sbj} \prec \mathbf{V_m} \prec T_m \prec C_m \prec \mathbf{Obj} \prec \text{Adv}$

No ordering conflict arises, since, in particular, the verb is required to precede the object at both spellout domains.

To conclude, to the extent that upward and downward head displacement display asymmetries in their ability to license phrasal movements, these are arguably due to their differing effects on linear order, not to any alleged differences in their syntactic derivations. This

[2] In the representations below, $x < y$ denotes 'x precedes y', and we ignore the ordering of phonetically null elements.

is precisely as predicted by the theory of GenHM, in which upward and downward head displacement only differ with respect to postsyntactic linearization.

APPENDIX B: The spellout of head chains and phrasal chains

The crosslinguistic typology of VP fronting has revealed an asymmetry between phrasal movement and head movement: traces of head movement are doubled in the fronted VP, as in Russian (6), but traces of phrasal movement are not (7).

(6) [$_{VP}$ Dumat' o ženit'be]$_i$ on dumaet$_k$ [$_{VP}$ ~~dumat'$_k$ o ženit'be~~]$_i$.
think.INF about marriage he thinks
'He thinks about marriage' Russian (Harizanov and Gribanova 2017:5)

(7) ... and [$_{VP}$ elected ~~John~~] John was ~~[$_{VP}$ elected John]~~.

This asymmetry can be further seen in Polish, e.g. in a sentence involving object topicalization and subsequent VP fronting:

(8) [$_{VP}$ Wybrać (*Marka$_i$)], może Marka$_i$ wybiora$_k$ ~~[$_{VP}$ wybiora$_k$ Marka$_i$]~~
elect.INF Marek maybe Marek elect.FUT.3pl
'Elect Marek, maybe they will.' Polish

In (8), both the verb and the object vacate the VP. However, only the verb is pronounced in the fronted VP, creating verb doubling. Similar doubling is not possible for the object.

Assuming the Copy Theory of Movement and Chain Reduction (Chomsky 1993, Nunes 1995), the fronted copy of the verb in (6) is expected to undergo deletion by the same mechanism that deletes the fronted copy of *John* in (7). The occurrence of doubling has received two types of account. One type of approach takes the spellout asymmetry in head- and phrasal movement chains as evidence that the two processes are not the same operation (LaCara 2016, Harizanov and Gribanova 2017, Hein 2018), and it is the stand we take. The other family of approaches maintain that head movement and phrasal movement are both Internal Merge, and the asymmetry is due to special properties of head movement chains. For instance, Bastos (2001), Nunes (2004), Bošković and Nunes (2007) propose that head movement may result in morphological fusion of the moved head with the target head, which prevents Chain Reduction from applying, which in turn causes doubling. Landau (2006) attributes the appearance of verb doubling in Hebrew to prosodic constraints which require the fronted, topicalized copy of the verb to be overt. On the other hand, both Saab (2008, 2017) and Preminger (2019) derive doubling from copy-deletion algorithms that are specific for heads, and may produce either doubling or deletion, depending on the syntactic context in which they apply.

In our theory, the basis for deriving verb doubling is the proposal that GenHM is not the same operation as phrasal movement. Phrasal movement creates type identical copies, while GenHM does not – rather, it creates a *token identical shared* M-value (as detailed in section 2). For this reason, mechanisms deleting copies, such as Chain Reduction, do

not apply to head chains. Head displacement is governed by a different spellout algorithm, called Head Chain Pronunciation, which is part of Linearization (9).

(9) *Head Chain Pronunciation*
Delink all positions in a head chain except:

a. the highest strong position, if any;
b. otherwise, the highest position.

For phrasal movement chains, we proposed that copy deletion is part of the Move operation (instead of adopting Nunes' (1995) Chain Reduction). Thus, Move is as operation with three components: *Copy, Merge* and *Delete* (10) (adapting ideas in Saab 2008, 2017).

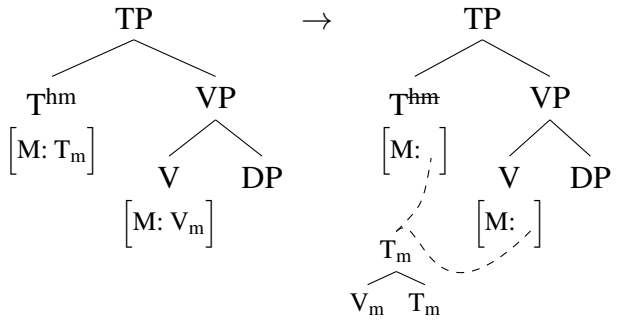
(10) Move(α, β), where α is a syntactic object containing β:

a. *Copy*: create a type-identical copy of β, β^+
b. *Merge*: merge β^+ and α
c. *Delete*: assign [-P] to β

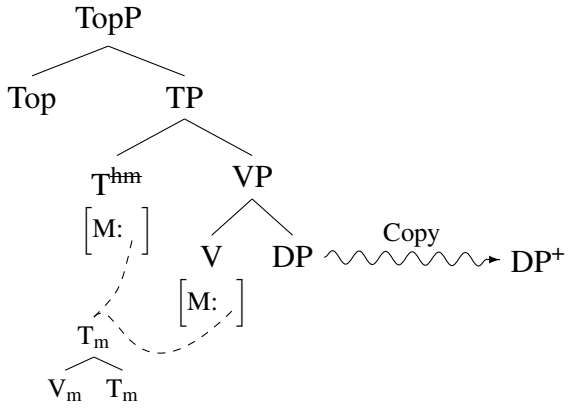
[-P] is a feature which makes the terminal node invisible to Vocabulary Insertion, effecting deletion of the lower copy.

Below, we demonstrate how copy deletion of movement interacts with Head Chain Pronunciation to derive the spellout asymmetry between heads and phrases discussed above. We do so by presenting a step-by-step derivation of (8). First, syntactic operations applying cyclically – in this case, GenHM and two instances of Move (11-15).

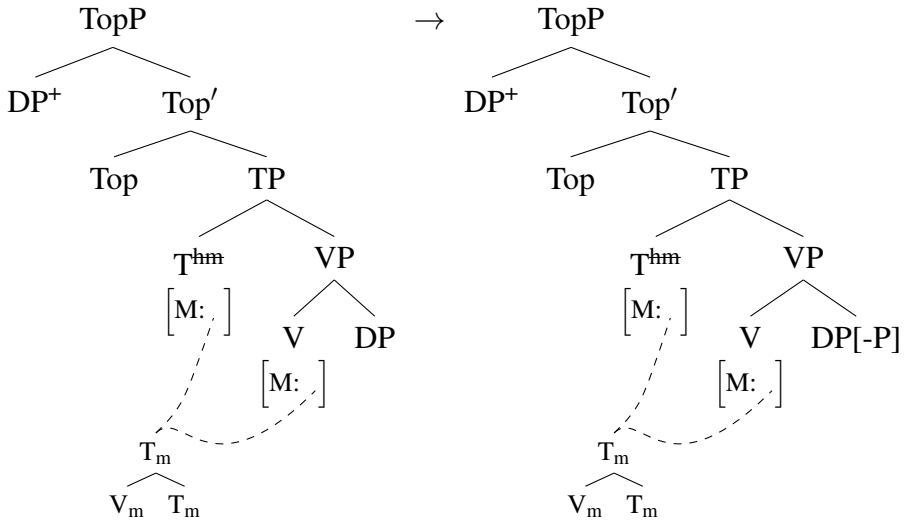
(11) *GenHM between V and T*



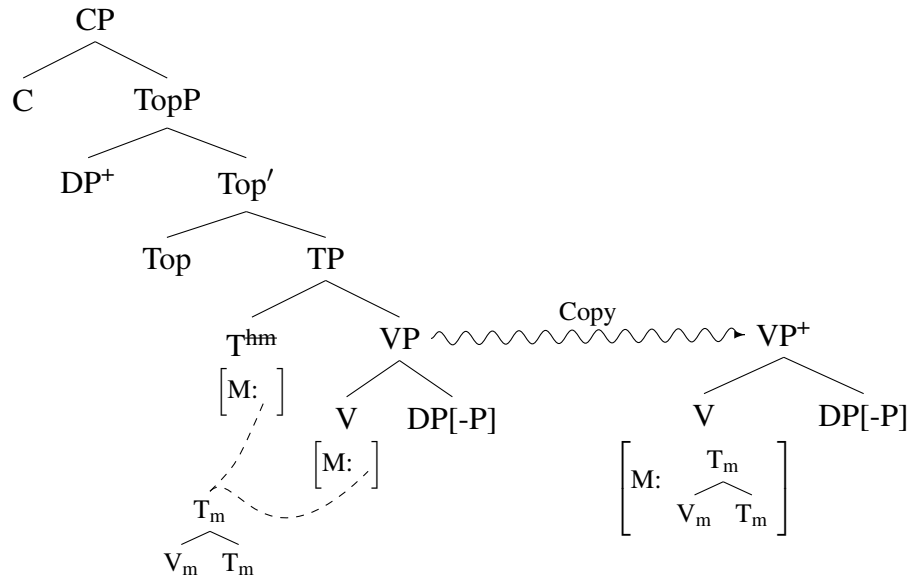
(12) *Object topicalization: Merge Top, Copy object DP*



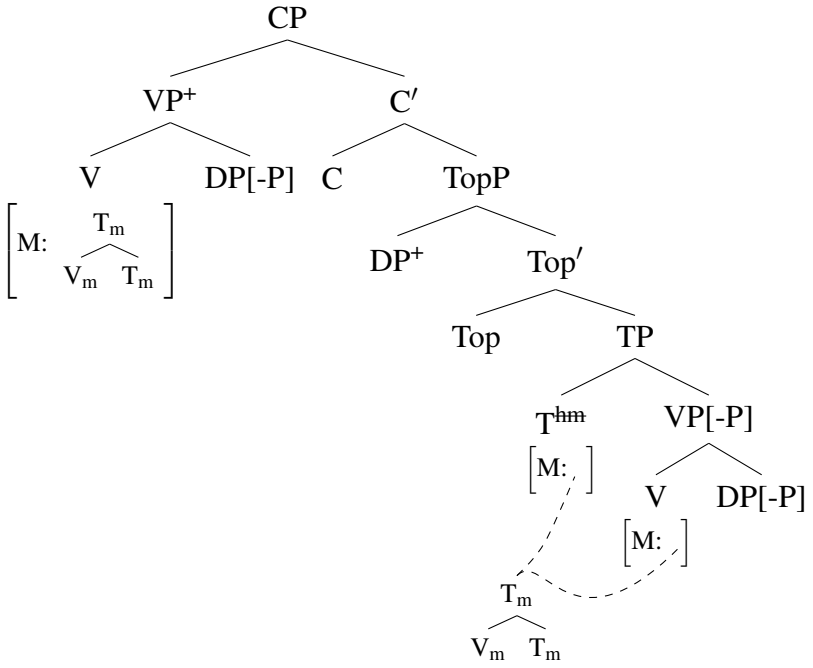
(13) *Object topicalization: Merge(TopP,DP+), assign [-P] to DP*



(14) *VP Fronting: Merge C, Copy VP*



(15) *VP Fronting: Merge (CP,VP+), assign [-P] to VP*



Under the proposed definition of Move, where [-P] assignment is part of the operation, the object DP is marked for deletion (assigned [-P]) immediately after its copy is merged in a higher position. Since DP movement derivationally precedes VP movement in this case, the VP copy created in (14) and merged in (15) contains an object DP that's already marked with [-P]. Thus, obligatory non-pronunciation of phrasal movement "traces" in VP-fronting follows from cyclicity of syntactic operations. (This extends to other instances of remnant movement).

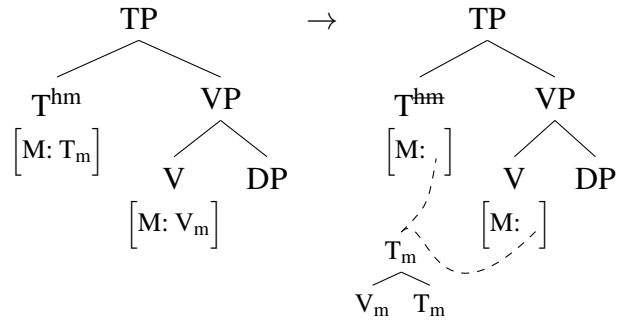
The structure in (15) is the input to PF rules, which include Head Chain Pronunciation followed by Vocabulary Insertion. Due to syntactic VP copying, the structure contains two head chains with a type-identical M-value, and Head Chain Pronunciation applies to each independently, giving rise to verb doubling. The lower head chain is pronounced in T, the highest position, while the higher chain (inside the fronted VP) is pronounced with in V, the only syntactic terminal it is associated with.

The account of verb doubling presented above shares the basic idea with LaCara 2016, Harizanov and Gribanova 2017, Hein 2018 in that, unlike phrasal movement, head displacement does not create copies that could then undergo deletion. A difference between those accounts and ours is that GenHM is syntactic, while these authors propose postsyntactic head displacement operations (see section 5 for evidence that it is syntactic – it must precede VP fronting to give rise to inflection doubling).

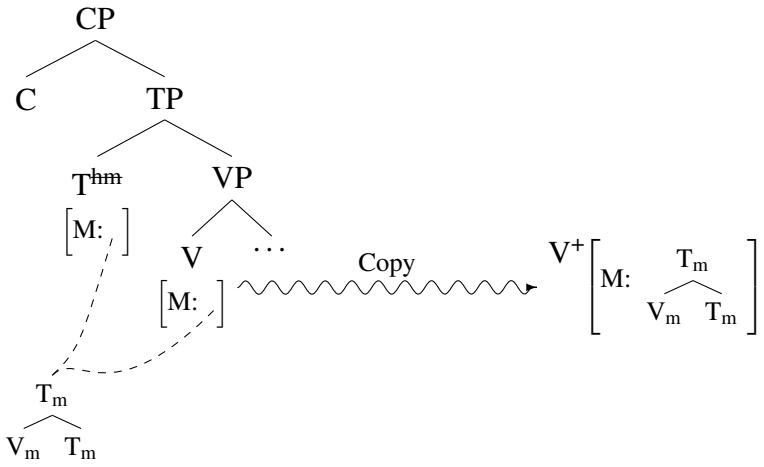
On the present account, every instance of VP fronting will produce verb doubling if there is GenHM with a head external to the VP. Remnant VP-fronting is, however, not the only way in which so called predicate clefts arise. Another mechanism that has been claimed to produce them is long head movement of the verb (i.a. Koopman 1984, Lema and Rivero 1990, Embick and Izvorski 1997, Landau 2006, Vicente 2007). We follow previous literature in treating long head movement on a par with phrasal movement, i.e. as Move (it cannot be produced by GenHM, which is strictly local). Since long head movement is an operation that creates copies, the regular copy deletion mechanism applies. As with VP fronting, long verb movement gives rise to verb doubling if V is related by GenHM with a higher head.

(16) likro, hu kara et ha-sefer.
read.INF he read ACC the-book
'As for reading, he read the book.' Hebrew (Landau 2006:50)

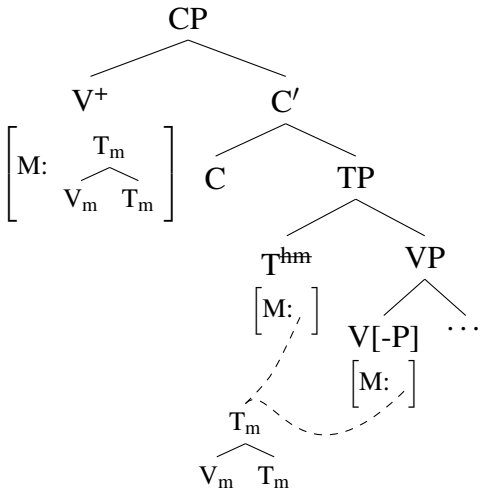
(17) *GenHM between V and T*



(18) *Long V Movement: Merge C, Copy V*



(19) *Long V Movement: Merge (CP,V$^+$), assign [-P] to V*



Like, VP movement, bare V movement creates a type-identical copy of the verb and its M-value. Thus bare V fronting gives rise to verb doubling for the same reasons as VP fronting, outlined above.[3] Furthermore, our theory provides a unified account of why T_m is pronounced deficiently (as infinitival inflection) in the higher copy in both V- and VP-fronting. As discussed in section 4, the PF rule of *Orphan Assignment* assigns the [O] feature to any morphological terminal X_m that's not associated with the corresponding terminal X. T_m is such a morphological terminal in both the VP- and V-fronting cases.

[3] Hein (2018) argues that, unlike VP fronting, bare V fronting can only result in doubling, and never in *do*-support. He implements it by stipulating that copies of long head movement are immune to the copy deletion algorithm that applies to phrases, and thus always gives rise to doubling. If the generalization he provides is indeed true, we could introduce a similar stipulation in the definition of Move. There is, however, evidence that long head movement can result in deletion of lower copies, e.g. in participle fronting in Slavic (Lema and Rivero 1990, Embick and Izvorski 1997).

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